

## 5,500,000 American Depositary Shares

# BIONTECH

### Representing 5,500,000 Ordinary Shares

---

We are offering 5,500,000 American Depositary Shares, or the ADSs, with each ADS representing one ordinary share, or the Underwritten Offering. The Selling Shareholder identified in this prospectus is offering 825,000 ADSs if and to the extent that the underwriters exercise their option to purchase additional ADSs described below. We will not receive any of the proceeds from the sale of ADS by the Selling Shareholder. ADSs representing our ordinary shares are listed on the Nasdaq Global Select Market under the symbol “BNTX.” On July 21, 2020, the last reported sale price of the ADSs on the Nasdaq Global Select Market was \$91.60 per ADS.

---

This offering is part of a Global Offering consisting of a rights offering and this Underwritten Offering, covering, in the aggregate, up to 7,505,596 ordinary shares (including ordinary shares represented by ADSs), as described further in this prospectus. The ADSs being offered by this prospectus are being so offered based upon irrevocable, binding agreements under German law from certain holders of our ordinary shares, representing 74.83% of our outstanding ordinary shares (including ordinary shares represented by ADSs), not to transfer or exercise rights to subscribe for our new ordinary shares that we intend to grant in a rights offering we intend to conduct. This offering together with the rights offering constitute the Global Offering.

**Investing in the ADSs representing our ordinary shares involves a high degree of risk. See “[Risk Factors](#)” beginning on page 22 of this prospectus.**

**We are an “emerging growth company” and a “foreign private issuer” as defined under the U.S. federal securities laws and, as such, are eligible for reduced public company disclosure requirements. See “Prospectus Summary—Implications of Being an Emerging Growth Company and a Foreign Private Issuer” for additional information.**

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

	<u>PER ADS</u>	<u>TOTAL</u>
Public offering price	\$ 93.00000	\$ 511,500,000
Underwriting discounts and commissions <sup>(1)</sup>	\$ 5.29161	\$ 29,103,855
Proceeds to us before expenses	\$ 87.70839	\$ 482,396,145

(1) See "Underwriting" for details concerning underwriter compensation and expense reimbursement arrangements.

The underwriters have the option for a period of 30 days from the date of this prospectus to purchase an additional 825,000 ADSs from the Selling Shareholder.

Delivery of the ADSs is expected to be made on or about July 27, 2020.

---

**J.P. Morgan**  
**UBS Investment Bank**  
**COMMERZBANK**

---

**BofA Securities**  
**Wolfe Capital Markets and Advisory**

---

**Berenberg**  
**Canaccord Genuity**  
**Bryan, Garnier & Co.**

Prospectus dated July 22, 2020

**TABLE OF CONTENTS**

<a href="#">ABOUT THIS PROSPECTUS</a>	i
<a href="#">ABOUT THE GLOBAL OFFERING</a>	i
<a href="#">PRESENTATION OF FINANCIAL INFORMATION</a>	i
<a href="#">TRADEMARKS, SERVICE MARKS AND TRADE NAMES</a>	ii
<a href="#">MARKET AND INDUSTRY DATA</a>	ii
<a href="#">PROSPECTUS SUMMARY</a>	1
<a href="#">RISK FACTORS</a>	22
<a href="#">CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS</a>	30
<a href="#">USE OF PROCEEDS</a>	32
<a href="#">DIVIDEND POLICY</a>	34
<a href="#">CAPITALIZATION</a>	35
<a href="#">DILUTION</a>	37
<a href="#">SELECTED CONSOLIDATED FINANCIAL DATA</a>	39
<a href="#">UNAUDITED PRO FORMA CONDENSED COMBINED FINANCIAL INFORMATION</a>	41
<a href="#">BUSINESS</a>	49
<a href="#">PRINCIPAL AND SELLING SHAREHOLDERS</a>	187
<a href="#">DESCRIPTION OF SHARE CAPITAL AND ARTICLES OF ASSOCIATION (SATZUNG)</a>	190
<a href="#">DESCRIPTION OF AMERICAN DEPOSITARY SHARES</a>	205
<a href="#">SHARES AND ADSs ELIGIBLE FOR FUTURE SALE</a>	213
<a href="#">TAXATION</a>	215
<a href="#">UNDERWRITING</a>	226
<a href="#">EXPENSES OF THE GLOBAL OFFERING</a>	235
<a href="#">LEGAL MATTERS</a>	236
<a href="#">EXPERTS</a>	236
<a href="#">SERVICE OF PROCESS AND ENFORCEMENT OF LIABILITIES</a>	236
<a href="#">WHERE YOU CAN FIND MORE INFORMATION</a>	238
<a href="#">INCORPORATION OF CERTAIN INFORMATION BY REFERENCE</a>	239

Neither we, the Selling Shareholder, nor any of the underwriters have authorized anyone to provide you with information that is different from that contained in this prospectus, any amendment or supplement to this prospectus, or any free writing prospectus we may authorize to be delivered or made available to you. Neither we, the Selling Shareholder, nor any of the underwriters take responsibility for, or provide assurance as to the reliability of, any other information that others may give you. We and the underwriters are offering to sell ADSs and seeking offers to purchase ADSs only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date on the cover page of this prospectus, regardless of the time of delivery of this prospectus or the sale of any ADSs. Our business, financial condition, results of operations and prospects may have changed since the date on the cover page of this prospectus.

For investors outside the United States: Neither we, the Selling Shareholder, nor the underwriters have taken any action that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the ADSs representing our ordinary shares and the distribution of this prospectus outside of the United States.

The prospectus summary beginning on page 1 herein highlights information contained elsewhere in this prospectus and does not contain all of the information that you should consider in making your investment decision. Before deciding to invest in the ADSs representing our ordinary shares, you should read this entire prospectus carefully, including the sections titled “Risk Factors” and “Business” in this prospectus and the sections titled “Risk Factors,” “Business” and “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and our consolidated financial statements and related notes in our Forms 20-F and 6-K incorporated by reference herein. You should also read the other documents incorporated by reference into the registration statement of which this prospectus forms a part. See “Where You Can Find More Information.”

## ABOUT THIS PROSPECTUS

Unless otherwise indicated or the context otherwise requires, all references in this prospectus to the terms “BioNTech,” the “Company,” “we,” “us” and “our” refer to BioNTech SE and our wholly owned subsidiaries.

## ABOUT THE GLOBAL OFFERING

This prospectus relates to a firm commitment underwritten offering of our ordinary shares to be represented by American Depositary Shares, or ADSs, which we refer to as the Underwritten Offering. The Underwritten Offering is part of a Global Offering that consists of (i) a rights offering to be extended to our ordinary shareholders and ADS holders, or the Rights Offering, and (ii) the Underwritten Offering. Under German law, where a company obtains binding, irrevocable agreements from certain existing shareholders not to transfer or exercise rights to be granted in a future rights offering, the company is permitted to attempt to sell the shares represented by such rights either before or after the rights offering. Based on binding irrevocable agreements not to transfer or exercise rights that we have obtained from certain holders of our ordinary shares, representing 74.83% of our outstanding ordinary shares (including ordinary shares represented by ADSs), we are conducting the Underwritten Offering pursuant to this prospectus prior to the commencement of the Rights Offering.

The Rights Offering is being conducted pursuant to a separate registration statement and prospectus. The price to public that is set in the Underwritten Offering will be the subscription price for the Rights Offering. Shareholders and ADS holders as of the respective record dates for our ordinary shares and the ADSs representing our ordinary shares who have not agreed to forego exercising their rights will have the opportunity in the Rights Offering to subscribe for up to 1,889,189 new ordinary shares or new ADSs (representing approximately 0.81% of our outstanding ordinary shares) at the subscription price. **ADSs PURCHASED IN THE UNDERWRITTEN OFFERING ARE NOT ENTITLED TO RECEIVE RIGHTS TO SUBSCRIBE FOR NEW ORDINARY SHARES OR NEW ADSs IN THE RIGHTS OFFERING.** Accordingly, a total of up to 7,389,189 ordinary shares (including ordinary shares represented by ADSs) may be sold by us in the Global Offering.

## PRESENTATION OF FINANCIAL INFORMATION

This prospectus includes financial information derived from our audited consolidated financial statements as of December 31, 2019 and 2018 and for the years ended December 31, 2019, 2018 and 2017, which have been prepared in accordance with International Financial Reporting Standards, or IFRS, as issued by the International Accounting Standards Board, or IASB, which differ in certain significant respects from U.S. generally accepted accounting principles, or U.S. GAAP, and are incorporated by reference herein. It also includes financial information derived from our unaudited interim condensed consolidated financial statements as of March 31, 2020 and for the three months ended March 31, 2020 and 2019 that have been prepared on the same basis as the audited financial statements and are incorporated by reference herein.

Our financial information is presented in Euros. For the convenience of the reader, we have translated some of our financial information into U.S. dollars. Unless otherwise indicated, these translations were made at the rate of €1.00 to \$1.1107, the noon buying rate of the Federal Reserve Bank of New York on May 29, 2020. Such U.S. dollar amounts are not necessarily indicative of the amounts of U.S. dollars that could actually have been purchased upon exchange of Euros at the dates indicated. All references in this prospectus to “\$” mean U.S. dollars and all references to “€” mean Euros and all references in this prospectus to “k\$” and “k€” refer to thousands of U.S. dollars and thousands of Euros, respectively.

We have made rounding adjustments to some of the figures contained in this prospectus. Accordingly, numerical figures shown as totals in some tables may not be exact arithmetic aggregations of the figures that preceded them.

### **TRADEMARKS, SERVICE MARKS AND TRADE NAMES**

The BioNTech SE logo, FixVac<sup>®</sup>, RiboMab<sup>®</sup>, RiboCytokine<sup>®</sup>, MammaTyper<sup>®</sup>, RECON<sup>®</sup> and NEO-STIM<sup>™</sup> and other trademarks or service marks of BioNTech appearing in this prospectus are the property of the Company. Solely for convenience, some of the trademarks, service marks, logos and trade names referred to in this prospectus are presented without the <sup>®</sup> and <sup>™</sup> symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the rights of the applicable licensors to these trademarks, service marks and trade names. This prospectus contains additional trademarks, service marks and trade names of others. All trademarks, service marks and trade names appearing in this prospectus are, to our knowledge, the property of their respective owners. We do not intend our use or display of other companies' trademarks, service marks, copyrights or trade names to imply a relationship with, or endorsement or sponsorship of us by, any other companies.

### **MARKET AND INDUSTRY DATA**

This prospectus contains industry, market and competitive position data that are based on industry publications and studies conducted by third parties as well as our own internal estimates and research. These industry publications and third-party studies generally state that the information they contain has been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information. While we believe that each of these publications and third-party studies is reliable, we have not independently verified the market and industry data obtained from these third-party sources. Forecasts and other forward-looking information obtained from these sources are subject to the same qualifications and uncertainties as the other forward-looking statements contained in this prospectus. These forecasts and forward-looking information are subject to uncertainty and risk due to a variety of factors, including those described in "Risk Factors." These and other factors could cause results to differ materially from those expressed in our forecasts or estimates or those of independent third parties. While we believe our internal research is reliable and the definitions of our market and industry are appropriate, neither such research nor these definitions have been verified by any independent source.

## PROSPECTUS SUMMARY

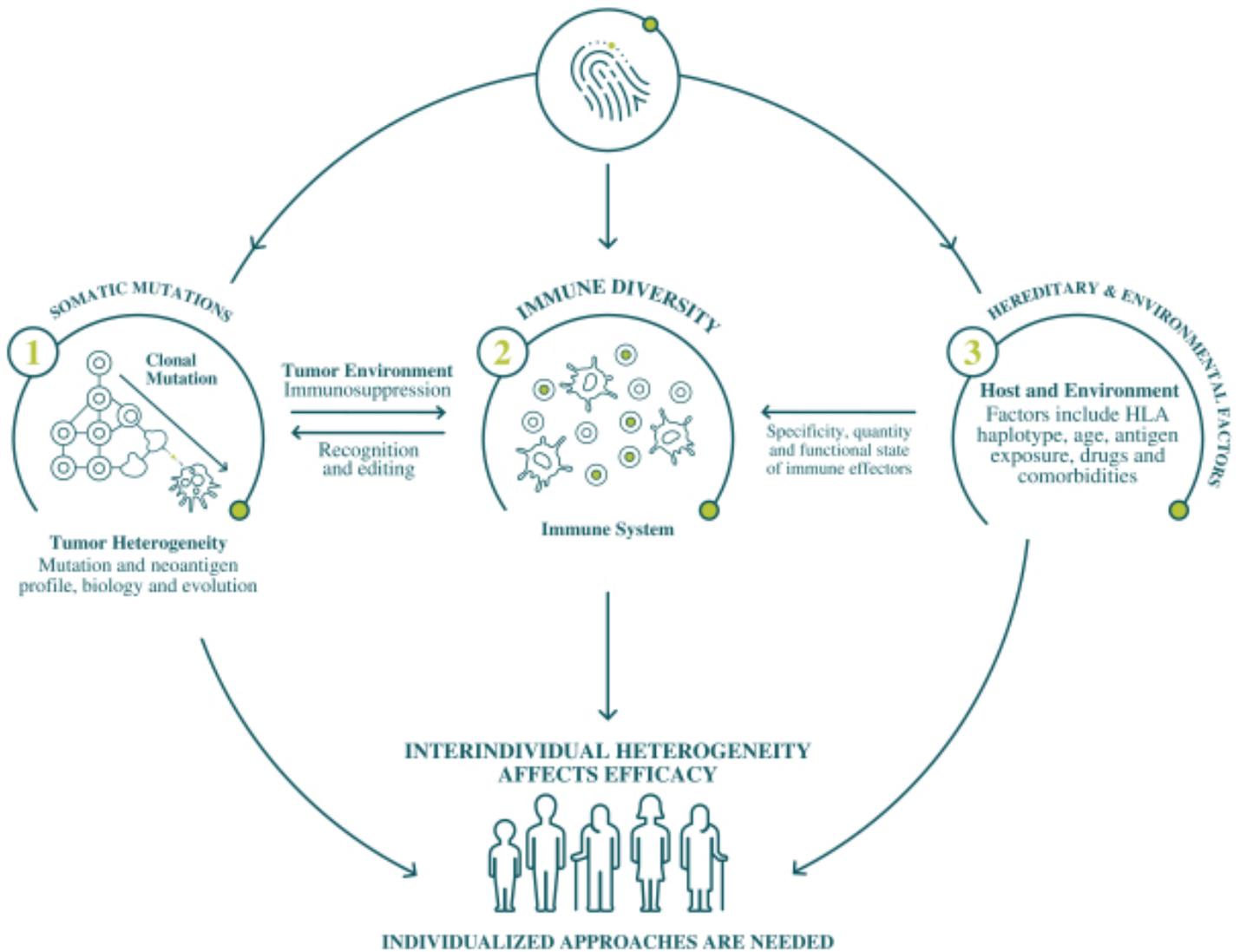
*This summary highlights selected information contained elsewhere in this prospectus and in the documents we incorporate by reference herein. This summary does not contain all of the information you should consider before making an investment decision. You should read this entire prospectus carefully, especially the risks of investing in the ADSs representing our ordinary shares discussed under “Risk Factors” beginning on page 22 of this prospectus, along with our consolidated financial statements and notes to those consolidated financial statements and the other information incorporated by reference in this prospectus.*

### Overview

BioNTech was founded in 2008 on the understanding that every cancer patient’s tumor is unique and that in order to effectively address this challenge, we must create individualized treatments for each patient. To realize this vision, we combine decades of groundbreaking research in immunology, cutting-edge therapeutic platforms and a suite of patient profiling and bioinformatic tools to develop immunotherapies for cancer and other diseases. We leverage powerful new therapeutic mechanisms and exploit a diverse array of biological targets to harness the power of each patient’s immune system to address the unique molecular signature of each patient’s underlying disease. The breadth of our immunotherapy technologies and expertise has also enabled us to develop therapies to address a range of rare and infectious diseases, and we have recently rapidly mobilized these with the aim of addressing the COVID-19 pandemic. We believe we are uniquely positioned to develop and commercialize the next generation of immunotherapies with the potential to significantly improve clinical outcomes for patients and usher in a new era of individualized medicine.

Our approach to therapeutic development in oncology is based on the key drivers of cancer heterogeneity. The interaction between cancer and the immune system is shaped by various host, tumor and environmental factors. The complex interplay of these sources of interpatient heterogeneity both affects the course of disease and determines the most appropriate choice of treatment.

**THREE KEY FACTORS INFLUENCE THE PATIENT'S UNIQUE TUMOR PROFILE**



Leveraging our expertise in the field of immunology, we and our collaborators have advanced a development pipeline of over 20 product candidates, of which 12 have entered into 13 ongoing clinical trials. Our most advanced programs are focused on oncology, where we have treated over 500 patients across 17 tumor types to date. In our Phase 1 trials, we have observed single-agent antigen-specific immune responses in over 90% of advanced melanoma patients treated with BNT111, our wholly owned lead off-the-shelf immunotherapy product candidate from our FixVac platform. In addition, we have observed single-agent antigen-specific immune responses in patients treated with BNT121, the precursor to RO7198457 (BNT122), our lead individualized neoantigen specific immunotherapy product candidate from our iNeST platform, which we are co-developing with Genentech, Inc., or Genentech. For both product candidates, we have also observed durable reduction in tumor volume, including objective responses, in both the monotherapy and checkpoint-combination settings.

We believe our technology and expertise is broadly applicable across a number of therapeutic areas, such as infectious diseases and rare diseases. In April 2020, we initiated a first-in-human clinical trial program for our BNT162 vaccine program to prevent COVID-19, which includes four vaccine candidate variants based on three distinct mRNA formats. We are co-developing BNT162 with Pfizer Inc., or Pfizer, worldwide (ex-China) and with

Shanghai Fosun Pharmaceutical (Group) Co., Ltd, or Fosun Pharma, in China. We initiated the BNT162 program in late January 2020 in response to the global COVID-19 pandemic, and initiated human testing following preclinical studies and within approximately three months of initiating the research program. Our ability to rapidly design and test multiple vaccine variants leveraged our deep experience with mRNA vaccines and our prior preclinical work in the infectious disease field.

Our immunotherapy product candidates span four distinct drug classes:

- **mRNA Therapeutics.** We have developed multiple proprietary formats and formulations of messenger ribonucleic acid, or mRNA, to deliver genetic information to cells, where it is used to express proteins for therapeutic effect.
- **Cell Therapies.** We are developing a range of cell therapies, including CAR-T cells, neoantigen-based T cell therapies and TCR therapies, in which the patient's T cells are modified or primed to target cancer-specific antigens.
- **Antibodies.** We are developing next-generation antibodies, including bispecifics, that are designed to target immune checkpoints and novel cancer antigens.
- **Small Molecule Immunomodulators.** We use small molecules to augment the activity of other drug classes by inducing specific and discrete patterns of immunomodulation.

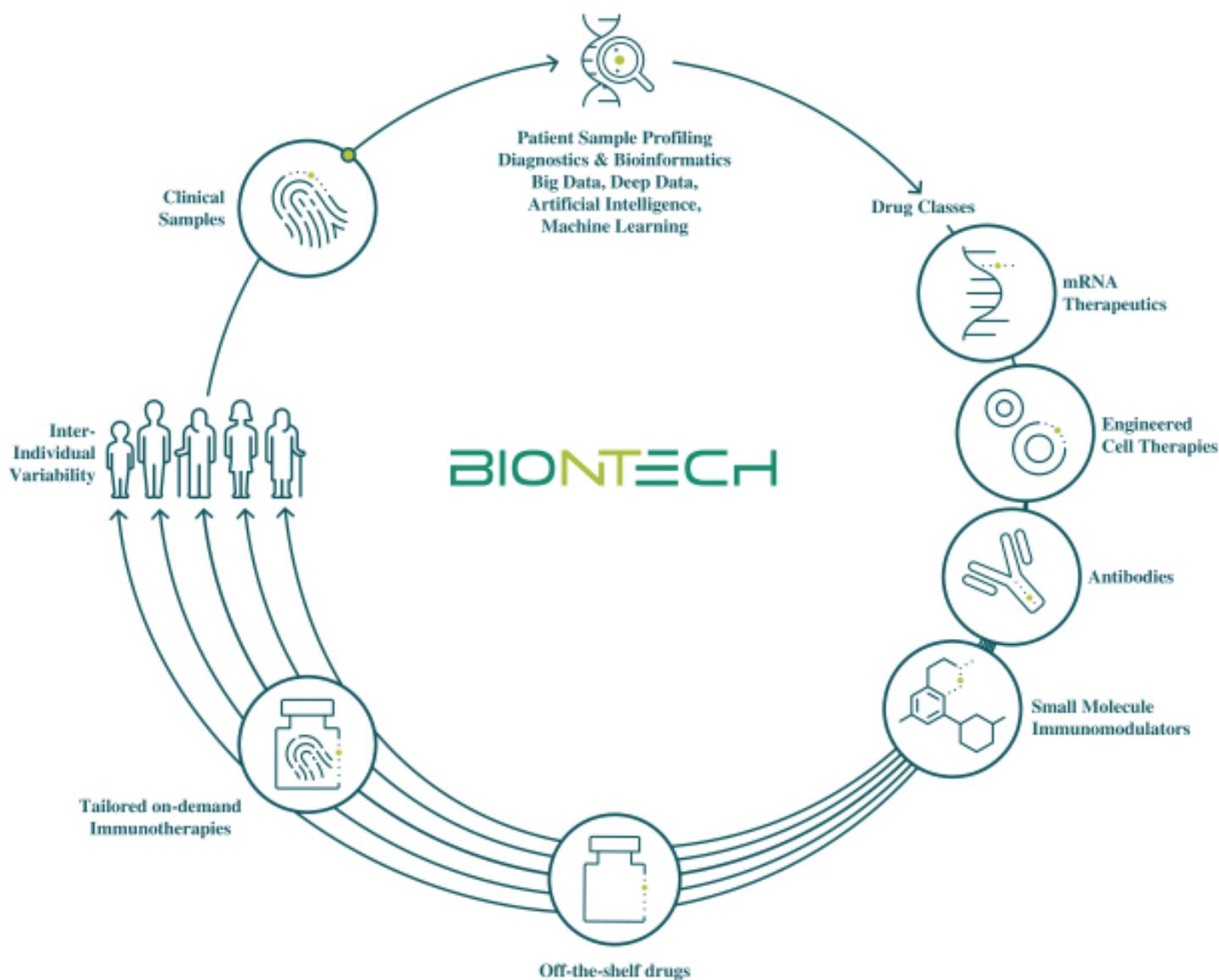
### **Our Approach**

In oncology, we are focused on delivering on the promise of individualized immunotherapy for cancer patients. We believe that we can accomplish this by applying the following principles:

- Harnessing the full potential of the immune system by exploiting multiple drug classes and addressing multiple complementary immune pathways.
- Broadening the universe of patients benefiting from cancer immunotherapy.
- Improving the success rate of treatment by developing and engineering highly potent, precise and target-specific drug candidates either as off-the-shelf or individualized immunotherapies.
- Focusing on curative approaches by addressing interindividual variability and cancer heterogeneity.

Similarly, in infectious disease, we are deploying our full suite of technologies and immunotherapeutic understanding to develop mRNA vaccines against emerging infectious diseases, such as COVID-19, in a manner that is designed to be faster and more easily scalable, and with more flexible constructs, than traditional vaccine development.

Our patient-centric approach starts with profiling and diagnostics by utilizing a target identification engine. This engine combines next generation sequencing, genomics, bioinformatics, machine learning and artificial intelligence to (a) identify gene targets of interest, (b) characterize the functional relevance of these targets (i.e., the ability to raise an immune response to or through a target) and (c) demonstrate their drugability. From our founding onwards, we have been developing the novel technologies needed to match the identified targets to the optimal individualized treatment approach. Our patient-centric model is illustrated below.



## Our Pipeline

We are advancing a deep and broad portfolio of product candidates derived from our four drug classes.

### Oncology

Drug Class	Platform	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Rights/ Collaborator	Milestones
mRNA	FixVac (fixed combination of shared cancer antigens)	BNT111	Advanced melanoma (Adjuvant & Metastatic)					Global	Report Phase 1 data; publication upcoming; Phase 2 with registrational potential start 2H 2020
		BNT112	Prostate cancer					Global	
		BNT113	HPV16+ head and neck cancer <sup>1</sup>					Global	Phase 2 with registrational potential start 2H 2020
		BNT114	Triple negative breast cancer					Global	Data update 2H 2020
		BNT115	Ovarian cancer <sup>1</sup>					Global	
		BNT116	NSCLC					Global	Phase 1 start 1H 2021
	iNeST (patient specific cancer antigen therapy)	RO7198457 (BNT122 <sup>2</sup> )	IL melanoma with CP <sup>3</sup>					Genentech (global 50:50 profit/loss share)	Enrollment update 2H 2020 <sup>4</sup> ; Interim data update in 2H 2021
			Multiple solid tumors NSCLC and colorectal cancer (Adjuvant)						Two Phase 2 trials planned 2H 2020
	Intratumoral Immunotherapy	SAR441000 (BNT131)	Solid tumors ( <i>IL-12<math>\alpha</math></i> , <i>IL-15<math>\alpha</math></i> , <i>GM-CSF</i> , <i>IFN<math>\alpha</math></i> )					Sanofi (global profit/loss share)	Data update 2H 2020 <sup>5</sup>
	RiboMabs (mRNA-encoded antibodies)	BNT141	Multiple solid tumors					Global	Phase 1 start 1H 2021
		BNT142	Multiple solid tumors ( <i>CD3+CLDN6</i> )					Global	Phase 1 start 1H 2021
RiboCytokines (mRNA-encoded cytokines)	BNT151	Multiple solid tumors ( <i>Opiwv</i> of <i>IL-2</i> )					Global	Phase 1 start 1H 2021	
	BNT152, BNT153	Multiple solid tumors ( <i>IL-7</i> , <i>IL-2</i> )					Global	Phase 1 start 1H 2021	
Cell Therapies	CAR-T Cells	BNT211	Multiple solid tumors ( <i>CLDN6</i> )					Global	Phase 1/2 start 2H 2020
		BNT212	Pancreatic, other cancers ( <i>CLDN18.2</i> )					Global	
	Neonigen-based T cell therapy	BNT221 (NEO-PTC-01)	Multiple solid tumors					Global	Phase 1 start 2H 2020
TCRs	To be selected	All tumors					Global		
Antibodies	Next-Gen CP <sup>6</sup> Immunomodulators	GEN1046 (BNT311)	Multiple solid tumors ( <i>PD-L1<math>\alpha</math></i> - <i>1BB</i> )					Genmab (global 50:50 profit/loss share)	Data update 2H 2020
		GEN1042 (BNT312)	Multiple solid tumors ( <i>CD40<math>\alpha</math></i> - <i>1BB</i> )						
Targeted Cancer Antibodies	BNT321 (MYT-5873)	Pancreatic cancer ( <i>Le</i> )					Global		
SMIMAT	Toll-Like Receptor Binding	BNT411	Solid tumors ( <i>TLR7</i> )					Global	

### Other

Drug Class	Platform	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Rights/ Collaborator	Milestones
mRNA	Infectious Disease Immunotherapies	BNT161	Influenza					Pfizer	Phase 1 start 2021
		BNT162	COVID-19					Fosun Pharma (China), Pfizer (Global, except China)	Phase 2/3 start late July 2020
		To be selected	Up to 10 indications					Penn <sup>7</sup>	First Phase 1 trial to start 1H 2021
		To be selected	HIV and tuberculosis					Bill & Melinda Gates Foundation	
	Rare Disease PRT <sup>8</sup>	BNT171	Not disclosed					Genevant (global 50:50 profit/loss share)	Phase 1 start 2H 2021
To be selected	4 more rare disease indications								

1 BNT113 and BNT115 are currently being studied in investigator-initiated phase 1 trials

2 BNT122 (iNeST) is investigated in arm 2 (N=15) of the 3 arm TNBC-MERIT trial, with BNT114 as an optional treatment; BNT114 is investigated in arm 1 (N=12) and arm 3 (N=15) of the TNBC-MERIT trial (total patients in study: N=42)

3 Checkpoint inhibitor

4 Update on the ongoing study including patient enrollment number, efficacy and safety data for an interim update expected in the second half of 2021

5 As the trial is sponsored and conducted by Sanofi, the timing of data updates is not under our control and is subject to change by Sanofi

6 Checkpoint

7 Small Molecule Immunomodulators

8 We are eligible to receive worldwide licenses

9 Protein Replacement Therapy

## [Table of Contents](#)

We believe the breadth of our technology positions us to combine modes of action in a coordinated, potentially synergistic way to treat cancer in a more efficacious manner than current existing therapies. For example, we have capitalized on synergies in our portfolio by combining our CAR-T cell development with a CARVac primer based on our FixVac platform. We further believe that our patient-centric approach and our broad, potentially synergistic portfolio of drug platforms place us at the forefront of a paradigm shift toward individualized immunotherapies in oncology and allow us to potentially address a larger share of cancer patients, as illustrated below:

Cancer segment	Patient Population	Challenge	Our Therapeutic Strategy
High mutational burden/ adjuvant stage cancers	Significant portion of cancer patients	Poor risk-benefit profile of checkpoint inhibitors	<ul style="list-style-type: none"> <li>• <b>mRNA Neoantigen Immunotherapy (iNeST)</b></li> </ul>
Low mutational burden cancers	>60% of cancers	Poor response to checkpoint inhibitors	<ul style="list-style-type: none"> <li>• <b>Shared Antigens (FixVac, CAR-T cells, Antibodies)</b></li> </ul>
"Immune desert" cancers	>40% of high-mutational cancers	Poor infiltration and activation of T-cells in TME <sup>†</sup>	<ul style="list-style-type: none"> <li>• <b>mRNA Immunotherapy</b></li> <li>• <b>Immunostimulatory Compounds (intratumoral, RiboCytokines)</b></li> </ul>
Cancers with MHC / B2M loss	20-30% of CPI-experienced advanced cancers	Failure of immune system to recognize tumor cells	<ul style="list-style-type: none"> <li>• <b>Antibodies</b></li> <li>• <b>CAR-Ts</b></li> </ul>
Refractory tumors	Patients with large tumors and multiple resistance mechanisms	Few treatment options	<ul style="list-style-type: none"> <li>• <b>Engineered Cell Therapies</b></li> <li>• <b>Combination Therapies</b></li> </ul>

<sup>†</sup>Tumor microenvironment

We have established relationships with seven pharmaceutical collaborators, which comprise Genentech, Sanofi S.A., or Sanofi, Genmab A/S, or Genmab, Genevant Sciences GmbH, or Genevant, Bayer AG, or Bayer, Pfizer Inc., or Pfizer, and Shanghai Fosun Pharmaceutical (Group) Co., Ltd, or Fosun Pharma, in order to advance our science and development capabilities and provide capital, most of which has been non-dilutive. In addition, we have established research collaborations with the University of Pennsylvania and Translational Oncology at the University Medical Center of the Johannes Gutenberg University Mainz (Translationale Onkologie an der Universitätsmedizin der Johannes Gutenberg Universität Mainz gemeinnützige GmbH), or TRON. We either wholly own or retain significant rights to all of our clinical stage programs, either in the form of a global share of profit and co-commercialization rights with our collaborators in certain markets or significant royalties and milestones.

Our ability to develop, control and optimize the manufacturing of our product candidates is a core strategic pillar and competitive advantage, especially for our individualized mRNA product candidates. We operate three Good Manufacturing Practice, or GMP, certified manufacturing facilities in Germany, where we manufacture mRNA therapeutics and engineered cell therapies for our own pipeline and for external customers. We operate a fourth manufacturing facility in Germany where we manufacture custom peptides to support our extensive immunomonitoring activities, which are critical to our development programs. Additionally, we have collaborated with Siemens AG to develop efficient, semi-automated processes to produce our individualized mRNA immunotherapies on demand.

Our team is comprised of pioneers and entrepreneurs in the fields of immunology and oncology, with experience in pioneering cutting-edge technologies for new, forward-looking therapeutic applications in order to capture new opportunities. Our scientific founders each have over 25 years of experience characterizing the



molecular signatures of cancer and discovering potent high-precision immunotherapies. They are translating this combined knowledge into the development of highly individualized treatments to target patients' specific cancers and other diseases. Our co-founders, Chief Executive Officer Prof. Ugur Sahin, M.D., and Supervisory Board member Prof. Christoph Huber, M.D., along with our Chief Medical Officer Özlem Türeci, M.D., have been published widely in the field of immunology and oncology and are recognized as thought leaders in their disciplines.

## **Recent Developments**

### ***June 30, 2020 Preliminary Financial Results***

As of June 30, 2020, we maintained cash and cash equivalents of €573.0 million (\$636.4 million). Cash and cash equivalents as of June 30, 2020 is preliminary, unaudited and subject to completion and may differ from what will be reflected in our unaudited interim financial statements as of and for the three months ended June 30, 2020. Our unaudited interim condensed consolidated financial statements as of and for the three and six months ended June 30, 2020 will not be available to you prior to investing in the Underwritten Offering.

In addition to €573.0 million (\$636.4 million) in cash and cash equivalents at June 30, 2020, we expect to receive €223.9 million (\$251.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) as proceeds from the June 2020 Private Placement described below, which is expected to settle in August 2020.

### ***Pfizer COVID-19 Collaboration***

On April 9, 2020, we announced that we and Pfizer had entered into a collaboration agreement to co-develop our potential first-in-class COVID-19 mRNA vaccine program, BNT162, aimed at preventing COVID-19. Under the terms of the agreement, Pfizer agreed to pay us \$185 million in upfront payments, including an equity investment of €103.9 million (\$113 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)), which was received in late April 2020, and a cash payment of €65.5 million (\$72 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)), which was received in May 2020. The issuance of 2,377,446 ordinary shares with the nominal amount of €2,377,446 was registered within the commercial register (*Handelsregister*) as of May 5, 2020. We are eligible to receive future milestone payments of up to \$563 million for potential aggregate consideration of \$748 million. Pfizer and we will share development costs equally. Initially, Pfizer will fund 100% of the development costs, and we will repay Pfizer our 50% share of these costs if success-based milestones are reached, or with proceeds generated from the commercialization of the vaccine, if approved. If the vaccine program is not successful or does not generate sufficient proceeds, we will not be required to pay back our 50% share of the development costs incurred.

We and Pfizer are jointly conducting clinical trials for four COVID-19 vaccine candidate variants initially in the United States and Europe across multiple sites. In late April 2020, we and Pfizer announced that the German regulatory authority, the Paul-Ehrlich-Institut, approved the Phase 1/2 clinical trial and the first patients in the first cohort of our Phase 1/2 clinical trial were dosed shortly thereafter. In early May 2020, Pfizer and we initiated a clinical trial for BNT162 in the United States and the first participants were dosed shortly thereafter. On July 13, 2020, we and Pfizer announced that our BNT162b1 and BNT162b2 vaccine candidate variants were granted Fast Track designation by the FDA. During the clinical development stage, we and our partners will provide clinical supply of the vaccine from our GMP-certified mRNA manufacturing facilities in Europe. We and Pfizer are working together to scale-up manufacturing capacity at risk to provide worldwide supply in response to the pandemic. If the vaccine candidate is approved, we and Pfizer would also work jointly to commercialize the vaccine worldwide (excluding China which is covered by our collaboration with Fosun Pharma). If the vaccine candidate is approved, we and Pfizer expect to manufacture up to 100 million doses by the end of 2020 and potentially more than 1.3 billion doses by the end of 2021.

On July 20, 2020, we announced that we and Pfizer entered into a binding term sheet for a supply agreement with the United Kingdom. Pursuant to the term sheet, we and Pfizer expect to supply 30 million doses of BNT162, if approved, to the United Kingdom. Under the terms of the binding term sheet, we and Pfizer are eligible to receive a fully refundable advance payment per dose upon signing of a definitive supply agreement. The advance payment will be treated as a prepayment towards the total cost of the contracted number of doses of BNT162, with the remainder of the contracted price per dose to be paid upon delivery of the contracted doses.

On July 22, 2020, we announced that the United States government has agreed to purchase an initial order of 100 million doses of BNT162 and has the option to acquire up to 500 million additional doses from us and Pfizer. The U.S. government will pay \$1.95 billion upon the receipt of the first 100 million doses, following FDA authorization or approval.

We are also in late-stage discussions with other governments and governmental bodies related to the establishment of supply agreements for BNT162, if approved. We expect that we and Pfizer will enter into further binding and non-binding agreements to supply additional doses of BNT162 as early as 2020 and 2021. Certain of the agreements may also provide an option to purchase additional doses, under specified circumstances.

#### ***July 2020 BNT162 Data Announcements***

On July 1, 2020, we and Pfizer announced preliminary data from our ongoing U.S. Phase 1/2 trial of BNT162b1. The initial part of this randomized, placebo-controlled, observer-blinded study is evaluating the safety, tolerability and immunogenicity of escalating dose levels of BNT162b1, one of four vaccine candidate variants in development as part of our BNT162 program, in 45 healthy adults between 18 and 55 years of age.

The participants received two doses, 21 days apart, of placebo, 10µg or 30µg of BNT162b1, or received a single dose of 100µg of the vaccine candidate. Because of a strong vaccine booster effect, the highest neutralizing titers were observed seven days after the second dose of 10µg or 30µg on day 28 after vaccination. The neutralizing GMTs were 168 and 267 for the 10µg and 30µg dose levels, respectively, corresponding to 1.8- and 2.8-times the neutralizing GMT of 94 observed in a panel of 38 sera from subjects who had contracted SARS-CoV-2.

In all 24 subjects who received 2 vaccinations at 10µg and 30µg dose levels of BNT162b1, elevation of RBD-binding IgG concentrations was observed after the second injection with respective GMCs of 4,813 and 27,872 units/ml at day 28, seven days after immunization. These concentrations are 8- and 46.3-times the GMC of 602 units/ml in a panel of 38 sera from subjects who had contracted SARS-CoV-2.

At day 21 after a single injection, the 12 subjects who received 100µg of BNT162b1 had an RBD-binding IgG GMC of 1,778 units/ml and a SARS-CoV neutralizing GMT of 33, which are 3-times and 0.35-times, respectively, the GMC and GMT of the convalescent serum panel.

At the 10µg or 30µg dose levels, adverse reactions, including low grade fever, were more common after the second dose than the first dose. Following dose 2, 8.3% of participants who received 10µg and 75.0% of participants who received 30µg BNT162b1 reported fever <sup>3</sup> 38.0 °C. Local reactions and systemic events after injection with 10µg and 30µg of BNT162b1 were dose-dependent, generally mild to moderate, and transient. The most commonly reported local reaction was injection site pain, which was mild to moderate, except in one of 12 subjects who received a 100µg dose, which was severe. No serious adverse events were reported. Given higher numbers of subjects experiencing local reactions and systemic events after a single 100µg dose with no significant increases in immunogenicity compared to the 30µg dose level, the 12 participants in the 100µg group were not administered a second dose.

On July 20, 2020, we and Pfizer announced preliminary data from our ongoing German Phase 1/2 trial of BNT162b1. The initial part of this open-label, non-randomized, non-placebo-controlled study is evaluating the safety, tolerability and immunogenicity of escalating dose levels of BNT162b1, one of four vaccine candidate variants in development as part of our BNT162 program, in 60 healthy adults, between 18 and 55 years of age.

The preliminary data we reported was from 12 subjects each who received two doses of 1µg, 10µg, 30µg and 50µg (except for one individual each in the 10µg and 50µg who discontinued due to non-study drug related reasons) and 12 subjects who received a single dose of 60µg. The two doses received by the participants were given 21 days apart.

In 34 of the 36 subjects who received two vaccinations at 10µg, 30µg, or 50µg dose levels of BNT162b1, RBD-specific CD4+ T cell responses were observed. All subjects but the two exceptions at the lowest dose level had cytokine profiling of the RBD-specific CD4+ T cells that demonstrated a TH1-dominant profile for these cells. While the magnitude varied between individuals, participants with the strongest CD4+ T cell responses to RBD had more than 10-fold of the memory responses observed in the same participants when stimulated with cytomegalovirus (CMV), Epstein Barr virus (EBV), influenza virus and tetanus toxoid-derived immuno- dominant peptide panels. The strength of RBD-specific CD4+ T cell responses correlated positively with both RBD-binding IgG and with SARS-CoV-2 neutralizing antibody titers. Among vaccine-induced CD8+ T cell responses, which were observed in 29 of 36 participants, strong responses were mounted by the majority of participants and were comparable with memory responses against CMV, EBV, influenza virus and tetanus toxoid in the same participants. The strength of RBD-specific CD8+ T cell responses correlated positively with vaccine-induced CD4+ T cell responses, but did not significantly correlate with SARS-CoV-2 neutralizing antibody titers. Additionally, although at 1µg the immunogenicity rate was lower (6 of 8 responding participants), the magnitude of vaccine-induced CD4+ and CD8+ T cells in some participants was almost as high as with 50µg BNT162b1.

Elevation of SARS-CoV-2 RBD-binding IgG concentrations was observed, with respective GMCs ranging from 265 units/ml to 1,672 units/ml at day 21. At day 29, seven days after the second dose, RBD-binding IgG GMCs ranged from 2,015 units/ml to 25,006 units/ml. At day 43, RBD-binding IgG GMCs ranged from 3,920 units/ml to 18,289 units/ml. These concentrations are 6.5- to 30.4-times the GMC of 602 units/ml in a panel of sera from 38 subjects who had contracted SARS-CoV-2. At day 29, the SARS-CoV-2 neutralizing GMTs reached 36 (1µg dose), 158 (10µg dose), 308 (30µg dose) and 578 (50µg dose) compared to neutralizing GMT of 94 observed in the convalescent serum panel. At day 43, SARS-CoV-2 neutralizing GMTs reached .7-fold (1µg dose) to 3.2-fold (50µg dose) compared to those of a panel of SARS-CoV-2 infection convalescent human sera. Furthermore, sera of vaccinated subjects displayed broadly neutralizing activity in pseudovirus neutralization assays across a panel of sixteen SARS-CoV-2 RBD variants represented in publicly available SARS-CoV-2 sequences and against the newly dominant D614G strain. In summary, antibody responses elicited by BNT162b1 in our German clinical trial largely mirrored those observed in our U.S. clinical trial.

At the 10µg, 30µg and 50µg dose levels, certain adverse reactions, including low grade fever, were more common after the second dose than the first dose. Following the second dose, 25.0%, 25.0% and 33.3% of participants who received the 10µg, 30µg and 50µg doses, respectively reported fever of at least 38.0 degrees Celsius. Local reactions and systemic events after injection with 10µg, 30µg and 50µg of BNT162b1 were dose- dependent, generally mild to moderate and transient, with occasional severe events (grade 3) of flu-like symptoms and injection site reactions. The most commonly reported local reaction was injection site pain, which was mild to moderate, except in one of 12 subjects who received a 60µg dose, which was severe. No serious adverse events were reported, and there were no withdrawals due to adverse events related to the vaccine. Based on the adverse reactions reported after the 50µg boost dose, a second 60µg dose was not administered to participants who had received an initial 60µg dose.

For additional information on these preliminary results, please review our reports on Form 6-K filed with the SEC on July 1, 2020 and July 20, 2020 and incorporated by reference herein.

Based on preclinical and clinical data observed to-date, we and Pfizer have decided to progress our BNT162 development program into a Phase 2b/3 trial, which is anticipated to commence in late July 2020, subject to input and approval from the appropriate regulatory bodies. For the initial Phase 2b/3 trial, we intend to select either BNT162b1 or BNT162b2. Both the BNT162b1 and the BNT162b2 vaccine candidates have received Fast Track

status from the FDA. Since clinical evaluation of the BNT162b2 candidate started several weeks later than BNT162b1, only preliminary clinical data are currently available for the BNT162b2 candidate. A set of data obtained for a cohort of subjects 18-55 years of age immunized with 10µg of BNT162b2 indicates that BNT162b2 induces similar virus neutralizing antibody responses as observed for BNT162b1. The preliminary observations are subject to further data collection and analysis. Assessment of dose dependent immune response and safety profile as well as analysis of T cell responses is currently pending. On the basis of additional data expected to be collected and analyzed for BNT162b1 and BNT162b2 in the coming days, along with input from the FDA, we intend to select a lead candidate to take into a Phase 2b/3 trial. We and Pfizer currently expect to inform the FDA of our selection of the BNT162 candidate variant before the closing of this offering. Based on clinical data from our ongoing Phase 1/2 trials of BNT162b1 in the United States and Germany, BNT162b1 appears to be a viable variant to advance into a Phase 2b/3 trial. However, given that additional information relating to BNT162b2 is becoming available over the next few days, we and Pfizer plan to make the ultimate decision on the final candidate based on multiple factors, including the overall observed safety, tolerability and immunogenicity profiles for each vaccine candidate at different dose levels, a full immunogenicity data set and feedback from the FDA on the data collected for each candidate. If we ultimately move forward with the BNT162b2 variant, it will be due to the fact that based on our scientific judgment in light of the totality of preclinical data and clinical data available to us at the time of selection and the other factors described above, the BNT162b2 variant has better potential for clinical and commercial success. We do not plan to disclose which BNT162 variant has been selected until we receive FDA approval to commence the Phase 2b/3 clinical trial, and we likely will not publish any data with respect to the BNT162b2 variant before we make our selection.

#### ***June 2020 iNeST Data Update***

In June 2020, we presented data from a monotherapy dose-finding cohort of our RO7198457 (BNT122) Phase 1 trial in multiple solid tumors in which RO7198457 (BNT122) was observed to have a manageable safety profile and induced strong neoantigen-specific immune responses in patients with low and intermediate mutational load tumors types. This data related to 31 patients enrolled in cohorts with doses ranging from 25-100µg. The most common tumor types were HR+/HER2+ breast, prostate, and ovarian cancer with a median of 5 lines of prior therapies (range 1-17). Most patients enrolled had a low level of PD-L1 expression in the tumor as determined by immunohistochemistry (97% patients with <5% PD-L1 expression on tumor cells (TC) and 93% patients with <5% expression on immune cell (IC)). The majority of adverse events were Grade 1 or Grade 2 and those occurring in more than 20% of patients included infusion related reaction (IRR), fatigue, cytokine release syndrome (CRS), nausea, and diarrhea. IRR and CRS were transient and reversible and presented primarily as Grade 1 or Grade 2 chills and fever. A single dose limiting toxicity of Grade 3 CRS occurred at the 100µg dose level. None of the patients discontinued RO7198457 (BNT122) due to AEs. RO7198457 (BNT122) induced pulsatile release of pro-inflammatory cytokines with each dose, consistent with TLR agonist activity of RNA. *Ex vivo* T cell responses were detected in approximately 86% of patients treated with RO7198457 (BNT122) as a monotherapy. Analysis of MHC multimers showed the induction of up to 5.3% neo-epitope specific CD8 T-cells with effector memory phenotype in the peripheral blood. RO7198457 (BNT122) induced T cells against multiple neoantigens were detected in post-treatment tumor biopsies. Of 26 patients that underwent at least one tumor assessment, one patient with gastric cancer and metastatic liver lesions had a durable best response of confirmed complete response and remains on study after 1.5 years (3.8%) and 12 patients had stable disease (46.2%).

Also in June 2020, we presented data from 132 patients enrolled in cohorts with doses ranging from 15µg to 50µg of RO7198457 (BNT122) in combination with 1200mg atezolizumab. The most common tumor types enrolled were non-small cell lung cancer, or NSCLC, triple-negative breast cancer, or TNBC, melanoma and colon cancer with a median of three lines of prior therapies (range 1-11). Most patients enrolled had low levels of PD-L1 expression in the tumor as determined by immunohistochemistry (93% patients with <5% PD-L1 expression on tumor cells (TC0/1) and 79% patients with <5% PD-L1 expression on immune cell (IC0/1)). The

majority of adverse events were Grade 1 or Grade 2 and those occurring in more than 15% of patients included infusion related reaction (IRR), fatigue, nausea, cytokine release syndrome (CRS) and diarrhea. IRR and CRS were transient and reversible and presented primarily as Grade 1 or Grade 2 chills and fever. There were no dose limiting toxicities. Eight patients (5.6%) discontinued due to AEs related to study drugs. RO1798457 (BNT122) induced a self-limiting increase of pro-inflammatory cytokines with each dose, consistent with the TLR agonist activity of RNA. *Ex vivo* T cell responses were observed in peripheral blood in 46 out of 63 (73%) patients. Induction of up to 5.7% MHC multimer-stained CD8+ T-cells with effector memory phenotype was observed in the peripheral blood. RO7198457 (BNT122) induced T cells against multiple neoantigens were detected in post-treatment tumor biopsies. Of 108 patients that underwent at least one tumor assessment, 1 patient had a complete response as their best response (0.9%), 8 patients had partial responses (7.4%), and 53 patients had stable disease (49.1%).

Based on data from our study of BNT121 as an adjunct to surgery in patients with metastatic melanoma, we believe that RO7198457 (BNT122) is potentially well suited to control metastatic relapses in patients with a lower tumor burden. Additionally, RO7198457 (BNT122) as a monotherapy and in combination with atezolizumab has been observed to have a manageable safety profile to date and to induce significant levels of neoantigen-specific immune responses, even in late-stage, heavily pre-treated patients. Accordingly, we and our collaborator, Genentech, intend to initiate two additional randomized Phase 2 trials in the second half of 2020 in early and adjuvant stage NSCLC and colorectal cancer, where we believe the mechanism of action of RO7198457 (BNT122) is best suited. We also continue to investigate RO7198457 (BNT122) in our ongoing Phase 2 trial in first line melanoma in combination with pembrolizumab.

### ***June 2020 Private Placement***

On June 29, 2020, we announced the signing of a private investment by a fund associated with Temasek Capital Management Pte. Ltd., or Temasek, and another accredited investor, which investment we refer to as the June 2020 Private Placement. The June 2020 Private Placement consisted of approximately €123.9 million (\$138.9 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) in ordinary shares and a €100.0 million (\$112.1 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) four-year mandatory convertible note. Upon the closing of the June 2020 Private Placement, which is expected to occur in August 2020, subject to customary closing conditions, the investors will receive an aggregate of 2,595,996 of our ordinary shares and will be subject to a 180-day lock-up period. The four-year mandatory convertible note will have a coupon of 4.5% per annum and a conversion premium of 20% above the reference price.

### ***Acquisition of Neon Therapeutics, Inc.***

On May 6, 2020, we announced the closing of our acquisition of Neon Therapeutics, Inc., or Neon, a biotechnology company developing novel neoantigen-based T cell therapies, through a stock transaction and including de minimis cash consideration, or the Merger. The Merger was first announced on January 16, 2020. Neon, now BioNTech US Inc., or BioNTech US, is operated as our wholly owned subsidiary. The transaction combines two organizations with a common culture of pioneering translational science and a shared vision for the future of cancer immunotherapy. Through the acquisition, we leverage Neon's deep expertise in the development of neoantigen therapies, with both vaccine and T-cell capabilities. Our most advanced program acquired in the Merger is NEO-PTC-01, a personalized neoantigen-targeted T cell therapy candidate consisting of multiple T cell populations targeting the most therapeutically relevant neoantigens from each patient's tumor. We also acquired a precision T cell therapy program targeting shared neoantigens in genetically defined patient populations. The lead program from this approach, NEO-STC-01, is a T cell therapy candidate targeting shared RAS neoantigens. In addition, Neon had assembled libraries of high-quality TCRs against various shared neoantigens across common HLAs. This pipeline is underpinned by Neon's platform technologies including RECON®, its machine-learning bioinformatics platform, and NEO-STIM™, its proprietary process to directly prime, activate and expand neoantigen-targeting T cells *ex vivo*.

Based on the acquisition date share price, the implied aggregate value of the Merger consideration was approximately €89.9 million (\$97.1 million) financed by issuing new ordinary shares as a stock transaction and including a de minimis cash consideration which was paid to settle Neon's outstanding stock options. The new subsidiary is based in Cambridge, Massachusetts and serves as our U.S. headquarters.

### ***Impacts of COVID-19***

On March 11, 2020, the World Health Organization declared the outbreak of COVID-19 as a pandemic, which continues to spread throughout the United States, the European Union and around the world. As we advance our clinical programs, we are in close contact with our principal investigators and clinical sites, which are located in jurisdictions affected by the COVID-19 pandemic, and are assessing the impact of the COVID-19 pandemic on our clinical trials, expected timelines and costs on an ongoing basis. In light of recent developments relating to the COVID-19 pandemic, the primary focus of healthcare providers and hospitals is currently on fighting the novel coronavirus. In addition, in response to the spread of COVID-19, we have modified our business practices, including restricting employee travel, developing social distancing plans for our employees and cancelling physical participation in meetings, events and conferences. In addition, for certain of our earlier-stage programs, including BNT141 and BNT142 (RiboMabs), BNT151 and BNT152/153 (RiboCytokines), BNT161 (Influenza), BNT171 (Rare Disease) and BNT411 (TLR7), we have delayed commencement of trials, experienced slowed patient enrollment or experienced other delays as a result of the COVID-19 pandemic. This partial disruption, even temporary, may severely impact our operations and overall business by delaying the progress of our clinical trials and preclinical studies. All anticipated milestones set forth in this prospectus are subject to further future adjustment as a result of the COVID-19 pandemic. See "Risk Factors."

### **Risks Associated with Our Business**

Our business is subject to a number of risks of which you should be aware before making an investment decision. These risks are discussed more fully in the section of this prospectus titled "Risk Factors" immediately following this prospectus summary and in the section titled "Risk Factors" in our Annual Report on Form 20-F for the year ended December 31, 2019, incorporated by reference herein. These risks include, but are not limited to, the following:

- Data from our COVID-19 vaccine development program is not predictive of the safety or efficacy of any vaccine candidate. Even if a COVID-19 vaccine is approved for use, we will need to devote significant resources to scale-up our manufacturing and distribution capabilities, which would divert resources away from our other clinical and preclinical programs. Even if a COVID-19 vaccine is approved for use, there can be no assurance that it would ever become profitable, due to, among other things, government interest, public perception regarding a vaccine and competing treatments being developed.
- We are a clinical-stage biopharmaceutical company with no pharmaceutical products approved for commercial sale. We have incurred significant losses since our inception and we anticipate that we will continue to incur significant losses for the foreseeable future, which makes it difficult to assess our future viability.
- We will require substantial additional financing to achieve our goals, and a failure to obtain this capital on acceptable terms, or at all, could force us to delay, limit, reduce or terminate our product development programs, commercialization efforts or other operations.
- We will need to develop and expand our company, and we may encounter difficulties in managing this development and expansion, which could disrupt our operations.
- No mRNA immunotherapy has been approved, and none may ever be approved. mRNA drug development has substantial clinical development and regulatory risks due to the novel and unprecedented nature of this new category of therapeutics.

- Our product candidates may not work as intended, may cause undesirable side effects or may have other properties that could delay or prevent their regulatory approval, limit the commercial profile of an approved label, or result in significant negative consequences following marketing approval, if any.
- Clinical development involves a lengthy and expensive process with an uncertain outcome, and delays can occur for a variety of reasons outside of our control. Clinical trials of our product candidates may be delayed, and certain programs may never advance in the clinic or may be more costly to conduct than we anticipate, any of which can affect our ability to fund our company and would have a material adverse impact on our business.
- Interim top-line and preliminary data from studies or trials that we announce or publish from time to time may change as more data become available and are subject to audit and verification procedures that could result in material changes in the final data.
- We face risks related to health epidemics, such as the current COVID-19 outbreak, that could adversely affect our operations.
- Our planned clinical trials or those of our collaborators may reveal significant adverse events not seen in our preclinical or nonclinical studies and may result in a safety profile that could delay or terminate clinical trials, or delay or prevent regulatory approval or market acceptance of any of our product candidates.
- Some of our product candidates are classified as gene therapies by the FDA and the EMA, and the FDA has indicated that our product candidates will be reviewed within its Center for Biologics Evaluation and Research, or CBER. Even though our mRNA product candidates are designed to have a different mechanism of action from gene therapies, the association of our product candidates with gene therapies could result in increased regulatory burdens, impair the reputation of our product candidates, or negatively impact our platform or our business.
- We may be unable to obtain regulatory approval for our product candidates under applicable international regulatory requirements. The denial or delay of such approval would delay commercialization of our product candidates and adversely impact our potential to generate revenue, our business and our results of operations.
- We face significant competition in an environment of rapid technological and scientific change, and our failure to effectively compete would prevent us from achieving significant market penetration. Most of our competitors have significantly greater resources than we do and we may not be able to compete successfully.
- Even if we obtain regulatory approval for our product candidates, the products may not gain the market acceptance among physicians, patients, hospitals, cancer treatment centers and others in the medical community necessary for commercial success.
- Our mRNA product candidates are based on novel technologies and any product candidates we develop may be complex and difficult to manufacture. We may encounter difficulties in manufacturing, product release, shelf life, testing, storage, supply chain management or shipping. If we or any of the third-party manufacturers we work with encounter such difficulties, our ability to supply materials for clinical trials or any approved product could be delayed or stopped.
- Certain of our product candidates are uniquely manufactured for each patient and we may encounter difficulties in production, particularly with respect to scaling our manufacturing capabilities. If we or any of the third-party manufacturers with whom we contract encounter these types of difficulties, our ability to provide our product candidates for clinical trials or our products for patients, if approved, could be delayed or stopped, or we may be unable to maintain a commercially viable cost structure.
- We have entered into several arrangements with a related party for the performance of nonclinical research programs, and these arrangements present potential conflicts of interest.

- Our existing collaborations, or any future collaboration arrangements that we may enter into, may not be successful, which could significantly limit the likelihood of receiving the potential economic benefits of the collaboration and adversely affect our ability to develop and commercialize our product candidates.
- If our efforts to obtain, maintain, protect, defend and/or enforce the intellectual property related to our product candidates and technologies are not adequate, we may not be able to compete effectively in our market.
- We may not fully realize the anticipated benefits of the Neon acquisition or realize such benefits within the timing anticipated.
- The price of the ADSs may be volatile and fluctuate substantially, which could result in substantial losses for purchasers of the ADSs.

### **Corporate Information**

We were incorporated on June 2, 2008 as Petersberg 91, V V AG, a German stock corporation (*Aktiengesellschaft*). We changed our name to BioNTech AG on December 11, 2008. On March 8, 2019, we converted to a European stock corporation (*Societas Europaea*, or SE) under the laws of Germany and the European Union called BioNTech SE. We completed our initial public offering in October 2019. ADSs representing our ordinary shares are currently listed on the Nasdaq Global Select Market under the symbol “BNTX.”

Our principal executive offices are located at An der Goldgrube 12, D-55131 Mainz, Germany. Our telephone number is +49 6131-9084-0. Our website address is <http://www.biontech.de>. The information contained on, or that can be accessed through, our website is not incorporated by reference into this prospectus. We have included our website address as an inactive textual reference only.

### **Implications of Being an Emerging Growth Company and a Foreign Private Issuer**

#### ***Emerging Growth Company***

As a company with less than \$1.07 billion in revenue during our last fiscal year, we are an “emerging growth company” as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. As such, we may take advantage of certain exemptions from various reporting requirements that are applicable to publicly traded entities that are not emerging growth companies. These exemptions include:

- the ability to include only two years of audited financial statements and only two years of related Management’s Discussion and Analysis of Financial Condition and Results of Operations disclosure;
- an exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting pursuant to the Sarbanes-Oxley Act of 2002, as amended;
- to the extent that we no longer qualify as a foreign private issuer, (i) reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements and (ii) exemptions from the requirement to hold a non-binding advisory vote on executive compensation, including golden parachute compensation; and
- an exemption from compliance with the requirement that the Public Company Accounting Oversight Board has adopted regarding a supplement to the auditor’s report providing additional information about the audit and the financial statements.

As a result, the information contained in this prospectus may be different from the information you receive from other public companies in which you hold shares.

Section 107 of the JOBS Act also provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards applicable to public companies. This provision allows an emerging growth company to delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. This transition period is only applicable under U.S. GAAP. As a result, we will adopt new or revised accounting standards on the relevant dates on which adoption of such standards is required or permitted by the IASB.

We may take advantage of these provisions for up to five years from the completion of our initial public offering or until such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company upon the earliest to occur of: (i) the last day of the first fiscal year in which our annual gross revenues exceed \$1.07 billion, (ii) the date on which we have issued more than \$1 billion in non-convertible debt securities during the previous three years and (iii) the first day of the year following the first year in which, as of the last business day of our most recently completed second fiscal quarter, the market value of our common equity held by non-affiliates exceeds \$700 million. As of June 30, 2020, which was the last business day of our most recently completed second fiscal quarter, the market value of our common equity held by non-affiliates exceeded \$700 million. Consequently, we expect that we will cease to be an emerging growth company no later than December 31, 2020, and we expect to qualify as a large accelerated filer as of that date. As a result, we expect that, as of December 31, 2020, we will be required to adhere to, among other things, the auditor attestation requirement in the assessment of internal control over financial reporting and compliance with the requirement that the Public Company Accounting Oversight Board has adopted regarding a supplement to the auditor's report providing additional information about the audit and the financial statements. For additional information, please see "Risk Factors" in our Annual Report on Form 20-F for the year ended December 31, 2019, incorporated by reference herein.

#### ***Foreign Private Issuer***

We report under the Securities Exchange Act of 1934, as amended, or the Exchange Act, as a non-U.S. company with foreign private issuer status. Even after we no longer qualify as an emerging growth company, as long as we continue to qualify as a foreign private issuer under the Exchange Act, we are exempt from certain provisions of the Exchange Act that are applicable to U.S. domestic public companies, including:

- the rules under the Exchange Act requiring domestic filers to issue financial statements prepared under U.S. GAAP;
- the sections of the Exchange Act regulating the solicitation of proxies, consents or authorizations in respect of a security registered under the Exchange Act;
- the sections of the Exchange Act requiring insiders to file public reports of their share ownership and trading activities and liability for insiders who profit from trades made in a short period of time; and
- the rules under the Exchange Act requiring the filing with the Securities and Exchange Commission, or the SEC, of quarterly reports on Form 10-Q containing unaudited financial statements and other specified information, and current reports on Form 8-K upon the occurrence of specified significant events.

Notwithstanding these exemptions, we will file with the SEC, within four months after the end of each fiscal year, or such applicable time as required by the SEC, an annual report on Form 20-F containing financial statements audited by an independent registered public accounting firm.

We may take advantage of these exemptions until such time as we are no longer a foreign private issuer. We would cease to be a foreign private issuer at such time as more than 50% of our outstanding voting securities are held by U.S. residents and any of the following three circumstances applies: (i) the majority of our executive

officers or directors are U.S. citizens or residents, (ii) more than 50% of our assets are located in the United States or (iii) our business is administered principally in the United States.

Both foreign private issuers and emerging growth companies also are exempt from certain more stringent executive compensation disclosure rules. Thus, as long as we remain a foreign private issuer, even after we no longer qualify as an emerging growth company, we will continue to be exempt from the more stringent compensation disclosures required of companies that are neither an emerging growth company nor a foreign private issuer.

**THE UNDERWRITTEN OFFERING**

Public offering price	\$93.00 per ADS.
ADSs offered by us	5,500,000 ADSs, each representing one ordinary share
The Selling Shareholder	MIG Verwaltungs AG, through MIG GmbH & Co. Fonds 7 KG, MIG GmbH & Co. Fonds 8 KG and MIG GmbH & Co. Fonds 9 KG
Ordinary shares to be outstanding immediately after the Underwritten Offering	238,173,455 ordinary shares, including ordinary shares represented by ADSs
Option to purchase additional ADSs	The underwriters have an option, exercisable for a period of 30 days after the date of this prospectus, to purchase an aggregate of up to 825,000 additional ADSs from the Selling Shareholder.
American Depositary Shares	<p>The underwriters will deliver American Depositary Shares, or the ADSs. Each ADS represents one of our ordinary shares, no par value per share.</p> <p>As an ADS holder, you will not be treated as one of our shareholders and you will not have shareholder rights. The depositary, The Bank of New York Mellon, will be the holder of the ordinary shares underlying the ADSs. You will have the rights of an ADS holder as provided in the deposit agreement among us, the depositary and holders and beneficial owners of ADSs from time to time. To better understand the terms of the ADSs, see “Description of American Depositary Shares.” We also encourage you to read the deposit agreement, the form of which is incorporated by reference as an exhibit to the registration statement of which this prospectus forms a part.</p>
Depositary	The Bank of New York Mellon
Risk factors	See “Risk Factors” beginning on page 22 as well as the risk factors contained in our Annual Report on Form 20-F for the year ended December 31, 2019 and the other information contained in this prospectus or incorporated by reference herein for a discussion of factors you should consider before deciding to invest in the ADSs.
Use of proceeds	We estimate that the net proceeds to us from the Underwritten Offering will be approximately \$478.0 million (€430.4 million), after deducting underwriting discounts and commissions and estimated offering expenses payable by us. We will not receive any proceeds from the potential sale of ADSs in this Underwritten Offering by the Selling Shareholder, pursuant to the underwriters’ option to purchase additional ADSs from the Selling Shareholder. We intend to use the

net proceeds from the Underwritten Offering and the net proceeds, if any, from the Rights Offering, to:

- advance our iNeST program candidate RO7198457 (BNT122) into late-stage trials;
- advance our ongoing and currently planned clinical trials for our FixVac product candidates, BNT111, BNT112, BNT113, BNT114, BNT115 and our targeted cancer antibody, MVT-5873 (BNT321), as well as fund our portion of the research and development expenses for SAR441000 (BNT131), which is being developed in collaboration with Sanofi, GEN1046 (BNT311) and GEN1042 (BNT312), which are being developed in collaboration with Genmab and advance the development of BNT162, our COVID-19 vaccine candidate, which is being developed in collaboration with Pfizer;
- initiate clinical trials for additional product candidates, including product candidates from our CAR T, RiboMabs, RiboCytokines and TCR platforms in oncology;
- further accelerate and expand our infectious disease immunotherapy programs;
- advance our rare disease protein replacement therapy platforms outside of oncology;
- advance additional preclinical product candidates, develop additional product candidates leveraging our therapeutic platforms and fund the further development of our core technologies; and
- fund the further expansion of our manufacturing and laboratory capacity, the continued development of our infrastructure and investment in preparation for commercialization for launch of BNT162, if approved.

We expect to use the remainder of any net proceeds from the Global Offering, as well as our existing cash and cash equivalents, for general corporate purposes. We may also use a portion of the net proceeds to in-license or acquire or invest in complementary technologies, products, businesses or assets, either alone or together with a collaborator. However, we have no current commitments or obligations to do so.

See “Use of Proceeds” for a more complete description of the intended use of proceeds from the Global Offering.

Nasdaq Global Select Market symbol

ADSs representing our ordinary shares are listed on the Nasdaq Global Select Market under the symbol “BNTX.”

As required by German law, following the setting of the price to public for this underwritten offering, which we refer to as the Underwritten Offering, we intend to commence a rights offering, or the Rights Offering, to holders of our ordinary shares and ADSs representing our ordinary shares. The Underwritten Offering and the Rights Offering are part of a single, global offering which we refer to in this prospectus as the “Global Offering.”

We have obtained irrevocable, binding agreements from certain holders of our ordinary shares, representing 74.83% of our outstanding ordinary shares (including ordinary shares represented by ADSs), not to transfer or exercise their rights to subscribe for new ordinary shares in the Rights Offering. Under German law, the law of our jurisdiction of organization, we are permitted to offer new ordinary shares and ADSs, in an amount equal to the percentage of securities represented by the irrevocable agreements not to transfer or exercise rights, to new investors in advance of the Rights Offering. We intend to accomplish this through the Underwritten Offering described above. Following the Underwritten Offering, our shareholders and ADS holders as of the respective record dates who have not agreed to forego exercising rights have the opportunity in the Rights Offering to subscribe for up to 1,889,189 new ordinary shares or new ADSs (representing approximately 0.81% of our outstanding ordinary shares) at a subscription price equal to the price to public in the Underwritten Offering. **ADSs purchased in the Underwritten Offering are not entitled to receive rights to subscribe for new ordinary shares or new ADSs in the Rights Offering.** Accordingly, a total of up to 7,389,189 ordinary shares (including ordinary shares represented by ADSs) may be sold by us in the Global Offering. If all of the shares and ADSs in the Rights Offering are subscribed for (excluding those attributable to holders that have irrevocably agreed not to transfer or exercise rights), we will offer 7,389,189 ordinary shares (including ordinary shares represented by ADSs) in the Global Offering and will have 240,062,644 ordinary shares outstanding immediately after the Global Offering.

Unless otherwise indicated, the number of our ordinary shares to be outstanding after the Underwritten Offering is based on 226,779,744 ordinary shares outstanding as of March 31, 2020 and excludes:

- 16,338,305 ordinary shares available for issuance upon the exercise of options outstanding as of March 31, 2020;
- 254,065 ordinary shares available for issuance upon the exercise of options expected to be granted in 2021 and 2022 under our long-term incentive program as of March 31, 2020;
- 5,282,436 ordinary shares available for future issuance under our Employee Stock Ownership Plan or any future share option plan as of March 31, 2020 (after taking into account the issuance of options expected to be granted in 2021 and 2022);
- 1,580,777 ordinary shares issued to Fosun Pharma in connection with our collaboration with Fosun Pharma;
- 2,377,446 ordinary shares issued to Pfizer in connection with our collaboration with Pfizer;
- 1,935,488 ADSs representing our ordinary shares issued to former stockholders of Neon in the Merger; and
- 5,524,506 ordinary shares held in treasury.

Unless otherwise indicated, all information contained in this prospectus:

- excludes the 2,595,996 ordinary shares to be issued in the June 2020 Private Placement, which is expected to close in August 2020;
- assumes no exercise of the outstanding options described above;
- assumes no exercise of the option granted to the underwriters to purchase up to 825,000 additional ADSs from the Selling Shareholder in the Underwritten Offering; and
- excludes the effects of our acquisition of Neon; for more information, see “Unaudited Pro Forma Condensed Combined Financial Information.”

## SUMMARY CONSOLIDATED FINANCIAL DATA

The following tables set forth a summary of our historical consolidated financial data for the years ended December 31, 2019, 2018 and 2017, as of March 31, 2020 and for the three months ended March 31, 2020 and 2019. We derived the summary of our results for the years ended December 31, 2019, 2018 and 2017 from our audited consolidated financial statements incorporated by reference herein. The summary consolidated financial data as of March 31, 2020 and for the three months ended March 31, 2020 and 2019 have been derived from our unaudited interim condensed consolidated financial statements incorporated by reference herein and have been prepared on the same basis as the audited financial statements. In the opinion of management, the unaudited interim data reflects all adjustments necessary for a fair presentation of the financial information in those statements. We present our consolidated financial statements in Euros and in accordance with IFRS as issued by the IASB.

The summary consolidated financial data below should be read together with our consolidated financial statements and related notes, and our unaudited interim condensed consolidated financial statements included elsewhere in this prospectus, as well as the section of this prospectus titled “Selected Consolidated Financial Data” and the section titled “Management’s Discussion and Analysis of Financial Condition and Results of Operations” in our Forms 20-F and 6-K incorporated by reference herein. Our historical results for any prior period are not necessarily indicative of results to be expected in any future period, and the results for the three months ended March 31, 2020 are not necessarily indicative of the results to be expected for the full year ended December 31, 2020.

	For the Three Months Ended March 31,		For the Years Ended December 31,		
	2020	2019	2019	2018	2017
(in thousands except per share data)					
<b>Consolidated statements of operations:</b>					
Revenues from contracts with customers	€ 27,663	€ 26,154	€ 108,589	€ 127,575	€ 61,598
Cost of sales	(5,842)	(3,205)	(17,361)	(13,690)	(9,318)
<b>Gross profit</b>	<b>€ 21,821</b>	<b>€ 22,949</b>	<b>€ 91,228</b>	<b>€ 113,885</b>	<b>€ 52,280</b>
Research and development expenses	(65,122)	(57,241)	(226,466)	(143,040)	(85,496)
Sales and marketing expenses	(486)	(560)	(2,718)	(3,041)	(6,603)
General and administrative expenses	(15,815)	(9,276)	(45,547)	(26,334)	(23,520)
Other operating income	425	331	2,724	5,396	2,349
Other operating expenses	(100)	(38)	(739)	(720)	(288)
<b>Operating loss</b>	<b>€(59,277)</b>	<b>€(43,835)</b>	<b>€(181,518)</b>	<b>€ (53,854)</b>	<b>€(61,277)</b>
Finance income	6,417	3,578	4,122	8,046	2,133
Finance expenses	(103)	(74)	(326)	(48)	(26,007)
Interest expenses related to lease liability	(415)	(425)	(1,718)	(1,721)	(676)
Share of loss of equity method investees	—	—	—	(84)	(78)
<b>Loss before tax</b>	<b>€(53,378)</b>	<b>€(40,756)</b>	<b>€(179,440)</b>	<b>€ (47,662)</b>	<b>€(85,905)</b>
Income taxes	(8)	(6)	268	(600)	(45)
<b>Loss for the period</b>	<b>€(53,386)</b>	<b>€(40,762)</b>	<b>€(179,172)</b>	<b>€ (48,262)</b>	<b>€(85,950)</b>
Loss attributable to equity holders of the parent	(53,386)	(40,646)	(179,056)	(48,019)	(85,653)
Loss attributable to non-controlling interests	—	(116)	(116)	(243)	(297)
<b>Basic and diluted loss per share</b>	<b>€ (0.24)</b>	<b>€ (0.20)</b>	<b>€ (0.85)</b>	<b>€ (0.25)</b>	<b>€ (0.51)</b>

The following table presents our summary consolidated statement of financial position as of March 31, 2020 (i) on an actual basis, (ii) on a pro forma basis to give effect to (a) the issuance of 1,935,488 ADSs representing our ordinary shares in our acquisition of Neon, (b) the issuance of 1,580,777 of our ordinary shares in a private placement to Fosun Pharma for proceeds of €45.6 million (\$50.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) and (c) the issuance of 2,377,446 of our ordinary shares in a private placement to Pfizer for proceeds of €103.9 million (\$113.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) and (iii) on a pro forma as adjusted basis to give further effect to the sale of up to 5,500,000 ADSs representing ordinary shares by us in the Underwritten Offering at the public offering price of \$93.00 per ADS, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us.

(in thousands)	As of March 31, 2020		
	Actual	Pro Forma <sup>(1)</sup> (unaudited)	Pro Forma As adjusted <sup>(1)</sup> (2)
<b>Consolidated statements of financial position:</b>			
Cash and cash equivalents	€ 451,597	€ 601,055	€ 1,031,411
Total assets	732,208	971,214	1,401,570
Total liabilities	284,078	284,078	284,078
Share capital	232,304	238,198	243,698
Capital reserve	686,714	919,826	1,344,682
Accumulated losses	(478,213)	(478,213)	(478,213)
Total equity	448,130	687,136	1,117,492

- (1) Does not reflect the issuance of 2,595,996 ordinary shares and a four-year mandatory convertible note for anticipated gross proceeds of €223.9 million (\$251.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) in the June 2020 Private Placement, expected to close in August 2020.
- (2) If the Rights Offering is fully subscribed (excluding ordinary shares underlying rights offered to holders that have irrevocably agreed not to transfer or exercise their rights), our cash and cash equivalents, total assets and total equity would each increase by €150.0 million and our share capital would increase by €1.9 million.

## RISK FACTORS

*Investing in the ADSs representing our ordinary shares involves a high degree of risk. You should carefully consider the following risks, together with all of the other information contained in this prospectus and in our filings with the Securities and Exchange Commission, or the SEC, that we have incorporated by reference in this prospectus. If any of the following risks actually occur, our business, prospects, operating results and financial condition could suffer materially. In such event, the trading price of the ADSs representing our ordinary shares could decline and you might lose all or part of your investment.*

### **Risks Related to Our COVID-19 Vaccine Development Program and Our Intellectual Property**

***We may experience significant volatility in the market price of the ADSs representing our ordinary shares following announcements and data releases regarding our ongoing development of BNT162 as a potential COVID-19 vaccine.***

Biopharmaceutical companies that are developing potential therapeutics and vaccines to combat COVID-19 and SARS-CoV-2, including BioNTech SE, have experienced significant volatility in the price of their securities upon publication of preclinical and clinical data as well as news about their development programs. For example, following the announcement of our collaborations with Pfizer and Fosun Pharma relating to the development of BNT162, our vaccine candidate program for the prevention of COVID-19, the last reported sales price of the ADSs representing our ordinary shares on the Nasdaq Global Select Market increased from \$30.93 on March 13, 2020, the day before the announcement, to \$92.00 on March 18, 2020, before decreasing to \$46.50 on March 20, 2020. In addition to the preclinical and clinical data we and Pfizer have already disclosed in connection with our BNT162 development program, we and Pfizer intend over the coming months to make public several additional COVID-19 vaccine data readouts and clinical updates. We also expect to announce data, in due course, for the other three vaccine candidate variants that we are currently testing for the prevention of COVID-19 as part of our BNT162 program. On July 20, 2020, we announced that we and Pfizer have entered into a binding term sheet for a supply agreement with the United Kingdom and on July 22, 2020, we announced that the U.S. government has agreed to purchase doses of BNT162 from us and Pfizer. In addition, we are in late-stage discussions with other governments and governmental bodies related to the establishment of supply agreements for BNT162, if approved. We cannot predict public reaction or the impact on the market price of the ADSs representing our ordinary shares once the terms of any or all of these supply arrangements are announced. We also cannot guarantee that the ultimate supply agreements we enter into, if any, will be for the number of doses we currently estimate and that aggregate consideration to be received under any such supply agreements will ultimately be what we currently expect. Given the attention being paid to the COVID-19 pandemic and the public scrutiny of COVID-19 development announcements and data releases to date, we expect that the public announcements we and Pfizer intend to make in the coming months regarding the ongoing development of BNT162 will attract significant attention and scrutiny and that, as a result, the price of the ADSs representing our ordinary shares may be particularly volatile during this time.

***We are currently developing multiple candidate variants in our BNT162 program, which rely on different mechanisms of action, and the efficacy or safety of one variant is not indicative or predictive of the efficacy or safety of another variant.***

We are currently developing four vaccine candidate variants for the prevention of COVID-19 as part of our BNT162 program. The first, which is the variant for which we and Pfizer announced Phase 1/2 data on July 1 and July 20, 2020, is BNT162b1, which utilizes nucleoside-modified mRNA (modRNA) and encodes the receptor binding domain antigen. Two of our four vaccine candidate variants, including BNT162b1, include a modRNA, one includes a uridine containing mRNA (uRNA), and the fourth variant utilizes self-amplifying mRNA (saRNA). Each mRNA format is combined with a lipid nanoparticle (LNP) formulation. The larger spike sequence is included in two of the vaccine candidate variants and the smaller optimized receptor binding domain from the spike protein is included in the other two candidate variants. Each variant has a distinct mechanism of action, and, as a result, clinical activity or safety results observed from one variant may not be indicative or

## [Table of Contents](#)

predictive of the efficacy or safety profile or results observed of another variant. For example, the data we recently announced for our BNT162b1 variant may differ in material respects from the safety or efficacy profile of the other vaccine candidate variants and should not be considered predictive of the safety or efficacy of our other vaccine candidate variants.

***We cannot guarantee that the BNT162 variant we choose to advance into late stage clinical development will perform better than any of the variants we do not choose to advance. Further, even if we demonstrate a sufficient safety profile for BNT162 we may not be able to demonstrate sufficient efficacy in subsequent trials to obtain regulatory approval.***

Based on preclinical and clinical data observed to-date, we and Pfizer have decided to progress our BNT162 development program into a Phase 2b/3 trial, which we plan to commence in late July 2020, subject to input and approval from the appropriate regulatory bodies. For the initial Phase 2b/3 trial, we intend to select either the vaccine candidate variant for which we have already released data publicly, BNT162b1, or our modRNA vaccine candidate variant targeting the 2P-mutated full spike protein, BNT162b2. Both the BNT162b1 and the BNT162b2 vaccine candidates have received Fast Track status from the FDA. Since clinical evaluation of the BNT162b2 candidate started several weeks later than BNT162b1, only preliminary clinical data are currently available for the BNT162b2 candidate. A set of data obtained for a cohort of subjects aged to 18-55 years immunized with 10µg of BNT162b2 indicates that BNT162b2 may induce strong virus neutralizing antibody responses with titers in a similar range as observed for BNT162b1. The preliminary observations are subject to further data collection and analysis. Assessment of dose dependent immune response and safety profile as well as analysis of T cell responses is currently pending. On the basis of additional data expected to be collected and analyzed for BNT162b1 and BNT162b2 in the coming days, along with input from the FDA, we intend to select a lead candidate to take into a Phase 2b/3 trial. We and Pfizer currently expect to inform the FDA of our selection of the BNT162 candidate variant before the closing of this offering. Based on clinical data from our ongoing Phase 1/2 trials of BNT162b1 in the United States and Germany, BNT162b1 appears to be a suitable variant to advance into a Phase 2b/3 trial. If we and Pfizer ultimately determine to advance the BNT162b2 variant, we intend to base this decision on multiple factors, including the overall observed safety, tolerability and immunogenicity profiles for each vaccine candidate at different dose levels, as well as feedback from the FDA on the data collected for each candidate. If we ultimately move forward with the BNT162b2 variant, it will be due to the fact that based on our scientific judgment in light of the totality of preclinical data and clinical data available to us at the time of selection and the other factors described above, the BNT162b2 variant has better potential for clinical and commercial success. We do not plan to disclose which BNT162 variant has been selected until we receive FDA approval to commence the Phase 2b/3 clinical trial, and we do not plan to publish any data with respect to the BNT162b2 variant before we make our selection.

We cannot guarantee that the candidate variant that we select will ultimately prove to be the optimal variant. We and Pfizer intend to choose the variant to advance based on our scientific judgment in light of the preclinical and clinical data available to us at the time as to which variant has the best chance for success. It is possible that subsequent data regarding the variant we choose could prove to be less favorable or subsequent data from a variant that is not advanced could prove to be more favorable. In addition, it is possible that public perception of subsequently released data on the variant we choose to advance could be negative and could cause our stock price to decrease regardless of the progress of the Phase 2b/3 trial. It is also possible that the FDA may disagree with or have questions about our variant selection, which could delay the start of our Phase 2b/3 trial.

Regardless of the variant we select for Phase 2b/3, we cannot guarantee that the results from subsequent data analyses and announcements will be in line with the data that we have previously published. In addition, the total number of patients evaluated in Phase 1 is small relative to the number we intend to evaluate in Phase 2b/3 and may not be indicative of the safety or immunogenicity of BNT162 in a larger and more diverse patient population. Similarly, the samples of convalescent sera, or blood samples from people who have recovered from COVID-19, used to benchmark the level of antibodies produced by subjects receiving BNT162 in clinical studies, have been taken from a small number of people and may not be representative of the antibody levels in a

## [Table of Contents](#)

broader population of people who have recovered from COVID-19. Future results in clinical trials of BNT162 may not be as positive when compared to the antibody levels in other samples of convalescent sera.

Furthermore, because the assays being used to measure and analyze the effectiveness of COVID-19 vaccines have only recently been developed and are continuing to evolve, indications of immunogenicity and the duration of immunity observed in our Phase 1/2 trials may not be predictive of the achievement of clinically relevant endpoints.

In addition, by definition our Phase 1/2 clinical trials are designed to evaluate only safety and not efficacy. Positive results from these Phase 1/2 trials do not guarantee we will be able to demonstrate in our Phase 2b/3 trial that BNT162 is efficacious. More specifically, we do not yet know the levels of immunity required to prevent COVID-19 infection, and have not yet tested the ability of our vaccine candidates to prevent infection in humans. Failure to adequately demonstrate safety or to eventually demonstrate sufficient efficacy of BNT162 could delay or prevent us from receiving regulatory approval of BNT162 and there can be no assurance that BNT162 will be approved in a timely manner, if at all.

***The development of our BNT162 program may divert resources from the clinical development of our other product candidates and we may not recoup our investments in the program.***

Although we believe that our BNT162 program could result in an effective COVID-19 vaccine, clinical trials involve a lengthy and expensive process with an uncertain outcome. Given the severity and urgency of the COVID-19 pandemic, we have committed significant capital and resources to fund and supply the development of BNT162. However, the development of BNT162 will require us to expend financial, personnel and other resources and may cause delays in or otherwise negatively impact our other development programs, despite uncertainties surrounding the longevity and extent of COVID-19 as a global health concern. Furthermore, our business could be negatively impacted by our allocation of significant resources to a global health threat that is unpredictable and could rapidly dissipate or against which our vaccine, if developed, may not be partially or fully effective.

***If we are successful in producing a vaccine against COVID-19, we may need to devote significant resources to its scale-up and development.***

If any clinical trials for BNT162 are perceived to be successful, we may need to work toward the large scale technical development, manufacturing scale-up and larger scale deployment of this vaccine candidate through a variety of government mechanisms such as an Emergency Use Authorization program in the United States. We may also need to access facilities capable of rapidly manufacturing BNT162 in the volumes necessary to support large-scale clinical trials or commercial sales. If we are unable to conduct production and manufacturing activities or if our vaccine requires more doses to achieve sufficient efficacy than we expect, we may not complete our product development or commercialization efforts in a timely manner. In addition, during a global health crisis, such as the COVID-19 pandemic, where the spread of a disease needs to be controlled, closed or heavily regulated national borders will create challenges and potential delays in our development and production activities and may necessitate that we pursue strategies to develop and produce our vaccine candidate variants within self-contained national or international borders, at potentially much greater expense and with longer timeframes for public distribution.

***There can be no assurance that BNT162, even if approved, would ever become profitable, due to government interest and public perception regarding a vaccine.***

As a result of the emergency situations in many countries, there is a heightened risk that a COVID-19 vaccine may be subject to adverse governmental actions in certain countries, including intellectual property expropriation, compulsory licenses, strict price controls or other actions. Additionally, we may need to, or we may be required by governmental or non-governmental authorities to, set aside specific quantities of doses of BNT162 for designated purposes or geographic areas. We are likely to face challenges related to the allocation of

## [Table of Contents](#)

supply of BNT162, particularly with respect to geographic distribution. Thus, even if BNT162 is approved, such governmental actions may limit our ability to recoup our current and future expenses.

Furthermore, public sentiment regarding commercialization of a COVID-19 vaccine may limit or negate our ability to generate revenues from sales of BNT162. Given that COVID-19 has been designated as a pandemic and represents an urgent public health crisis, we are likely to face significant public attention and scrutiny over any future business models and pricing decisions with respect to BNT162. If we are unable to successfully manage these risks, we could face significant reputational harm, which could negatively affect the price of the ADSs representing our ordinary shares.

### ***The regulatory pathway for BNT162 is highly dynamic and continues to evolve and may result in unexpected or unforeseen challenges.***

To date, BNT162 has moved rapidly through the regulatory review process of the FDA and foreign regulatory authorities. The speed at which all parties are acting to create and test many therapeutics and vaccines for SARS-CoV-2 and COVID-19 is unusual, and evolving or changing plans or priorities within the FDA and foreign regulatory authorities, including changes based on new knowledge of COVID-19 and how the disease affects the human body, may significantly affect the regulatory timeline for BNT162. Results from clinical testing may raise new questions and require us to redesign proposed clinical trials, including revising proposed endpoints or adding new clinical trial sites or cohorts of subjects.

For example, the FDA on June 30, 2020 adopted guidance outlining the FDA's current recommendations regarding the data needed to facilitate clinical development and licensure of vaccines to prevent COVID-19. In particular, the June 30, 2020 guidance suggests that the primary efficacy endpoint estimate for a placebo-controlled efficacy trial should be at least 50%. The guidance also includes discussion of chemical, manufacturing and controls and safety concerns. Although we intend to design any future clinical trials for BNT162 in accordance with this guidance, we cannot be certain that, as the regulatory pathway continues to evolve, we will be able to complete a clinical trial in accordance with the FDA's guidance and regulations then in effect. A failure to complete a clinical trial in accordance with guidance and regulations then in effect could impair our ability to obtain approval for BNT162, which may adversely affect our operating results, reputation and ability to raise capital and enter into or maintain collaborations to advance our other product candidates.

Additionally, the FDA has the authority to grant an Emergency Use Authorization to allow unapproved medical products to be used in an emergency to diagnose, treat, or prevent serious or life-threatening diseases or conditions when there are no adequate, approved, and available alternatives. If we are granted an Emergency Use Authorization for BNT162, we would be able to commercialize BNT162 prior to FDA approval. However, the FDA may revoke an Emergency Use Authorization where it is determined that the underlying health emergency no longer exists or warrants such authorization, and we cannot predict how long, if ever, an Emergency Use Authorization would remain in place. Such revocation could adversely impact our business in a variety of ways, including if BNT162 is not yet approved by the FDA and if we and our manufacturing partners have invested in the supply chain to provide BNT162 under an Emergency Use Authorization.

### ***Even if regulatory approval is received for a BNT162 vaccine candidate, the later discovery of previously unknown problems associated with BNT162 may result in restrictions, including withdrawal of the product from the market, and lead to significant liabilities and reputational damage.***

Because the path to marketing approval of any vaccine against COVID-19 is unclear, we may have a widely used vaccine in circulation in the United States or another country prior to our receipt of marketing approval. Unexpected safety issues, including any that we have not yet observed in our Phase 1/2 clinical trials for BNT162, could lead to significant reputational damage for BioNTech and our technology platforms going forward and other issues, including delays in our other programs, the need for re-design of our clinical trials and the need for significant additional financial resources.

## [Table of Contents](#)

We also may be restricted or prohibited from marketing or manufacturing a BNT162 vaccine, even after obtaining product approval, if previously unknown problems with the product or its manufacture are subsequently discovered. We cannot provide assurance that newly discovered or developed safety issues will not arise following regulatory approval. With the use of any vaccine by a wide patient population, serious adverse events may occur from time to time that did not arise in the clinical trials of the product or that initially appeared to be unrelated to the vaccine itself and only with the collection of subsequent information were found to be causally related to the product. Any such safety issues could cause us to suspend or cease marketing of our approved products, possibly subject us to substantial liabilities, and adversely affect our ability to generate revenue and our financial condition.

***We may be unable to produce a successful COVID-19 vaccine and establish a competitive market share for our vaccine before a competitor or before the COVID-19 outbreak is effectively contained or the risk of coronavirus infection is significantly diminished.***

A large number of vaccine manufacturers, academic institutions and other organizations currently have programs to develop COVID-19 vaccine candidates. While we are not aware of all of our competitors' efforts, we believe that the University of Oxford/AstraZeneca plc, CanSino Biologics Inc., Sanofi/GlaxoSmithKline plc Inovio Pharmaceuticals, Inc., China National Pharmaceutical Group (Sinopharm)/Beijing Institute of Biological Products and Wuhan Institute of Biological Products, Moderna, Inc., Johnson & Johnson, Novavax, Inc. and other companies are all in the early stages of developing vaccine candidates against COVID-19. Our competitors pursuing vaccine candidates may have greater financial, product candidate development, manufacturing and marketing resources than we do. Larger pharmaceutical and biotechnology companies have extensive experience in clinical testing and obtaining regulatory approval for their products, and may have the resources to heavily invest to accelerate discovery and development of their vaccine candidates.

Our efforts to develop BNT162 for regulatory approval and commercialization may fail if competitors develop and commercialize one or more COVID-19 vaccines before we are able to do so, or if they develop and commercialize one or more COVID-19 vaccines that are safer, more effective, produce longer immunity against COVID-19, require fewer administrations, have fewer or less severe side effects, have broader market acceptance, are more convenient or are less expensive than any vaccine candidate that we may develop.

***Other companies or organizations may challenge our intellectual property rights or may assert intellectual property rights that prevent us from developing and commercializing our product candidates and other technologies.***

We practice in new and evolving scientific fields, the continued development and potential use of which has resulted in many different patents and patent applications from organizations and individuals seeking to obtain intellectual property protection in the fields. We own and in-license patent applications and issued patents that describe and/or claim certain technologies, including products, reagents, formulations and methods including uses and manufacturing methods, or features or aspects of any of these. These issued patents and pending patent applications claim certain compositions of matter and methods relating to the discovery, development, manufacture and commercialization of therapeutic modalities and our delivery technologies, including LNPs. If we, our co-owners or our licensors are unable to obtain, maintain, protect, defend or enforce patent protection with respect to our product candidates and other technology and any product candidates and technology we develop, our business, financial condition, results of operations and prospects could be materially harmed.

As the scientific fields mature, our known competitors and other third parties have filed, and will continue to file, patent applications claiming inventions in the field in the United States and abroad. There is uncertainty about which patents will issue, and, if they do, as to when, to whom and with what claims. With respect to both in-licensed and owned intellectual property, we cannot predict whether the patent applications we and our licensors are currently pursuing will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide sufficient protection from competitors.

## [Table of Contents](#)

We, our co-owners or our licensors may in the future become a party to patent proceedings or priority disputes in the United States, Europe or other jurisdictions. The Leahy-Smith America Invents Act, or the America Invents Act, enacted in September 2011, included a number of significant changes that affect the way patent applications will be prosecuted and also may affect patent litigation. These include allowing third-party submission of prior art to the USPTO during patent prosecution and additional procedures to attack the validity of a patent through USPTO-administered post-grant proceedings, including post-grant review, inter partes review and derivation proceedings. We expect that our competitors and other third parties will institute litigation and other proceedings, such as interference, reexamination and opposition proceedings, as well as inter partes and post-grant review proceedings against us and the patents and patent applications that we own and in-license. For example, various third parties have filed opposition papers challenging our issued EP patent 2714071 which relates to our iNeST product candidates, and whose claims recite steps relating to neoantigen selection.

We expect that we will be subject to similar proceedings or priority disputes, including oppositions, in Europe or other foreign jurisdictions relating to patents and patent applications in our portfolio.

If we, our co-owners or our licensors are unsuccessful in any interference proceedings or other priority or validity disputes, including any derivations, post-grant review, inter partes review or oppositions, to which we or they are subject, we may lose valuable intellectual property rights through the narrowing or loss of one or more patents owned or in-licensed, or our owned or in-licensed patent claims may be narrowed, invalidated or held unenforceable. In many cases, the possibility of appeal exists for either us or our opponents, and it may be years before final, unappealable rulings are made with respect to these patents in certain jurisdictions. The timing and outcome of these and other proceedings is uncertain and may adversely affect our business if we are not successful in defending the patentability and scope of our pending and issued patent claims. In addition, third parties may attempt to invalidate our intellectual property rights. Even if our rights are not directly challenged, disputes could lead to the weakening of our intellectual property rights. Our defense against any attempt by third parties to circumvent or invalidate our intellectual property rights could be costly to us, could require significant time and attention of our management and could have a material adverse impact on our business and our ability to successfully compete against our current and future competitors.

There are many issued and pending patent filings that claim aspects of technologies that we may need for our mRNA product candidates or other product candidates, including patent filings that relate to relevant delivery technologies. There are also many issued patents that claim targeting genes or portions of genes that may be relevant for immunotherapies we wish to develop. In addition, there may be issued and pending patent applications that may be asserted against us in a court proceeding or otherwise based upon the asserting party's belief that we may need such patents for the development, manufacturing and commercialization of our product candidates. Thus, it is possible that one or more organizations, ranging from our competitors to non-practicing entities or patent assertion entities, has or will hold patent rights to which we may need a license, or hold patent rights which could be asserted against us. Such licenses may not be available on commercially reasonable terms or at all, or may be non-exclusive. If those organizations refuse to grant us a license to such patent rights on reasonable terms or a court rules that we need such patent rights that have been asserted against us and we are not able to obtain a license on reasonable terms or at all, we may be unable to perform research and development or other activities or market products covered by such patents, and we may need to cease the development, manufacture and commercialization of one or more of the product candidates we may develop. Any of the foregoing could result in a material adverse effect on our business, financial condition, results of operations or prospects.

## **Risks Related to Ownership of the ADSs and the Underwritten Offering**

***A significant portion of our total outstanding ordinary shares after the Underwritten Offering will be restricted from immediate resale but may be sold in the near future. The large number of shares eligible for sale or subject to rights requiring us to register them for sale could cause the market price of the ADSs to drop significantly, even if our business is performing well.***

Sales of a substantial number of ordinary shares or the ADSs could occur at any time, subject to certain restrictions described below. These sales, or the perception in the market that holders of a large number of shares intend to sell shares, could reduce the market price of the ADSs. Based on the number of our ordinary shares outstanding as of July 22, 2020, we will have 238,173,455 ordinary shares outstanding after the Underwritten Offering. Additionally, if the Rights Offering is fully subscribed (excluding new ordinary shares underlying rights offered to holders that have irrevocably agreed not to transfer or exercise their rights), we will have 240,062,644 shares outstanding.

In connection with the Underwritten Offering, we, all of our directors and officers and certain significant shareholders have entered into lock-up agreements with the underwriters under which we and they agreed, subject to specific exceptions, not to sell any of our shares for at least 90 days following the date of this prospectus. The remaining ordinary shares will be available for sale after the Underwritten Offering since they are not subject to contractual and legal restrictions on resale. Any or all of the shares subject to lock-up agreements may be released prior to the expiration of the lock-up period at the discretion of the lead underwriters for the Underwritten Offering. To the extent shares are released before the expiration of the lock-up period and these shares are sold into the market, the market price of the ADSs could decline.

We intend to file one or more registration statements on Form S-8 under the Securities Act of 1933, as amended, or the Securities Act, to register all ordinary shares issued or issuable under our equity plans. Any such Form S-8 registration statements will automatically become effective upon filing. Accordingly, shares registered under such registration statements will be available for sale in the open market following the expiration of the applicable lock-up period. See “Shares and ADSs Eligible for Future Sale” appearing elsewhere in this prospectus for a more detailed description of the restrictions on selling shares.

Sales of ADSs or our ordinary shares as restrictions end or pursuant to registration rights may make it more difficult for us to finance our operations through the sale of equity securities in the future at a time and at a price that we deem appropriate. These sales also could cause the trading price of the ADSs to fall and make it more difficult for you to sell the ADSs.

***If you purchase ADSs in the Underwritten Offering, you will incur immediate and substantial dilution in the book value of your investment.***

You will suffer immediate and substantial dilution in the net tangible book value of the ADSs if you purchase ADSs in the Underwritten Offering. Based on the public offering price of \$93.00 per ADS, after giving effect to the Underwritten Offering, purchasers of ADSs in the Underwritten Offering will experience immediate dilution in net tangible book value of \$88.23 per ADS. In addition, after giving effect to the Underwritten Offering, investors purchasing ADSs in the Underwritten Offering will contribute 28.32% of the total amount invested by shareholders since inception but will only own 2.31% of the ordinary shares outstanding. See “Dilution” for a more detailed description of the dilution to new investors in the Underwritten Offering.

***Holder of the ADSs may not be able to participate in any future preemptive subscription rights issues or elect to receive dividends in shares, which may cause additional dilution to their holdings. For example, purchasers who acquire ADSs in the Underwritten Offering will not receive rights to participate in the concurrent Rights Offering.***

Under German law, the existing shareholders of a company generally have a preemptive right in proportion to the amount of shares they hold in connection with any issuance of ordinary shares, convertible bonds, bonds

## Table of Contents

with warrants, profit participation rights and participating bonds. However, our shareholders in a shareholders' meeting may vote, by a majority representing at least three-quarters of the share capital represented at the meeting, to waive this preemptive right provided that, from the company's perspective, there exists good and objective cause for such waiver.

The deposit agreement provides that the depositary need not make rights available to you unless the distribution to ADS holders of both the rights and any related securities are either registered under the Securities Act or exempted from registration under the Securities Act. We are under no obligation to file a registration statement with respect to any such rights or securities or to endeavor to cause such a registration statement to be declared effective. Moreover, we may not be able to establish an exemption from registration under the Securities Act. Accordingly, ADS holders may be unable to participate in our future rights offerings and may experience dilution in their holdings. In addition, if the depositary is unable to sell rights that are not exercised or not distributed or if the sale is not lawful or reasonably practicable, it will allow the rights to lapse, in which case you will receive no value for these rights. Purchasers who acquire ADSs in the Underwritten Offering will not receive rights to participate in the concurrent Rights Offering.

***Our principal shareholders and management own a significant percentage of our ordinary shares and will be able to exert significant control over matters subject to shareholder approval.***

Our executive officers, directors, five percent shareholders, and their affiliates beneficially own approximately 69.99% of our ordinary shares (including ordinary shares represented by ADSs) and, upon closing of the Underwritten Offering, that same group will beneficially own approximately 68.37% of our outstanding ordinary shares (including ordinary shares represented by ADSs), assuming no exercise of the underwriters' option to purchase additional ADSs from the Selling Shareholder. If the underwriters exercise in full their option to purchase additional ADSs from the Selling Shareholder, that same group will beneficially own approximately 68.37% of our outstanding ordinary shares (including ordinary shares represented by ADSs). Therefore, even after the Underwritten Offering, these shareholders will have the ability to influence us through their ownership positions. For example, these shareholders, acting together, may be able to exert significant influence over matters such as elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our ordinary shares that you may believe are in your best interest as one of our shareholders.

***We have broad discretion in the use of our cash, cash equivalents and investments, including the net proceeds from the Underwritten Offering, and we may not use them effectively.***

Our management will have broad discretion in the application of our cash, cash equivalents and investments, including the net proceeds from the Global Offering, and could spend the proceeds in ways that do not improve our results of operations or enhance the value of our ordinary shares. The failure by our management to apply these funds effectively could result in financial losses that could have a material adverse impact on our business, cause the price of the ADSs to decline, and delay the development of our product candidates. Pending their use, we may invest our cash, cash equivalents and investments, including the net proceeds from the Global Offering, in a manner that does not produce income or that loses value. See "Use of Proceeds" for more information.

## CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements concerning our business, operations and financial performance and condition, as well as our plans, objectives and expectations for our business operations and financial performance and condition. Many of the forward-looking statements contained in this prospectus can be identified by the use of forward-looking words such as “anticipate,” “believe,” “could,” “estimate,” “expect,” “intend,” “may,” “might,” “plan,” “potential,” “should,” “target,” “would” and other similar expressions that are predictions of or indicate future events and future trends, although not all forward-looking statements contain these identifying words.

Forward-looking statements are based on our management’s beliefs and assumptions and on information currently available to our management. Such statements are subject to risks and uncertainties, and actual results may differ materially from those expressed or implied in the forward-looking statements due to a variety of factors, including, but not limited to, those identified in the section titled “Risk Factors” in this prospectus and in our Annual Report on Form 20-F for the year ended December 31, 2019, incorporated by reference herein. These risks and uncertainties include factors relating to:

- the initiation, timing, progress, results, and cost of our research and development programs and our current and future preclinical studies and clinical trials, including statements regarding the timing of initiation and completion of studies or trials and related preparatory work, the period during which the results of the trials will become available and our research and development programs;
- the timing of and our ability to obtain and maintain regulatory approval for our product candidates;
- our COVID-19 vaccine development program, including the timing thereof (including as it relates to the selection of a candidate variant and the FDA’s acceptance of our candidate variant to advance into a Phase 2b/3 trial), the data therefrom, and our ability to successfully commercialize any approved vaccine;
- our ability to supply the quantities of BNT162 to support clinical development and, if approved, market demand, including our production estimates for 2020 and 2021;
- the potential to supply the United States government with up to 500 million additional doses of BNT162 pursuant to its option to purchase additional doses from us and Pfizer;
- our expectations around the timing of entry, number of potential doses covered and amount of consideration under potential agreements for the supply of BNT162, our COVID-19 vaccine candidate, if approved;
- the impact of the evolving COVID-19 pandemic, and the global response thereto;
- our ability to identify research opportunities and discover and develop investigational medicines;
- the ability and willingness of our third-party collaborators to continue research and development activities relating to our development candidates and investigational medicines;
- our expectations regarding the size of the patient populations for our product candidates, if approved for commercial use;
- our estimates of our expenses, ongoing losses, future revenue and capital requirements and our needs for or ability to obtain additional financing;
- our ability to identify, recruit and retain key personnel;
- our and our collaborators’ ability to protect and enforce our intellectual property protection for our proprietary and collaborative product candidates, and the scope of such protection;
- the development of and projections relating to our competitors or our industry;
- our ability to commercialize our product candidates, if approved;

---

## [Table of Contents](#)

- the pricing and reimbursement of our investigational medicines, if approved;
- the rate and degree of market acceptance of our investigational medicines;
- the amount of and our ability to use net operating losses and research and development credits to offset future taxable income;
- our ability to manage our development and expansion;
- regulatory developments in the United States and foreign countries;
- our ability to manufacture our product candidates with advantages in turnaround times or manufacturing cost;
- our ability to implement, maintain and improve effective internal controls;
- the ability to realize the anticipated benefits of transactions related to our acquisition of Neon and other acquisitions, restructuring activities, including in connection with our acquisition of Neon, or other initiatives in a timely manner or at all;
- the extent to which the Rights Offering is subscribed;
- our use of the proceeds from the Global Offering; and
- our expectations regarding the time during which we will be a foreign private issuer.

The preceding list is not intended to be an exhaustive list of all of our forward-looking statements. The forward-looking statements contained in this prospectus speak only as of the date of this prospectus, and unless otherwise required by law, we do not undertake any obligation to update them in light of new information or future developments or to release publicly any revisions to these statements in order to reflect later events or circumstances or to reflect the occurrence of unanticipated events.

## USE OF PROCEEDS

We estimate that the net proceeds to us from the Underwritten Offering will be approximately \$478.0 million (€430.4 million), based on the public offering price of \$93.00 per ADS, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us. We will not receive any proceeds from the potential sale of ADSs in this Underwritten Offering by the Selling Shareholder, pursuant to the underwriters' option to purchase additional ADSs from the Selling Shareholder.

If the Rights Offering is fully subscribed (excluding ordinary shares underlying rights offered to holders that have irrevocably agreed not to transfer or exercise their rights), we estimate that the additional net proceeds to us in the Global Offering will be approximately \$166.6 million (€150.0 million), based on the subscription price of \$93.00 per ordinary share or ADS, and after deducting fees and estimated offering expenses payable by us.

We currently intend to use the net proceeds from the Global Offering to:

- advance our iNeST program candidate RO7198457 (BNT122) into late-stage trials;
- advance our ongoing and currently planned clinical trials for our FixVac product candidates, BNT111, BNT112, BNT113, BNT114, BNT115 and our targeted cancer antibody, MVT-5873 (BNT321), as well as fund our portion of the research and development expenses for SAR441000 (BNT131), which is being developed in collaboration with Sanofi, GEN1046 (BNT311) and GEN1042 (BNT312), which are being developed in collaboration with Genmab and advance the development of BNT162, our COVID-19 vaccine candidate, which is being developed in collaboration with Pfizer;
- initiate clinical trials for additional product candidates, including product candidates from our CAR-T, RiboMabs, RiboCytokines and TCR platforms in oncology;
- further accelerate and expand our infectious disease immunotherapy programs;
- advance our rare disease protein replacement therapy platforms outside of oncology;
- advance additional preclinical product candidates, develop additional product candidates leveraging our therapeutic platforms and fund the further development of our core technologies; and
- fund the further expansion of our manufacturing and laboratory capacity, the continued development of our infrastructure and investment in preparation for commercialization for launch of BNT162, if approved.

We expect to use the remainder of any net proceeds from the Global Offering, as well as our existing cash and cash equivalents, for general corporate purposes. We may also use a portion of the net proceeds to in-license or acquire or invest in complementary technologies, products, businesses or assets, either alone or together with a collaborator. However, we have no current plans, commitments or obligations to do so.

Our expected use of net proceeds from the Global Offering represents our current intentions based on our present plans and business condition, which could change as our plans and business conditions evolve. The amounts and timing of our actual use of net proceeds will vary depending on numerous factors, including the progress of our clinical development of our product candidates, including our ongoing clinical trials. As a result, we cannot predict with certainty all of the particular uses for the net proceeds to be received upon the closings of the Global Offering or the amounts that we will actually spend on the uses set forth above. Our management will have broad discretion in the application of the net proceeds from the Global Offering.

We expect that we will need to raise significant additional funds beyond the Global Offering in order to continue to advance our pipeline. In particular, we will need additional funds in order to advance our product

---

[Table of Contents](#)

candidates through Phase 3 clinical trials and to potential commercialization. We may seek to raise capital through public or private equity or debt financing, government or other third-party grants or funding, sales of assets, marketing and distribution arrangements, other collaborations or a combination of these approaches.

Based on our planned use of the net proceeds of the Global Offering and our existing cash and cash equivalents, we estimate that such funds will be sufficient to enable us to fund our operating expenses and capital expenditure requirements through at least the next 18 months. We have based this estimate on assumptions that may prove to be incorrect, and we could use our available capital resources sooner than we currently expect.

Pending our use of the net proceeds from the Global Offering, we plan to invest the net proceeds in short- and intermediate-term interest-bearing financial instruments.

## DIVIDEND POLICY

We have never paid or declared any cash dividends on our ordinary shares, and we do not anticipate paying any cash dividends on our ordinary shares in the foreseeable future. We intend to retain all available funds and any future earnings to fund the development and expansion of our business. In addition, our ability to pay cash dividends is also limited in certain circumstances under the terms of an agreement we have entered into with the Bill & Melinda Gates Foundation. All of the shares represented by the ADSs offered by this prospectus will generally have the same dividend rights as all of our other outstanding shares.

Under German law, we may pay dividends only from the distributable profit (*Bilanzgewinn*) reflected in our unconsolidated financial statements (as opposed to the consolidated financial statements for us and our subsidiaries) prepared in accordance with the principles set forth in the German Commercial Code (*Handelsgesetzbuch*) and adopted by our management board (*Vorstand*) and the supervisory board (*Aufsichtsrat*), or, as the case may be, by our shareholders in a shareholders' meeting. See "Description of Share Capital and Articles of Association (*Satzung*)," which explains in more detail the procedures we must follow and the German law provisions that determine whether we are entitled to declare a dividend.

## CAPITALIZATION

The table below sets forth our cash and cash equivalents and our total capitalization as of March 31, 2020:

- on an actual basis;
- on a pro forma basis to give effect to (i) the issuance of 1,935,488 ADSs representing our ordinary shares in our acquisition of Neon, (ii) the issuance of 1,580,777 of our ordinary shares in a private placement to Fosun Pharma for proceeds of €45.6 million (\$50.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) and (iii) the issuance of 2,377,446 of our ordinary shares in a private placement to Pfizer for proceeds of €103.9 million (\$113.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)); and
- on a pro forma as adjusted basis to give further effect to the sale of up to 5,500,000 ordinary shares (including ADSs representing ordinary shares) by us in the Underwritten Offering at the public offering price of \$93.00 per ADS, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us.

The table below does not reflect the effects of the issuance of the 2,595,996 ordinary shares and a mandatory convertible note to be issued in the June 2020 Private Placement, which is expected to close in August 2020, and our receipt of proceeds of €223.9 million (\$251.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) therefrom.

Our capitalization following the Underwritten Offering will be adjusted based on the actual public offering price and other terms of the Underwritten Offering determined at pricing, including the amount by which actual offering expenses are higher or lower than estimated. You should read this table in conjunction with our consolidated financial statements and related notes included in this prospectus as well as the sections in this prospectus titled “Use of Proceeds” and “Selected Consolidated Financial Data” and the section titled “Management’s Discussion and Analysis of Financial Condition and Results of Operations” in our Forms 20-F and 6-K incorporated by reference herein.

	As of March 31, 2020		
	Actual	Pro Forma (unaudited)	Pro Forma As Adjusted <sup>(1)</sup>
<i>(in thousands except share data)</i>			
Cash and cash equivalents	€ 451,597	€ 601,055	€ 1,031,411
Total debt	19,548	19,548	19,548
Equity			
Ordinary shares, no par value per share: 232,304,250 shares, actual; 238,197,961 shares, pro forma; 243,697,961 shares, pro forma as adjusted			
Share capital	232,304	238,198	243,698
Capital reserve	686,714	919,826	1,344,682
Treasury shares	(5,525)	(5,525)	(5,525)
Accumulated losses	(478,213)	(478,213)	(478,213)
Other reserves	12,850	12,850	12,850
Total equity	448,130	687,136	1,117,492
Total capitalization	€ 467,678	€ 706,684	€ 1,137,040

- (1) If the Rights Offering is fully subscribed (excluding ordinary shares underlying rights offered to holders that have irrevocably agreed not to transfer or exercise their rights), our cash and cash equivalents and total equity would each increase by €150.0 million, our share capital would increase by €1.9 million and our capital reserve would increase by €148.1 million.

---

[Table of Contents](#)

The number of our ordinary shares issued and outstanding actual is based on 232,304,250 ordinary shares outstanding (including 5,524,506 shares held in treasury) as of March 31, 2020 and excludes:

- 16,338,305 ordinary shares available for issuance upon the exercise of options outstanding as of March 31, 2020;
- 254,065 ordinary shares available for issuance upon the exercise of options expected to be granted in 2021 and 2022 under our long-term incentive program as of March 31, 2020; and
- 5,282,436 ordinary shares available for future issuance under our Employee Stock Ownership Plan or any future share option plan as of March 31, 2020 (after taking into account the issuance of options expected to be granted in 2021 and 2022).

## DILUTION

If you invest in the ADSs in the Underwritten Offering, your interest will be diluted immediately to the extent of the difference between the public offering price per ADS and our as adjusted net tangible book value per ADS after completion of the Underwritten Offering. The discussion in this section does not reflect the effects of the issuance of the 2,595,996 ordinary shares and a mandatory convertible note to be issued in the June 2020 Private Placement, which is expected to close in August 2020, and our receipt of proceeds of €223.9 million (\$251.0 million, translated using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) therefrom.

Net tangible book value per ADS represents the amount of our total assets less our total liabilities, excluding intangible assets, divided by the number of our ordinary shares outstanding as of March 31, 2020. As of March 31, 2020, we had a historical net tangible book value of €354.2 million (\$393.4 million), corresponding to a net tangible book value per ordinary share of €1.56 (\$1.73) (equivalent to \$1.73 per ADS). Our pro forma net tangible book value as of March 31, 2020 was €593.2 million (\$658.9 million), corresponding to a pro forma net tangible book value per ordinary share of €2.55 (\$2.83) (equivalent to \$2.83 per ADS), based on the total number of shares of our common stock outstanding as of March 31, 2020, and after giving effect to (i) the issuance of 1,935,488 ADSs representing our ordinary shares in connection with our acquisition of Neon, (ii) the issuance of 1,580,777 of our ordinary shares in a private placement to Fosun Pharma for proceeds of €45.6 million (\$50.0 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) and (iii) the issuance of 2,377,446 of our ordinary shares in a private placement to Pfizer for proceeds of €103.9 million (\$113.0 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)).

After giving effect to the issuance and sale of 5,500,000 ADSs in the Underwritten Offering at the public offering price of \$93.00 per ADS, which was the last reported sale price of the ADSs on the Nasdaq Global Select Market on July 21, 2020, our pro forma as adjusted net tangible book value as of March 31, 2020 would have been €1,023.6 million (\$1,136.9 million), corresponding to a net tangible book value per ordinary share of €4.29 (\$4.77) (equivalent to \$4.77 per ADS). This represents an immediate increase in net tangible book value of €1.74 (\$1.94) per ordinary share (equivalent to \$1.94 per ADS) to existing shareholders and immediate dilution of \$88.23 per ADS to new investors purchasing ADSs in the Underwritten Offering. Dilution per ADS to new investors is determined by subtracting our pro forma as adjusted net tangible book value per ADS from the public offering price per ADS paid by new investors.

The following table illustrates this dilution on a per-ADS basis:

Public offering price per ADS	\$93.00
Historical net tangible book value per ADS as of March 31, 2020	\$1.73
Pro forma net tangible book value per ADS as of March 31, 2020	\$2.83
Increase in net tangible book value per ADS attributable to the Underwritten Offering	\$1.94
Pro forma as adjusted net tangible book value per ADS after the Underwritten Offering	\$ 4.77
Dilution per ADS to new investors participating in the Underwritten Offering	\$88.23

## [Table of Contents](#)

If the Rights Offering is fully subscribed (excluding ordinary shares underlying rights offered to holders that have irrevocably agreed not to transfer or exercise their rights), our pro forma as adjusted net tangible book value per ordinary share would be €4.89 (\$5.43) (equivalent to \$5.43 per ADS), representing an immediate increase in pro forma as adjusted net tangible book value to existing shareholders of €2.34 (\$2.60) (equivalent to \$2.60 per ADS) per ordinary share and immediate dilution of \$87.57 per ADS to new investors, after deducting underwriting discounts and commissions, fees and estimated offering expenses payable by us.

The following table sets forth, on a pro forma as adjusted basis as of March 31, 2020, after giving effect to (i) the issuance of 1,935,488 ADSs representing our ordinary shares in connection with our acquisition of Neon, (ii) the issuance of 1,580,777 of our ordinary shares in a private placement to Fosun Pharma for proceeds of €45.6 million (\$50.0 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) and (iii) the issuance of 2,377,446 of our ordinary shares in a private placement to Pfizer for proceeds of €103.9 million (\$113.0 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)), the number of ordinary shares owned by existing shareholders and to be owned by new investors purchasing ADSs in the Underwritten Offering, the total consideration paid by existing shareholders and new investors purchasing ADSs in the Underwritten Offering, the average price per ordinary share paid by our existing shareholders and the average price per ADS to be paid by new investors purchasing ADSs in the Underwritten Offering. The calculation below is based on the public offering price of \$93.00, before deducting underwriting discounts and commissions and estimated offering expenses payable by us:

	Ordinary Shares Purchased		Total Consideration		Average Price Per Share	Average Price Per ADS
	Number	Percent	Amount	Percent		
Existing shareholders	232,673,455	97.69%	\$1,294,746,948	71.68%	\$ 5.56	\$ 5.56
Investors participating in the Underwritten Offering	5,500,000	2.31%	\$ 511,500,000	28.32%	93.00	93.00
<b>Total</b>	<b>238,173,455</b>	<b>100%</b>	<b>\$1,806,246,948</b>	<b>100%</b>	<b>\$ 7.58</b>	<b>\$ 7.58</b>

The number of our ordinary shares issued and outstanding actual, is based on 226,779,744 ordinary shares outstanding as of March 31, 2020 and excludes:

- 16,338,305 ordinary shares available for issuance upon the exercise of options outstanding as of March 31, 2020;
- 254,065 ordinary shares available for issuance upon the exercise of options expected to be granted in 2021 and 2022 under our long-term incentive program as of March 31, 2020;
- 5,282,436 ordinary shares available for future issuance under our Employee Stock Ownership Plan or any future share option plan as of March 31, 2020 (after taking into account the issuance of options expected to be granted in 2021 and 2022); and
- 5,524,506 ordinary shares held in treasury.

We may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised through the sale of equity or convertible debt securities, the issuance of such securities may result in further dilution to our shareholders.

## SELECTED CONSOLIDATED FINANCIAL DATA

The following tables present selected consolidated financial data as of December 31, 2019, for the years ended December 31, 2019, 2018 and 2017, as of March 31, 2020 and for the three months ended March 31, 2020 and 2019. We derived the selected consolidated statements of operations for the years ended December 31, 2019, 2018 and 2017 and the selected consolidated statement of financial position data as of December 31, 2019 from our audited consolidated financial statements incorporated by reference herein. The selected consolidated statements of operations data for the three months ended March 31, 2020 and 2019 and the selected consolidated statement of financial position data as of March 31, 2020 have been derived from our unaudited interim condensed consolidated financial statements incorporated by reference herein and have been prepared on the same basis as the audited financial statements. In the opinion of management, the unaudited interim data reflects all adjustments necessary for a fair presentation of the financial information in those statements. We present our consolidated financial statements in Euros and in accordance with IFRS as issued by the IASB.

The selected consolidated financial data below should be read together with our consolidated financial statements and related notes, our unaudited interim condensed consolidated financial statements and the section titled “Management’s Discussion and Analysis of Financial Condition and Results of Operations” in our Forms 20-F and 6-K incorporated by reference herein, as well as the section of this prospectus titled “Capitalization.” Our historical results for any prior period are not necessarily indicative of results to be expected in any future period, and the results for the three months ended March 31, 2020 are not necessarily indicative of the results to be expected for the full year ended December 31, 2020.

	For the Three Months Ended March 31,		For the Years Ended December 31,		
	2020	2019	2019	2018	2017
(in thousands except per share data)					
<b>Consolidated statements of operations:</b>					
Revenues from contracts with customers	€ 27,663	€ 26,154	€ 108,589	€ 127,575	€ 61,598
Cost of sales	(5,842)	(3,205)	(17,361)	(13,690)	(9,318)
<b>Gross profit</b>	<b>€ 21,821</b>	<b>€ 22,949</b>	<b>€ 91,228</b>	<b>€ 113,885</b>	<b>€ 52,280</b>
Research and development expenses	(65,122)	(57,241)	(226,466)	(143,040)	(85,496)
Sales and marketing expenses	(486)	(560)	(2,718)	(3,041)	(6,603)
General and administrative expenses	(15,815)	(9,276)	(45,547)	(26,334)	(23,520)
Other operating income	425	331	2,724	5,396	2,349
Other operating expenses	(100)	(38)	(739)	(720)	(288)
<b>Operating loss</b>	<b>€(59,277)</b>	<b>€(43,835)</b>	<b>€(181,518)</b>	<b>€ (53,854)</b>	<b>€(61,277)</b>
Finance income	6,417	3,578	4,122	8,046	2,133
Finance expenses	(103)	(74)	(326)	(48)	(26,007)
Interest expenses related to lease liability	(415)	(425)	(1,718)	(1,721)	(676)
Share of loss of equity method investees	—	—	—	(84)	(78)
<b>Loss before tax</b>	<b>€(53,378)</b>	<b>€(40,756)</b>	<b>€(179,440)</b>	<b>€ (47,662)</b>	<b>€(85,905)</b>
Income taxes	(8)	(6)	268	(600)	(45)
<b>Loss for the period</b>	<b>€(53,386)</b>	<b>€(40,762)</b>	<b>€(179,172)</b>	<b>€ (48,262)</b>	<b>€(85,950)</b>
Loss attributable to equity holders of the parent	(53,386)	(40,646)	(179,056)	(48,019)	(85,653)
Loss attributable to non-controlling interests	—	(116)	(116)	(243)	(297)
<b>Basic and diluted loss per share</b>	<b>€ (0.24)</b>	<b>€ (0.20)</b>	<b>€ (0.85)</b>	<b>€ (0.25)</b>	<b>€ (0.51)</b>

(in thousands)	As of	
	March 31, 2020 (unaudited)	December 31, 2019
<b>Consolidated statement of financial position:</b>		
Cash and cash equivalents	€ 451,597	€ 519,149
Total assets	732,208	797,647
Total liabilities	284,078	304,155
Share capital	232,304	232,304
Accumulated losses	(478,213)	(424,827)
Total equity	€ 448,130	€ 493,492

## UNAUDITED PRO FORMA CONDENSED COMBINED FINANCIAL INFORMATION

On May 6, 2020, BioNTech SE, or BioNTech, announced the closing of the Neon Therapeutics, Inc., or Neon, acquisition. The merger agreement was first announced on January 16, 2020. Based on the acquisition date share price, the implied aggregate value of the merger consideration was approximately \$97.1 million (€89.9 million using the exchange rate as of closing) financed by issuing new ordinary shares as a stock transaction and including de minimis cash consideration which was paid to settle Neon's outstanding stock options.

The following unaudited pro forma condensed combined financial information are based on BioNTech's historical consolidated financial statements prepared in accordance with International Financial Reporting Standards as issued by the IASB, or IFRS, and Neon's historical consolidated financial statements as adjusted to give effect to our acquisition of Neon. As Neon prepared its financial statements in accordance with U.S. generally accepted accounting principles, or U.S. GAAP, and applied U.S. dollars as its reporting currency, adjustments have been made to convert Neon's financial statements to IFRS and its reporting currency to Euros. Please see Notes 2 and 3 to the unaudited pro forma condensed combined financial information for a discussion of the adjustments made to convert Neon's financial information from U.S. GAAP to IFRS.

The unaudited pro forma condensed combined statement of operations for the year ended December 31, 2019 and the three months ended March 31, 2020 gives effect to this transaction as if it had occurred on January 1, 2019. The unaudited pro forma condensed combined statement of financial position as of March 31, 2020 gives effect to this transaction as if it had occurred on March 31, 2020.

The unaudited pro forma condensed combined financial information includes the latest estimates of the fair value of Neon's assets to be acquired and liabilities to be assumed and the related allocations of the purchase price using the factual circumstances as of the time of closing. These figures are applied to the unaudited condensed combined statement of financial position as of March 31, 2020. As the detailed valuation studies are still ongoing, these estimates and assumptions are subject to change.

As indicated in Note 5 to the unaudited pro forma condensed combined financial information, BioNTech has made certain adjustments to adjust the historical book values of the assets and liabilities of Neon to reflect preliminary estimates of the fair values necessary to prepare the unaudited pro forma condensed combined financial information, with the excess of the estimated purchase price over the net assets of Neon, as adjusted to reflect estimated fair values, recorded as goodwill.

Additionally, as indicated in Note 2 to the unaudited pro forma condensed combined financial information, estimated effects related to the application of IFRS have been based on preliminary assessments and as indicated in Note 3 to the unaudited pro forma condensed combined financial information, the reporting currency has been applied based on a simplified method. Actual results are expected to differ from this unaudited pro forma condensed combined financial information once BioNTech has completed the valuation studies necessary to finalize the required purchase price allocation and finalized conforming accounting changes for Neon. Such differences may be material.

The assumptions and estimates underlying the unaudited adjustments to the pro forma condensed combined financial information are described in the accompanying notes, which should be read together with the pro forma condensed combined financial information. The unaudited pro forma condensed combined financial information should be read together with:

- BioNTech's audited consolidated financial statements and related notes incorporated by reference in this registration statement as of December 31, 2019 and 2018 and for the years ended December 31, 2019, 2018 and 2017;

---

## [Table of Contents](#)

- BioNTech’s unaudited interim condensed consolidated financial statements and related notes incorporated by reference in this registration statement as of and for the three months ended March 31, 2020 and for the three months ended March 31, 2019;
- Neon’s audited consolidated financial statements and related notes as of December 31, 2019 and 2018 and for the years then ended incorporated by reference in this registration statement; and
- Neon’s unaudited interim condensed consolidated financial statements and related notes as of March 31, 2020 and for the three months ended March 31, 2020 and 2019 incorporated by reference in this registration statement.

The unaudited pro forma condensed combined financial information does not include the realization of any future cost savings or restructuring or integration charges that are expected to result from the Merger.

The unaudited pro forma condensed combined financial information is not intended to represent or be indicative of the consolidated results of operations and financial condition of the consolidated company that would have been reported had the acquisition been completed as of the dates presented, and should not be taken as being representative of the future consolidated results of operations or financial condition of the consolidated company.

**Unaudited Pro Forma Condensed Combined Statement of Financial Position**  
as of March 31, 2020  
(in thousands)

	BioNTech SE Historical IFRS EUR	Neon Therapeutics, Inc. Historical US GAAP USD	Neon Therapeutics, Inc. Historical US GAAP EUR <sup>1</sup>	Neon Therapeutics, Inc. IFRS Adjustments EUR <sup>1</sup>	Pro Forma Adjustments EUR <sup>1</sup>	Notes	Pro Forma Combined EUR <sup>1</sup>
Intangible assets	93,932	—	—	—	83,618	5 a), 5 e)	177,550
Property, plant and equipment	96,290	6,694	6,110	—	(482)	5 e)	101,918
Right-of-use assets	49,131	7,228	6,597	290	—	2 a)	56,018
Other non-current assets	—	471	430	—	—		430
<b>Total non-current assets</b>	<b>239,353</b>	<b>14,393</b>	<b>13,137</b>	<b>290</b>	<b>83,136</b>		<b>335,916</b>
Inventories	9,629	—	—	—	—		9,629
Trade receivables	10,310	—	—	—	—		10,310
Deferred expenses and other current assets	21,319	1,962	1,791	—	—		23,110
Cash and cash equivalents	451,597	15,047	13,734	—	—		465,331
<b>Total assets</b>	<b>732,208</b>	<b>31,402</b>	<b>28,662</b>	<b>290</b>	<b>83,136</b>		<b>844,296</b>
<b>Total shareholders' equity</b>	<b>448,130</b>	<b>14,431</b>	<b>13,172</b>	<b>290</b>	<b>74,868</b>	2 a), 5 a), 5 d)	<b>536,460</b>
Contract liabilities	75,187	—	—	—	—		75,187
Deferred tax liabilities	—	—	—	—	7,931	5 b)	7,931
Other non-current liabilities	66,848	6,204 <sup>2</sup>	5,663	—	—		72,511
<b>Total non-current liabilities</b>	<b>142,035</b>	<b>6,204</b>	<b>5,663</b>	<b>—</b>	<b>7,931</b>		<b>155,629</b>
Trade payables	19,417	3,043	2,777	—	—		22,194
Contract liabilities	94,824	—	—	—	—		94,824
Other current liabilities	27,802	7,724 <sup>3</sup>	7,050	—	337	5 c)	35,189
<b>Total liabilities</b>	<b>284,078</b>	<b>16,971</b>	<b>15,490</b>	<b>—</b>	<b>8,268</b>		<b>307,836</b>
<b>Total liabilities and equity</b>	<b>732,208</b>	<b>31,402</b>	<b>28,662</b>	<b>290</b>	<b>83,136</b>		<b>844,296</b>

- (1) Please see Note 3 to the unaudited pro forma condensed combined financial information.  
(2) Consists of operating lease liabilities of \$6,200 and other liabilities of \$4.  
(3) Consists of accrued expenses of \$6,437 and operating lease liabilities of \$1,287.

### Unaudited Pro Forma Condensed Combined Statement of Operations

For the year ended December 31, 2019  
(in thousands, except for per share information)

	BioNTech SE Historical IFRS EUR	Neon Therapeutics, Inc. Historical US GAAP USD	Neon Therapeutics, Inc. Historical US GAAP EUR <sup>1</sup>	Neon Therapeutics, Inc. IFRS Adjustments EUR <sup>1</sup>	Pro Forma Adjustments EUR <sup>1</sup>	Notes	Pro Forma Combined EUR <sup>1</sup>
Revenue	108,589	—	—	—	—		108,589
Cost of sales	(17,361)	—	—	—	—		(17,361)
Research and development expenses	(226,466)	(59,718)	(53,768)	(226)	(1,117)	2 a), 2 b)	(281,577)
Sales and marketing expenses	(2,718)	—	—	—	—		(2,718)
General and administrative expense	(45,547)	(21,420)	(19,286)	(715)	—	2 a), 2 b)	(65,548)
Other operating income	2,724	—	—	—	—		2,724
Other operating expenses	(739)	—	—	—	—		(739)
Operating loss	(181,518)	(81,138)	(73,054)	(941)	(1,117)		(256,630)
Finance income, net	2,078	1,401	1,261	(660)	—	2 a)	2,679
Other expenses	—	(39)	(35)	—	—		(35)
Loss before tax	(179,440)	(79,776)	(71,828)	(1,601)	(1,117)		(253,986)
Income taxes	268	—	—	—	—		268
Loss for the period	(179,172)	(79,776)	(71,828)	(1,601)	(1,117)		(253,718)
Loss for the period attributable to non-controlling interests	(116)	—	—	—	—		(116)
Net loss attributable to common stockholders	(179,056)	(79,776)	(71,828)	(1,601)	(1,117)		(253,602)
Basic and diluted loss per share	(0.85)						(1.19)
Weighted-average shares	211,499				1,935		213,434

(1) Please see Note 3 to the unaudited pro forma condensed combined financial information.

**Unaudited Pro Forma Condensed Combined Statement of Operations**  
For the three months ended March 31, 2020 (in thousands, except for per share information)

	BioNTech SE Historical IFRS EUR	Neon Therapeutics, Inc. Historical US GAAP USD	Neon Therapeutics, Inc. Historical US GAAP EUR1	Neon Therapeutics, Inc. IFRS Adjustments EUR1	Pro Forma Adjustments EUR1	Notes	Pro Forma Combined EUR1
Revenue	27,663	—	—	—	—		27,663
Cost of sales	(5,842)	—	—	—	—		(5,842)
Research and development expenses	(65,122)	(9,446)	(8,566)	407	(279)	2 a), 2 b)	(73,560)
Sales and marketing expenses	(486)	—	—	—	—		(486)
General and administrative expense	(15,815)	(7,220)	(6,548)	518	—	2 a), 2 b)	(21,845)
Other operating income	425	—	—	—	—		425
Other operating expenses	(100)	—	—	—	—		(100)
Operating (loss) income	(59,277)	(16,666)	(15,114)	925	(279)		(73,745)
Finance income, net	5,899	68	62	(167)	—	2 a)	5,794
Other expenses	—	—	—	—	—		—
(Loss) income before tax	(53,378)	(16,598)	(15,052)	758	(279)		(67,951)
Income taxes	(8)	—	—	—	—		(8)
Net (loss) income attributable to common stockholders	(53,386)	(16,598)	(15,052)	758	(279)		(67,959)
Basic and diluted loss per share	(0.24)						(0.30)
Weighted-average shares	226,779				1,935		228,714

(1) Please see Note 3 to the unaudited pro forma condensed combined financial information.

#### Notes to Unaudited Pro Forma Condensed Combined Financial Information

##### 1 Basis of preparation

The historical consolidated financial statements of BioNTech and Neon have been adjusted in the unaudited pro forma condensed combined financial information to give effect to pro forma events that are (1) directly attributable to the business combination, (2) factually supportable and (3) with respect to the unaudited pro forma condensed combined statements of operations, expected to have a continuing impact on the combined results following the business combination. The business combination was accounted for under the acquisition method of accounting in accordance with IFRS 3, Business Combinations. As the acquirer for accounting purposes, BioNTech has performed preliminary estimates of the fair value of Neon's assets acquired and liabilities assumed and performed a preliminary conversion to conform the U.S. GAAP accounting policies of Neon to its own accounting policies under IFRS.

##### 2 Accounting policy conformity changes

The historical financial information of Neon was prepared in accordance with U.S. GAAP. The following preliminary adjustments convert Neon's financial information from U.S. GAAP to IFRS and align Neon's accounting policies to those applied by BioNTech.

## Table of Contents

- a) Neon adopted ASC 842 as of January 1, 2019 for lease accounting. For the year ended December 31, 2019 and the three months ended March 31, 2020, BioNTech applied IFRS 16 for lease accounting. The following adjustments reflect as if Neon had adopted IFRS 16 as of January 1, 2019:
- Decrease in research and development expenses of k€349 and decrease of general and administrative expenses of k€78 and increase of finance expense of k€660 the year ended December 31, 2019, respectively, due to increased depreciation and reclassification of operating lease interest expense into finance expense.
  - Decrease in research and development expenses of k€99 and decrease of general and administrative expenses of k€22 and increase of finance expense of k€167 the three months ended March 31, 2020, respectively, due to increased depreciation and reclassification of operating lease interest expense into finance expense.
  - Increase in right-of-use assets and total shareholder's equity of k€290 as of March 31, 2020.
- b) The following adjustments reflect the change from straight-line method to the accelerated method of recognizing stock compensation expense per IFRS 2 and the reversal of mark-to-market expense for stock options granted to non-employees:
- Increase in research and development expenses of k€575 and increase in general and administrative expenses of k€793 for the year ended December 31, 2019.
  - Decrease in research and development expenses of k€308 and decrease in general and administrative expenses of k€496 for the three months ended March 31, 2020.

### **3 Foreign currency adjustments**

The historical consolidated financial statements of Neon were presented in U.S. dollars. The historical financial information was translated from U.S. dollars to Euro using the following historical exchange rates:

	\$/€
Average exchange rate for the year ended December 31, 2019	1.11
Average exchange rate for the three months ended March 31, 2020	1.10
Period end exchange rate as of March 31, 2020	1.10
Exchange rate as of closing	1.08

### **4 Business combination**

#### *Financing transaction*

BioNTech completed the acquisition of Neon for 0.063 new ADSs representing new ordinary shares of BioNTech in exchange for each outstanding share of Neon common stock and settled Neon's outstanding stock options in cash.

#### *Preliminary purchase price allocation*

BioNTech has performed a preliminary valuation analysis of the fair market value of Neon's assets and liabilities. The following table summarizes the preliminary purchase price allocation as of March 31, 2020 including the consideration based on factual circumstances as of closing date (in thousands). The total consideration was calculated based on the new shares issued as of closing, and included the acquisition date share price as well as a cash consideration which will be made to settle Neon's outstanding stock options. The USD consideration is translated into Euro as of March 31, 2020 using the period end exchange rate as of March 31, 2020.

<b>Total consideration</b>	<b>€88,667</b>
Intangible assets	€ 482
Property, plant and equipment	€ 5,628
Right-of-use assets	€ 6,887
In-process research and development	€29,032
Prepaid expenses and other assets	€ 2,221
Cash and cash equivalents	€13,734
Long-term liabilities	€ (5,663)
Accounts payable	€ (2,777)
Other liabilities	€ (7,050)
Deferred tax liabilities, net	€ (7,931)
<b>Goodwill</b>	<b><u>€54,104</u></b>

This preliminary purchase price allocation has been used to prepare pro forma adjustments in the unaudited pro forma condensed combined statement of financial position and statement of operations. The final purchase price allocation will be determined when BioNTech has completed the detailed valuations and necessary calculations. The final allocation could differ materially from the preliminary allocation used in the pro forma adjustments. The final allocation may include material changes in allocations to intangible assets such as licenses, technology and customer relationships as well as goodwill and other changes to assets and liabilities.

## 5 Pro forma adjustments

The pro forma adjustments are based on BioNTech's preliminary estimates and assumptions that are subject to change. The following adjustments have been reflected in the unaudited pro forma condensed combined financial information:

- a) Reflects the adjustment of intangible assets acquired by BioNTech to their estimated fair values. As part of the preliminary valuation analysis, BioNTech identified intangible assets in form of in-process research and development projects. The fair value of identifiable intangible assets is determined primarily using the income method approach. Since all information required to perform a detailed valuation analysis of Neon's intangible assets could not be obtained as of the date of this filing, for purposes of these unaudited pro forma condensed combined financial information, BioNTech used certain assumptions based on publicly available data for the industry. Amortization for the in-process research and development in the amounts of k€1,117 for the year ended December 31, 2019 and k€279 for the three months ended March 31, 2020 has been reflected in the unaudited pro forma condensed combined statements of operations. These preliminary estimates of fair value will likely differ from final amounts BioNTech will calculate after completing a detailed valuation analysis, and the difference could have a material impact on the accompanying unaudited pro forma condensed combined financial information. A change in the valuation of intangible assets would correspond to an increase or decrease in the balance of goodwill.
- b) Adjusts the deferred tax liabilities resulting from the acquisition. The estimated increase in deferred tax liabilities to k€7,931 stems primarily from the fair value adjustments for non-deductible intangible assets based on an estimated tax rate of 27.32%. This estimate of deferred income tax balances is preliminary and subject to change based on management's final determination of the fair value of assets acquired and liabilities assumed by jurisdiction.
- c) Represents the cash consideration which will be made to settle Neon's outstanding stock options.

## [Table of Contents](#)

- d) Represents the elimination of the historical equity of Neon and the issuance of ordinary shares to finance the acquisition, as follows (in thousands):

Net equity proceeds from issuance of 0.063 American Depositary Shares of the Company per share of Neon and cash settlement of Neon's outstanding stock options	€ 88,330
Less: historical Neon shareholders' equity converted into Euro and IFRS adjusted as of March 31, 2020	<u>€(13,462)</u>
<b>Pro forma adjustment to shareholders' equity</b>	<b><u>€ 74,868</u></b>

- e) The adjustment reclassifies software assets of k€482 from property, plant and equipment to intangibles to conform the presentation of the balance of BioNTech's presentation.

## BUSINESS

### I. Overview

BioNTech was founded in 2008 on the understanding that every cancer patient's tumor is unique and that in order to effectively address this challenge, we must create individualized treatments for each patient. To realize this vision, we combine decades of groundbreaking research in immunology, cutting-edge therapeutic platforms and a suite of patient profiling and bioinformatic tools to develop immunotherapies for cancer and other diseases. We leverage powerful new therapeutic mechanisms and exploit a diverse array of biological targets to harness the power of each patient's immune system to address the unique molecular signature of each patient's underlying disease. The breadth of our immunotherapy technologies and expertise has also enabled us to develop therapies to address a range of rare and infectious diseases, and we have recently rapidly mobilized these with the aim of addressing the COVID-19 pandemic. We believe we are uniquely positioned to develop and commercialize the next generation of immunotherapies with the potential to significantly improve clinical outcomes for patients and usher in a new era of individualized medicine.

We and our collaborators have advanced a development pipeline of over 20 product candidates, of which 12 have entered into 13 ongoing clinical trials. While we believe our approach is broadly applicable across a number of therapeutic areas, our most advanced programs are focused on oncology, where we have treated over 500 patients across 17 tumor types to date. Our immunotherapy drug classes consist of messenger ribonucleic acid, or mRNA, therapeutics, cell therapies, antibodies and small molecule immunomodulators. Our product candidates span oncology, infectious diseases and rare diseases.

We have assembled an exceptional team of over 1,400 employees and have established relationships with seven pharmaceutical collaborators, including Genentech, Inc., or Genentech, Sanofi S.A., or Sanofi, Genmab A/S, or Genmab, Genevant Sciences GmbH, or Genevant, Bayer AG, or Bayer, Pfizer Inc., or Pfizer, and Shanghai Fosun Pharmaceutical (Group) Co., Ltd., or Fosun Pharma. We have built out comprehensive, highly automated, on-demand in-house manufacturing capabilities that complement the development of our individualized immunotherapies.

Our immunotherapy product candidates span the following four distinct drug classes:

- **mRNA Therapeutics.** We are utilizing messenger ribonucleic acid, or mRNA, to deliver genetic information to cells, where it is used to express proteins for therapeutic effect. We are developing a portfolio of immunotherapies that utilize four different mRNA formats and three different formulations to derive five distinct platforms for the treatment of cancer. Three of these platforms are currently in human testing: (i) our off-the-shelf shared antigen immunotherapy, or FixVac; (ii) our individualized neoantigen specific immunotherapy, or iNeST, in collaboration with Genentech; and (iii) our intratumoral immunotherapy, in collaboration with Sanofi. In addition, we are developing two platforms in which we use mRNA to express directly in the patient either (a) particular antibodies, or RiboMabs, or (b) specific cytokines, or RiboCytokines. In collaboration with Pfizer, the University of Pennsylvania, Genevant and Fosun Pharma we are also leveraging our mRNA technology beyond oncology to address COVID-19, influenza, other infectious diseases and rare diseases.
- **Cell Therapies.** We are developing a range of cell therapies, including chimeric antigen receptor, or CAR, T cells, neoantigen-based T cell therapies and T cell receptor, or TCR, therapies, in which the patient's T cells are modified or primed to target cancer-specific antigens. We are also combining our mRNA FixVac platform with our first CAR-T product candidates, using "CARVac" immune boosters to enhance the persistence of CAR-T cells *in vivo*.
- **Antibodies.** We are developing, in collaboration with Genmab, next-generation bispecific antibodies that are designed to target immune checkpoints that modulate the patient's immune response to cancer. We are also exploring additional targeted cancer antibody approaches utilizing our in-house and recently acquired antibody capabilities.

- **Small Molecule Immunomodulators.** We use small molecules to augment the activity of other drug classes by inducing specific and discrete patterns of immunomodulation. We are developing a small molecule toll-like receptor 7, or TLR7, immunomodulator for the treatment of solid tumors.

We have leveraged these four drug classes to build a robust pipeline of product candidates. Our pipeline includes 12 product candidates in 13 ongoing clinical trials. Our most advanced programs are focused on oncology, where we have to-date treated over 500 patients across 17 solid tumor types. We also are developing more than 10 additional preclinical programs and expect to initiate clinical testing with several of them in the near future. We are targeting the advancement of up to three product candidates into the clinic in 2020, with clinical data updates for up to four additional programs expected by the end of 2020. In our Phase 1 trials, we have observed antigen-specific immune responses in over 90% of advanced melanoma patients treated with BNT111, our lead FixVac off-the-shelf product candidate, as a single agent. In addition, we have observed single-agent antigen-specific immune responses in patients treated with BNT121, the precursor to RO7198457 (BNT122), our lead iNeST product candidate. In both trials, we have observed durable objective responses (reduction in tumor volume) in both the monotherapy and checkpoint-combination settings.

We believe our technology and expertise is broadly applicable across a number of therapeutic areas, such as infectious diseases and rare diseases. In April 2020, we initiated a first-in-human clinical trial program for our BNT162 vaccine program to prevent COVID-19, which includes four vaccine candidate variants based on three distinct mRNA formats. We are co-developing BNT162 with Pfizer worldwide (ex-China) and with Fosun Pharma in China. We initiated the BNT162 program in late January 2020 in response to the global COVID-19 pandemic, and initiated human testing following preclinical studies and within approximately three months of initiating the research program. On July 1 and July 20, 2020, we and Pfizer announced preliminary data from our Phase 1/2 clinical trials of BNT162. Our ability to rapidly design and test multiple vaccine variants leveraged our deep experience with mRNA vaccines and our prior preclinical work in the infectious disease field.

We have established multiple collaborations to advance our science and development capabilities and provide capital, most of which has been non-dilutive. We have entered into selective collaborations with leading pharmaceutical companies where a collaborator may bring incremental expertise or resources that we currently do not possess in-house. To date, we have formed relationships with seven pharmaceutical companies, which comprise Genentech, Sanofi, Genmab, Genevant, Bayer, Pfizer and Fosun Pharma. We have entered into some of these collaborations in order to advance our technologies and business outside of our initial focus on cancer. We are collaborating with Pfizer to develop an influenza vaccine and with Pfizer and Fosun Pharma to develop a COVID-19 vaccine, each utilizing our mRNA-based immunotherapy technology. We also have a collaboration with Genevant to develop protein replacement therapies in up to five rare disease indications. Furthermore, we are collaborating with the University of Pennsylvania, or Penn, to develop mRNA-based vaccines in up to 10 additional infectious disease indications. We have a relationship with Translational Oncology at the University Medical Center of the Johannes Gutenberg University Mainz (Translationale Onkologie an der Universitätsmedizin der Johannes Gutenberg Universität Mainz gemeinnützige GmbH), or TRON, to further our immunotherapy research. We either wholly own or retain significant rights to all of our clinical stage programs, either in the form of a global share of profit and co-commercialization rights with our collaborators in certain markets or significant royalties and milestones.

Our ability to develop, control and optimize the manufacturing process is a core strategic pillar and competitive advantage across our portfolio, in particular for our individualized product candidates. We operate three Good Manufacturing Practice, or GMP, certified manufacturing facilities in Germany, where we manufacture mRNA therapeutics and cell therapies for our own pipeline and for external customers. We operate a fourth manufacturing facility in Germany where we manufacture custom peptides to support our extensive immunomonitoring activities within our development programs. We have collaborated with Siemens AG, or Siemens, to develop efficient, semi-automated processes to produce our individualized mRNA immunotherapies on demand.

## ***Our Team***

Our team combines proven biotechnology entrepreneurs, world-renowned immunologists and sophisticated biopharma investors. We were founded in 2008 by our scientific founders, Prof. Ugur Sahin, M.D., Prof. Christoph Huber, M.D. and Özlem Türeci, M.D., with a seed investment of €150 million from the Strüngmann family, through its investment vehicle AT Impf, and MIG Fonds, or MIG. Andreas and Thomas Strüngmann are serial entrepreneurs, having co-founded Hexal AG, a German pharmaceutical firm, which they built and sold to Novartis, along with their majority stake in Eon Labs, Inc., a U.S. public pharmaceutical firm, for a combined €5.6 billion (at the time, \$8.3 billion). After selling Hexal, they founded a family office focused on healthcare. The Strüngmann family office and MIG have invested in, helped build and sold, either on their own or together, a number of biotechnology and healthcare companies, such as SuppreMol, Ganymed AG, or Ganymed, CorImmun, Sivantos (former Siemens hearing aid business), Press Ganey (surgery survey company) and Apceth (cell therapy manufacturing company). Helmut Jeggle and Michael Motschmann, on behalf of the Strüngmann family and MIG, respectively, along with Dr. Huber, were founding members of our Supervisory Board.

BioNTech has been supported since its inception by Prof. Rolf Zinkernagel, M.D., Ph.D. and Prof. Hans Hengartner, Ph.D., who serve on our Scientific Advisory Board. Dr. Zinkernagel is a Professor Emeritus at the University of Zurich, University Hospital, and former head of the Institute of Experimental Immunology in Zurich. Prof. Zinkernagel was awarded the Nobel Prize in 1996 for the discovery of how the immune system recognizes virus-infected cells. Prof. Hengartner is a world-renowned immunologist and Professor Emeritus at the Federal Institute of Technology ETH Zurich and the University of Zurich.

At the time of BioNTech's founding, Dr. Sahin and Dr. Türeci were the Chief Scientific Officer and the Chief Medical Officer, respectively, of Ganymed, a private biotechnology company that was founded in 2001 and was focused on developing a monoclonal antibody targeting CLDN18.2 (zolbetuximab). The Strüngmann family office and MIG were majority investors in Ganymed. When Dr. Sahin became Chief Executive Officer of BioNTech, he stepped down from the management board of Ganymed and became the chair of its Scientific Advisory Board. Dr. Türeci continued to lead Ganymed as its Chief Executive Officer until it was sold to Astellas Pharma Inc. in 2016 for up to \$1.4 billion.

Our initial group of scientific founders have been joined by experienced pharmaceutical executives, immunologists and biotechnology specialty investors. Sean Marett, our Chief Business Officer and Chief Commercial Officer, led the business development teams at Evotec, and previously was an executive at GlaxoSmithKline in the United States. Dr. Sierk Poetting, our Chief Financial Officer and Chief Operating Officer, joined us from Sandoz, where he served as the Chief Financial Officer in North America. Ryan Richardson, our Chief Strategy Officer, joined BioNTech from J.P. Morgan Securities LLC, where he served as Executive Director, Healthcare Investment Banking. We have also attracted talented scientists such as Katalin Karikó, our Senior Vice President & Head of RNA Protein Replacement, who has more than 30 years of experience working with RNA, has published more than 70 peer-reviewed papers and is co-inventor on mRNA-related patents, including a foundational patent relating to modified mRNA.

[Table of Contents](#)

**Our Pipeline of Product Candidates**

We are advancing a deep and broad portfolio of product candidates derived from our four drug classes focused on the treatment of cancer, infectious and rare diseases:

**Oncology**

Drug Class	Platform	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Rights/ Collaborator	Milestones
mRNA	FixVac (fixed combination of shared cancer antigens)	BNT111	Advanced melanoma (Adjuvant & Metastatic)					Global	Report Phase 1 data; publication upcoming; Phase 2 with registrational potential start 2H 2020
		BNT112	Prostate cancer					Global	Phase 2 with registrational potential start 2H 2020
		BNT113	HPV16+ head and neck cancer <sup>1</sup>					Global	Data update 2H 2020
		BNT114	Triple negative breast cancer					Global	Phase 1 start 1H 2021
		BNT115	Ovarian cancer <sup>1</sup>					Global	Enrollment update 2H 2020 <sup>2</sup> ; interim data update in 2H 2021
		BNT116	NSCLC					Global	Two Phase 2 trials planned 2H 2020
	InNeST (patient specific cancer antigen therapy)	RO7198457 (BNT122 <sup>3</sup> )	IL melanoma with CP <sup>4</sup> Multiple solid tumors NSCLC and colorectal cancer (Adjuvant)					Genentech (global 50:50 profit/loss share)	
		Intratumoral Immunotherapy	SAR441000 (BNT131)	Solid tumors ( <i>IL-12α</i> , <i>IL-15α</i> , <i>GM-CSF</i> , <i>IFNα</i> )					Sanofi (global profit/loss share)
	RiboMabs (mRNA-encoded antibodies)	BNT141	Multiple solid tumors					Global	Phase 1 start 1H 2021
		BNT142	Multiple solid tumors (CD3+CLDN6)					Global	Phase 1 start 1H 2021
	RiboCytokines (mRNA-encoded cytokines)	BNT151	Multiple solid tumors (Optimized <i>IL-2</i> )					Global	Phase 1 start 1H 2021
BNT152, BNT153		Multiple solid tumors ( <i>IL-7</i> , <i>IL-2</i> )					Global	Phase 1 start 1H 2021	
Cell Therapies	CAR-T Cells	BNT211	Multiple solid tumors (CLDN6)					Global	Phase 1/2 start 2H 2020
		BNT212	Pancreatic, other cancers (CLDN18.2)					Global	
	Neosantigen-based T cell therapy	BNT221 (NEO-PTC-01)	Multiple solid tumors					Global	Phase 1 start 2H 2020
Antibodies	Next-Gen CP <sup>6</sup> Immunomodulators	GEN1046 (BNT311)	Multiple solid tumors (PD-L1+/-JBB)					Genmab (global 50:50 profit/loss share)	Data update 2H 2020
		GEN1042 (BNT312)	Multiple solid tumors (CD40+/-JBB)					Genmab (global 50:50 profit/loss share)	
	Targeted Cancer Antibodies	BNT321 (MVT-5873)	Pancreatic cancer ( <i>sLe<sup>x</sup></i> )					Global	
SMIM <sup>7</sup>	Toll-Like Receptor Binding	BNT411	Solid tumors ( <i>TLR7</i> )					Global	

**Other**

Drug Class	Platform	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Rights/ Collaborator	Milestones
mRNA	Infectious Disease Immunotherapies	BNT161	Influenza					Pfizer Fosun Pharma (China), Pfizer (Global, except China)	Phase 1 start 2021
		BNT162	COVID-19					Pfizer (Global, except China)	Phase 2/3 start late July 2020
		To be selected	Up to 10 indications					Pant <sup>8</sup>	First Phase 1 trial to start 1H 2021
		To be selected	HIV and tuberculosis					Bill & Melinda Gates Foundation	
	Rare Disease PRT <sup>9</sup>	BNT171	Not disclosed					Genevant (global 50:50 profit/loss share)	Phase 1 start 2H 2021

1 BNT113 and BNT115 are currently being studied in investigator-initiated phase 1 trials  
 2 BNT122 (InNeST) is investigated in arm 2 (N=15) of the 3 arm TNBC-MERIT trial, with BNT114 as an optional treatment; BNT114 is investigated in arm 1 (N=12) and arm 3 (N=15) of the TNBC-MERIT trial (total patients in study: N=42)  
 3 Checkpoint Inhibitor  
 4 Update on the ongoing study including patient enrollment number, efficacy and safety data for an interim update expected in the second half of 2021  
 5 As the trial is sponsored and conducted by Sanofi, the timing of data updates is not under our control and is subject to change by Sanofi  
 6 Checkpoint  
 7 Small Molecule Immunomodulators  
 8 We are eligible to receive worldwide licenses  
 9 Protein Replacement Therapy

## 1. Oncology

**FixVac.** Our FixVac product candidates contain selected combinations of pharmacologically optimized uridine mRNA encoding known cancer-specific shared antigens. They feature our proprietary immunogenic mRNA backbone and proprietary RNA-lipoplex, or RNA-LPX, delivery formulation, designed to enhance stability and translation, target dendritic cells and trigger both innate and adaptive immune responses. We and investigators are currently evaluating five FixVac product candidates in clinical trials, including BNT111 in a Phase 1 trial in advanced melanoma, BNT112 in a Phase 1/2 trial in prostate cancer, BNT113 in a Phase 1 trial in HPV+ head and neck cancers, BNT114 in a Phase 1 trial in triple negative breast cancer and BNT115 in a Phase 1 trial in ovarian cancer.

As of the July 2019 interim cut-off, 95 patients with metastatic melanoma had been dosed at least once in our Phase 1 clinical trial of BNT111. Forty-two of these patients had macroscopic tumor lesions at the time they were enrolled, and these patients were evaluated for preliminary clinical activity, with 25 receiving BNT111 as a monotherapy and 17 receiving BNT in combination with a checkpoint inhibitor. Three of the 25 patients who received BNT111 as a monotherapy demonstrated a partial response, one patient had a metabolic complete response as measured by FGD-PET imaging and seven had stable disease following treatment. Six of the 17 patients who received BNT111 in combination with a checkpoint inhibitor demonstrated a partial response and two had stable disease following treatment. We intend to publish a peer-reviewed article with additional data from our ongoing trial of BNT111 in melanoma in 2020.

We expect to initiate a Phase 2 trial with registrational potential for BNT111 in metastatic melanoma in the second half of 2020. We enrolled the first patient in a Phase 1/2 trial for BNT112, our FixVac product candidate targeting prostate cancer, in the second half of 2019. In addition, we are planning to initiate a Phase 2 trial with registrational potential for BNT113 in HPV+ head and neck cancers by the end of 2020.

**Individualized neoantigen specific immunotherapy (iNeST).** Our iNeST immunotherapies contain unmodified, pharmacologically optimized mRNA encoding up to 20 patient-specific neoantigens and also feature our proprietary RNA-LPX formulation. We are conducting, in collaboration with Genentech, multiple clinical trials of our iNeST product candidate, RO7198457 (BNT122). The iNeST Phase 1a (monotherapy)/1b (in combination with atezolizumab) trial is a non-registrational, signal seeking study recruiting mostly patients with late stage advanced cancers, including patients that failed multiple lines of prior treatment. We believe that iNeST is particularly well suited for patients with a lower tumor burden. This positioning is supported by clinical activity shown in our previously reported Phase 1 trial, in which BNT121 was administered intranodally in 13 patients with metastatic melanoma. In this trial, as of October 2019 we have observed stable, progression-free survival in nine patients for up to 60 months following surgery and treatment with BNT121. In addition, three out of five patients had an objective response, two patients received iNeST alone and the third patient also received checkpoint immunotherapy. We also observed a significant decrease in the cumulative recurrence rate post-treatment as compared to pre-treatment. Based on these findings, we, in collaboration with Genentech, initiated a randomized iNeST Phase 2 trial in first-line metastatic melanoma in combination with pembrolizumab. In June 2020, we reported data from a monotherapy dose-finding cohort of our RO7198457 (BNT122) Phase 1 trial in multiple solid tumors, which showed that *ex vivo* T cell responses were detected in approximately 86% of patients treated with RO7198457 (BNT122) as a monotherapy and later in June 2020 we provided a data update for an additional cohort in combination with atezolizumab. We and Genentech expect to provide an enrollment update from our RO7198457 (BNT122) Phase 2 trial in first-line melanoma in the second half of 2020. We expect this enrollment update to include an update on the ongoing study, including patient enrollment numbers, with efficacy and safety data expected in an interim update in the second half of 2021. We and Genentech plan to initiate two additional clinical trials for RO7198457 (BNT122) in 2020 in adjuvant NSCLC and adjuvant colorectal cancer.

**mRNA intratumoral immunotherapy.** In collaboration with Sanofi, we are conducting a Phase 1 trial of SAR441000 (BNT131), our first mRNA-based intratumoral immunotherapy, as a monotherapy and in combination with cemiplimab in patients with solid tumors. SAR441000 (BNT131) consists of a modified mRNA that encodes

## [Table of Contents](#)

the IL-12sc, IL-15sushi, GM-CSF and IFN- $\alpha$  cytokines. SAR441000 (BNT131) is designed to be administered directly into the tumor in order to alter the tumor *microenvironment* and enhance the immune system's ability to recognize and fight cancer within the tumor (proximal) as well as in other untreated locations (distal).

*CLDN6 CAR-T cell immunotherapy.* We are developing a proprietary chimeric antigen receptor T cell, or CAR-T, product candidate, BNT211, targeting Claudin-6, or CLDN6, a novel solid tumor-specific antigen. We developed BNT211 utilizing our target discovery engine, and we plan to administer it along with a CARVac "primer" to boost the immune response and promote CAR-T cell persistence. We expect to initiate a Phase 1/2 clinical trial for BNT211 in patients with advanced CLDN6 + solid tumors in the second half of 2020.

*Neoantigen-based T cell therapies.* We recently acquired a neoantigen-based T cell platform. Our lead product candidate under this platform, NEO-PTC-01 (BNT221), is a personalized neoantigen-targeted adoptive T cell therapy candidate consisting of multiple T cell populations targeting the most therapeutically relevant neoantigens from each patient's tumor. We expect to initiate a Phase 1 clinical trial in NEO-PTC-01 (BNT221) in metastatic melanoma in the second half of 2020.

*Next-generation checkpoint immunomodulators.* We are developing, in collaboration with Genmab, novel next-generation bispecific antibodies that are designed for conditional activation of immunostimulatory checkpoint molecules. Our first bispecific candidates are GEN1046 (BNT311), which targets PD-L1 in conjunction with 4-1BB, and GEN1042 (BNT312), which targets CD40 in conjunction with 4-1BB. While 4-1BB is a known immune checkpoint target that is expressed on T cells and natural killer, or NK, cells, prior attempts to target 4-1BB with monoclonal antibodies have been severely limited by liver toxicities. Our 4-1BB targeting product candidates are designed to avoid toxicities by conditionally activating a 4-1BB receptor only together with the binding of either PD-L1 or CD40. We have initiated Phase 1/2a trials of GEN1046 (BNT311) and GEN1042 (BNT312) in solid tumors. We expect to report interim data on GEN1046 (BNT311) in 2H 2020.

*Targeted Cancer Antibodies.* In May 2019, we acquired an antibody with a novel mode of action, MVT-5873 (BNT321). BNT321 is a fully human IgG1 monoclonal antibody targeting sialyl Lewis A (sLea), a novel epitope expressed specifically in pancreatic and other solid tumors. MVT-5873 (BNT321) is currently in Phase 1 clinical development in pancreatic cancer, which we resumed in December 2019 upon the enrollment of the first patient. Positive interim data were announced in February 2018.

In addition, we have several other cancer immunotherapy programs in development, including:

- *RiboMabs:* novel classes of mRNA-based therapeutics that are designed to encode antibodies directly in the patient's body. We expect to initiate Phase 1 clinical trials for our first two RiboMab product candidates, BNT141 and BNT142, in the first half of 2021.
- *RiboCytokines:* novel classes of mRNA-based therapeutics that are designed to encode cytokines directly in the patient's body. We expect to initiate Phase 1 clinical trials for our first RiboCytokine product candidates, BNT151 and BNT152/BNT153 (combination), in the first half of 2021.
- *TCR therapy:* T cells with engineered TCRs that are designed to specifically target cancer cells.
- *Precision T cell therapy:* Autologous, non-engineered T cells targeting shared RAS neoantigens prevalent across many solid tumors.
- *Small molecule immunomodulators:* novel intratumoral agents that trigger inflammation and improvement of antigen presentation by antigen-presenting cells. We filed an IND for our first small molecule immunomodulator product candidate, BNT411, in the fourth quarter of 2019 and dosed the first patient in our Phase 1 clinical trial for BNT411 in solid tumors in July 2020.

## 2. *Infectious Disease Immunotherapies*

We have collaborated with third parties to exploit the immunotherapeutic properties of our mRNA drug class for the treatment and prevention of infectious diseases. Notably, we have recently started development of four vaccine candidate variants for the prevention of COVID-19. We expect to advance our flu vaccine into the clinic by the end of 2021, and our first programs under our Penn collaboration into the clinic by the first half of 2021.

- *COVID-19 vaccine:* In response to the COVID-19 pandemic, we are developing a vaccine candidate based on mRNA technology to induce immunity and prevent COVID-19 in response to the growing global health threat posed by the disease. Building on our existing collaboration with Pfizer, in April 2020, we announced that we and Pfizer had entered into a collaboration agreement to co-develop our potential first-in-class COVID-19 mRNA vaccine program, BNT162, aimed at preventing COVID-19. We and Pfizer are jointly conducting clinical trials for four COVID-19 vaccine candidate variants initially in the United States and Europe across multiple sites. If a vaccine candidate is approved, we and Pfizer will also work jointly to commercialize the vaccine worldwide (excluding China which is covered by a collaboration with Fosun Pharma). If the vaccine candidate is approved, we and Pfizer expect to manufacture up to 100 million doses by the end of 2020 and potentially more than 1.3 billion doses by the end of 2021. In March 2020, we entered into a strategic alliance with Fosun Pharma to co-develop a COVID-19 vaccine in China. Upon regulatory approval, Fosun Pharma will commercialize the vaccine in China, while we retained the full rights to develop and commercialize the vaccine in the rest of the world (jointly with Pfizer). On July 1 and July 20, 2020, we and Pfizer announced preliminary data from our Phase 1/2 clinical trials of BNT162.
- *Flu vaccine:* In August 2018, we entered into a collaboration with Pfizer to develop mRNA-based immunotherapies for the prevention of influenza, product candidate BNT161.
- *Infectious diseases:* In October 2018, we entered into a research collaboration with Penn, under which we have the exclusive option to develop and commercialize mRNA immunotherapies for the treatment of up to 10 infectious disease indications. In August 2019, we entered into a letter agreement and investment agreement with the Bill & Melinda Gates Foundation to advance the development of immunotherapies for the prevention and/or treatment of HIV and tuberculosis and up to three additional infectious diseases.

## 3. *Rare Disease Protein Replacement Therapies*

We are collaborating with Genevant in order to capitalize on opportunities for our mRNA technology in rare disease indications potentially featuring expedited paths to market. We are combining our mRNA technology with Genevant's lipid nanoparticle, or LNP, delivery technology to create up to five mRNA protein replacement therapies for the treatment of rare diseases with high unmet medical needs. We expect our first compound to enter the clinic in the second half of 2021.

## II. Our Strengths

We are developing a broad portfolio of technologies and product candidates that we believe position us at the forefront of the next generation of targeted, specific immunotherapies. Our key strengths include:

***We are a next-generation immunotherapy powerhouse pioneering individualized immunotherapies to address the shortcomings of existing treatments for cancer and other indications with significant unmet need.***

- We have established leadership and expertise in immunology and oncology. Through 11 years of rigorous scientific investigation and clinical translation, we have developed a portfolio of disruptive immunotherapy technologies designed to address the challenges of disease heterogeneity and patient variability.

## [Table of Contents](#)

- Our team has consistently been first-movers and has published over 150 scientific papers in leading peer-reviewed journals. We were the first to develop an intravenously delivered mRNA-based human therapeutic, the first to advance an individualized mRNA-based cancer immunotherapy into clinical trials, and the first to establish scaled in-house manufacturing for such a product candidate.
- Since our founding in 2008, we have advanced four of our therapeutic platforms into human clinical trials, generated promising early evidence of clinical activity in several cancer types, raised \$1.6 billion of capital from renowned global biopharmaceutical investors, formed collaborations with seven leading pharmaceutical companies, and acquired complementary assets ranging from research and manufacturing units to clinical programs.
- Our efforts are driven by a group of over 1,400 employees including over 600 in research and development, overseen by our founders who are internationally recognized thought leaders in their disciplines.

### ***We are developing product candidates addressing highly specific immuno-oncology targets, employing a technology-agnostic approach.***

- Our portfolio includes four drug classes, spanning mRNA therapeutics, cell therapies, antibodies and small molecule immunomodulators, which can be used alone or in combination to enhance therapeutic effect and produce potentially synergistic effects, as demonstrated in our combination of our BNT211 CAR-T product candidate with a CARVac immune primer.
- Our oncology pipeline includes 11 product candidates in 12 ongoing clinical trials, and more than 10 preclinical programs.
- We have developed significant expertise in the selection of optimal combinations of targets for the specific and individualized treatment of particular cancers. We have assembled libraries of more than 200 proprietary or known shared antigens and have developed predictive algorithms capable of efficiently identifying multiple neoantigens on an individualized basis for any patient. We further enhanced these capabilities with our acquisition of Neon.
- Our approach enables real-time monitoring of therapeutic effect on the immune system in a feedback loop of biological surveillance that we believe has the potential to further enhance the success of individualized immunotherapy approaches.

### ***We have tested our lead mRNA candidates in over 500 patients and have already demonstrated signs of single-agent clinical activity in our two lead programs.***

- Our most advanced programs are focused on oncology where we have to-date dosed over 500 patients across 17 solid tumor types.
- In our Phase 1 trials, we observed single-agent antigen specific immune responses in over 90% of advanced melanoma patients treated with BNT111, our lead off-the-shelf immunotherapy product candidate leveraging our wholly owned FixVac platform. In addition, we observed single-agent antigen-specific immune responses in patients treated with BNT121, the precursor to our lead individualized neoantigen specific immunotherapy product candidate derived from our iNeST platform. In June 2020, we reported data from a monotherapy dose-finding cohort of our RO7198457 (BNT122) Phase 1 trial in multiple solid tumors, which showed that *ex vivo* T cell responses were detected in approximately 86% of patients treated with RO7198457 (BNT122) as a monotherapy and later in June 2020 we provided a data update for an additional cohort in combination with atezolizumab. For both candidates, we have observed durable objective responses in both the monotherapy and checkpoint combination settings.

***We have developed a very broad and advanced mRNA therapeutic portfolio for the treatment of cancer.***

- We have over a decade of experience pioneering the use of mRNA as a drug class, yielding five distinct mRNA platforms in oncology, each with the potential to generate multiple first-in-class product candidates.
- We have developed four distinct mRNA formats, each tailored to specific therapeutic applications. We have also developed and optimized multiple delivery formulations for our mRNA product candidates, including our proprietary non-viral RNA-LPX, to deliver our mRNA systemically and target it to relevant organs in the body.
- The combination of these platforms, formats and delivery formulations is designed to address a wide range of disease targets, and tailor drug products for systemic or intratumoral delivery, as well as directly encode mAbs or cytokines in vivo.
- This broad mRNA expertise is a core strategic asset of our company. It is protected by a global patent portfolio and our proprietary technical knowledge and trade secrets.

***We have a deep, diversified pipeline and expect data updates for up to four oncology programs and one in infectious disease by the end of 2020.***

- We have already advanced our portfolio to a critical stage of maturity with multiple programs progressing in parallel. We expect numerous near-term product candidate development updates, including:
  - data updates in up to five clinical programs by the end of 2020; and
  - advancement of up to three product candidates into the clinic in 2020.
- Our preclinical oncology pipeline is progressing rapidly. We initiated clinical trials for both of our lead checkpoint immunomodulator antibody product candidates in 2019, and enrolled the first patients in clinical trials of BNT112 and BNT321 (MVT-5873). We initiated clinical trials for BNT162 for COVID-19 in the first half of 2020 and for our small molecule product candidate, BNT411, in July 2020. We expect to initiate clinical trials for our lead CAR-T product candidate, BNT211, and our recently acquired adoptive T cell therapy product candidate, NEO-PTC-01 (BNT221) in the second half of 2020. We also expect to initiate clinical trials for our RiboMab and RiboCytokine product candidates in the first half of 2021.
- We initiated clinical trials for BNT162 for COVID-19 in the first half of 2020. We expect to report our target indications and first product candidates for our infectious and rare disease platforms in 2020.

***We have formed multiple collaborations with leading pharmaceutical companies and have retained significant development, commercial and financial rights across our portfolio.***

- We have chosen to form collaborations in oncology to rapidly advance our science and enhance our development capabilities, bring our potentially disruptive therapies to patients more quickly and provide capital, most of which has been non-dilutive.
- We are currently collaborating with three pharmaceutical companies with expertise in oncology, Genentech, Sanofi and Genmab, and have retained significant rights in each of our collaborations.
- In addition, we have formed collaborations with leading pharmaceutical companies to broaden our footprint beyond oncology. We have collaborations with Pfizer focused on influenza and COVID-19, and Fosun Pharma for COVID-19. We are collaborating with Penn to develop mRNA-based immunotherapies for up to 10 additional infectious disease indications. We have also formed a collaboration with Genevant for up to five rare disease indications.

## [Table of Contents](#)

- We have retained worldwide rights to all product candidates under our FixVac, RiboMabs, RiboCytokines and CAR-T platforms.

### ***We have created a vertically integrated business with comprehensive in-house manufacturing capabilities.***

- We believe that to successfully bring individualized immunotherapies to patients, it is critical to control the manufacturing and supply processes. We therefore have chosen to invest early in scaling our in-house capabilities.
- We currently operate four manufacturing facilities in Germany spanning mRNA and peptide production, viral vectors and engineered T cells, and we continue to invest significant human and financial capital into these activities.
- In collaboration with Siemens, we are optimizing our iNeST production process, reducing turnaround time from over three months to less than six weeks currently, with the goal of delivering on-demand commercial supply.

### ***Our Company's scientific DNA, which is the foundation of the BioNTech approach, has attracted a talented team from over 50 countries around the world.***

- Prof. Ugur Sahin, M.D., our co-founder and Chief Executive Officer, and Özlem Türeci, M.D., our Chief Medical Officer, are physicians, scientists and innovators. They have made groundbreaking scientific and technological contributions in the field of personalized cancer immunotherapy and are co-inventors on more than 100 patents. Their daily work is motivated by their experience as researchers and cancer physicians aiming to exploit scientific insights and drive technological progress to develop commercially viable products that could help individual patients, an attitude and culture that has become the DNA of BioNTech.
- Our DNA, with a deep culture of intellectual curiosity and innovation, has made us a destination of choice for scientific pioneers. This culture has attracted an exceptionally talented team from over 50 countries around the world.
- We have participated in nearly 300 scientific publications, of which over 100 are in leading peer-reviewed journals.

## **III. Our Strategy**

Our vision is to harness the power of the human immune system to develop truly individualized and patient-centric therapies for cancer and other serious diseases. We aim to rapidly develop, manufacture and, if approved, commercialize a portfolio of novel immunotherapies, including both off-the-shelf drugs and individualized treatments. The key elements of our strategy to achieve this vision are as follows:

### ***Rapidly advance our potential first-in-class product candidates derived from our FixVac and iNeST platforms toward market approvals in oncology, either on our own or with our collaborators.***

- We and investigators are conducting five Phase 1 clinical trials with our wholly owned off-the-shelf FixVac mRNA immunotherapy. Our most advanced current FixVac product candidate, BNT111, is currently being evaluated in 115 patients with advanced melanoma, and we expect to initiate a Phase 2 trial with registrational potential in the second half of 2020.
- We are also advancing, in collaboration with Genentech, our iNeST individualized neoantigen specific mRNA immunotherapy in two clinical trials, targeting more than eight tumor types, and have two additional clinical trials planned for 2020. Our most advanced iNeST program is a Phase 2 trial of our product candidate, RO7198457 (BNT122), in 132 patients with metastatic melanoma, evaluating iNeST in combination with pembrolizumab as a first-line therapy.

## [Table of Contents](#)

- We believe both FixVac and iNeST have therapeutic potential in a wide variety of solid tumors. We have identified significant market opportunities in additional indications and plan to pursue potentially expedited routes to market approval.

### ***Progress additional product candidates through clinical development, leveraging our multiple drug classes and the synergies between them in order to expand our oncology pipeline.***

- In addition to FixVac and iNeST, we are also conducting a Phase 1 clinical trial of our intratumoral immunotherapy product candidate SAR441000 (BNT131) in collaboration with Sanofi, as a monotherapy in patients with advanced melanoma and as a combination therapy with an anti-PD-1/PD-L1 checkpoint inhibitor in patients with certain solid tumors.
- Beyond mRNA, we plan to rapidly advance other product candidates from our immunotherapy drug classes into clinical proof-of-concept studies in solid tumor indications.
- In collaboration with Genmab, we have initiated Phase 1/2a clinical trials for our product candidates GEN1046 (BNT311) and GEN1042 (BNT312) in solid tumors. These product candidates are based on our novel checkpoint immunomodulator bispecific monoclonal antibodies, which we believe have potential in a broad range of cancers.
- We have also initiated a Phase 1 clinical trial for our small molecule product candidate, BNT411, in solid tumors and plan to initiate a Phase 1/2 clinical trial for our wholly owned CAR-T product candidate, BNT211, in multiple solid tumors, targeting a novel solid-tumor specific antigen, CLDN6, and a Phase 1 clinical trial for our recently acquired adoptive T cell therapy product candidate, NEO-PTC-01 (BNT221) in the second half of 2020.

### ***Maximize the potential and leverage the broad applicability of our mRNA drug class in additional therapeutic areas beyond cancer, including through selective collaborations.***

- Beyond oncology, we intend to leverage our mRNA technology to direct the immune system to fight a range of infectious diseases and address missing or defective proteins in certain rare diseases.
- Our collaborations with Pfizer in influenza and COVID-19, Fosun Pharma in COVID-19 and with Genevant in rare diseases underscore the potential of our approach. We intend to continue to seek value-adding collaborations with leading industry players who contribute their competencies and know-how to complement our powerful suite of technologies to address challenging diseases outside of our core therapeutic focus on oncology.

### ***Strengthen our position as a leader in the highly automated, on-demand manufacturing of individualized therapies with the goal of delivering our therapies globally.***

- We will continue to invest to reduce cycle times and increase the automation of our processes, and to expand our manufacturing capacity across all platforms to support the efficient progression of our product candidates into late-stage clinical trials and commercialization.
- We will continue to invest in and scale up our advanced, in-house GMP manufacturing capabilities and capacity across mRNA and cell therapy production.

### ***Establish a commercial organization to bring our portfolio of cancer and infectious disease immunotherapies to patients.***

- We believe that developing our own commercial infrastructure will be key to maximizing the value of our programs. We intend to jointly participate in the commercialization of our collaborative programs where we retain significant commercial rights.

## [Table of Contents](#)

- We have expanded our footprint in the United States, and continued to do so with the acquisition of Neon, creating a U.S. research and development hub.

### ***Expand our current technology suite by continuing to develop existing and new drug classes and platforms, and selectively in-licensing technologies that are complementary to our existing pipeline.***

- As our understanding of immunology and oncology evolves, we plan to continue developing existing as well as new drug classes and platforms that are consistent with our strategy, with particular focus on those that can benefit from our in-house expertise.
- As evidenced by our recent acquisition of Neon, we also continuously assess the external environment for novel drug classes, platforms and product candidates that can further expand and improve our pipeline of innovative immunotherapeutics, and help us to execute our strategy.

### ***Maintain our culture of scientific excellence to continue to drive future innovation.***

- We are committed to maintaining close ties to the scientific and academic community by fostering our many long-standing university relationships.
- We also intend to continue our leadership in the Association for Cancer Immunotherapy, or CIMT, which provides us potential new sources of innovation and academic collaboration opportunities.

## **IV. Immunotherapy in Cancer**

The immune system has evolved over hundreds of millions of years to identify and eradicate what is foreign to the body with a high level of efficiency. The immune system's efficacy is attributable to approximately one trillion highly diversified immune cells that constantly travel throughout the body and interact in a coordinated manner. They are able to detect and eliminate diseased cells and pathogens with high precision by relying on a broad range of immune recognition receptors. Their powerful mechanisms both synergize and regulate each other.

The goal of immunotherapy in the field of oncology is to harness the power of the immune system to recognize malignant cells as "foreign," overcome immune evasion mechanisms employed by cancers, eradicate cancer cells and thereby eliminate tumors.

Immunotherapy approaches in cancer have a long history. Recent years have seen an acceleration of scientific advancements and clinical breakthroughs in this field. The introduction over the last decade of checkpoint inhibitors such as Yervoy, Opdivo, Keytruda and Tecentriq, and CAR-T therapies such as Yescarta and Kymriah has demonstrated that even leveraging one single mechanism to harness the immune system may result in unprecedented, significantly improved clinical outcomes for a subset of patients.

While these first-generation immunotherapies have ignited the paradigm shift toward immuno-oncology, they also have limitations. For example, less than 40% of patients respond to checkpoint inhibitors, while CAR-T therapies have been primarily limited to blood cancers in subsets of patients, and have been hampered by toxicities.

Realizing the full potential of immunotherapy is the objective of the next generation of immuno-oncology drugs to be developed.

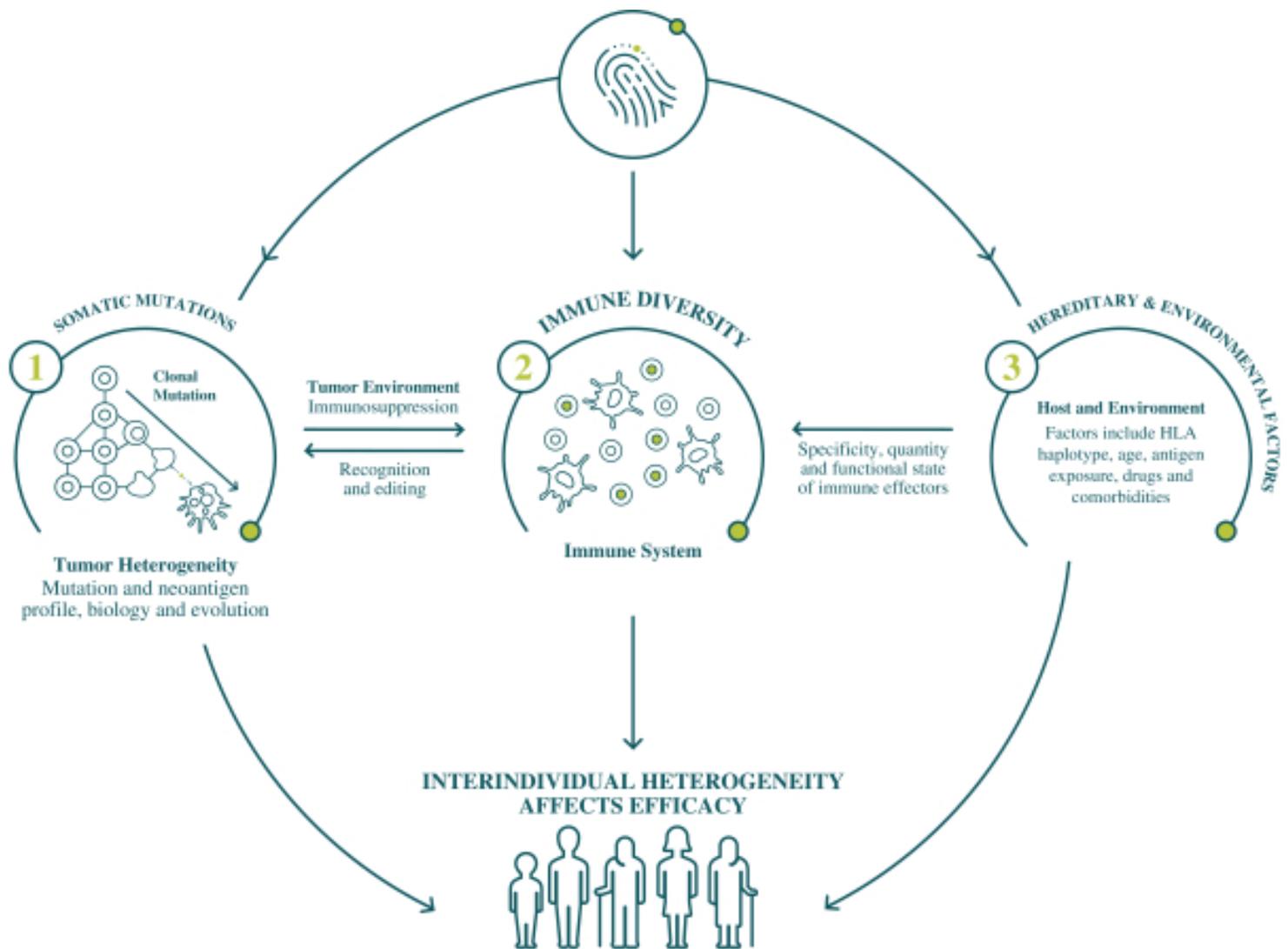
## **V. Challenges and Opportunities of Cancer Therapies**

Cancer results from an accumulation of abnormalities, known as somatic mutations, in the genome of cells over time leading to malignant transformation, combined with a failure by the immune system to detect and eradicate such transformed cells. Due to their random nature, the vast majority of these aberrations are unique to the individual patient.

As a consequence, heterogeneity is an intrinsic hallmark of cancer, posing a key challenge for cancer therapy:

- **Interindividual tumor heterogeneity.** Tumors, even within the same cancer type, differ at the molecular level. For example, two patients with the same type of cancer usually share less than five percent of their mutations. As a result, patients often respond very differently to the same drug.
- **Intratumor heterogeneity.** Within the same patient, cancer also evolves over time so that different tumor cell clones co-exist, in a manner known as clonal evolution. As a result, a patient's cancer may be intra-tumorally as well as inter-tumorally heterogeneous. Therapies might target only a subfraction of tumor cell clones. This can lead to immune escape and therapy failure.
- **Cancer evolution and immune escapes.** Cancer cells can adapt to therapeutic pressure, which results in treatment resistance. During immunotherapy, tumor cell clones may evolve that no longer express T cell recognized antigens or have defects in their antigen presentation machinery.
- **Tumor microenvironment.** Tumors induce various forms of immunosuppressive microenvironments that prevent T cells from proliferating and executing their anti-tumor effector function.
- **Host, environment and immune system.** The functional state of each patient's immune system is dependent on the patient's age, genetic makeup and environmental exposures. For example, the HLA haplotype, or the genetic makeup that encodes the major histocompatibility complex, is highly individual and decisive for which epitopes of an antigen are presented to T cells. Whereas a given tumor antigen might be a good target in one patient, a second patient might not be able to respond to it at all.

The graphic below depicts the interaction between three key factors influencing the patient unique tumor profile:



**Interindividual heterogeneity of patients.** The interaction between cancer and immune system is shaped by various host, tumor and environmental factors. The complex interplay of these sources of interpatient heterogeneity affects both the course of disease and the efficacy of immunotherapy.

Together, these factors make cancer an extremely complex and heterogeneous disease. As a consequence, in the majority of cancer types, less than 40% of treated individuals benefit from highly potent approved therapies, and responses are often not durable. While these hallmarks of cancer are a challenge for cancer therapy, they also present opportunities for immunotherapy. These interconnected layers of complexity and variability require a deep understanding of an individual cancer and call for a patient-centric approach in order to find an optimal treatment.

### **Transformation of Cancer Therapies**

We believe the recent convergence of breakthrough technologies in life sciences has enabled innovative concepts to address the immunobiology of cancer at its core. One of these breakthroughs has been the establishment of cancer immunotherapy in the armamentarium of cancer treatments. Another has been the emerging progress towards individualized medicine. Technologies such as next-generation sequencing, or NGS, have confirmed beyond doubt the problematic diversity of tumors on the inter-patient level. At the same time, NGS enables fast, cost-efficient and precise high-resolution mapping of each patient's individual disease. We believe the application of these breakthrough technologies has the potential to change drug development and profoundly alter the oncology treatment landscape.

The ability to translate a comprehensive molecular map of an individual tumor into treatment decisions, and make individually tailored therapeutics available, have become the focus of the next generation of cancer therapy. The technology necessary for leapfrog advancements in oncology now exists, but to realize its potential, a radical paradigm shift is required in drug development.

## VI. The BioNTech Approach

In oncology, we are focused on bringing cancer immunotherapy into the next generation. We believe that we can accomplish this by applying the following principles:

- **Exploiting the full potential of the immune system.** Our broad pipeline includes mRNA-based immune activators, antigen-targeting T cells and antibodies, and defined immunomodulators of various immune cell mechanisms. This portfolio is designed to mirror the evolution of the immune system to rely on multiple complementary pathways.
- **Broadening the universe of patients benefiting from cancer immunotherapy.** We discover and exploit novel targets and target combinations. Our aim is to extend the utility of immunotherapy to patient populations that are not currently amenable or do not benefit from the targets of current immunotherapies. One example is patients with low mutational load tumors, such as pancreatic and prostate cancer, which we address with tumor-associated antigens.
- **Improving the success rate.** We engineer and develop highly potent drug candidates designed to achieve precision for the specific target. We further augment activity and counteract resistance mechanisms by combining compounds with non-overlapping, synergistic mechanisms of action, such as combining our FixVac immunotherapy (CARVac) with our novel CAR-T therapies.
- **Focusing on curative approaches.** The root cause of recurrence or for lack of tumor eradication is interindividual variability and cancer heterogeneity. Addressing this biological reality is one of the mandatory design aspects of the product candidates we develop. For example, each of our cancer immunotherapies incorporates multiple targets in order to account for this variability.

We have applied these four guiding principles to a broad suite of therapeutic platforms optimized for a distinct mode of action, high precision targeting, high potency and efficacy. We expect each platform to yield a pipeline of drug candidates for further development.

We believe this technology-agnostic range of platforms and product candidates positions us to remain at the forefront of the shift toward an individually tailored, patient-centric therapeutic approach in oncology.

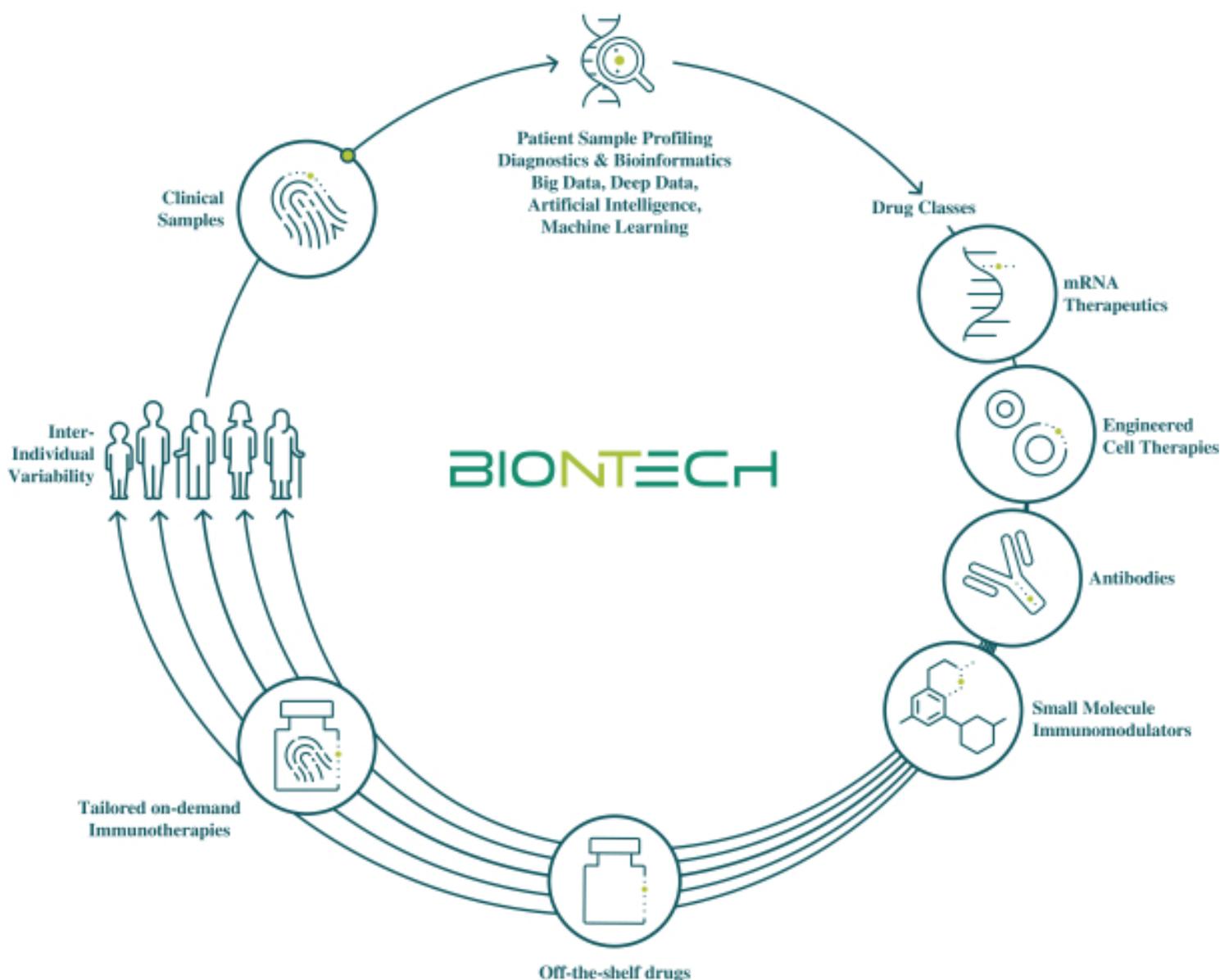
Similarly, in infectious disease, we are deploying our full suite of technologies and immunotherapeutic understanding to develop mRNA vaccines against emerging infectious diseases, such as COVID-19, in a manner that is designed to be faster and more easily scalable, and with more flexible constructs, than traditional vaccine development.

### *Patient-Centric Approach*

We believe the next generation of cancer immunotherapy will start from the perspective of the molecular changes that have occurred in an individual patient, and then will provide a specific therapy for that patient. We believe that BioNTech is ideally positioned to drive this transformation.

Our patient-centric approach starts with profiling and diagnostics by utilizing a target identification engine. This engine combines next generation sequencing, genomics, bioinformatics, machine learning and artificial intelligence to (a) identify gene targets of interest, (b) characterize the functional relevance of these targets (i.e. the ability to raise an immune response to or through a target) and (c) demonstrate their drugability. From our very beginning onwards, we have been developing the novel technologies needed to match the identified targets to the optimal individualized treatment approach.

Our patient-centric approach is illustrated and described below:



**Our patient-centric approach.** Utilizing patient profiling, diagnostics and bioinformatics, we select from our suite of drug classes to provide optimal individualized treatment. Our treatments include off-the-shelf drugs as well as highly tailored immunotherapies that are produced on-demand for the individual patient.

Utilizing this approach:

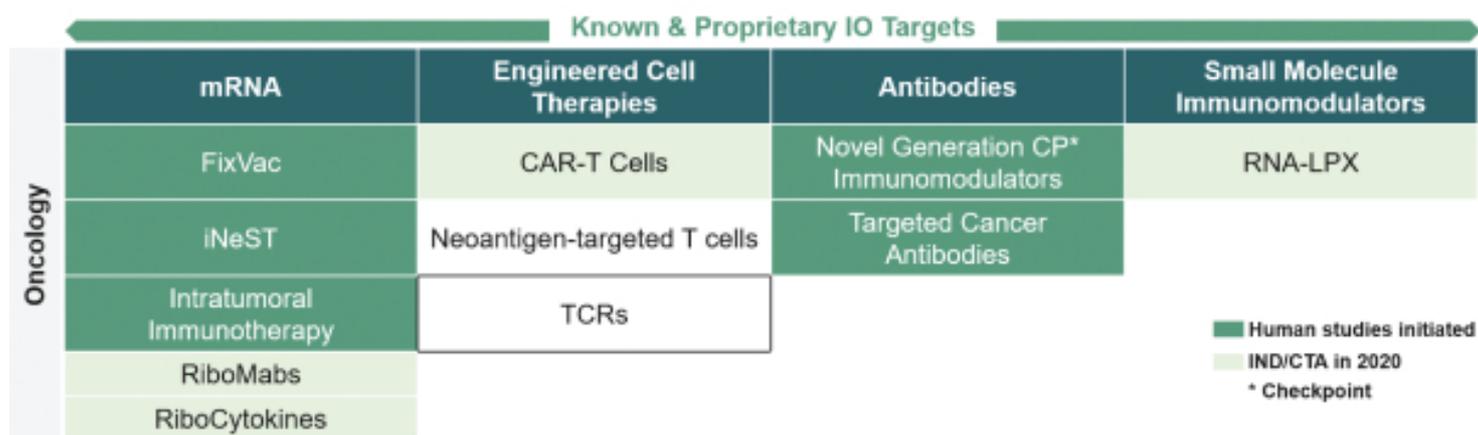
1. We develop and leverage our competencies in target discovery, biomarker science and computational medicine to thoroughly profile a patient's tumor sample and immune cells for the selection of suitable targets and treatments. Combined with our deep domain expertise in immunology and product vision, we are able to use this data to develop next-generation product candidates.
2. We have developed and are iteratively optimizing next-generation therapeutic platforms leveraging four drug classes. Each therapeutic platform bundles innovations designed to deliver a distinct mode of action with high-precision targeting, high potency and efficacy. Each platform is being developed to provide a pipeline of drug candidates with complementary and potentially synergistic modes of action.
3. Our drug platforms are highly versatile and support the fast development of scalable manufacturing processes. We develop and establish highly digitalized and automated manufacturing technologies and quality controlled processes enabling fast delivery of customized therapies comprising off-the-shelf drugs, on-demand immunotherapies, and combinations thereof.

[Table of Contents](#)

We invest in innovation whenever we encounter technology barriers which may constrain clinical success. We are technology-agnostic and we seek to utilize the technology that is most suited for the respective purpose. By focusing on the three pillars discussed above over the last decade, we have integrated all of the building blocks of immunotherapy under one roof, enabling an approach with the potential to optimize patient outcomes.

**Broad and Potentially Synergistic Suite of Platforms**

We believe the depth and breadth of our understanding of immune system and cancer biology allows us to create an extensive pipeline of specific and potentially efficacious product candidates. We are exploiting a comprehensive repertoire of known and proprietary therapeutically relevant immunology targets and are developing a diverse spectrum of immunotherapeutic approaches, as shown in the chart below.



We believe that harnessing complementary, potentially synergistic modes of action increases the likelihood of therapeutic success, reduces the risk of emergence of secondary resistance mechanisms, and also unlocks a larger potential market. Critically, this approach allows us to pursue a technology agnostic approach, providing the most appropriate therapeutic platform or a combination thereof for the intended patient and purpose.

For example, we believe our neoantigen immunotherapies are particularly well-suited to treat high mutation load cancers in the adjuvant setting to prevent the tumor from spreading or recurring following initial treatment such as surgery. In this setting, tumor volumes tend to be low and there remains the potential for strong T cell responses since the patient’s immune system has not been weakened by prior lines of treatment, and checkpoint inhibition alone often offers a poor risk-benefit profile or low response rate. Similarly, we believe our FixVac, CAR-T, neoantigen-targeted T cell and next-generation checkpoint immunomodulator platforms may have especially strong potential in lower mutation burden tumors such as ovarian or prostate cancers, which comprise a significant proportion of tumors and often also have a poor response to checkpoint inhibition. Likewise, we believe that monoclonal targeted cancer antibodies and CAR-T cell therapies are particularly well-suited for tumors that have defects in their antigen-presentation machinery.

## Table of Contents

We believe our breadth of our technology positions us to combine modes of action in a coordinated way to treat cancer in a more efficacious manner than current existing therapies. We further believe that our patient-centric approach and our broad, potentially synergistic portfolio of drug platforms place us at the forefront of the paradigm shift toward individualized immunotherapies.

Cancer segment	Patient Population	Challenge	Our Therapeutic Strategy
High mutational burden/ adjuvant stage cancers	Significant portion of cancer patients	Poor risk-benefit profile of checkpoint inhibitors	• <i>mRNA Neoantigen Immunotherapy</i> ( <i>iNeST</i> )
Low mutational burden cancers	>60% of cancers	Poor response to checkpoint inhibitors	• <i>Shared Antigens</i> ( <i>FixVac, CAR-T cells, Antibodies</i> )
"Immune desert" cancers	>40% of high-mutational cancers	Poor infiltration and activation of T-cells in TME <sup>1</sup>	• <i>mRNA Immunotherapy</i> • <i>Immunostimulatory Compounds</i> ( <i>intratumoral, RiboCytokines</i> )
Cancers with MHC / B2M loss	20-30% of CPI-experienced advanced cancers	Failure of immune system to recognize tumor cells	• <i>Antibodies</i> • <i>CAR-Ts</i>
Refractory tumors	Patients with large tumors and multiple resistance mechanisms	Few treatment options	• <i>Engineered Cell Therapies</i> • <i>Combination Therapies</i>

<sup>1</sup>Tumor microenvironment

**Diversity of cancer patient populations, challenges and our therapeutic strategies.** We believe our diversified portfolio allows us to potentially address a large share of cancer patients. Abbreviations: B2M, beta-2 microglobulin, a component of MHC.

## VII. Selection of Therapeutic Targets and Therapies

Immunotherapy targets can be categorized as *antigens* for targeted immunotherapy with antibody- or T cell-based effector mechanisms and *immunomodulatory targets* to be exploited to improve the anti-tumoral function of immune cells.

### A. Targeting Cancer Antigens

In order to address the broadest possible number of patients, our therapeutically targeted cancer antigen library comprises tumor associated antigens, viral neoantigens and mutant neoantigens:

#### 1. Tumor Associated Antigens

Tumor associated antigens, or TAAs, are cancer selective targets that typically have a highly restricted expression pattern in normal tissues but are frequently expressed in a wide range of human cancers. Over the last 15 years, we have built up a database of approximately 200 cancer-selective antigens, including proprietary disease targets that could be used as targets for immunotherapy-based approaches.

- Cancer-Germline and Cancer-Embryo-Fetal Antigens, which are normally expressed during embryonal development and silenced after birth or restricted to germline cells. These antigens are aberrantly expressed in a variety of human malignancies and are generally not expressed in healthy tissue, making them particularly suitable for our FixVac-, antibody- and CAR-T cell-based therapeutic approaches.
- Differentiation antigens, which are normally expressed in a highly tissue-specific manner in normal tissues (*e.g.*, on melanocytes or on prostate cells) but are also present in a high proportion of tumors derived from these tissues, are well-suited for therapeutic targeting with FixVac and antibody approaches.



- Tumor-associated carbohydrate antigens are carbohydrate-based cell surface tumor antigens generated by cancer cell-specific aberrant glycosylation that enable the development of antibody and CAR-T cell therapies.

## **2. Viral Neoantigens**

Viral oncoproteins, or viral neoantigens, are virus-derived proteins that drive the oncogenic transformation of infected cells by viruses that can cause cancer. Examples are the E6 and E7 oncoproteins from human papilloma virus, or HPV. Viral oncoproteins are commonly acknowledged as safe and promising targets for immunotherapy as they are (i) absent from any non-infected tissue, (ii) highly immunogenic since they are not prone to central tolerance mechanisms and (iii) not subject to immune escape by gene silencing as they are crucial to maintaining the transformed state of the tumor cells. We leverage viral neoantigens as targets for our BNT113 FixVac program in HPV16+ head and neck cancer.

## **3. Mutant Neoantigens**

Somatic mutations, or mutations of non-germline cells, are a hallmark of cancer. Driver mutations promote the oncogenic process, whereas passenger mutations are considered as functionally irrelevant. Both types of mutations, however, can alter the sequence of proteins and create new epitopes which are processed and presented on specialized major histocompatibility complex, or MHC, molecules. Mutated epitopes that are recognized by T cells are called neoepitopes and the sequence-altered proteins they are derived from are neoantigens. They are promising targets for cancer immunotherapy as (i) activation of the immune system against such antigens is highly specific (they are only expressed on cancer cells) and (ii) mutant neoantigens are exempt from central tolerance and thus T cell affinity for neoantigens may be significantly superior. We utilize individualized mutant neoantigens as targets for our iNeST product candidates.

## **B. Immunomodulatory Targets**

The activity of immune cells can be controlled or manipulated by the targeting of receptors that control key biological processes in these cells, known as immunomodulation. Immunomodulatory targeting strategies include:

### **1. Checkpoint Inhibition**

Checkpoint inhibition is a therapeutic approach by which T cell function is stimulated with mAbs that block their inhibitory receptors, which can be exploited by cancer cells to shut down T cell activity. Examples of checkpoint targets are PD-1, PD-L1, CTLA-4, TIGIT, LAG3 and many others. The concept is known as “releasing the brakes” and has been shown to be therapeutically effective in tumors with strong pre-existing immune cell infiltration. Our GEN1046 (BNT311) product candidate is a next-generation bispecific checkpoint immunomodulator, with one arm targeting PD-L1.

### **2. Immunostimulation**

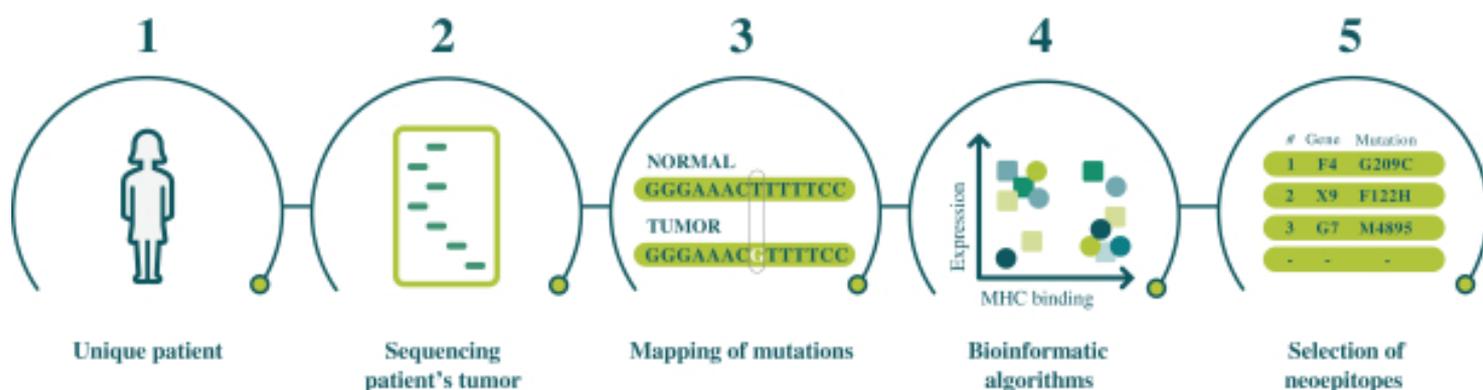
Immunostimulatory approaches are directed against receptors known to directly activate immune cells. Examples of these targets include co-stimulatory molecules such as CD40 and 4-1BB or cytokine receptors such as IL-2R, IL-7R and IL-12R. Immunostimulatory approaches provide a powerful opportunity to enhance immune activation, even in types of cancer that are not responsive to checkpoint inhibition due to lack of immune cell infiltration. However, this approach is often limited by a narrow therapeutic window associated with dose-limiting toxicity.

We believe that both concepts can be combined in a potentially synergistic and safe fashion by developing precisely engineered molecules, such as our BNT151 RiboCytokine program or GEN1042 (BNT312), our next-generation bispecific checkpoint immunomodulator targeting both CD40 and 4-1BB.

### C. Our Computational Approach to Individualized Immunotherapy

Bioinformatics are critical in the production of individualized therapies. We have accumulated a high level of experience in bioinformatic approaches to mutation detection, cancer genomics and immunotherapy through our ongoing research and preclinical studies and clinical trials.

Our validated patient-centric bioinformatic process, as illustrated below, allows the application of complex algorithms to the patient's data in the context of drug manufacturing. Our bioinformatics processes are robust and scalable, incorporating our experience handling genomic data in a high-throughput environment, as we target making on-demand production of individualized immunotherapies commercially viable.



**From Patient to Analysis.** Our bioinformatic process for the selection of neoepitopes.

#### 1. Sequencing

We sequence the patient's tumor and healthy tissue samples using NGS technology. Comparison of the patient's sequenced tumor and healthy samples provides us with the data from which we can identify targets for the design of individualized cancer immunotherapies. This is a multi-step process in which mutation detection and neoantigen prediction are particularly important.

#### 2. Mutation Detection

Mutation detection, which defines which tumor-specific mutations are present in any cancer, is the starting point for defining targets for individualized immunotherapy. Determining mutations from NGS data with high precision and sensitivity is challenging because numerous factors can lead to false positives, which can mask mutations. Despite advances in the field, commonly used mutation detection algorithms still exhibit high false positive mutation detections. In order to address these challenges, we have exclusively licensed a technology from TRON that combines tumor modeling with mutation detection, called MyMUT. MyMUT is a next-generation mutation detection system, which we believe has the following key characteristics:

- **High specificity and robustness.** By combining tumor modeling, sophisticated statistical and genomic filters, and replicate sampling, MyMUT achieves clinical precision in detecting mutations with comparable sensitivity to state-of-the-art mutation detection systems. Higher specificity translates to potentially more effective immunotherapies, with faster and cheaper production. MyMUT is designed to deliver uniform performance for all patients regardless of tumor complexity, mutation burden or sample purity. MyMUT's performance with low mutation tumors also allows us to offer individualized immunotherapies to patients with low tumor mutation burdens.
- **Intratumor heterogeneity.** By performing tumor modeling, MyMUT can also identify clonal and subclonal mutations with high precision, allowing us to prioritize the former in neoantigen-directed immunotherapies and address intratumoral heterogeneity by targeting mutations that are common in a higher proportion of cancer cells within a tumor.

- **Quality control (QC).** By analyzing the genomic properties of sequenced samples, MyMUT can detect errors that pass standard sequencing QC, ensuring the quality and safety of individualized immunotherapies.

### **3. Neopeptide Selection**

Only a portion of mutated peptides (neopeptides) are suitable for raising an immune response *in vivo*. Our approach focuses on evoking responses involving both CD8+ T cells and CD4+ T cells. We do this by discerning the likelihood of presentation of the neopeptide to the T cell receptor as an MHC peptide complex using data from mRNA expression levels and MHC binding affinity predictions, among other factors. For example, in our first individualized neopeptide immunotherapy clinical study, all 13 stage III and IV melanoma patients selected for treatment developed a CD4+ and/or CD8+ T cell response, achieving an overall 60% immune response rate to predicted neopeptides.

Presentation of a neopeptide on an MHC molecule does not, however, guarantee recognition by T cells, and an integrated view combining several properties impacting immunogenicity is necessary. Our algorithms are continuously being improved and extended with data collections from various sources such as our past and current clinical studies as well as HLA data. By using machine learning approaches applied to these large datasets we aim to further improve prediction of overall presentation of neopeptides tailored to patients' specific HLA types. With our acquisition of Neon, we further bolstered our neopeptide selection capabilities with the addition of Neon's RECON bioinformatics engine. RECON uses a number of inputs from each patient, including DNA sequences from samples of tumor and normal tissue, RNA sequences from tumor samples, and the patient's specific MHC allele profile. RECON processes data from these inputs using a proprietary combination of algorithms in order to produce a prioritized list of neoantigen-targeting peptides that can be manufactured for use in our product candidates.

## **VIII. Our mRNA Drug Class**

### **At a glance: mRNA as a Therapeutic Drug Class**

- Natural molecule found universally within cells, with well-characterized properties.
- Suitable to encode for antibodies, antigens, cytokines and any other type of protein.
- Transient, with adaptable activity and half-life. Avoids genomic integration problems sometimes seen in gene therapy, potentially resulting in a better safety profile.
- Can be designed and optimized pharmacologically and immunologically, making it suitable for a broad range of applications.
- Fast manufacturability, making it a cost-effective and flexible therapeutic to produce.

In the last decade mRNA has progressed into a promising new class of medicine, with the potential to treat a wide variety of diseases with high unmet medical needs. mRNA is a long, polymeric molecule, composed of four different building blocks called nucleotides. In mRNA, hundreds or thousands of these nucleotides are linked in a unique order to convey genetic information to cells, where it is used to express proteins with biological effects.

Considering that all mRNA is generated with four different building blocks, but with unique sequence order, all therapeutic mRNAs have highly similar compositions, while having the capacity to encode a variety of different proteins. These characteristics allow for rapid development of mRNA therapeutics that are broadly applicable for treatment of many diseases, including cancer, infectious diseases and rare diseases. Our mRNA pipeline addresses all of these therapeutic areas.

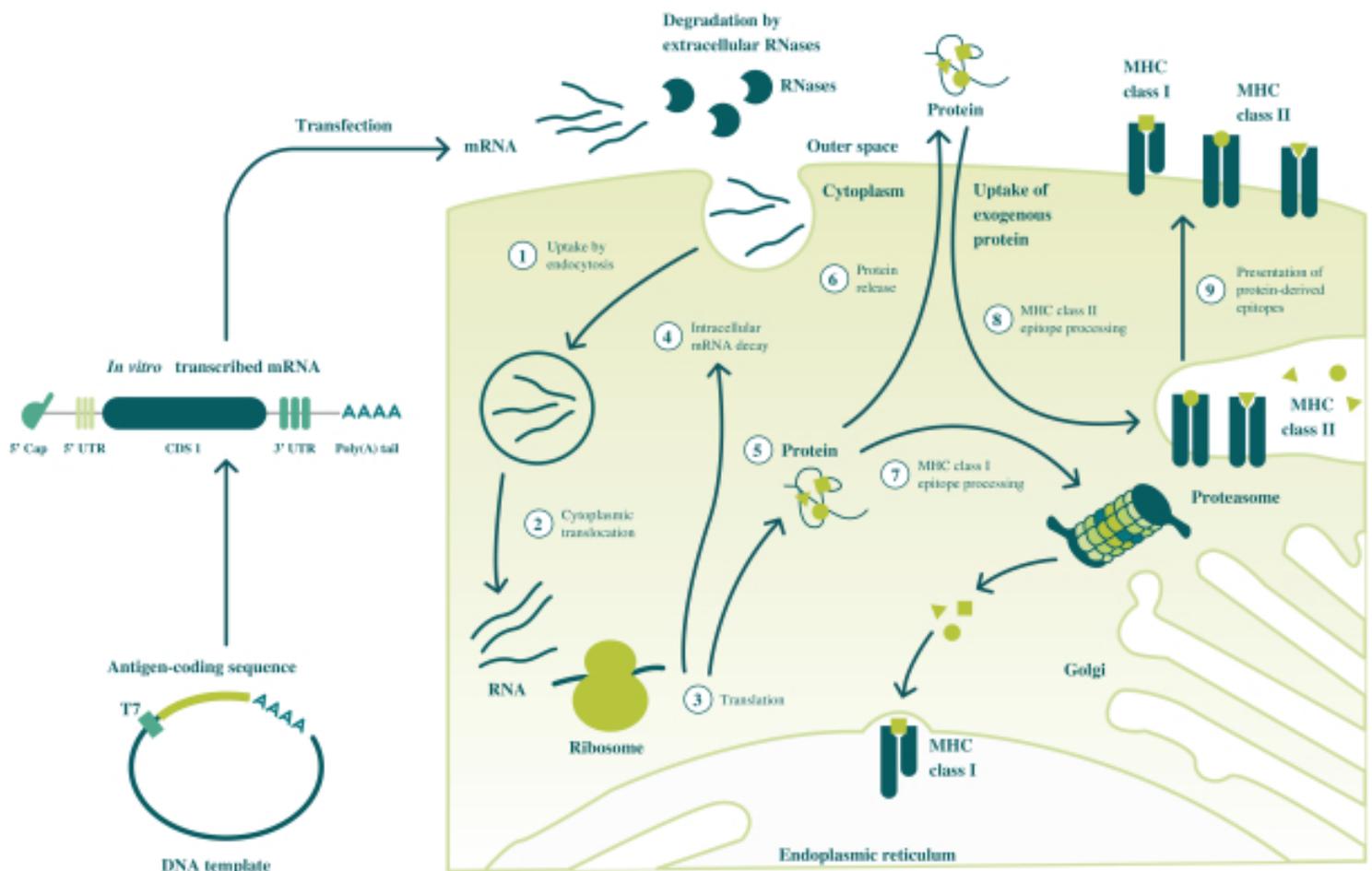
### A. General Principles of mRNA Pharmacology

As a drug, manufactured mRNA provides instructions to a target cell to produce a desired therapeutic protein. The mRNA drug will temporarily change the status of the target cell where these instructions are translated into proteins. Based on the information encoded by the mRNA, the proteins will be either secreted or remain intracellular. The mRNA drug will eventually be degraded and eliminated from the body.

Our mRNA drugs are synthesized from a DNA template. With the exception of the 5' cap, the template determines all structural elements of the mRNA. The mRNA molecule comprises:

- an open reading frame, or ORF, which encodes for the protein of interest;
- untranslated regions, or UTRs, which flank the ORF; and
- the cap and the poly(A) tail, which are the two terminal structures of the linear mRNA, and are responsible for increased stability and translational efficiency of mRNA.

The mRNA drug needs to be appropriately formulated in order to protect it from breakdown by extracellular RNases. The formulation is selected based on the intended application and route of delivery. After uptake into the target cell, the mRNA molecules are loaded into ribosomes, where translation into protein takes place. Subsequently, the mRNA is degraded by cellular mechanisms. In case of an immunotherapy application, the protein is degraded into immunogenic epitopes. These are loaded onto specialized molecules, namely MHC I or MHC II. These molecules present the epitopes to immune cells to provoke the desired immune response. In the case of other mRNA applications, the mRNA encodes proteins that are secreted from the cells, such as antibodies, and function extracellularly.

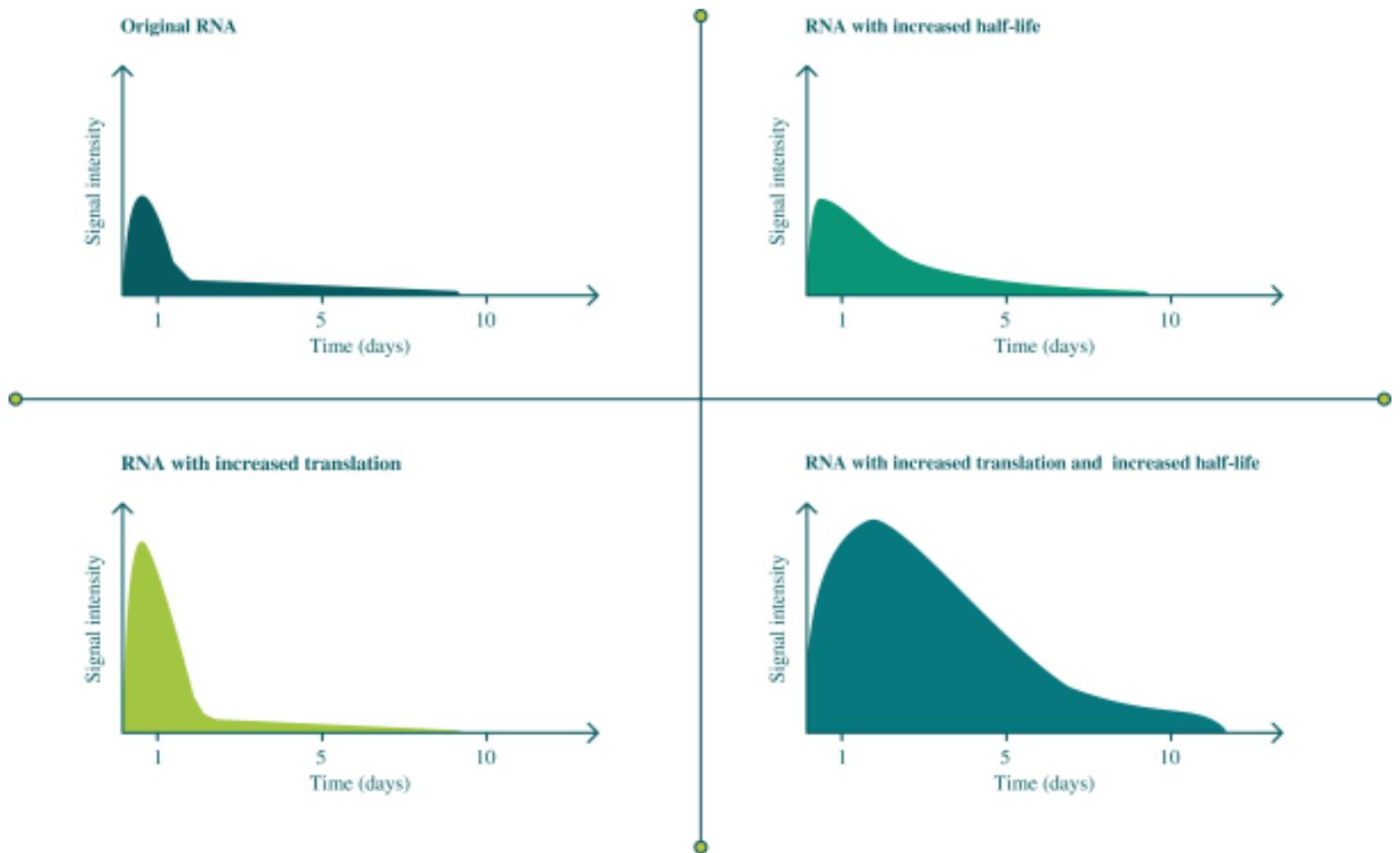


**General principles of mRNA pharmacology.** Step 1: mRNA is either delivered in a buffered solution as naked molecules or formulated as nano-particles to protect degradation by extracellular enzymes and is taken up by cells. Step 2: Subsequently, mRNA is released from endosomes into the cytoplasm. Step 3: mRNA is translated by the protein synthesis machinery of host cells. Step 4: Termination of translation

## Table of Contents

by degradation of mRNA. Step 5: The translated protein product acts in the cell in which it has been generated. Step 6: Alternatively, the protein product is secreted and may act via autocrine, paracrine or systemic, body-wide mechanisms. Steps 7 and 8: For vaccine activity, mRNA encoded antigens are degraded into shorter fragments and loaded onto MHC class I and class II molecules. Step 9: Protein-derived epitopes can then be presented on the cell surface by both MHC class I and MHC class II molecules, enabling stimulation of CD8+ and CD4+ T cells.

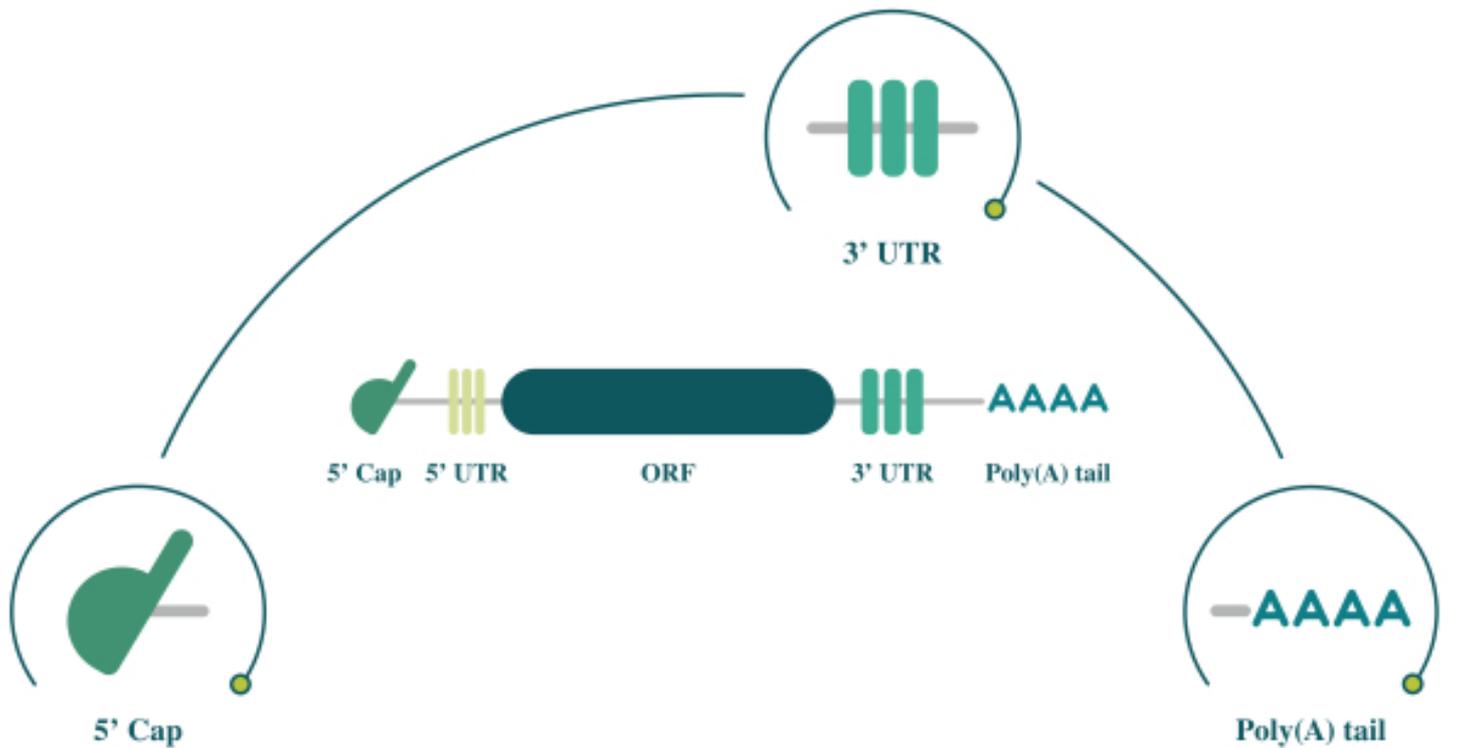
The structural elements of the mRNA have an impact on its performance. This includes potential immunogenicity, efficacy of translation and stability of the molecule. We leverage our extensive experience to design, synthesize, manufacture and formulate our therapeutic mRNA, and adapt its composition to suit the desired application.



**Our strategy for optimizing mRNA potency.** The pharmacological properties of mRNA can be improved by biochemical optimization of the molecule for either (i) increasing the half-life of the mRNA, i.e., the mRNA is translated for a longer period of time before it is degraded, which results in sustained protein production after mRNA delivery, or for (ii) increasing the mRNA translation efficiency, i.e., the peak protein production is increased. Our optimization approach relies on combining both strategies in order to maximize the mRNA therapeutic effect.

## B. Our mRNA Backbone Concepts and Technologies

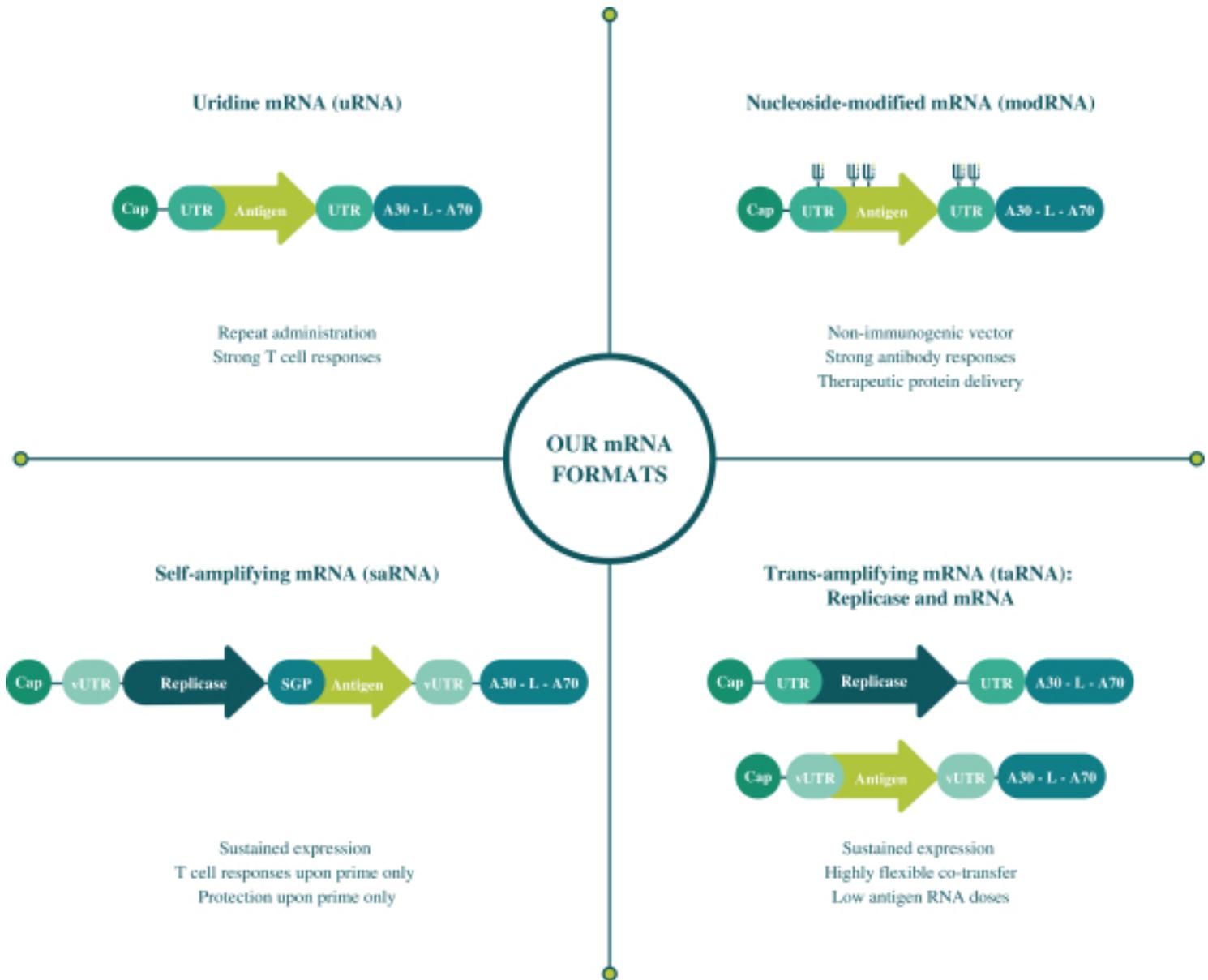
Our mRNAs all contain basic structural elements, including the 5' cap, the untranslated regions and the poly(A) tail, in addition to a coding sequence, that are all encoded by our DNA template.



- The cap is added to the 5' end of the mRNA during its synthesis. Our studies have demonstrated that incorporation of a unique cap analogue into the mRNA helps to achieve superior translational performance by stabilizing the mRNA molecule and directing the immune response. This unique cap analogue is extremely useful for our immunotherapy approaches.
- The composition and structure of the 5' and 3' untranslated regions of the mRNA molecule are important determinants of the intracellular stability of mRNA. As a result of rigorous screening of different mRNA sequences, we identified specific UTRs that promote increased protein translation for long duration.
- We have performed extensive research on the structure of the poly(A) tail and the translational performance of mRNA and customized our template design accordingly.

## Table of Contents

The translational performance of mRNA can be increased by removing contaminating double-stranded RNA from the mRNA. We have extensive expertise in different mRNA purification procedures. We have also invented a novel mRNA purification method that greatly impacts translatability of our mRNA. Depending on the protein characteristics needed for treatment of a disease, we optimize the DNA template through a proprietary codon optimization process, changing the nucleotide sequence of the template without altering the amino acid composition of the encoded protein. We make further adjustments during mRNA production. We believe these fine tunings of the respective molecules are essential for the purpose-adapted performance of our mRNA.



**Our mRNA formats.** As shown above, we have developed four mRNA formats, each optimized for different therapeutic applications. Abbreviations: y, 1-methylpseudouridine; UTR, untranslated region.

Our mRNA formats include:

### 1. Optimized Uridine mRNA (uRNA)

The nucleotide sequence of mRNA determines the amino acid sequence of the protein. In addition, the nature of nucleosides used for production of mRNA drugs can also influence recognition of the molecule by the immune system. Presence of naturally occurring uridine (U) in our optimized uridine mRNA makes it immunogenic by activating immune sensors. We have further optimized our uridine mRNA for immunogenicity (augmented antigen presentation on MHC I and MHC II) and pharmacological activity (enhanced stability and translational efficiency). Immunogenicity of the mRNA is an added benefit when mRNA is used for

immunotherapy applications, by acting as an immunotherapy adjuvant. This makes our therapeutics for iNeST and FixVac even more potent, and we are additionally using this mRNA format in one of our COVID-19 vaccine candidate variants.

## **2. Nucleoside-modified mRNA (*modRNA*)**

Immunogenic reaction against mRNA drugs needs to be avoided in applications where therapeutic proteins are produced, such as in our RiboMab and RiboCytokine platforms. We have profound expertise in incorporating naturally-occurring modified nucleosides into our therapeutic mRNAs. We have demonstrated that the presence of a variety of modified nucleosides in the manufactured mRNA suppresses its intrinsic immune activation, while leading to superior protein production for long duration. Deimmunizing mRNA by incorporating modified nucleosides helps to avoid production of anti-drug antibodies and broaden the therapeutic application of these types of mRNA drugs. We believe this customization has resulted in therapeutic mRNA that is both potent and well tolerated. We are also testing this mRNA format in multiple COVID-19 vaccine candidate variants, including BNT162b1, the vaccine candidate variant for which we and Pfizer announced preliminary data from our Phase 1/2 clinical trials on July 1 and July 20, 2020, and BNT162b2.

## **3. Self-amplifying mRNA (*saRNA*)**

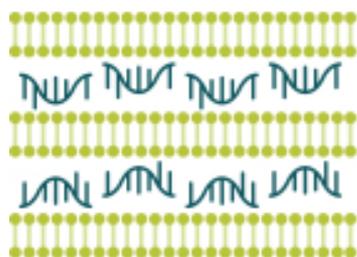
Our self-amplifying mRNA, or saRNA, drugs use the concept of viral replication, while not being an infectious, disease-causing agent itself. saRNA resembles conventional mRNA encoding the protein of interest, but also encoding a polymerase, called replicase, that multiplies part of the mRNA within the target cell. During self-amplification inside the cell, a double-stranded RNA intermediate is generated, which is recognized by intracellular immune sensors. This makes saRNA a very potent activator of the immune system and therefore an excellent category of immunotherapy. As we have demonstrated, our saRNA ensures high levels of sustained antigen production with a small amount of initial mRNA input. Our scientific team has designed this mRNA technology to act as a potent tool for prophylactic vaccination, with the potential application in infectious diseases with high medical needs. Accordingly, we are testing this mRNA format in one of our COVID-19 vaccine candidate variants.

## **4. Trans-amplifying mRNA (*taRNA*)**

We have also expanded on our self-amplifying mRNA capabilities, developing a novel mRNA amplification technology by separating the target mRNA to be amplified and the replicase encoding mRNA. This advancement broadens the spectrum of applications by making the development of therapeutic mRNAs even more flexible, as the replicase can amplify mRNA encoding of not only one protein, but several different ones. In the case of vaccines, this allows us to produce the replicase in advance for use with different vaccines. Our trans-amplifying mRNA is a proprietary mRNA format that is particularly well-suited for prophylactic vaccines to prevent infectious diseases.

### C. Our mRNA Delivery Formulation Technologies

We have deep and broad expertise in the targeted delivery of mRNA therapeutics. We are convinced that our development of suitable delivery formulations in conjunction with our own therapeutic mRNAs is a key competitive advantage.



#### Lipoplexes

(FixVac, iNeST, CARVac)



#### LNPs

(RiboMabs, RiboCytokines,  
Rare Disease)



#### Polyplexes

(Discovery Programs)

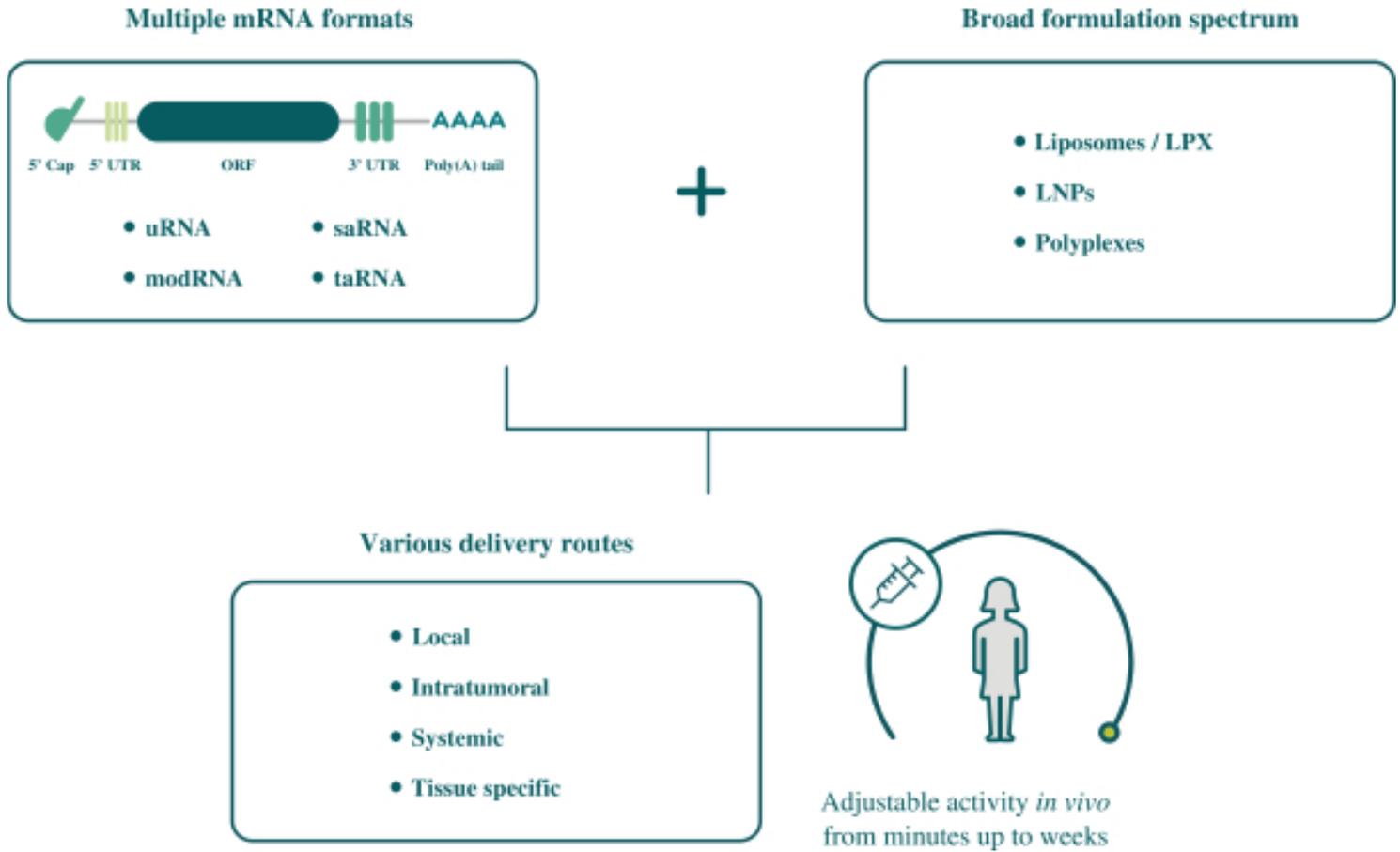
**Our mRNA delivery formulation technologies.** We utilize a range of mRNA delivery formulations for different therapeutic needs.

We employ multiple mRNA delivery formulations, each designed for different functions and optimized for therapeutic product needs:

- **Lipoplex:** Our lipoplex formulation, or LPX, embeds the mRNA between a lipid bilayer, which is used for our FixVac and iNeST platforms. We use a proprietary size- and charge-based non-viral mRNA lipoplex that was developed to deliver mRNA to dendritic cells in lymphoid compartments such as the spleen for optimal antigen presentation and immune response activation.
- **LNPs:** For other applications, we encapsulate our mRNA in lipid nanoparticles, or LNPs. These formulations are suitable for our RiboMab, RiboCytokine and rare disease protein replacement platforms. Our LNP formulations can be adjusted according to our needs for delivery to particular target tissues, such as the liver in the case of our rare disease protein replacement platform.
- **Polyplexes:** Our portfolio also comprises polyplexes, which are being utilized in certain of our discovery programs, in which the mRNA is bound to a polymer and then forms nanoparticles.

## [Table of Contents](#)

As shown in the graphic below, our mRNA platforms utilize our wide range of mRNA formats, mRNA delivery formulations and mRNA delivery routes to optimize and tailor treatments.



**Our therapeutic mRNA technology toolbox.** Our product candidates utilize multiple mRNA formats, a broad spectrum of delivery formulations and applications using various delivery routes.

### **D. Our mRNA Platforms**

We are developing multiple mRNA-based therapeutic platforms. These include FixVac, iNeST, mRNA-based intratumoral immunotherapy, RiboMabs and RiboCytokines in the oncology space. In addition, we have implemented mRNA platforms for the development of infectious disease vaccines and protein replacement therapies for rare diseases.

## Table of Contents

Importantly, each of these platforms enables the development of multiple pharmaceutical product candidates or programs.

	mRNA Platform	Drug Targets	mRNA Formats	Delivery Formulations
	7 mRNA platforms	Broad range of biological targets	4 types of mRNA	Multiple optimized formulations
Oncology	FixVac	Shared Antigens	uRNA	RNA-LPX
	iNeST	Neoepitopes	uRNA	RNA-LPX
	Intratumoral Immunotherapy	Immunomodulators	modRNA	Various formulations Intratumoral
	RiboMabs	mAb targets	modRNA	LNPs Intravenous delivery
	RiboCytokines	Cytokines	modRNA	Various LNP formulations
Other	Infectious Disease Vaccines	Pathogens	saRNA, taRNA, modRNA	Various LNPs for i.m. & s.c. delivery
	Rare Disease Protein Replacement Therapy	Diverse Proteins	modRNA	Liver targeted LNPs

uRNA: uridine mRNA; modRNA: nucleoside-modified mRNA; saRNA: self-amplifying mRNA; taRNA: trans-amplifying mRNA;

**Our mRNA Platforms.** We have multiple mRNA-based platforms utilizing different mRNA formats and delivery formulations, directed at a range of biological targets in oncology and infectious and rare diseases.

### 1. Cancer Immunotherapies

Our goal is to develop safe, potent, efficacious and cost-effective cancer immunotherapies which stimulate and potentially expand tumor cell specific CD4+ and CD8+ T cells in cancer patients. Our cancer immunotherapy development integrates our competencies in mRNA backbone optimization, formulation development and immunological research.

We have developed novel immunotherapy approaches to replicate the highly potent and effective natural activation of the immune system in response to a viral infection. Our first generation mRNA cancer immunotherapies were delivered as naked mRNA by ultrasound guided injection into a patient's lymph node and induced T cell responses and antitumoral activity when targeting mutant neoantigens in advanced melanoma patients. To further improve this potency and antigen specificity we have developed a nano-particulate mRNA lipoplex immunotherapy for intravenous delivery.

### RNA-LPX Technology

#### At a glance: RNA-LPX Cancer Immunotherapy Technology

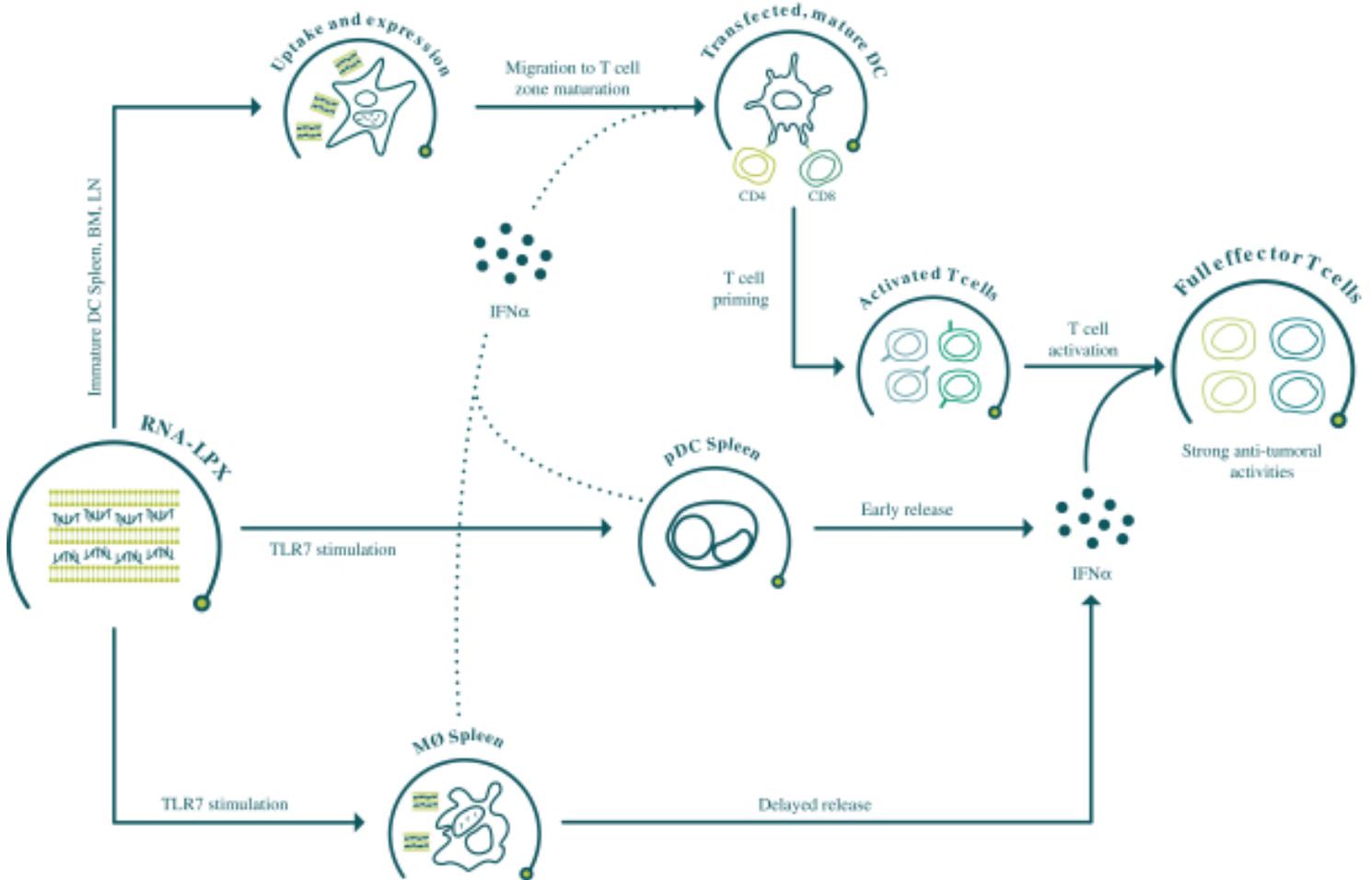
- Potential first-in-class clinical intravenous nano-particulate mRNA immunotherapy, allowing systemic delivery.
- Strong potency by systemic targeting to dendritic cells in lymphoid tissues.
- Universally applicable for all cancer antigens.
- Opportunity to deliver multiple antigens in parallel, enabling the induction of poly-specific T cell responses.
- Synchronized adjuvant effect mediated by toll-like receptor 7 (TLR7)-triggering and type-I interferon-driven innate and adaptive immune stimulation.



## Table of Contents

- Preclinical anti-tumoral activity demonstrated against multiple tumors.
- Unprecedented clinical immune responses against shared TAAs.
- Beneficial clinical activity demonstrated in advanced melanoma patients.

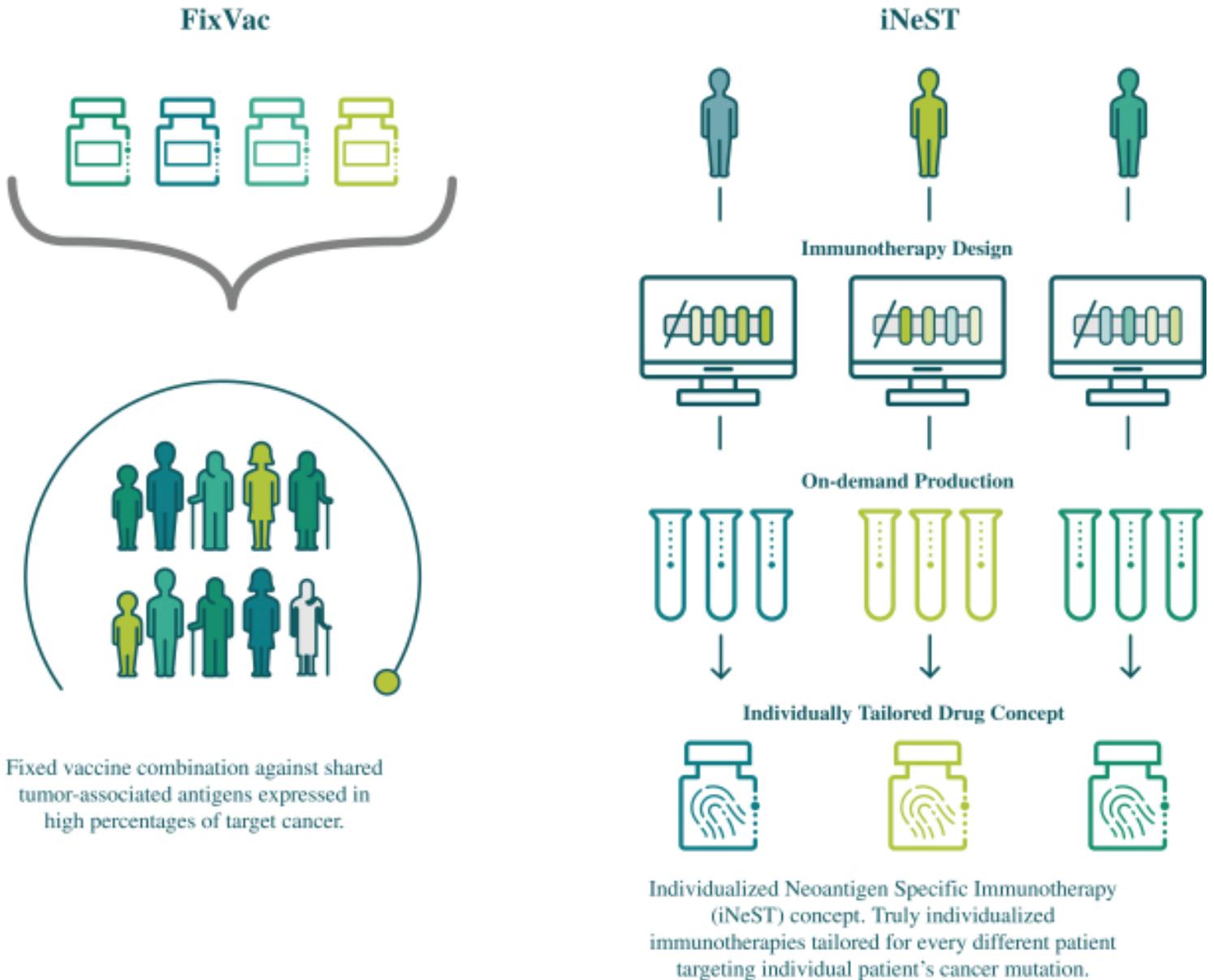
To advance from local to systemic dendritic cell, or DC, targeting, we developed an innovative liposome-based RNA-lipoplex formulation, RNA-LPX, that allows for intravenous administration of our mRNA cancer immunotherapies. We have demonstrated in the clinic that systemic DC targeting by mRNA cancer immunotherapies can result in potent activity at very low doses. Consequently, less material is required for treating high patient numbers, making manufacturing more cost-effective.



**Our RNA-LPX technology.** Our proprietary RNA-LPX formulation is designed to deliver vaccine mRNA precisely into DCs and macrophages in the spleen and other lymphoid compartments. The RNA-LPX has an inherent adjuvant function stimulating the release of cytokines such as IFN- $\alpha$  thereby promoting the activation of DCs and the induction of strong T cell responses. Abbreviations: BM, bone marrow; LN, lymph node; DC, dendritic cell; pDC, plasmacytoid dendritic cell; M $\phi$ , macrophage; IFN- $\alpha$ , interferon alpha.

## Table of Contents

RNA-LPX protects mRNA from degradation outside of the cell and mediates its efficient uptake and expression of encoded antigens in various dendritic cell populations. Our RNA-LPX technology is designed to target a wide variety of antigens and address cancer patients with all possible HLA haplotypes. Utilizing RNA-LPX, we can target fixed groups of known shared antigens with our FixVac platform and a whole new class of patient-specific neoantigen targets with our iNeST platform.



### a) FixVac

#### At a glance: Our FixVac Platform

- **Concept:** Cancer immunotherapies targeting shared antigens that we have identified to be frequently expressed across patients with a specific cancer type.
- **mRNA Format:** Optimized uridine mRNA providing superior immunogenicity.
- **mRNA Delivery Formulation:** Proprietary size- and charge-based RNA-LPX targeting DCs.
- **Development Approach:** Worldwide rights; wholly owned.
- **Lead Candidate:** BNT111 for metastatic melanoma.
- **Data Highlights:** Three partial responses, one complete response and seven stable diseases in 25 patients with metastatic lesions at enrollment, following BNT111 monotherapy.

## [Table of Contents](#)

Our FixVac approach involves off-the-shelf mRNA immunotherapies targeting cancer cell-specific shared tumor associated antigens for selected patient populations. Our FixVac product candidates target TAAs which are commonly expressed by a significant portion of patients in a given cancer type. We have developed a sophisticated target selection process which enables us to produce poly-specific FixVac immunotherapies that cover up to 95% of patients with a given cancer type. The use of off-the-shelf FixVac immunotherapies allows for large-batch manufacturing and prompt supply to patients with ready-to-use medication, ensuring a straight-forward cost- and time-efficient manufacturing process with favorable logistics.

Besides targeting commonly expressed TAAs, our target selection strategy facilitates the identification of suitable viral oncoproteins for the treatment of virus-induced cancers like HPV+ head and neck cancer. Patient stratification, if needed, can easily be performed at the clinical site or a central lab using standard biotechnological methods, thereby reducing treatment costs. As the viral genome is comparatively small, encoding only for a few proteins, we believe our FixVac approach is ideally suited for the treatment of virus-induced cancers.

### ***Our FixVac Development Plan***

We currently have six FixVac programs in development, with five in human trials, including our ongoing Phase 1 trial in advanced melanoma, a Phase 1 trial in HPV+ head and neck cancer and a Phase 1 trial in triple negative breast cancer. We expect to progress our advanced melanoma program into Phase 2 clinical trials with registrational potential in the second half of 2020. We enrolled the first patient in a Phase 1/2 trial in prostate cancer and the first patient was dosed in a Phase 1 ovarian cancer trial in the second half of 2019. In addition, we are planning to initiate a Phase 2 study with registrational potential for FixVac in HPV+ cancers by the end of 2020.

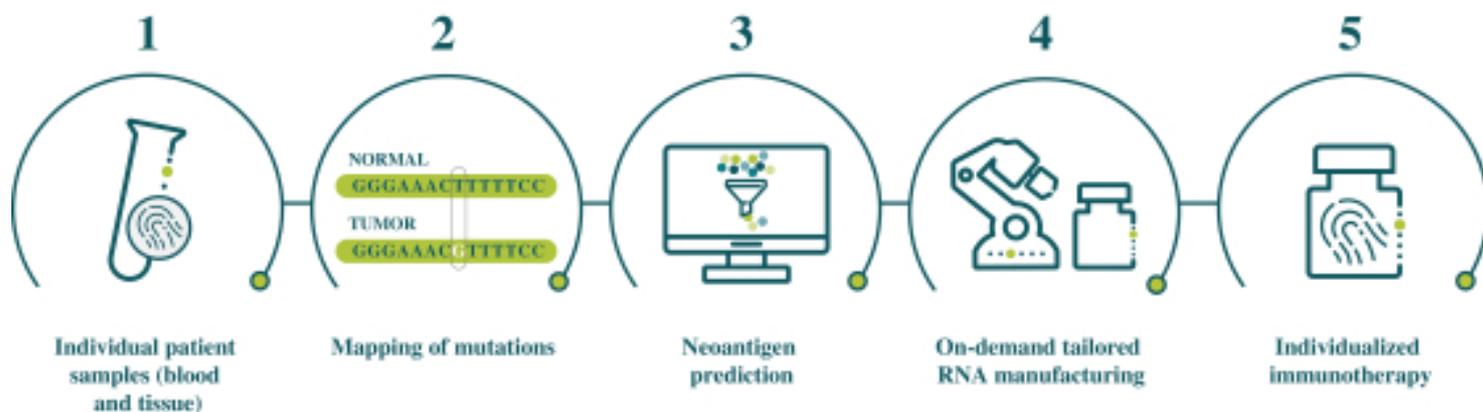
<u>Candidate</u>	<u>Antigens</u>	<u>Development Phase</u>	<u>Next Potential Milestone</u>
BNT111	Melanoma-specific antigens: NY-ESO-1, tyrosinase, MAGE-A3 and TPTE	Phase 1: Advanced melanoma	Report Phase 1 data: publication upcoming; initiate Phase 2 trial with registrational potential in 2H 2020
BNT112	Five prostate cancer-specific antigens, including PAP and three internally identified antigens	Phase 1/2: Prostate cancer	—
BNT113	HPV E6 and E7 oncoproteins	Phase 1: HPV+ head and neck cancer (IST)	Initiate Phase 2 trial with registrational potential by end of 2020
BNT114	Selected breast cancer-specific antigens	Phase 1: TNBC	Report data update in 2H 2020
BNT115	Selected ovarian cancer-specific antigens	Phase 1	—
BNT116	Non-small cell lung cancer	Preclinical	—

**b) Individualized Neoantigen Specific Immunotherapy (iNeST)**

**At a glance: Our iNeST Platform**

- **Concept:** Individualized cancer immunotherapy targeting neoantigens identified on a patient by patient basis and selected for immunogenicity.
- **mRNA Format:** Optimized uridine mRNA providing superior immunogenicity.
- **mRNA Delivery Formulation:** Proprietary size- and charge-based RNA-LPX targeting DCs.
- **Development Approach:** 50:50 cost share with Genentech.
- **Lead Indication:** RO7198457 (BNT122) as a first-line melanoma therapy in combination with pembrolizumab.
- **Data Highlights:** In a previous Phase 1 trial of BNT121, we observed first-in-human data in 13 patients with metastatic melanoma demonstrating stable progression-free survival in nine patients for up to 60 months, and additional objective responses in three of five patients with metastatic disease at time of treatment with iNeST, including one patient receiving combination therapy. We also observed a significant decrease in the cumulative recurrence rate post-treatment as compared to pre-treatment. In June 2020, we reported data from a monotherapy dose-finding cohort of our RO7198457 (BNT122) Phase 1 trial in multiple solid tumors, which showed that *ex vivo* T cell responses were detected in approximately 86% of patients treated with RO7198457 (BNT122) as a monotherapy and later in June 2020 we provided a data update for an additional cohort in combination with atezolizumab.

We are a pioneer and global leader in developing fully individualized cancer immunotherapies. We have developed a first of its kind, on-demand manufacturing process to treat each individual patient based on the mutation profile of the patient's tumor. We are investigating this treatment approach in the clinic in collaboration with Genentech.



**Our iNeST process.** The figure above depicts our iNeST process for the on-demand production of individualized mRNA cancer immunotherapies.

Our iNeST process is summarized below:

- A blood sample and tumor biopsy is taken from the patient to obtain healthy cells and tumor tissue. We extract healthy cells from the patient's blood sample and tumor cells from the tumor sample. We use NGS to analyze genetic material (DNA and RNA) of these cells to identify which mutations are present in the cancer cells compared to healthy cells.
- We apply proprietary bioinformatic algorithms to identify tumor-specific mutations. The mutations within a cancer cell differ widely from patient to patient and form a unique signature for each tumor. This genomic information can be further utilized to analyze tumor heterogeneity and microenvironment as well as individual aspects of the immune system like the HLA type.

## Table of Contents

- Based on these bioinformatic algorithms, we then select mutations that are the most promising therapeutic targets. The specific traits of the patient's immune system, including HLA type, are key to the selection of the most appropriate targets. Picking multiple mutations increases the chance to induce potent T cell responses and reduces the risk that the tumor evades T cell attack over time. We account for heterogeneity of each tumor by preferentially selecting mutations that are expressed on all tumor cells. Importantly, the selected mutations are intended to ensure both CD4+ and CD8+ T cell induction.
- Following mutation selection, we design the structure for the iNeST product. The chosen mutations have to be arranged in a certain order and the DNA sequence of the mutations has to be optimized. This is important to ensure a robust production of the starting material, or DNA matrix, for the GMP manufacturing of the iNeST product.
- Next we produce the patient-specific iNeST product under GMP conditions and the iNeST product undergoes numerous different quality control tests.
- The iNeST product is transferred to the hospital and injected into the same patient by the physician.
- This process has been designed for the on-demand delivery of our iNeST products, and currently takes approximately six weeks.

### Our iNeST Development Plan

We are currently developing iNeST therapeutics for the treatment of metastatic melanoma and multiple solid tumors. We are conducting two clinical trials of iNeST in collaboration with Genentech, including one randomized Phase 2 trial in first-line melanoma in combination with pembrolizumab and a Phase 1a/1b trial in patients with locally advanced or metastatic tumors (including in melanoma, non-small cell lung cancer, bladder cancer and other solid tumors) as a monotherapy and in combination with atezolizumab. In June 2020, we presented data from a monotherapy dose-finding cohort of our RO7198457 (BNT122) Phase 1a/1b trial in multiple solid tumors, and later in June 2020 we provided a data update for an additional cohort in combination with atezolizumab. Further, we expect to provide an enrollment update from the first-line melanoma trial in the second half of 2020, and provide an interim data update in the second half of 2021. We and Genentech plan to initiate two additional clinical trials for RO7198457 (BNT122) in 2020 in NSCLC and colorectal cancer in the adjuvant setting.

<u>Candidate</u>	<u>Antigens</u>	<u>Development Phase</u>	<u>Next Potential Milestone</u>
RO7198457 (BNT122)	Up to 20 neoantigens selected on a patient by patient basis	Phase 2: first-line melanoma in combination with pembrolizumab  Phase 1a/1b: multiple solid tumors	Enrollment update in 2H 2020; <sup>1</sup> Interim data update in 2H 2021  Phase 2 trials planned in NSCLC and colorectal cancer in the adjuvant setting in 2H 2020

- 1 We expect this enrollment update to include an update on the ongoing study, including patient enrollment numbers, with full efficacy and safety data for an interim update expected in the second half of 2021.

#### c) Intratumoral mRNA Immunotherapy

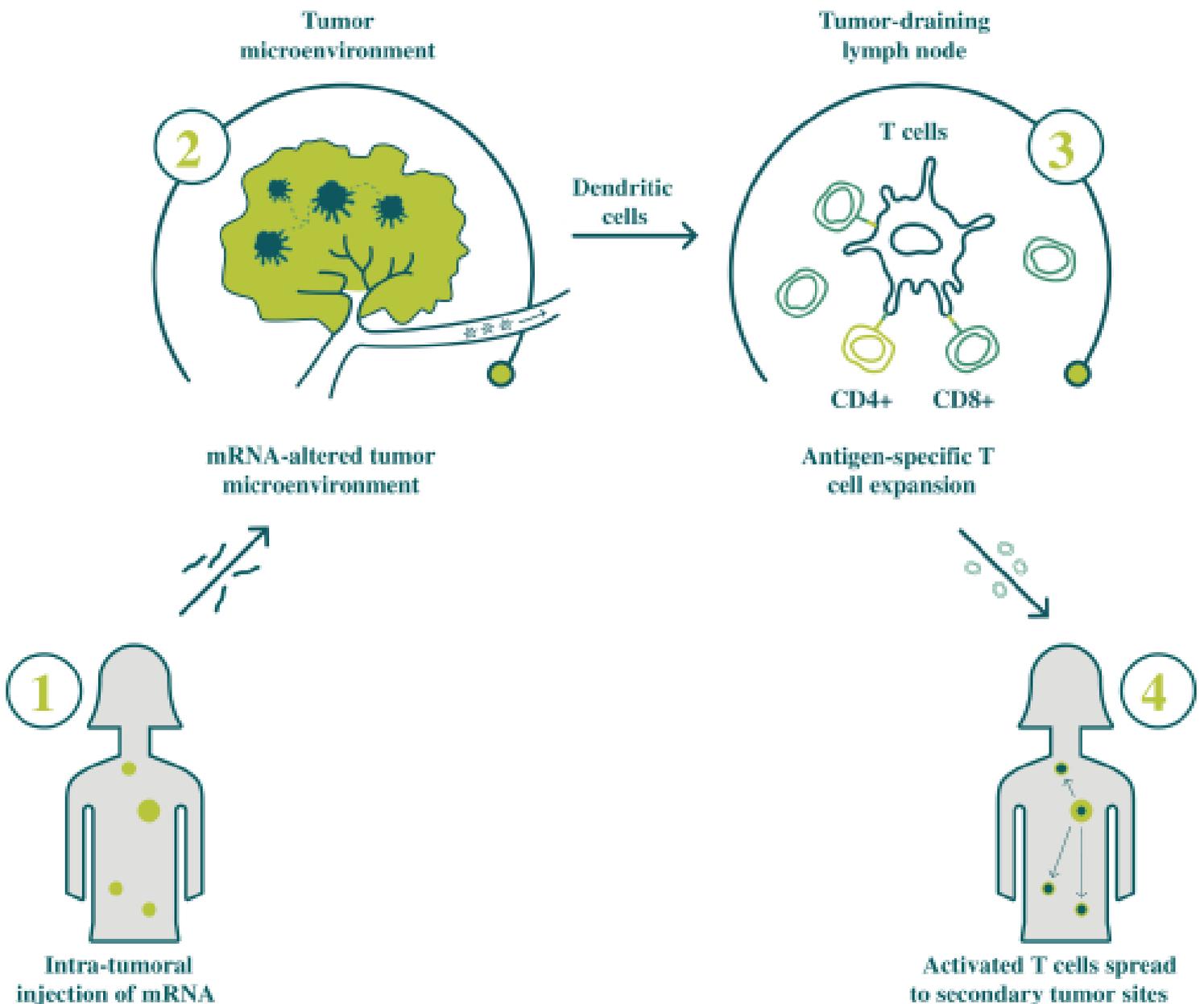
##### At a glance: Our Intratumoral mRNA Platform

- **Concept:** Immunomodulator-encoding mRNA injected directly into the tumor in order to avoid off-target toxicities.

- **mRNA Format:** Nucleoside-modified mRNA engineered for minimal immunogenicity in order to avoid immune detection and allow translation of the encoded cytokines to occur within the cells.
- **mRNA Delivery Formulation:** Various formulations, delivered by intratumoral injection.
- **Development Approach:** Co-development and co-commercialization, at our option, in collaboration with Sanofi.
- **Lead Candidate:** SAR441000 (BNT131) for advanced solid tumors as a monotherapy and in combination with cemiplimab.

In collaboration with Sanofi, we are leveraging our mRNA technology to develop intratumoral immunotherapies for the treatment of solid tumors. Intratumoral immunotherapy is designed to promote innate and adaptive immune responses against tumors, without toxicities related to systemic administration. Our intratumoral immunotherapy involves injection of cytokine-encoding mRNA directly into a tumor in order to alter the tumor microenvironment and promote greater T cell activity. This approach has been found in preclinical studies to boost cancer-specific immune responses locally, while also producing tumor responses in remote parts of the body due to the circulation of properly activated anti-tumor immune cells, known as an abscopal effect.

The first intratumoral immunotherapy product candidate arising from our collaboration, SAR441000 (BNT131), includes modified mRNA that encodes for the IL-15sushi, IL-12sc, GM-CSF and IFN- $\alpha$  cytokines. In preclinical studies, SAR441000 (BNT131) promoted increased levels of local cytokine expression within the tumor microenvironment and activated innate and adaptive immune responses against tumors.



**Therapeutic mode of action of intratumoral mRNA immunotherapy.** The figure above demonstrates how SAR441000 (BNT131) promotes cytokine expression within the tumor itself.

### **Our Intratumoral Development Plan**

The lead intratumoral mRNA collaboration product candidate from our collaboration is being investigated in a Phase 1 clinical trial sponsored by Sanofi. This trial is expected to enroll approximately 264 patients with certain advanced solid tumors, as a monotherapy and in combination with cemiplimab. This trial is currently being run at four sites in Europe. A data update from this trial may be reported in the second half of 2020. As the trial is sponsored and conducted by Sanofi, the timing of data updates is not under our control, and is subject to change by Sanofi.

<u>Candidate</u>	<u>Encoded Cytokines</u>	<u>Development Phase</u>	<u>Next Steps</u>
SAR441000 (BNT131)	IL-15sushi, IL-12sc, GM-CSF and IFN- $\alpha$	Phase 1: Advanced solid tumors as a monotherapy and in combination with cemiplimab	Data update in 2H 2020*

\* As the trial is sponsored and conducted by Sanofi, the timing of data updates is not under our control, and is subject to change by Sanofi.

## **2. Infectious Disease Vaccines**

### **At a glance: Our Infectious Disease Vaccine Platform**

- **Concept:** mRNA-based vaccines targeting infectious disease pathogens.
- **mRNA Format:** Multiple.
- **mRNA Delivery Formulation:** LNPs.
- **Development Approach:** Collaborations with Pfizer and Fosun Pharma and exclusive option arrangement with Penn.
- **Lead Candidates:** COVID-19 vaccine candidate BNT162; Influenza vaccine candidate BNT161.

Expanding beyond our research in oncology, we are leveraging our mRNA technologies to direct the immune system more effectively against infectious diseases. Our infectious disease vaccine candidates contain self-replicating or trans-replicating, modified mRNA-encoding antigens specific to a target pathogen, delivered in various LNP formulations in order to activate and direct T cells and B cells to fight the pathogen.

### **COVID-19 Vaccine**

In March 2020, we entered a strategic alliance with Fosun Pharma to advance a COVID-19 vaccine in China. In July 2020, we received notice of acceptance to begin our clinical trial for BNT162b1 in China. Upon regulatory approval, Fosun Pharma will commercialize the vaccine in China, while we retained the full rights to develop and commercialize the vaccine in the rest of the world. Also in March 2020, we and Pfizer began collaborating to co-develop our potential first-in-class COVID-19 mRNA vaccine program, BNT162 aimed at preventing COVID-19. We and Pfizer are jointly conducting clinical trials for the COVID-19 vaccine candidates initially in the United States and Europe across multiple sites. We are currently developing four potential candidates utilizing multiple different mRNA formats as part of this program. In late April 2020, we and Pfizer announced that the German regulatory authority, the Paul-Ehrlich-Institut, approved the Phase 1/2 clinical trial and the first cohort of our Phase 1/2 clinical trial were dosed shortly thereafter. In early May 2020, Pfizer and we initiated a clinical trial for BNT162 in the United States and the first participants were dosed shortly thereafter. We initiated the BNT162 program in late January 2020 in response to the global COVID-19 pandemic, and initiated human testing following preclinical studies and within approximately three months of initiating the research program.

## [Table of Contents](#)

During the clinical development stage, we and our partners will provide clinical supply of the vaccine from our GMP-certified mRNA manufacturing facilities in Europe. We and Pfizer are working together to scale-up manufacturing capacity at risk to provide worldwide supply in response to the pandemic. If the vaccine candidate is approved, we and Pfizer will also work jointly to commercialize the vaccine worldwide (excluding China which is covered by a collaboration with Fosun Pharma). If the vaccine candidate is approved, we and Pfizer expect to manufacture up to 100 million doses by the end of 2020 and potentially more than 1.3 billion doses by the end of 2021.

### **July 2020 Data Announcements**

On July 1, 2020, we and Pfizer announced preliminary data from our ongoing U.S. Phase 1/2 trial of BNT162b1. The initial part of this randomized, placebo-controlled, observer-blinded study is evaluating the safety, tolerability and immunogenicity of escalating dose levels of BNT162b1, one of four vaccine candidate variants in development as part of our BNT162 program, in 45 healthy adults between 18 and 55 years of age.

The participants received two doses, 21 days apart, of placebo, 10µg or 30µg of BNT162b1, or received a single dose of 100µg of the vaccine candidate. Because of a strong vaccine booster effect, the highest neutralizing titers were observed seven days after the second dose of 10µg or 30µg on day 28 after vaccination. The neutralizing GMTs were 168 and 267 for the 10µg and 30µg dose levels, respectively, corresponding to 1.8- and 2.8-times the neutralizing GMT of 94 observed in a panel of 38 sera from subjects who had contracted SARS-CoV-2.

In all 24 subjects who received 2 vaccinations at 10µg and 30µg dose levels of BNT162b1, elevation of RBD-binding IgG concentrations was observed after the second injection with respective GMCs of 4,813 and 27,872 units/ml at day 28, seven days after immunization. These concentrations are 8- and 46.3-times the GMC of 602 units/ml in a panel of 38 sera from subjects who had contracted SARS-CoV-2.

At day 21 after a single injection, the 12 subjects who received 100µg of BNT162b1 had an RBD-binding IgG GMC of 1,778 units/ml and a SARS-CoV neutralizing GMT of 33, which are 3-times and 0.35-times, respectively, the GMC and GMT of the convalescent serum panel.

At the 10µg or 30µg dose levels, adverse reactions, including low grade fever, were more common after the second dose than the first dose. Following dose 2, 8.3% of participants who received 10µg and 75.0% of participants who received 30µg BNT162b1 reported fever <sup>3</sup> 38.0 °C. Local reactions and systemic events after injection with 10µg and 30µg of BNT162b1 were dose-dependent, generally mild to moderate, and transient. The most commonly reported local reaction was injection site pain, which was mild to moderate, except in one of 12 subjects who received a 100µg dose, which was severe. No serious adverse events were reported. Given higher numbers of subjects experiencing local reactions and systemic events after a single 100µg dose with no significant increases in immunogenicity compared to the 30µg dose level, the 12 participants in the 100µg group were not administered a second dose.

On July 20, 2020, we and Pfizer announced preliminary data from our ongoing German Phase 1/2 trial of BNT162b1. The initial part of this open-label, non-randomized, non-placebo-controlled study is evaluating the safety, tolerability and immunogenicity of escalating dose levels of BNT162b1, one of four vaccine candidate variants in development as part of our BNT162 program, in 60 healthy adults, between 18 and 55 years of age. The preliminary data we reported was from 12 subjects each who received two doses of 1µg, 10µg, 30µg and 50µg (except for one individual each in the 10µg and 50µg who discontinued due to non-study drug related reasons) and 12 subjects who received a single dose of 60µg. The two doses received by the participants were given 21 days apart.

In 34 of the 36 subjects who received two vaccinations at 10µg, 30µg, or 50µg dose levels of BNT162b1, RBD-specific CD4+ T cell responses were observed. All subjects but the two exceptions at the lowest dose level

## [Table of Contents](#)

had cytokine profiling of the RBD-specific CD4+ T cells that demonstrated a TH1-dominant profile for these cells. While the magnitude varied between individuals, participants with the strongest CD4+ T cell responses to RBD had more than 10-fold of the memory responses observed in the same participants when stimulated with cytomegalovirus (CMV), Epstein Barr virus (EBV), influenza virus and tetanus toxoid-derived immunodominant peptide panels. The strength of RBD-specific CD4+ T cell responses correlated positively with both RBD-binding IgG and with SARS-CoV-2 neutralizing antibody titers. Among vaccine-induced CD8+ T cell responses, which were observed in 29 of 36 participants, strong responses were mounted by the majority of participants and were comparable with memory responses against CMV, EBV, influenza virus and tetanus toxoid in the same participants. The strength of RBD-specific CD8+ T cell responses correlated positively with vaccine-induced CD4+ T cell responses, but did not significantly correlate with SARS-CoV-2 neutralizing antibody titers. Additionally, although at 1µg the immunogenicity rate was lower (6 of 8 responding participants), the magnitude of vaccine-induced CD4+ and CD8+ T cells in some participants was almost as high as with 50µg BNT162b1.

Elevation of SARS-CoV-2 RBD-binding IgG concentrations was observed, with respective GMCs ranging from 265 units/ml to 1,672 units/ml at day 21. At day 29, seven days after the second dose, RBD-binding IgG GMCs ranged from 2,015 units/ml to 25,006 units/ml. At day 43, RBD-binding IgG GMCs ranged from 3,920 units/ml to 18,289 units/ml. These concentrations are 6.5- to 30.4-times the GMC of 602 units/ml in a panel of sera from 38 subjects who had contracted SARS-CoV-2. At day 29, the SARS-CoV-2 neutralizing GMTs reached 36 (1µg dose), 158 (10µg dose), 308 (30µg dose) and 578 (50µg dose) compared to neutralizing GMT of 94 observed in the convalescent serum panel. At day 43, SARS-CoV-2 neutralizing GMTs reached .7-fold (1µg dose) to 3.2-fold (50µg dose) compared to those of a panel of SARS-CoV-2 infection convalescent human sera. Furthermore, sera of vaccinated subjects displayed broadly neutralizing activity in pseudovirus neutralization assays across a panel of sixteen SARS-CoV-2 RBD variants represented in publicly available SARS-CoV-2 sequences and against the newly dominant D614G strain. In summary, antibody responses elicited by BNT162b1 in our German clinical trial largely mirrored those observed in our U.S. clinical trial.

At the 10µg, 30µg and 50µg dose levels, certain adverse reactions, including low grade fever, were more common after the second dose than the first dose. Following the second dose, 25.0%, 25.0% and 33.3% of participants who received the 10µg, 30µg and 50µg doses, respectively reported fever of at least 38.0 degrees Celsius. Local reactions and systemic events after injection with 10µg, 30µg and 50µg of BNT162b1 were dose-dependent, generally mild to moderate and transient, with occasional severe events (grade 3) of flu-like symptoms and injection site reactions. The most commonly reported local reaction was injection site pain, which was mild to moderate, except in one of 12 subjects who received a 60µg dose, which was severe. No serious adverse events were reported, and there were no withdrawals due to adverse events related to the vaccine. Based on the adverse reactions reported after the 50µg boost dose, a second 60µg dose was not administered to participants who had received an initial 60µg dose.

For additional information on these preliminary results, please review our reports on Form 6-K filed with the SEC on July 1, 2020 and July 20, 2020 and incorporated by reference herein.

Based on preclinical and clinical data observed to-date, we and Pfizer have decided to progress our BNT162 development program into a Phase 2b/3 trial, which is anticipated to commence in late July 2020, subject to input and approval from the appropriate regulatory bodies. For the initial Phase 2b/3 trial, we intend to select either BNT162b1 or BNT162b2. Both the BNT162b1 and the BNT162b2 vaccine candidates have received Fast Track status from the FDA. Since clinical evaluation of the BNT162b2 candidate started several weeks later than BNT162b1, only preliminary clinical data are currently available for the BNT162b2 candidate. A set of data obtained for a cohort of subjects 18-55 years of age immunized with 10µg of BNT162b2 indicates that BNT162b2 induces similar virus neutralizing antibody responses as observed for BNT162b1. The preliminary observations are subject to further data collection and analysis. Assessment of dose dependent immune response and safety profile as well as analysis of T cell responses is currently pending. On the basis of additional data expected to be collected and analyzed for BNT162b1 and BNT162b2 in the coming days, along with input from the FDA, we intend to select a lead candidate to take into a Phase 2b/3 trial. We and Pfizer currently expect to

## [Table of Contents](#)

inform the FDA of our selection of the BNT162 candidate variant before the closing of this offering. Based on clinical data from our ongoing Phase 1/2 trials of BNT162b1 in the United States and Germany, BNT162b1 appears to be a viable variant to advance into a Phase 2b/3 trial. However, given that additional information relating to BNT162b2 is becoming available over the next few days, we and Pfizer plan to make the ultimate decision on the final candidate based on multiple factors, including the overall observed safety, tolerability and immunogenicity profiles for each vaccine candidate at different dose levels, a full immunogenicity data set and feedback from the FDA on the data collected for each candidate. If we ultimately move forward with the BNT162b2 variant, it will be due to the fact that based on our scientific judgment in light of the totality of preclinical data and clinical data available to us at the time of selection and the other factors described above, the BNT162b2 variant has better potential for clinical and commercial success. We do not plan to disclose which BNT162 variant has been selected until we receive FDA approval to commence the Phase 2b/3 clinical trial, and we likely will not publish any data with respect to the BNT162b2 variant before we make our selection.

### ***Influenza Vaccine***

We are collaborating with Pfizer to develop an influenza vaccine using our mRNA-based immunotherapy technology. Current influenza vaccines consist of antigens from inactivated influenza viruses, recombinant influenza haemagglutinin, or HA, proteins or live attenuated influenza viruses and are available as trivalent (containing two influenza A strains and one influenza B strain) or quadrivalent (containing two influenza A strains and two influenza B strains) vaccines. Currently available influenza vaccines are produced in chicken eggs or cell culture and take about five to six months to produce. This requires the composition of the coming season's vaccine to be selected by the World Health Organization, or WHO, far in advance for the vaccine to be available on time, which reduces the reliability of that prediction.

We anticipate that our mRNA-based vaccines can be manufactured within three months from the time the recommendation is published, including cloning and production and therefore the WHO's review of the vaccine components can occur closer to the influenza season to obtain a more reliable prediction. In addition, the mRNA manufacturing process is designed to produce an HA vaccine antigen that matches the HA of circulating influenza strains, in contrast to egg- or cell-based processes which can introduce mutations in the HA amino acid sequence. The flexibility of the mRNA vaccine platform could allow for generation of vaccines against genetically drifted seasonal viruses or pandemic strains. We and Pfizer have moved the anticipated Phase 1 start for our mRNA flu vaccine program to 2021 due to the prioritization of our COVID-19 vaccine development efforts.

### ***Other Infectious Diseases***

In October 2018, we entered into a research collaboration with Penn, under which we have the exclusive option to develop and commercialize prophylactic mRNA immunotherapies for the treatment of up to 10 infectious disease indications. We expect to report our first product candidates under this collaboration, and advance our first product candidate into the clinic, in the first half of 2021.

In August 2019, we entered into a letter agreement and investment agreement with the Bill & Melinda Gates Foundation to advance the development of immunotherapies for the prevention and/or treatment of HIV and tuberculosis and up to three additional infectious diseases.

### 3. mRNA-based Protein Replacement Platform for Rare Diseases

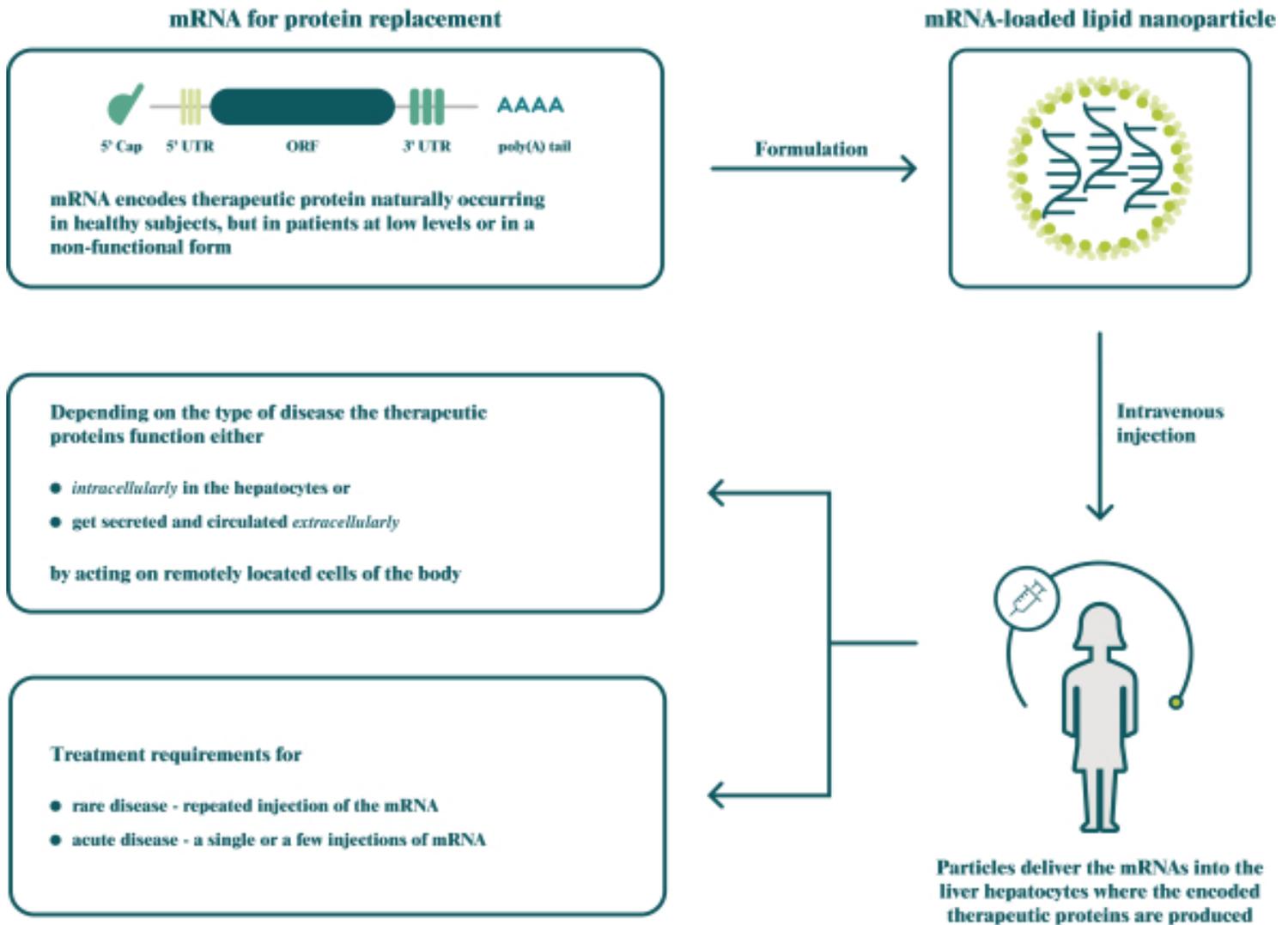
#### At a glance: Our Protein Replacement Platform for Rare Diseases

- **Concept:** Therapeutic proteins encoded by mRNA and produced in the patient as an alternative to recombinant protein replacement.
- **mRNA Format:** Nucleoside-modified mRNA, deimmunized to avoid immune activation in order to allow for translation of the therapeutic protein in the cells.
- **mRNA Delivery Formulation:** Liver-targeting LNPs.
- **Development Approach:** 50:50 cost and profit share with Genevant.

By incorporating modified nucleosides into our mRNA, we are able to reduce the immunogenicity of our product candidates, thereby allowing their use for therapeutic protein production. In addition, we utilize advanced mRNA delivery methods to protect the mRNA cargo *en route* to its target and promote its uptake into liver cells. Current protein-based replacement therapies were developed to treat rare diseases by administering recombinant proteins. Such therapies are limited to diseases where the missing protein function is extracellular. However, mRNA-based protein replacement therapy also has the potential to treat illnesses with intracellular protein defects, as long as the mRNA can be delivered into the affected cells.

Our mRNA-based protein replacement therapy features:

- **Nucleoside-modified mRNA.** Replacing uridines in mRNA with modified analogues is important to avoid immune activation that can provoke anti-drug antibody production and would limit efficacy of the treatment.
- **Liver targeted expression.** mRNA encoding therapeutic proteins are formulated into LNPs using in-licensed clinically-validated LNP delivery technology owned by Genevant. The mRNA-loaded LNPs are less than 100nm in size. When injected intravenously, these particles are selectively taken up by hepatocytes, the major cell component of the liver.



**Our mRNA-based protein replacement technology.** The illustration above depicts our mRNA-based protein replacement process for the treatment of rare diseases.

Our protein replacement technology is designed for the treatment of:

- Genetic disorders that manifest due to a missing or defective protein, where mRNA would need to be administered regularly for a lifetime.
- Acute diseases caused by transient depletion of a protein, such as a hormone, where treatment of such diseases with a single or a few doses of the encoding mRNA could be curative.

Therapeutic proteins encoded by the mRNA can either act intracellularly or be secreted and act extracellularly, in order to produce the desired therapeutic effect.

mRNA-based protein replacement technology has several advantages over recombinant proteins:

- **No need to develop a procedure for protein purification.** The development of recombinant proteins is a laborious and expensive procedure due to the requirement for a unique purification protocol for each protein. During mRNA-based protein replacement the protein is produced by the patient, which we believe avoids the need for purification and also accelerates drug development.
- **The protein has proper post-translational modification.** To function properly, most recombinant proteins need to be modified after synthesis. Proteins produced in patients from mRNA are more likely to obtain the correct modifications than recombinant proteins produced in cultured bacterial or mammalian cells.

- **Continuous *in vivo* supply of encoded protein.** Recombinant proteins, especially those with short half-lives, can be cleared from the body very quickly, thereby limiting therapeutic effect. During mRNA-based therapy, the encoded therapeutic protein is produced for a longer duration (*e.g.*, 10-14 days).
- **Production of intracellular proteins.** Recombinant proteins have limited intracellular therapeutic effects. In contrast, proteins encoded by mRNA can reach any cellular compartment and potentially help to cure diseases where the therapeutic protein needs to function in different subcellular locations, including the mitochondria, nucleus or cell membrane.

### ***Our Protein Replacement Development Plan in Rare Diseases***

We expect to initiate our first rare disease clinical trial in the second half of 2021.

#### **4. *RiboMabs***

##### ***At a glance: Our RiboMab Platform***

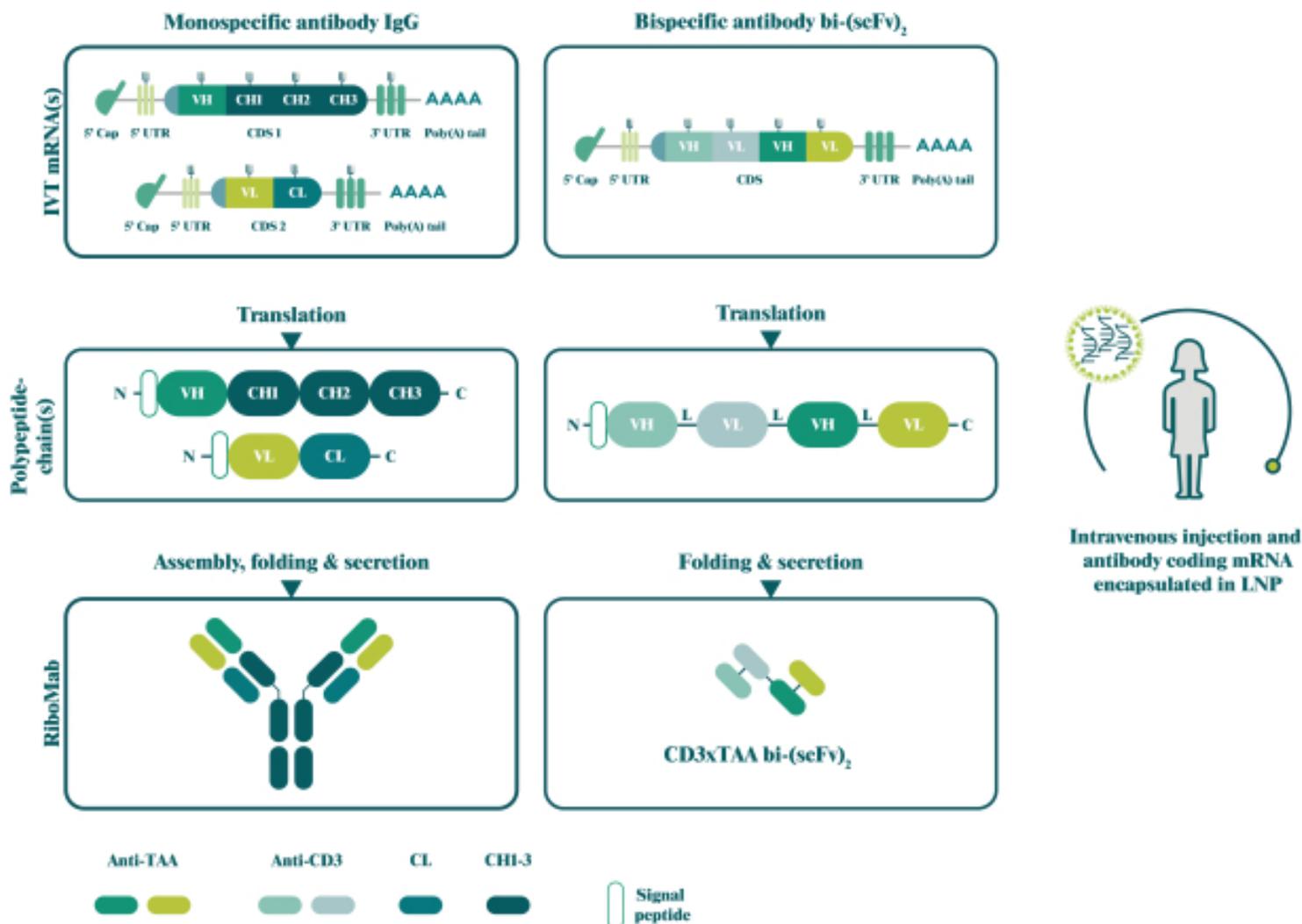
- **Concept:** Antibodies encoded by mRNA and produced in the patient as an alternative to recombinant antibodies.
- **mRNA Format:** Nucleoside-modified mRNA engineered for minimal immunogenicity in order to avoid immune detection and allow translation of the encoded antibodies to occur within the cells.
- **mRNA Delivery Formulation:** Various liver-targeting LNP formulations, delivered intravenously, to ensure systemic availability and prolonged production of the antibody *in vivo*.
- **Development Approach:** Worldwide rights; wholly owned.
- **Lead Candidate:** BNT141 in multiple solid tumors.

Our RiboMab product candidates are designed to encode secreted antibodies for expression *in vivo* by the patient's cells. We believe our RiboMab technology represents the next generation of antibody-based drugs. Antibody drugs are a leading class of biologics for the treatment of various diseases, but have a number of limitations. The development of antibodies is currently challenged by demanding and costly procedures of production, purification and formulation of a recombinant protein, which we believe hampers the rapid development and clinical testing of new drugs in this class. Recombinant protein antibodies require development of a cell line, establishment and adaptation of processes for production, purification and analytical testing. The whole process typically takes 18 to 30 months to optimize, scale-up and produce first clinical batches. Some of these antibodies are produced in low yields making them unsuitable for therapeutic application.

By contrast, mRNA not only involves a simpler and less expensive manufacturing process, but also is effective in much lower volumes than are required to produce similar effects using recombinant proteins. RiboMabs provide an antibody's mRNA sequence, and the body does the production work itself. This simplicity is designed to allow for both shorter development times and a greater diversity of druggable targets. For efficient RiboMab production, the encoding mRNA is encapsulated in LNPs that deliver the mRNA to the liver cells. For cancer treatment, we focus on tumor-associated antigens to keep adverse effects for the patients as low as possible. We believe we can integrate any antibody sequence in our RiboMab-encoding mRNA.

## Table of Contents

We have demonstrated the feasibility of our RiboMab technology for a variety of antibody formats, such as full immunoglobulins (Ig), primarily IgG, or different bispecific antibody variants, all of which engage the patient's own immune cells to eradicate antigen-positive tumor cells.



**Our RiboMab technology.** The figure above depicts the structure of *in vitro* transcribed (IVT) IgG and bi-(scFv)<sub>2</sub> RiboMabs. IVT-mRNA encoding the therapeutic antibody is encapsulated in LNPs and injected intravenously into patients. The mRNA is delivered to the liver where it is translated into antibodies and secreted into the blood stream. Abbreviations: A100, poly adenosine tail; bi-(scFv)<sub>2</sub>, bispecific single chain variable fragment; C, C-terminus; CH, constant heavy domain; CL, constant light domain; IgG, immunoglobulin G; IVT, *in vitro* transcribed; L, linker; LNP, lipid nanoparticles; mly, 1-methylpseudouridine; N, N-terminus; TAA, tumor-associated antigen; VH, variable heavy domain; VL, variable light domain; UTR, untranslated region.

We believe our broad portfolio of antibody formats will enable us to produce mRNAs encoding the appropriate antibody format for the individual patient's medical need and the desired treatment regimen (*e.g.*, monotherapy or combination therapy).

## [Table of Contents](#)

### **Our RiboMab Development Plan**

Our first development candidate, BNT141, is an IgG antibody, which we expect to enter the clinic in the first half of 2021 in a basket trial targeting multiple solid tumor types. We are also currently evaluating multiple additional RiboMab development candidates in the preclinical setting, including RiboMabs encoding bispecific antibodies, one of which, BNT142, we expect to enter the clinic in the first half of 2021.

<b>Candidate</b>	<b>Target</b>	<b>Development Phase</b>	<b>Next Potential Milestone</b>
BNT141 (monospecific)	Undisclosed	Preclinical	Initiate Phase 1 trial in 1H 2021
BNT142 (bispecific)	CD3xCLDN6	Preclinical	Initiate Phase 1 trial in 1H 2021

### **5. RiboCytokines**

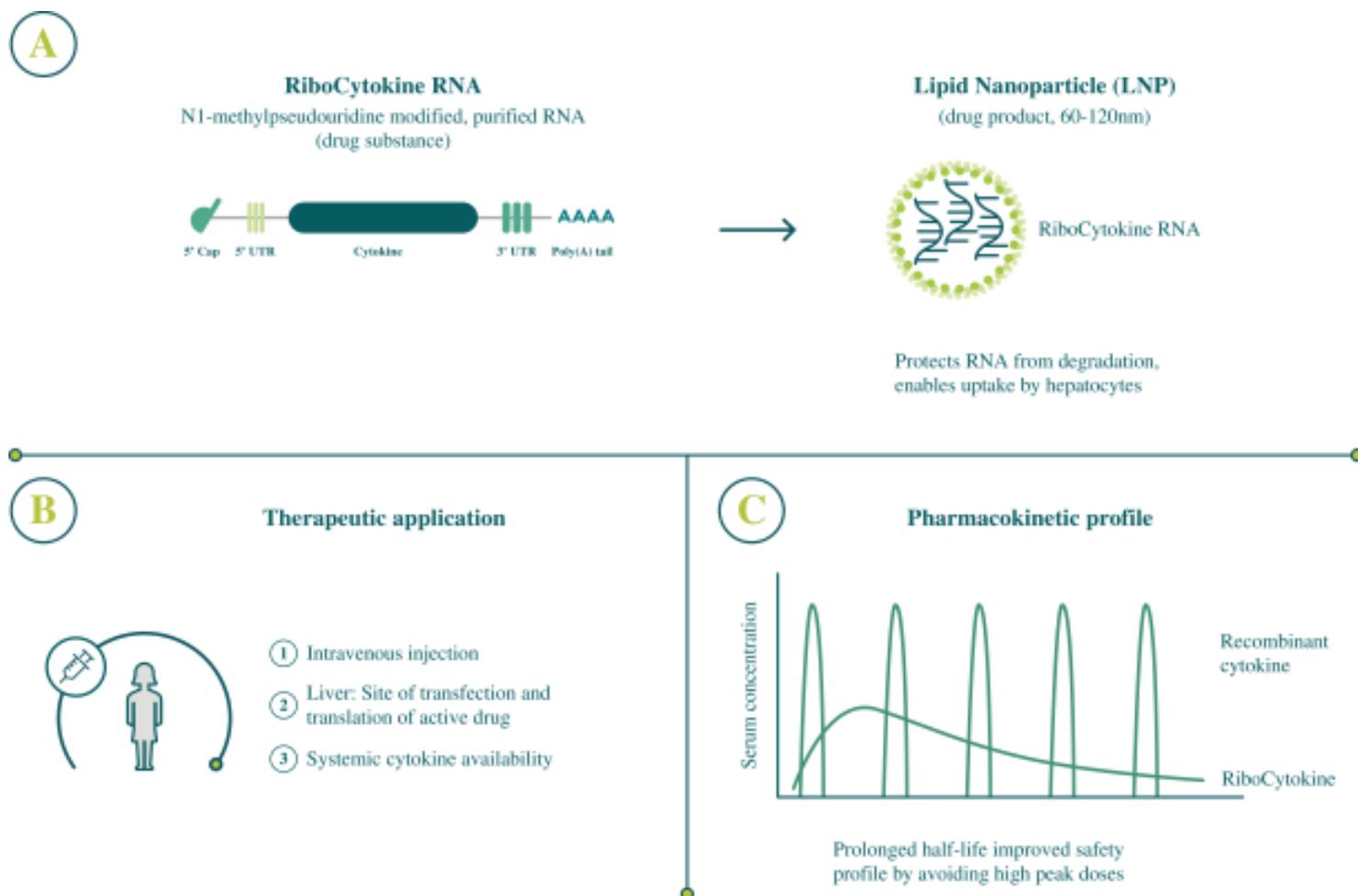
#### **At a glance: Our RiboCytokine Platform**

- **Concept:** Cytokines encoded by mRNA and produced in the patient as an alternative to recombinant cytokines.
- **mRNA Format:** Nucleoside-modified mRNA engineered for minimal immunogenicity in order to avoid immune detection and allow translation of the encoded cytokines to occur within the cells.
- **mRNA Delivery Formulation:** Various liver-targeting LNP formulations, delivered intravenously, to ensure systemic availability and prolonged production of the cytokine *in vivo*.
- **Development Approach:** Worldwide rights; wholly owned.
- **Lead Candidate:** BNT151 in multiple advanced malignancies.

Our RiboCytokine product candidates utilize mRNA that encodes the desired cytokines for expression *in vivo* by the patient's cells. Cytokines represent a large group of relatively small proteins (<30 kDa) that regulate a variety of biological functions as they elicit signaling for immune and non-immune cells. In particular, cytokines play a pivotal role in orchestrating the initiation, execution and extinction of innate and adaptive immunity against pathogens as well as malignant cells. Due to their natural role as immunomodulators, recombinant cytokines are currently used for the treatment of a number of infectious, inflammatory, autoimmune and malignant diseases. One of the major challenges associated with the therapeutic use of cytokines relates to their short serum half-life and low bioavailability. This impedes therapeutic efficacy as it necessitates high and frequent dosing, which often results in dose-limiting toxicities.

## Table of Contents

We have developed a wholly owned, novel mRNA-based platform technology called RiboCytokines, designed to address the limitations of recombinantly expressed cytokines.



**Concept of our RiboCytokine technology.** The graphic above depicts our RiboCytokine technology, including mRNA formulated in LNPs and administered by injection, having a beneficial pharmacokinetic profile.

Our RiboCytokine platform allows for sustained delivery of the encoded cytokines with prolonged half-life, including through:

- **Usage of N1-methylpseudouridine modified mRNA.** N1-methylpseudouridine as a nucleoside analogue prevents the recognition of mRNA by TLRs, avoiding immune attack against the RiboCytokines.
- **Liver targeted expression.** RiboCytokines are formulated using clinically validated LNP delivery technology owned by Genevant. LNPs selectively target the liver resulting in high-level expression.

We believe that apart from a beneficial pharmacokinetic profile, our mRNA-based RiboCytokine technology has a number of additional advantages over other types of cytokine therapies:

- **Less immunogenic than recombinant cytokines.** Expression of self and foreign antigens in the liver is associated with immune tolerance due to a unique anti-inflammatory microenvironment. We expect RiboCytokines to be less likely to trigger an immune response when compared to their recombinant counterparts.
- **Shorter development times and greater diversity.** The development of recombinant cytokines is a challenge due to demanding and costly CMC procedures of production, purification and formulation. The simplicity of our mRNA manufacturing allows for both shorter development times and a greater diversity of druggable targets.

## [Table of Contents](#)

We believe that our RiboCytokine technology is particularly well-suited to identify candidates for combination treatment with our proprietary CAR-T cell and cancer immunotherapies platforms.

### **Our RiboCytokine Development Plan**

We expect our first two RiboCytokine product candidates, BNT151 and BNT152/BNT153 (combination), to enter the clinic in the first half of 2021 in basket trials targeting multiple advanced malignancies.

<u>Candidate</u>	<u>Cytokines</u>	<u>Development Phase</u>	<u>Next Potential Milestone</u>
BNT151	Optimized IL-2	Preclinical	Initiate Phase 1 trial in 1H 2021
BNT152/BNT153	IL-7/IL-2	Preclinical	Initiate Phase 1/2 trial in 1H 2021

## **IX. Our Cell Therapies Drug Class**

The tailored reprogramming of autologous T cells from cancer patients to recognize and attack their tumors has become a disruptive medical innovation. Retargeting of T cells can be achieved via introduction of tumor-specific receptors into patient-derived T cells. For that purpose, T cells are mostly engineered by retroviral gene transfer to express either T cell receptors, or TCRs, or chimeric antigen receptors, or CARs. Recently, CAR expressing T cells, or CAR-T cells, became the first engineered T cell therapy to obtain FDA approval for some B cell derived hematological malignancies. Additionally, with our Neon acquisition we recently acquired an adoptive T cell platform targeting patient-specific and shared neoantigens. This platform utilizes a proprietary *ex vivo* co-culture process, NEO-STIM, to prime, activate and expand autologous neoantigen-specific T cells specific either for a personal set of neoantigens for each patient or for a set of selected shared neoantigens.

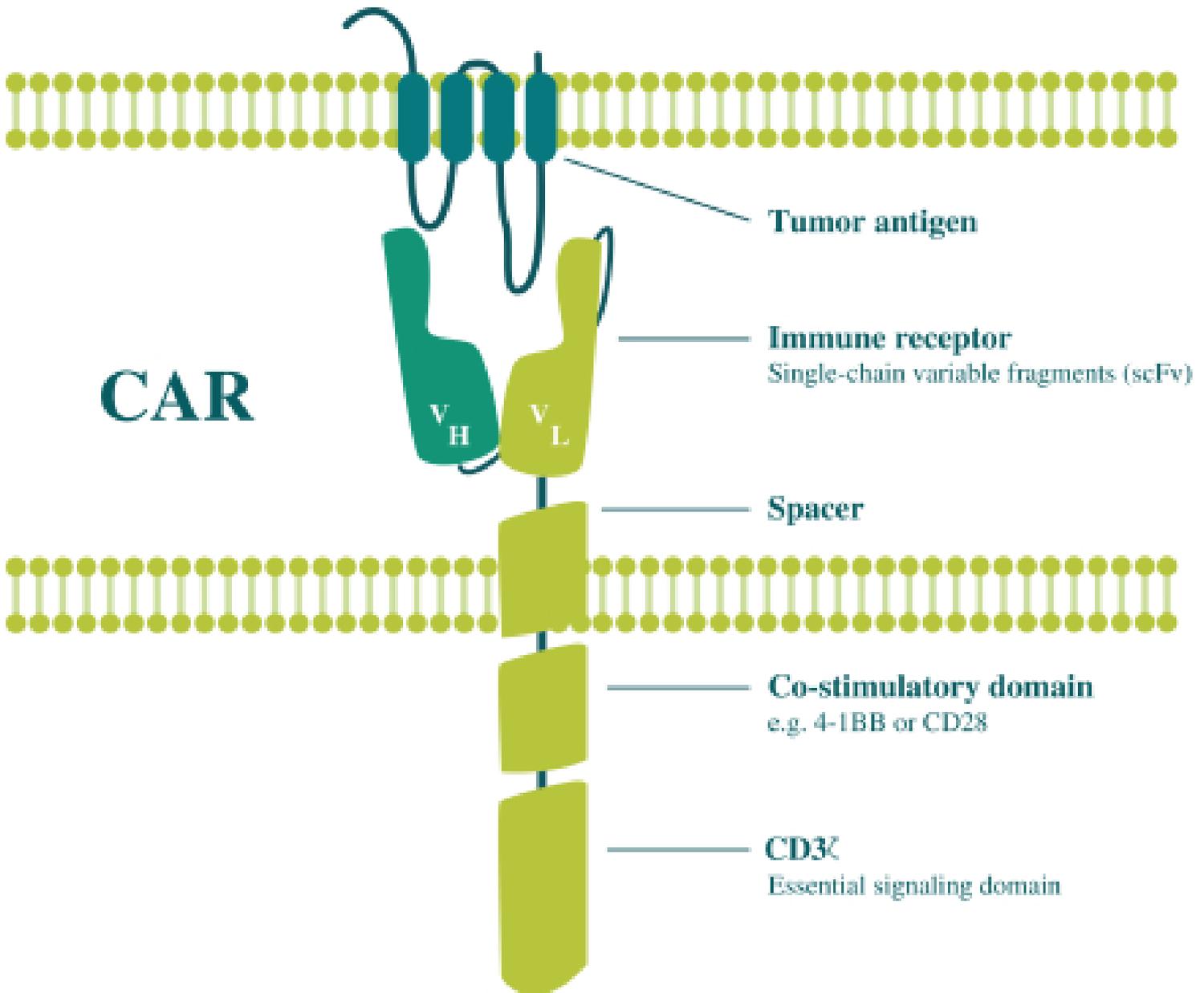
### **A. CAR-T Cells**

#### ***At a glance: Our CAR-T Platform***

- **Concept:** Second-generation CAR-T therapy designed to overcome the shortcomings of CAR-T therapy in solid tumors.
- **Mechanism:** T cells with CARs engineered to target cancer-specific antigens, including novel antigens selected from our proprietary antigen library and administered with an mRNA-based immune booster, which we refer to as CARVac, to enhance CAR-T cell expansion and persistence.
- **Development Approach:** Worldwide rights; wholly owned.
- **Lead Candidate:** BNT211 for multiple solid tumors.

## [Table of Contents](#)

CARs are artificial receptors that consist of an antigen recognition domain derived from a tumor-specific antibody linked to intracellular T cell signaling domains. CARs redirect T cells to eradicate tumors through specific recognition of native surface proteins expressed on tumor cells in a non-MHC-restricted manner. Therefore, CAR-T cells can be used for the treatment of all individuals whose tumor expresses the respective target, independent of the individual's HLA genotype. CARs can be used for redirection of both CD4+ and CD8+ T cells.



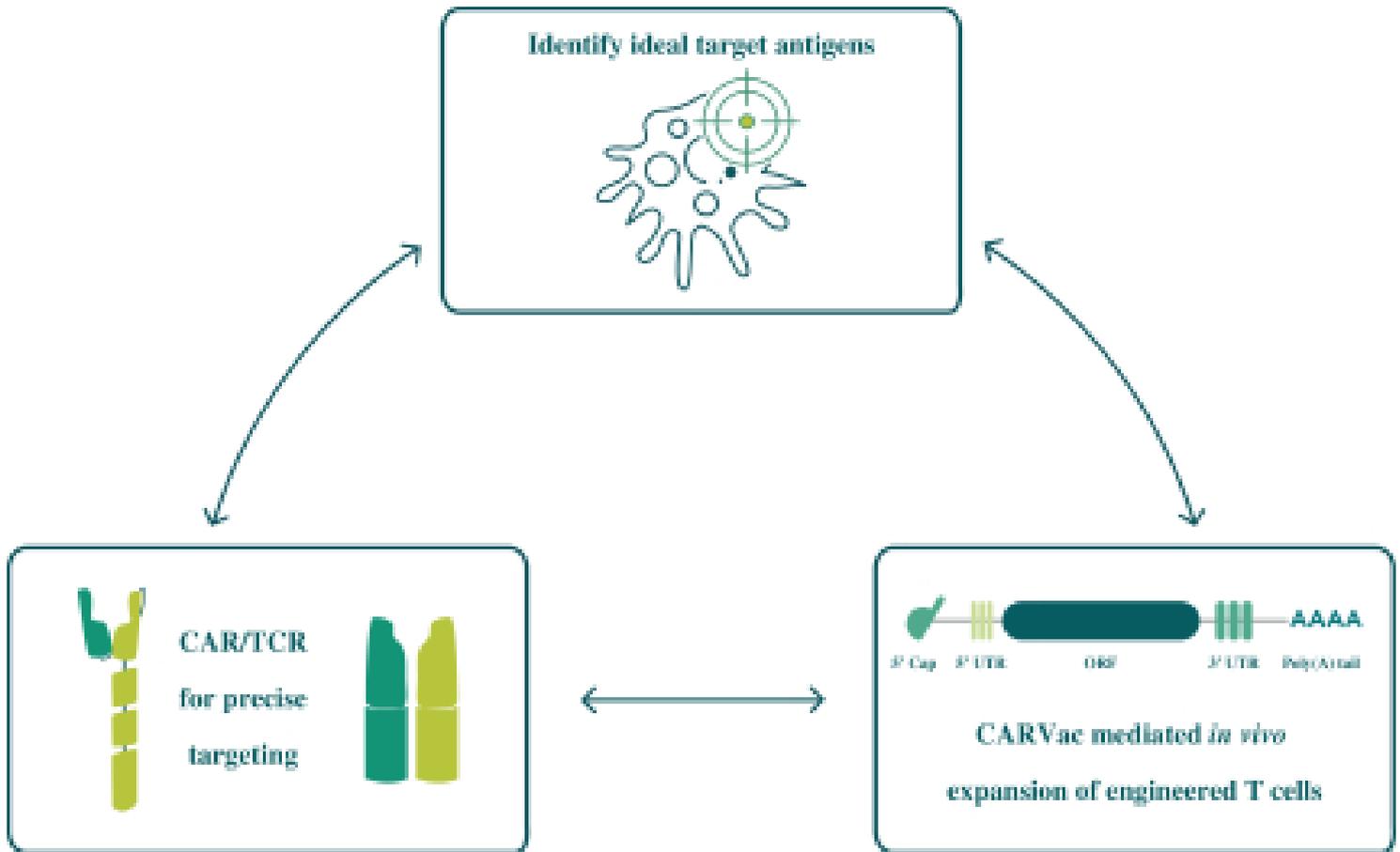
**Second-generation CAR.** The figure above illustrates the basic structure of a second-generation CAR, such as those included in our BNT211 and BNT212 product candidates.

While CAR-T therapy has shown potent anti-tumor responses in patients with B cell malignancies, clinical efficacy in solid tumors so far is limited. The main hurdles for application of CAR-T therapies in solid tumors are:

- Lack of highly tumor-selective targets, which are needed for safe and effective tumor targeting; and
- Low anti-tumoral activity due to insufficient expansion of engineered T cells.

We are developing the next generation of engineered T cell therapies that:

- target novel and known tumor-specific antigens, including mutant neoantigens, and a broad spectrum of tumor-associated antigens expressed in a wide range of cancers; and
- leverage our proprietary CARVac technology for controlled *in vivo* stimulation, activation and expansion of engineered T cells.



**Our platforms for development of next-generation engineered T cell therapies.** Our engineered cell therapies combine our antigen selection capabilities with our vaccine immunotherapy to enhance T cell activation and expansion.

The powerful characteristics of CAR-T cells, including their potential to eradicate targeted tumor cells in combination with their potentially life-long persistence in the host, require careful target selection. We believe the essential features of an ideal antigen for T cell-based immunotherapy are:

- Absence of expression from any toxicity-relevant non-malignant tissue, to prevent off-tumor/on-target toxicity; and
- Expression on the cell surface of tumor cells at sufficient levels to allow for recognition and lysis by CAR-T cells.

We are developing CAR-T programs targeting two different members of the Claudin family, namely CLDN6 and CLDN18.2. Claudins, or CLDNs, are central components of tight junctions that regulate epithelial-cell barrier function and polarity. Most of the CLDNs are broadly expressed, while CLDN6 and CLDN18.2 are exclusively expressed in different high medical need cancers. Disturbance and dysregulation of tight junction molecules is a frequent hallmark of cancer cells and often associated with malignant transformation and metastasis and, hence, disease progression.

CLDN6 is an oncofetal cell surface antigen expressed in embryonic stem cells during fetal development. The gene encoding CLDN6 is strictly silenced and not expressed in healthy adult tissues but re-activated in different cancers with a high medical need including ovarian, endometrial, testicular and lung cancers.

In contrast to CLDN6, CLDN18.2 is a tissue restricted marker that is exclusively expressed in short-lived differentiated cells of the gastric mucosa. CLDN18.2 is observed in a large fraction of gastric cancers. In addition, CLDN18.2 is aberrantly activated in a variety of tumor entities, including esophageal cancer, pancreatic adenocarcinoma and cholangiocarcinoma.

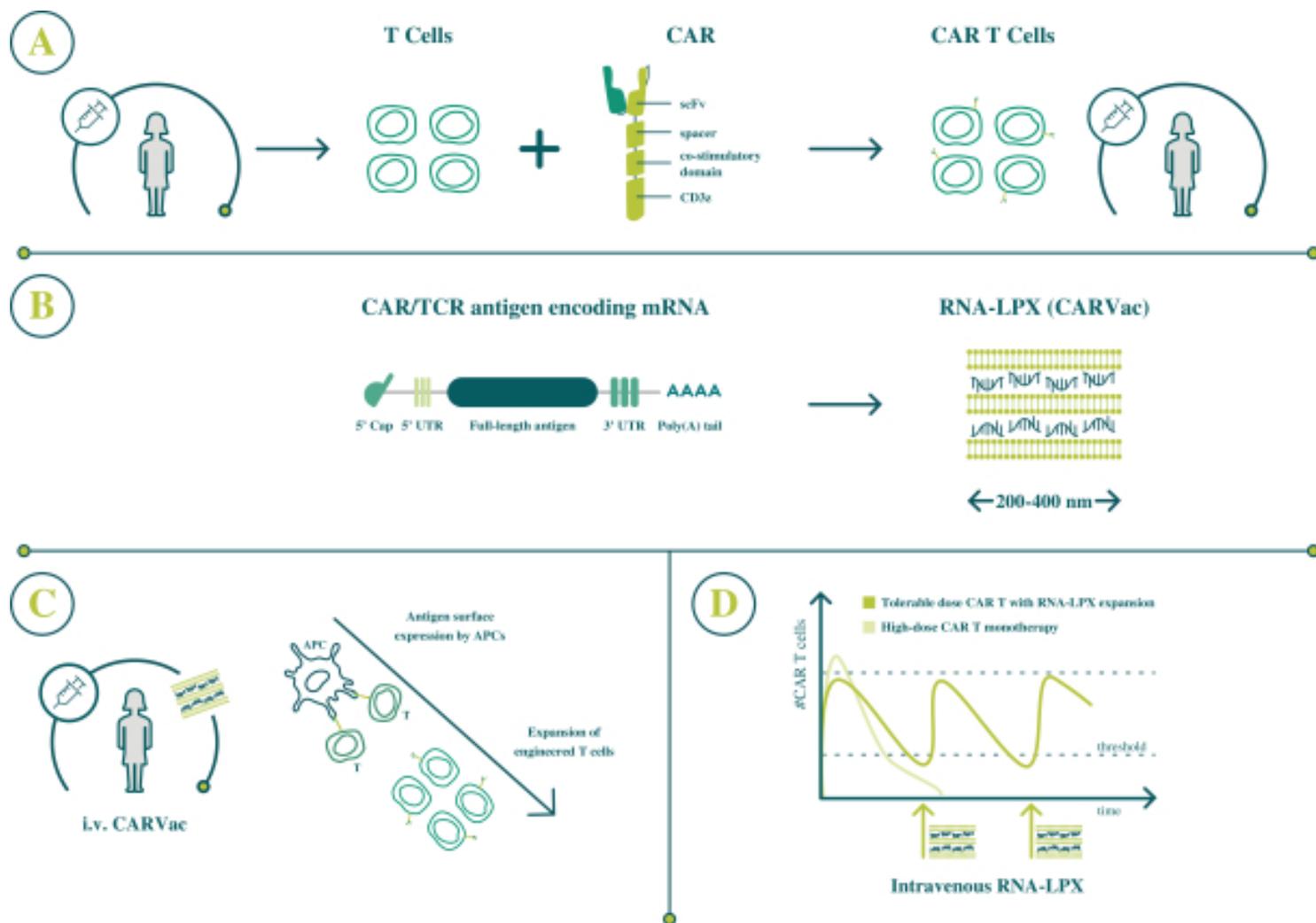
#### ***In-vivo expansion of engineered T cells using liposomally formulated mRNA***

Besides targeting an ideal tumor-specific antigen, the frequency and the persistence of CAR-T cells in the respective patient is a critical factor determining antitumor efficacy. A positive correlation between clinical outcome and CAR-T cell engraftment and persistence has been shown in several CD19-targeting CAR-T trials. Both tend to be much more limited in the solid tumor setting, likely due to the lack of circulating antigen-presenting cells, or APCs, such as dendritic cells expressing the target CAR antigen.



## Table of Contents

To address this critical factor, we developed an approach for *in vivo* stimulation of CAR-T cells that relies on our proprietary FixVac technology for systemic mRNA delivery in combination with our CAR-T product candidates. Intravenous administration of a FixVac encoding for the tumor antigen induces expression of the desired target on antigen-presenting cells in secondary lymphoid tissues. FixVac treatment facilitates *in vivo* expansion of CAR-T cells in a dose-dependent manner. Moreover repetitive administration of FixVac results in an improved CAR-T cell persistence as well as increased anti-tumor activity.



**Our CAR-T cell immunotherapies combined with CARVac-mediated *in vivo* expansion.** (A) Autologous T cells engineered to express a CAR are adoptively transferred into the patient. (B) Full-length CAR target-encoding mRNA is complexed with liposomes to form RNA-LPX lipoplexes (CARVac). (C) Intravenously administered CARVac selectively targets APCs in secondary lymphoid organs facilitating uptake, antigen expression and maturation of APCs. Exposure of CAR-T cells to their target results in CAR-T cell *in vivo* expansion. (D) CARVac can be administered repetitively to achieve controlled expansion and persistence of CAR-T cells within the therapeutic window.

### Our CAR-T Development Plan

Our first CAR-T product candidate, BNT211, includes a second-generation CAR directed against CLDN6. Our second product candidate is BNT212, which includes a CLDN18.2-targeting CAR. We expect to initiate a Phase 1/2 basket trial of our novel combination CLDN6 CAR-T cell and CLDN6 CARVac product candidate in multiple solid tumors in the second half of 2020.

Candidate	Antigen Target	Development Phase	Next Potential Milestone
BNT211	CLDN6	Preclinical	Initiate Phase 1/2 trial in 2H 2020
BNT212	CLDN18.2	Preclinical	—

## B. Neoantigen-targeting T Cells

### At a glance: Our Neoantigen-targeting T Cell Platform

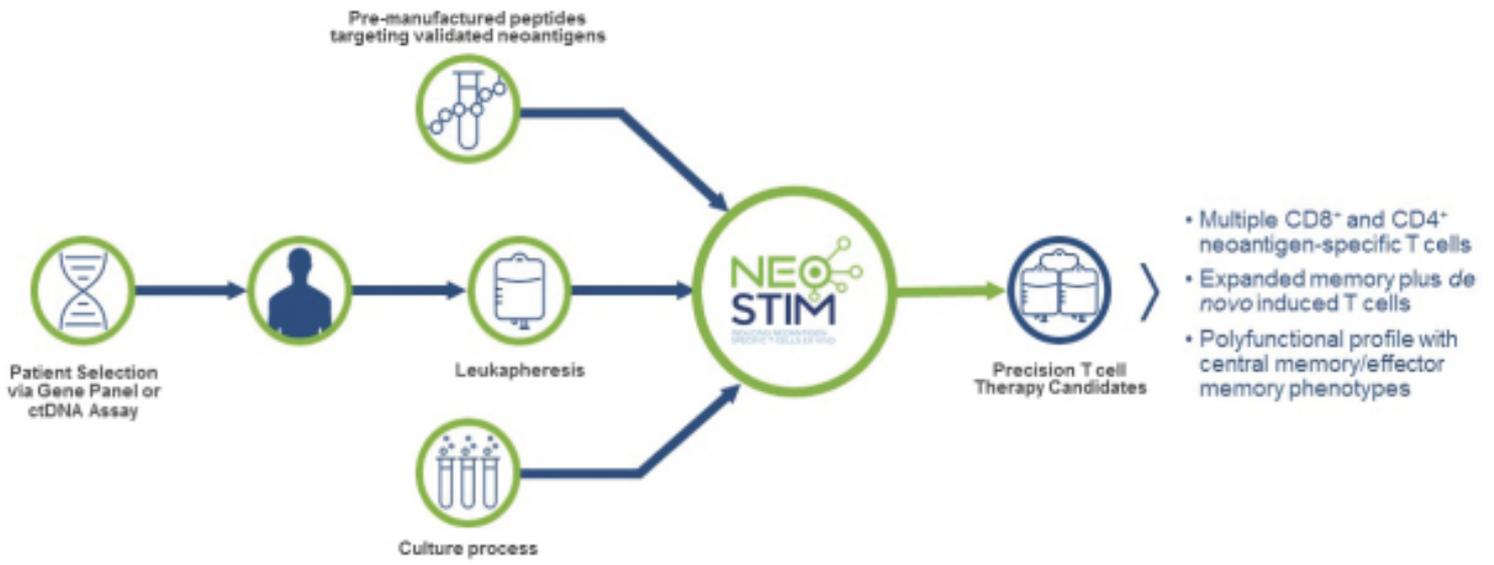
- **Concept:** Adoptive T cell therapies targeting personal or shared sets of cancer neoantigens.
- **Mechanism:** Autologous, neoantigen-specific T cells primed, activated and expanded utilizing a proprietary antigen-specific T cell induction protocol, NEO-STIM, to target either a personal set of neoantigens for each patient or a set of selected shared neoantigens.
- **Development Approach:** Worldwide rights.
- **Lead Candidate:** BNT221 for metastatic melanoma and other potential cancer indications.

Through our recent Neon acquisition, we obtained a neoantigen-targeting T cell platform. This platform can be utilized to develop product candidates across several neoantigen-targeting non-engineered and engineered T cell therapies using two distinct approaches:

- An individualized approach enabling neoantigen-targeted therapies that are tailored for the individual profile of each patient's tumor.
- A shared neoantigen approach enabling neoantigen therapies that target prevalent neoantigens that are shared across subsets of patients or tumor types.

Our RECON bioinformatics engine is designed to predict the most therapeutically-relevant neoantigen targets associated with each patient's tumor. Effective prediction is critical because, although many mutations within a patient's tumor will lead to the production of a mutated protein, not all mutated proteins lead to suitable therapeutic neoantigen targets. RECON uses a number of inputs from each patient, including DNA sequences from samples of tumor and normal tissue, RNA sequences from tumor samples, and the patient's specific MHC allele profile. RECON processes data from these inputs using a proprietary combination of algorithms in order to produce a prioritized list of neoantigen-targeting peptides that can be manufactured for use in product candidates. After selection of the target neoantigens, our proprietary method for *ex vivo* T cell stimulation, which we call NEO-STIM, allows us to directly prime, activate and expand antigen-specific T cells.





## Table of Contents

**Our Neoantigen-targeting T Cell Processes.** The illustrations above show our processes for neoantigen-targeting T cell development under our individualized and shared neoantigen approaches.

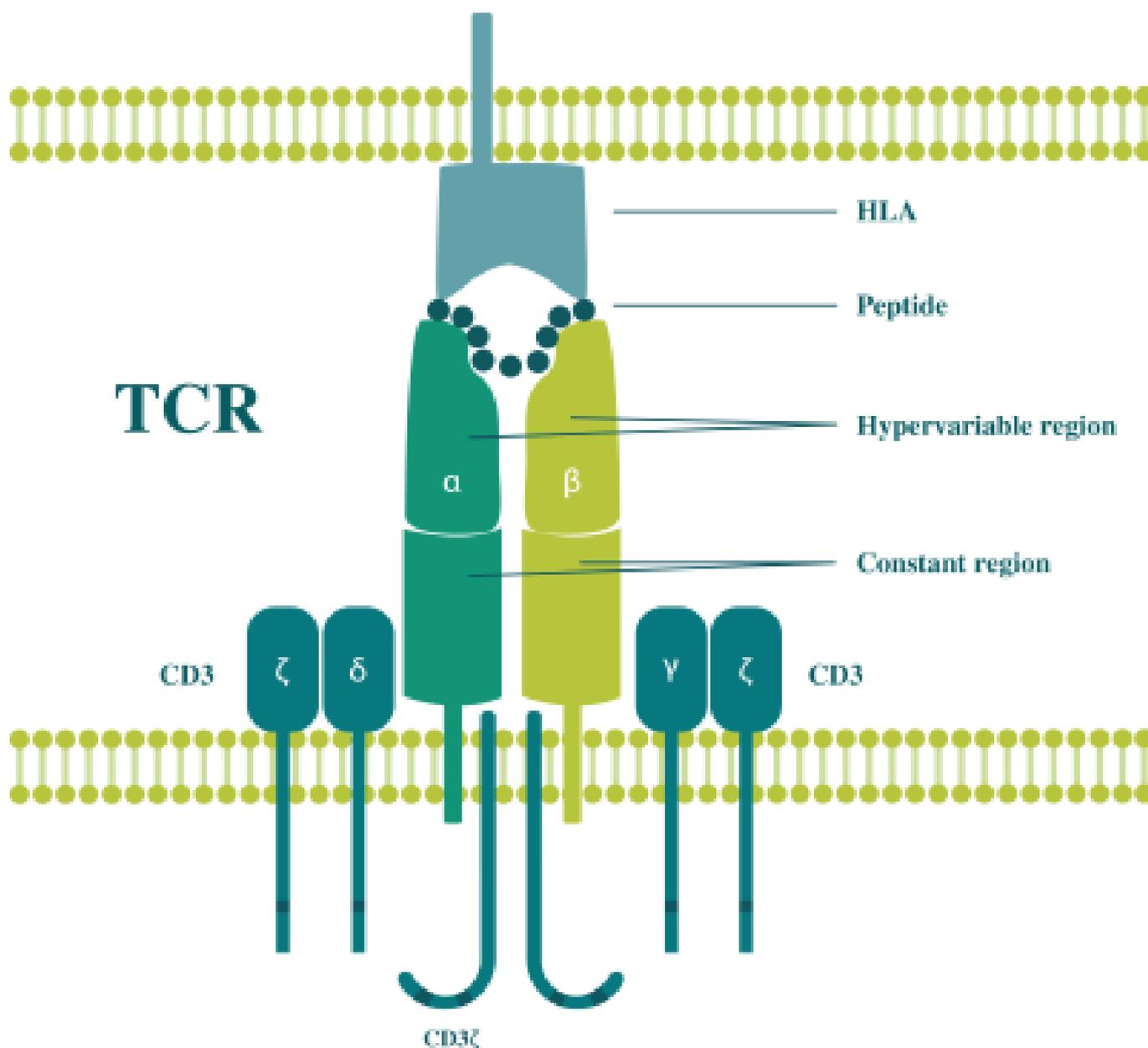
### Our Neoantigen-targeting T Cell Development Plan

Our lead product candidate under this platform is our individualized neoantigen-targeting T cell therapy, NEO-PTC-01 (BNT221). We expect to initiate a Phase 1 dose escalation trial of NEO-PTC-01 (BNT221) in metastatic melanoma in the second half of 2020. The second planned indication for NEO-PTC-01 (BNT221) is metastatic ovarian cancer.

<u>Candidate</u>	<u>Antigen Target</u>	<u>Development Phase</u>	<u>Next Potential Milestone</u>
BNT221	Individualized	Preclinical	Initiate Phase 1 trial in 2H 2020

### C. TCRs

The T cell receptor, or TCR, is part of a complex signaling machinery, which includes the TCR  $\alpha$  and  $\beta$  chains that are responsible for antigen recognition, the co-receptor CD4+ or CD8+ and the CD3 signal transduction complex. TCRs recognize antigens presented on the cell surface as small peptides loaded on the patients' HLA molecules. Those peptides are derived from proteins after intracellular degradation. In contrast to CARs that recognize solely native membrane proteins, the repertoire of suitable TCR target antigens include TAAs and mutant neoantigens.



**TCR Complex.** The illustration above shows the basic structure of a TCR complex.

### Our TCR Discovery and Validation Platform

We have developed an integrated technology platform for the systematic identification of functional, fully human TCRs from single antigen-reactive T cells. This technology consists of a proprietary high-throughput approach for the fast retrieval, cloning and rapid validation of novel paired T cell receptor sequences. Our approach facilitates the isolation of tumor cell specific TCRs against multiple antigens and various HLA class I and II alleles.

We believe our TCR discovery technology has the potential to unlock an array of patient- and tumor-specific TCRs suitable for clinical use. We believe this technology has potential utility for:

- therapeutic TCR products encompassing single TCRs to target a specific antigen;
- a therapeutic TCR warehouse encompassing multiple TCRs to target one or more tumor antigens; or
- individualized T cell therapy involving on-demand identification and timely manufacturing of customized, engineered T cells with autologous TCRs against neoepitopes for adoptive transfer.

## X. Our Antibodies Drug Class

In the past decades, monoclonal antibodies, or mAbs, have transformed from scientific tools to powerful human therapeutics. As one of the fastest growing classes of drugs, to date, more than 40 mAbs have been approved to treat a variety of diseases including cancer, inflammation, autoimmune diseases and others. In addition, identified antigen-binding domains are also fundamental elements for the construction of novel therapeutic formats and formulations, such as CAR-T cells, bispecific therapeutics and targeted nanoparticles.

We have developed and integrated multiple complementary antibody and antibody-mimetic protein technologies into our overall portfolio of treatment approaches.

### A. Our Next-generation Checkpoint Immunomodulators

#### *At a glance: Our Next-generation Checkpoint Immunomodulators*

- **Concept:** Bispecific antibodies for dual immunomodulation, initially targeting 4-1BB, an immune checkpoint that is expressed on T cells and NK cells and can enhance immune cell proliferation and activation, in combination with simultaneous checkpoint inhibition.
- **Mechanism:** Conditional activation of 4-1BB checkpoint only upon simultaneous binding of PD-L1 or CD40 (in the case of our initial candidates), potentially avoiding toxicities seen in prior attempts at 4-1BB agonism by localizing 4-1BB activation to the tumor environment.
- **Development Approach:** 50:50 cost and profit share with Genmab, combining our and Genmab's immunostimulatory antibodies and extensive immunology expertise with Genmab's DuoBody® bispecific antibody platform.
- **Lead Candidate:** GEN1046 (BNT311), our PD-L1x4-1BB product candidate for multiple solid tumors.

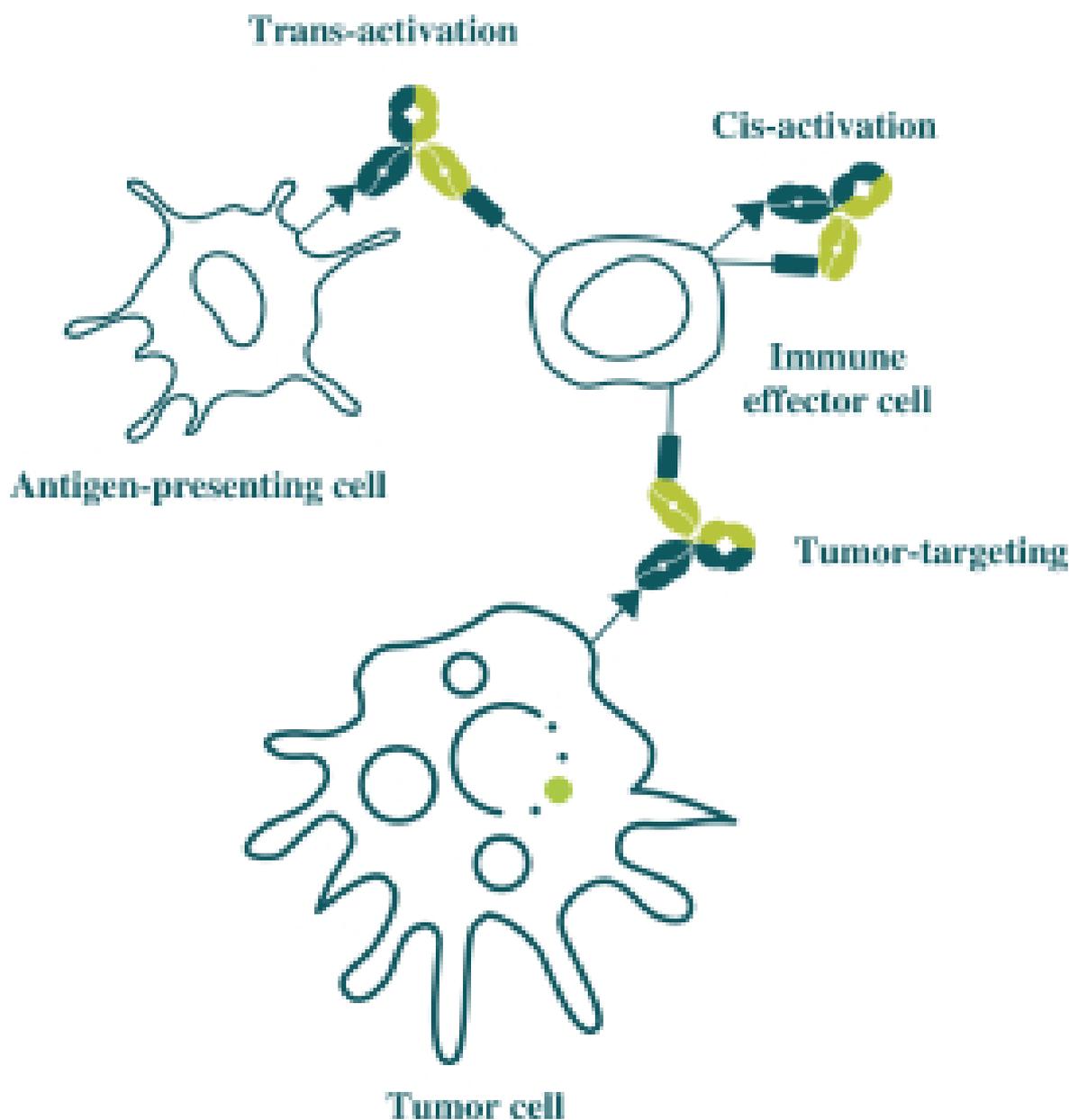
Following the success of immune checkpoint-blocking antibodies targeting CTLA-4, PD-1 or PD-L1 in cancer treatment, bispecific antibody approaches represent the next generation of emerging immunotherapies with the potential to further improve clinical efficacy. In addition to bispecific T cell engager formats, which redirect T-cell cytotoxicity to malignant cells, bispecific antibodies can be formatted as tumor-targeted immunomodulators and dual immunomodulators. Tumor-targeted immunomodulators direct potent immune costimulation to the tumor-infiltrating immune cells, whereas dual immunomodulators simultaneously address two immunomodulating targets, resulting in blockade of inhibitory targets, depletion of suppressive cells or activation of immune effector cells.

We are developing, in collaboration with Genmab, bispecific antibodies that function as tumor-targeted and dual immunomodulators, applying Genmab's proprietary DuoBody® technology in combination with our joint target identification and product concept expertise. These next-generation checkpoint immunomodulators are thought to induce beneficial co-stimulation, promoting specific T cell activation, survival, proliferation and T cell effector functions. Our collaboration encompasses three potential classes of immunotherapeutic bispecific antibodies:

- Tumor-targeted DuoBody® molecules are bispecific antibodies targeting a tumor-specific antigen expressed by the malignant cell, and an immunomodulatory receptor expressed by tumor-infiltrating immune cells. This is expected to induce powerful activation of tumor-specific effector immune cells with reduced risk of immune-related adverse events.

## Table of Contents

- Cis-activating DuoBody® molecules are bispecific antibodies that bind two distinct immunomodulating targets presented on the same cell. These targets are specifically expressed on activated immune cells with the rationale to boost existing immune responses by additive or synergistic effects of dual immunomodulation.
- Trans-activating DuoBody® molecules are bispecific antibodies that bind two distinct immunomodulating targets expressed on two separate cell subsets. By simultaneously targeting, for example, effector immune cells and antigen-presenting cells, these compounds are thought to amplify the immune cell priming process and augment subsequent effector responses.



**Next-generation checkpoint immunomodulators.** Our collaboration with Genmab potentially includes bispecific antibodies from three different classes: trans-activating, cis-activating and tumor-targeting antibodies.

### **Our Next-generation Checkpoint Immunomodulator Development Plan**

We are currently developing two next-generation checkpoint immunomodulator product candidates in collaboration with Genmab: GEN1046 (BNT311), our jointly owned PDL1x4-1BB bispecific antibody, and GEN1042 (BNT312), our jointly owned CD40x4-1BB bispecific antibody.

<u>Candidate</u>	<u>Targets</u>	<u>Development Phase</u>	<u>Next Potential Milestone</u>
GEN1046 (BNT311)	PD-L1x4-1BB	Phase 1/2a trial in multiple solid tumors	Data update in 2H 2020
GEN1042 (BNT312)	CD-40x4-1BB	Phase 1/2a trial in multiple solid tumors	—

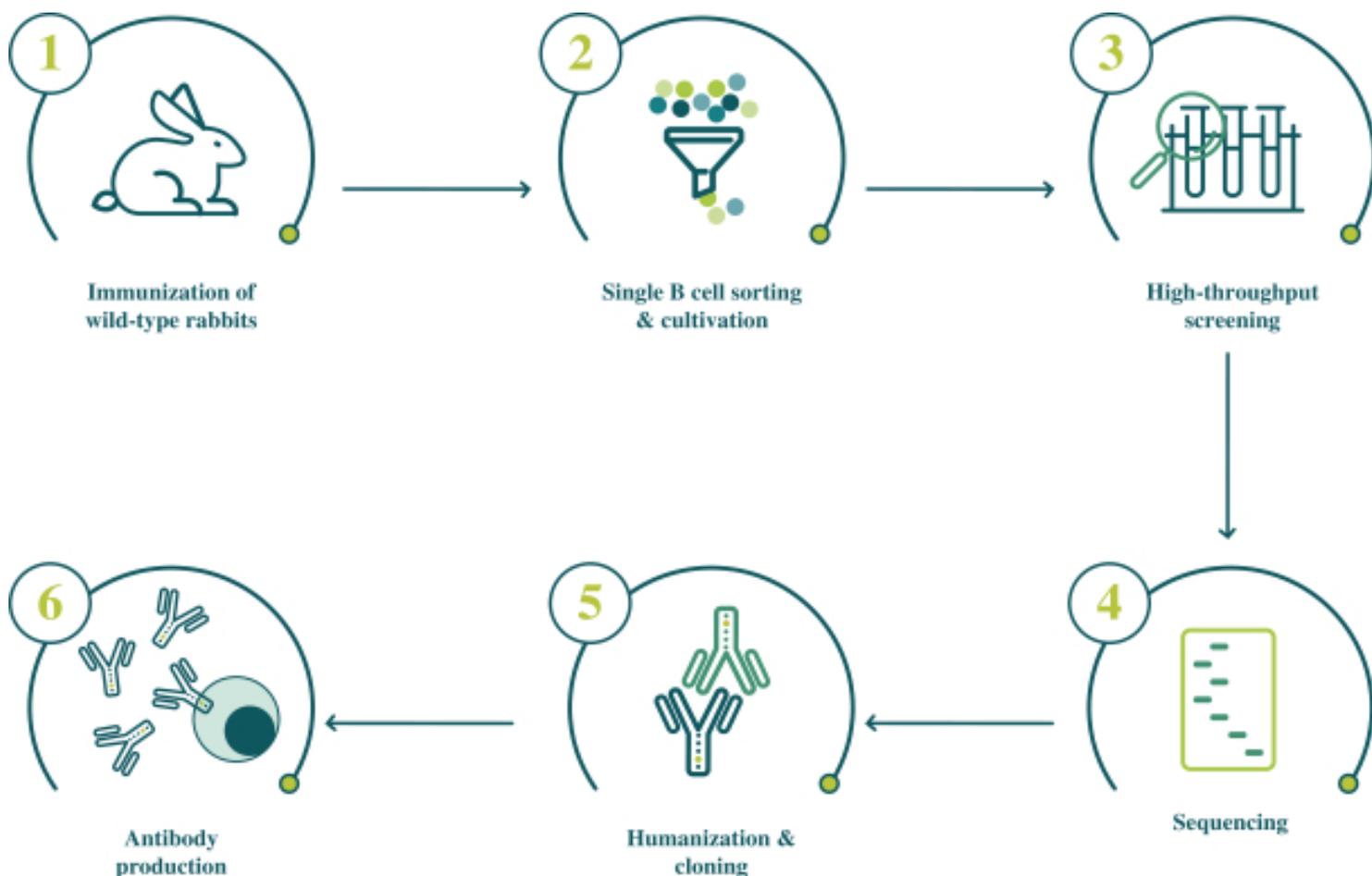
### **B. Our Antibody Discovery Engines**

We believe that our multiple antibody discovery engines significantly expand our targeting repertoire and enable us to directly, rapidly and efficiently produce new mAb candidates. In addition, antigen-binding domain sequences identified through our antibody discovery engines also feed into our proprietary CAR-T cell and mRNA-encoded RiboMab platforms as well as our next-generation checkpoint immunomodulator collaboration. For instance, binders to human 4-1BB were identified from a previous antibody generation campaign and are currently under clinical and preclinical development as part of our next-generation checkpoint immunomodulator collaboration with Genmab. HuMab, our human antibody discovery engine

acquired from MabVax Therapeutics in 2019, led to the clinical development of our fully human IgG1 monoclonal antibody product candidate targeting Sialyl Lewis<sub>x</sub> (sLe<sub>x</sub>), a carbohydrate moiety that is present in over 90% of pancreatic and a large percentage of gastrointestinal cancers.

## 1. Our Rabbit-based Antibody Discovery Engine

With the acquisition of MAB Discovery GmbH's antibody generation unit in 2019, we integrated a unique and proprietary rabbit-based antibody discovery platform that can generate and develop high quality, functional mAbs targeting traditional proteins and receptors as well as a wide variety of more challenging targets. Rabbit monoclonal antibodies are highly diverse and do not require affinity maturation, due to consistently high affinities. They often recognize epitopes on human antigens that are not immunogenic in rodents, thus increasing the total number of targetable epitopes. The mechanisms of antibody diversification in rabbits allow an easy and quick translation of preclinical data into the clinic with an improved probability of success. We established a streamlined semi-automated process of rabbit immunization for the efficient production of high-affinity rabbit mAbs.



**Our rabbit-based antibody discovery engine.** The figure above depicts our semi-automated process for the discovery and production of high-affinity rabbit mAbs.

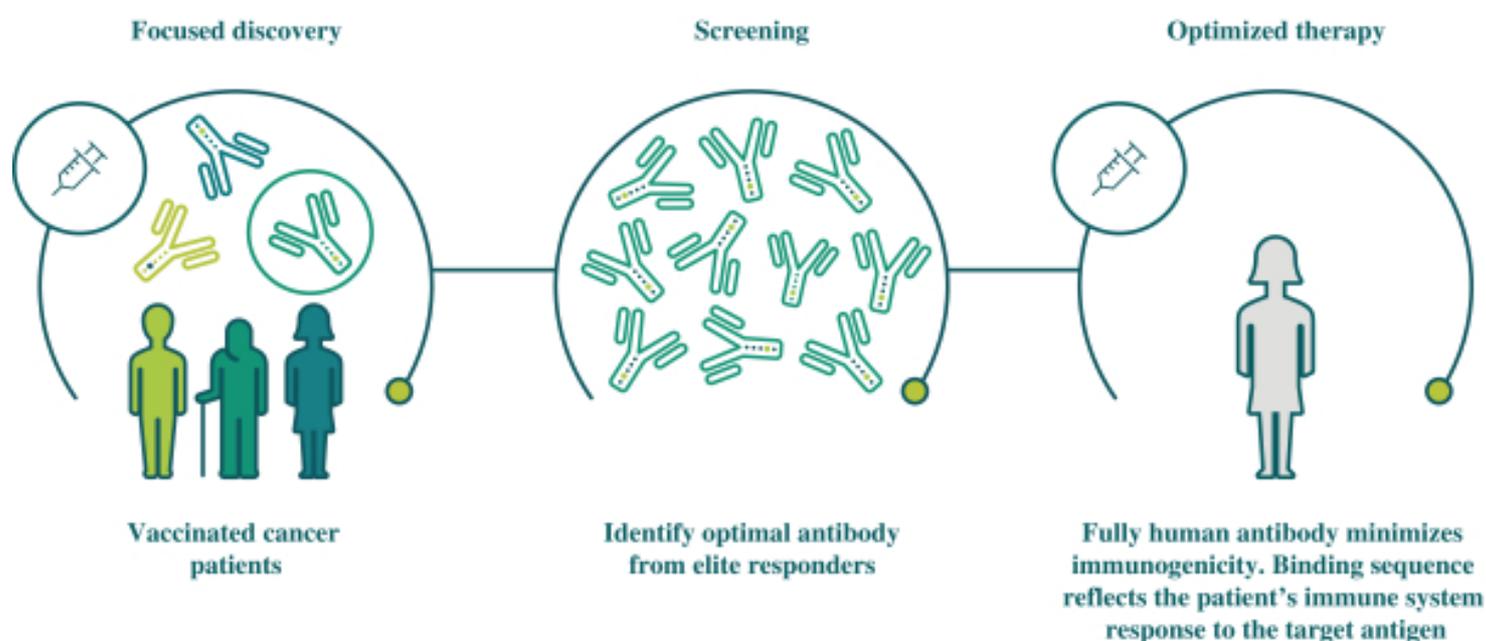
## 2. Our Fully Human Antibody Discovery Engine

Our HuMab discovery technology focuses on abnormal carbohydrate targets upregulated on solid tumors. Aberrant glycosylation is a common phenotypic change of cancer cells that mainly affects the outer part of glycans. These abnormal carbohydrate structures are known as tumor-associated carbohydrate antigens, or TACAs, and are associated with malignancy grade, invasion, metastasis and poor prognosis. TACAs are considered promising novel targets for therapeutic intervention using, in particular, mAbs or CAR-T cells. However, TACAs usually induce only low-affinity humoral immune responses, since carbohydrate moieties do not trigger the necessary T cell responses.

Using B cell sorting, hit identification, sequencing, antibody production and high-throughput antibody screening, we are able to select optimal TACA-specific antibodies from multiple clinically confirmed

## Table of Contents

immunotherapy responders. All antibodies emanating from this platform are fully human with no need for additional humanization at minimal risk for immunogenicity.



**Our fully human antibody discovery engine.** The figure above shows our proprietary approach to the discovery and development of novel fully human antibody therapeutic and diagnostic agents.

### Our Targeted Cancer Antibody Development Plan

Candidate	Targets	Development Phase	Next Potential Milestone
MVT-5873 (BNT321)	sLea	Phase 1 basket trial in multiple solid tumors; first patient enrolled	—

## XI. Our Small Molecule Immunomodulator Drug Class

### At a glance: Our Small Molecule Immunomodulators

- **Concept:** Small molecule therapies, with a specific focus on TLRs, that can be used synergistically with other cancer therapeutics, including other product candidates in our portfolio.
- **Development Approach:** Worldwide rights; wholly owned.
- **Lead Candidate:** BNT411, our TLR7 agonist product candidate intended as a monotherapy or in combination with chemotherapy and/or checkpoint inhibitors.

Small molecule cancer therapeutics can be used to regulate cancer growth, halt blood vessel formation in tumors, deliver toxins to cancer cells and mark cancer cells for destruction by the immune system. Unlike larger antibody-based cancer therapies, small molecule compounds are often developed for targets located within cells since they can enter the cells more easily as a result of their physical properties and low molecular weight. Small molecules also often have other intrinsic benefits including relative ease and cost of production compared to larger compounds, as well as more frequently having the potential for oral administration to patients. They can also often be used synergistically in combination with other therapeutics such as mRNA, checkpoint inhibitors, radiation therapy and chemotherapy.

We aim to discover and develop the next generation of small molecule immunomodulatory compounds to improve the standard of care. We have a team of approximately 25 scientists and technicians, with extensive small molecule experience, focused on drug discovery.

## [Table of Contents](#)

Our immunomodulatory small molecule product class focuses on a range of endosomal and intracellular targets that are known to stimulate the activity of a wide range of immune cells. We have a particular emphasis on TLRs. TLRs are a family of pattern recognition receptors that function as primary sensors of the innate immune system to recognize pathogens. We believe TLRs represent a promising target class for cancer immunotherapy, particularly for inflammatory re-programming of the tumor microenvironment. In many cancers, tumors are protected by an anti-inflammatory environment, which reduces the ability of the immune system to attack the cancer cells. TLR7 agonists are able to initiate a direct cellular immune response, for example, by activating immature dendritic cells, cytotoxic T cells and NK cells, as well as stimulating the release of signal molecules such as cytokines and chemokines including IFN- $\alpha$  and IP-10, which can be directed against tumor cells. The activation of the innate and adaptive immune system and the release of cytokines and chemokines, for instance by our small molecule TLR7 agonist, results in the potent stimulation of antigen-specific T cells, B cells and innate immune cells such as NK cells and macrophages.

Our initial focus is on small molecule product candidates that activate the innate and adaptive immune system via TLR7 and are designed to be used in combination with chemotherapeutics as well as checkpoint inhibitors.

### ***Our Small Molecule Immunomodulator Development Plan***

Our initial development candidate is a potent TLR7 agonist, which we are developing as a monotherapy or a combination therapy for small cell lung cancer and other solid tumors.

<u>Candidate</u>	<u>Target</u>	<u>Development Phase</u>	<u>Next Potential Milestone</u>
BNT411	TLR7	Phase 1/2a trial in extensive-stage small-cell lung carcinoma	—

## **XII. OUR PRODUCT CANDIDATES**

We are developing a broad and deep pipeline of over 20 product candidates across our four drug classes. Our product candidates are currently being investigated in 12 clinical trials.

Oncology

Drug Class	Platform	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Rights/ Collaborator	Milestones
mRNA	FicVac (fixed combination of shared cancer antigens)	BNT111	Advanced melanoma (Adjuvant & Metastatic)					Global	Report Phase 1 data; publication upcoming; Phase 2 with registrational potential start 2H 2020
		BNT112	Prostate cancer					Global	
		BNT113	HPV16+ head and neck cancer <sup>1</sup>					Global	Phase 2 with registrational potential start 2H 2020
		BNT114	Triple negative breast cancer					Global	Data update 2H 2020
		BNT115	Ovarian cancer <sup>1</sup>					Global	
		BNT116	NSCLC					Global	Phase 1 start 1H 2021
	InNeST (patient specific cancer antigen therapy)	RO7198457 (BNT122 <sup>2</sup> )	Multiple solid tumors NSCLC and colorectal cancer (Adjuvant)					Genentech (global 50:50 profit/loss share)	Enrollment update 2H 2020 <sup>3</sup> ; interim data update in 2H 2021 Two Phase 2 trials planned 2H 2020
		Intratumoral Immunotherapy	SAR441000 (BNT131)	Solid tumors ( <i>IL-12<math>\alpha</math></i> , <i>IL-15<math>\alpha</math></i> , <i>GM-CSF</i> , <i>IFN<math>\beta</math></i> )				Sanoofi (global profit/loss share)	Data update 2H 2020 <sup>4</sup>
	RiboMabs (mRNA-encoded antibodies)	BNT141	Multiple solid tumors					Global	Phase 1 start 1H 2021
		BNT142	Multiple solid tumors ( <i>CD3+CLDN6</i> )					Global	Phase 1 start 1H 2021
	RiboCytokines (mRNA-encoded cytokines)	BNT151	Multiple solid tumors ( <i>Opiostatin IL-2</i> )					Global	Phase 1 start 1H 2021
BNT152, BNT153		Multiple solid tumors ( <i>IL-7, IL-2</i> )					Global	Phase 1 start 1H 2021	
Cell Therapies	CAR-T Cells	BNT211	Multiple solid tumors ( <i>CLDN6</i> )					Global	Phase 1/2 start 2H 2020
		BNT212	Pancreatic, other cancers ( <i>CLDN18.2</i> )					Global	
	Neonatal-based T cell therapy	BNT221 (NEO-PTC-01)	Multiple solid tumors					Global	Phase 1 start 2H 2020
TCRs	To be selected	All tumors					Global		
Antibodies	Next-Gen CP <sup>5</sup> Immunomodulators	GEN1046 (BNT311)	Multiple solid tumors ( <i>PD-L1+4-1BB</i> )					Genmab (global 50:50 profit/loss share)	Data update 2H 2020
		GEN1042 (BNT312)	Multiple solid tumors ( <i>CD40+4-1BB</i> )						
	Targeted Cancer Antibodies	BNT321 (MVT-5873)	Pancreatic cancer ( <i>sLe<sup>x</sup></i> )					Global	
SMIM <sup>6</sup>	Toll-Like Receptor Binding	BNT411	Solid tumors ( <i>TLR7</i> )					Global	

Other

Drug Class	Platform	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Rights/ Collaborator	Milestones
mRNA	Infectious Disease Immunotherapies	BNT161	Influenza					Pfizer	Phase 1 start 2021
		BNT162	COVID-19					Fosun Pharma (China), Pfizer (Global, except China)	Phase 2/3 start late July 2020
		To be selected	Up to 10 indications					Penn <sup>7</sup>	First Phase 1 trial to start 1H 2021
		To be selected	HIV and tuberculosis					Bill & Melinda Gates Foundation	
	Rare Disease PRT <sup>8</sup>	BNT171	Not disclosed					Genevant (global 50:50 profit/loss share)	Phase 1 start 2H 2021
		To be selected	4 more rare disease indications						

1 BNT113 and BNT115 are currently being studied in investigator-initiated phase 1 trials  
 2 BNT122 (InNeST) is investigated in arm 2 (N=15) of the 3 arm TNBC-MERIT trial, with BNT114 as an optional treatment; BNT114 is investigated in arm 1 (N=12) and arm 3 (N=15) of the TNBC-MERIT trial (total patients in study: N=42)  
 3 Checkpoint inhibitor  
 4 Update on the ongoing study including patient enrollment number, efficacy and safety data for an interim update expected in the second half of 2021  
 5 As the trial is sponsored and conducted by Sanoofi, the timing of data updates is not under our control and is subject to change by Sanoofi  
 6 Checkpoint  
 7 Small Molecule Immunomodulators  
 8 We are eligible to receive worldwide licenses  
 9 Protein Replacement Therapy

## A. Our mRNA Product Class in Oncology

### 1. FixVac

FixVac is our wholly owned, systemic, off-the-shelf mRNA-based cancer immunotherapy platform, from which we are developing several first-in-human and potential first-in-class product candidates. Our FixVac product candidates contain selected combinations of pharmacologically optimized uridine mRNA encoding known cancer-specific shared antigens. FixVac product candidates feature our proprietary immunogenic mRNA backbone and proprietary RNA-LPX delivery formulation, which are designed to enhance stability and translation as well as trigger both innate and adaptive immune responses.

#### a) *BNT111: Our FixVac Cancer Immunotherapy for the Treatment of Advanced Melanoma*

We are developing our mRNA-based FixVac product candidate BNT111 for the treatment of advanced melanoma in patients with metastatic tumors and as an adjuvant treatment after tumor resection. We are currently studying BNT111 in an ongoing Phase 1 clinical trial.

#### **Melanoma**

Melanoma is an increasingly prevalent, deadly form of skin cancer in which melanocytes, which are the cells that color the skin, form malignant cells. With 132,000 new cases diagnosed globally each year, melanoma constitutes less than five percent of all skin cancers. In recent decades, however, the incidence rate of melanoma has risen faster than almost any other cancer type, on average by 1.5% per year over the last 10 years. In 2018, approximately 91,000 new melanoma cases were diagnosed in the United States, representing 5.3% of all new cancer cases in the United States.

Melanoma is the most lethal form of skin cancer, accounting for the majority of skin cancer deaths. There were an estimated 9,300 deaths from melanoma in the United States in 2018. While the five-year survival rate for melanoma, regardless of disease stage, is approximately 91.8%, patients with stage III melanoma have a five-year survival rate of approximately 63%. The five-year survival rate for metastatic melanoma (stage IV) is approximately 20%.

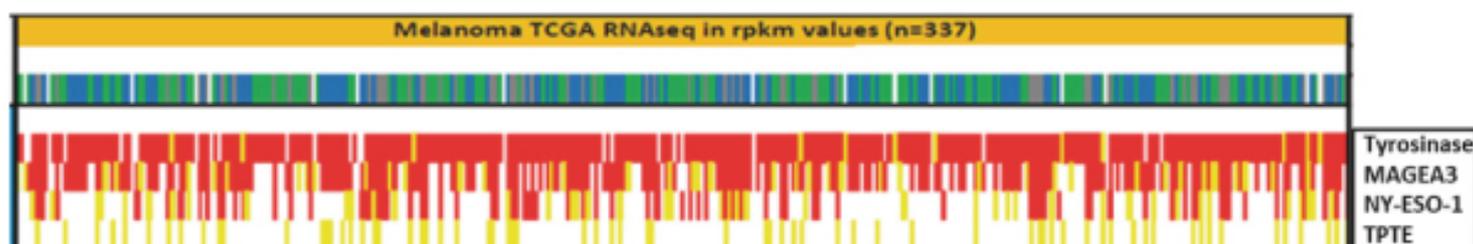
The current treatment regimen involves surgical removal for earlier stages, while a number of targeted therapies, such as BRAF and MEK inhibitors, and checkpoint inhibitors, or CPIs, are approved for advanced disease. CPIs include nivolumab (Opdivo) for advanced or metastatic melanoma after resection, and pembrolizumab (Keytruda) in unresectable or metastatic disease.

#### **Our BNT111 Targets**

BNT111 is designed to elicit an immune response to the following four antigens that have each been found to be associated with melanoma:

- New York esophageal squamous cell carcinoma 1, or NY-ESO-1, a well-known cancer-testis antigen that is also expressed in numerous cancers, including melanoma;
- melanoma-associated antigen A3, or MAGE-A3, which is not expressed in normal tissues, except the testis and the placenta;
- tyrosinase, an enzyme that is required for melanin production and that is produced in increased levels in melanoma; and
- trans-membrane phosphatase with tensin homology, or TPTE, a novel cancer/testis antigen that we discovered internally.

We sequenced 337 melanoma tumors and detected at least one of these four antigens in over 90% of such melanoma tumors.



**BNT111 antigens detected in over 90% of melanoma tumors.** The graphic above shows expression of BNT111 target antigens on a patient by patient basis. Each row at the bottom of the graphic represents an antigen, and each vertical line represents a patient, depicting whether or not that patient expressed each antigen.

### **Our BNT111 Clinical Trials**

#### *Ongoing Phase 1 Trial in Advanced Melanoma Patients (LIPOMERIT study)*

We are conducting a multi-center, open-label, first-in-human, Phase 1 dose escalation study evaluating the safety and tolerability of multiple intravenous administrations of BNT111 in patients with advanced melanoma. This is the first clinical trial worldwide in which an mRNA-based cancer immunotherapy is administered intravenously for systemic treatment.

The trial employs a conventional 3+3 design in which patients are dosed in groups of three at incrementally greater dosages until the maximum tolerated dose is identified, during the dose escalation phase, which is then followed by expanded dose cohorts. Patients are treated with doses from 7.2 $\mu$ g up to the highest administered dose of 400 $\mu$ g of total mRNA.

#### *July 2019 Interim Data*

As of the July 2019 interim cut-off date, 95 patients with metastatic melanoma had been dosed at least once at one of four centers in Germany. Baseline and demographic characteristics were largely as expected for a trial recruiting advanced stage IIIB-IIIC and stage IV melanoma patients with and without measurable disease. Approximately half of the patients were resected and had radiographically non-evaluable disease at baseline. The other half of the patients had radiographically evaluable disease at baseline and most of these patients were heavily pretreated. Only the subset of patients with evaluable disease at baseline was assessed for preliminary clinical activity.

**Immunogenicity.** Immune responses induced by BNT111 were assessed using various orthogonal assay systems by analyzing T cells against each vaccine antigen in pre- and post-treatment blood samples of patients. So far, about half of the dosed patients have been analyzed for immune responses in this ongoing study. A first analysis in a subset of 18 patients evaluated vaccine antigen reactivity of CD4+ and CD8+ T cells by IFN- $\alpha$  ELISpot after *in vitro* stimulation. All tested patients showed either a de novo or an augmented (as compared to baseline) immune response against at least one of the BNT111-encoded tumor antigens. Most patients exhibited either CD4+ or concurrently CD4+ and CD8+ T cell responses against the individual vaccine targets. A second analysis looked at the magnitude of immune responses on the individual level by using an *ex vivo* IFN- $\alpha$  ELISpot, which due to its

sensitivity level would capture only very strong T cell responses, and showed that more than 75% of patients exhibited vaccine-induced CD4+ or CD8+ T cell responses. The kinetics of *de novo*-induced CD8+ T cells were further characterized in selected patients of interest by a third method using *ex vivo* MHC peptide multimer staining of blood samples collected at baseline and at different time points after start of vaccination. Mostly, antigen-specific T cell counts showed a fast ramp-up from being undetectable at baseline to levels ranging from 1,000 to more than 100,000 per million circulating CD8+ T cells within the first 4-8 weeks. Under monthly maintenance treatment, frequencies of individual antigen-specific T cells continued to slowly increase or remained stable up to over one year.

*Clinical activity.* As of the July 2019 cut-off date, in our review of interim data, we assessed 42 patients with radiographically evaluable, measurable disease at baseline for preliminary clinical activity according to

## [Table of Contents](#)

Response Evaluation Criteria in Solid Tumors, Version 1.1, or RECIST v1.1. Twenty-five of these 42 patients received BNT111 as a monotherapy, and 17 patients received BNT111 in combination with an anti-PD-1 checkpoint inhibitor, or CPI (either pembrolizumab or nivolumab).

In the BNT111 monotherapy cohort, we observed clinical activity for all 25 patients. All of these patients had received at least one line of prior treatment with a checkpoint inhibitor, and 24 of the 25 patients had failed prior sequential or combination treatment with anti-PD-1 and anti-CTLA4 antibodies. Three of 25 patients (12%) showed a partial response, or PR, one patient had a metabolic complete response as measured by FGD-PET imaging and seven patients (28%) demonstrated stable disease. The clinical benefit rate, or CBR, is 44%. Two of the PRs manifested early on during treatment (at imaging day 90); the two others manifested at imaging days 180 and 360, respectively.

In the BNT111 in combination with anti-PD-1 checkpoint inhibitor cohort, 16 of the 17 patients had prior treatment with CPI. Six patients (35%) showed a partial response, and two patients (12%) demonstrated stable disease. The CBR is 47%. Objective responses were observed across all dose levels explored in expansion cohorts (14µg, 50µg and 100µg). Five of 10 (50%) patients who received the highest target dose of 100µg demonstrated a PR. By contrast, the expected ORR for anti-PD1 treatment in an anti-PD1 experienced patient population is in the range of 10%.

*Safety.* As of the July 2019 cut-off date, no dose-limiting toxicities to BNT111 have been reported. The highest explored dose level is 400µg total mRNA and doses up to 100µg total mRNA were tested further in expansion cohorts. The overall adverse event profile was dominated by mild-to-moderate, transient and manageable flu-like symptoms. This profile may have been driven by the mode of action of the RNA-LPX, which activates antigen presenting cells via signaling of TLRs, resulting in a temporary, self-limiting release of a distinct range of pro-inflammatory cytokines upon intravenous application. These symptoms were managed by pre-medication with non-steroidal antipyretics, such as ibuprofen and acetaminophen. Eight subjects dosed with BNT111 experienced related treatment-emergent serious adverse events, or TESAEs. The related TESAEs were comprised of two cases of Grade 2 pyrexia, and one case each of Grade 2 asthenia, Grade 2 dizziness, Grade 3 anaphylactic reaction, Grade 3 dizziness, Grade 3 syncope, Grade 3 exudative retinopathy, Grade 3 posterior reversible encephalopathy syndrome, Grade 3 epileptic seizure, and Grade 2 suspected pancreatitis. There were confounding factors, such as treatment with other therapies or underlying medical conditions, for the subjects with related TESAEs. We could not establish a clear causal relationship between BNT111 and the cases of anaphylactic reaction, retinopathy, encephalopathy syndrome, seizure and suspected pancreatitis. There have been no deaths in this study that were assessed by the investigators as related to BNT111.

### *Completed Phase 1 Trial in Patients with Advanced Melanoma (MERIT study)*

In 2016, we published results of a first-in-human dose escalation study evaluating the safety and tolerability of intranodal administration of an earlier generation of BNT111 in patients with advanced melanoma. In this study, the earlier formulation of BNT111 targeted only NY-ESO-1 and tyrosinase.

This international, multi-center, open-label interventional study's primary endpoints were the maximum tolerated dose for multiple dosing, safety and adverse reactions and tolerability profile of multiple dosing. The secondary endpoints were (i) to observe immunotherapy-induced immune responses following multiple treatment cycles and (ii) clinical benefit (complete response, partial response and stable disease).

Five dosages were administered to patients sequentially: 50µg, 100µg, 300µg, 600µg, and 1,000µg. The sample size for the first three doses was three each. The 600µg dose cohort was comprised of 13 patients and the 1,000µg dose cohort was comprised of seven patients. In the 100µg, 300µg and 600µg dose cohorts, seven patients in total received continued treatment. The overall individual treatment period was 43 to 51 days and comprised eight treatment cycles of ultrasound-guided intranodal injections on days one, four, eight, 11, 15-17, 22-26, 29-35 and 43-51. In case of an optional continued treatment for patients who neither exhibited

## [Table of Contents](#)

unacceptable drug-related toxicity nor disease progression, four additional treatment cycles were administered at the same dosage that the patient had received in his or her cohort. The first cycle of continued treatment was scheduled 14-42 days after the last visit, with the second and third additional treatment cycles following after a one-month interval each. The fourth treatment cycle then followed after an interval of three months.

The occurrence of new measurable lesions was observed in only one patient of the 1,000µg dose cohort, while new non-measurable lesions were identified in seven patients. Twenty-one patients, or 75%, were classified as having immune-related stable disease and six patients, or 21.4%, had immune-related progressive disease.

The most frequent adverse events included administration-site conditions, infections and infestations, musculoskeletal and connective tissue disorders, nasopharyngitis, fatigue, headache and back pain. No life-threatening adverse events nor deaths occurred in this study. Thirteen severe adverse events were reported, including infections and infestations and vascular disorders. Sixteen patients were affected by adverse events with a suspected relationship to the study drug. These were most frequently fatigue, application site erythema and application site pain. None of the drug-related adverse events was categorized as serious. No dose-limiting toxicities were observed.

### ***Next Steps***

We expect to report Phase 1 data from the LIPOMERIT trial and to initiate a Phase 2 clinical trial with registrational potential for BNT111 in the second half of 2020.

### ***b) BNT112: Our FixVac Cancer Immunotherapy for the Treatment of Prostate Cancer***

We are developing BNT112 for the treatment of prostate cancer.

### ***Prostate Cancer***

Prostate cancer is the second most common cancer amongst men worldwide and the fourth most commonly occurring cancer overall, with around 1.3 million new cases recorded worldwide in 2018 and 174,650 cases expected in 2019 in the United States alone. The stage of the prostate cancer (I-IV), alongside the prostate-specific antigen and Gleason score, are the key factors for defining the treatment options for individual cases. Surgical or radiation based approaches are often used in first-line therapy, however after relapse (up to 30-40% of patients), androgen-deprivation therapies are employed, which in turn also often becomes redundant (metastatic castration-resistant prostate cancer, or mCRPC) at which point patients are treated with either further hormonal agents or chemotherapy.



After at least six patients are treated and evaluable for at least one treatment cycle, we plan to commence enrollment of the second and third arms, each enrolling approximately 20 patients with newly diagnosed LPC. Patients in the second arm will receive BNT112 combined with goserelin acetate and cemiplimab, and patients in the third arm will receive BNT112 combined with goserelin acetate alone. Treatment periods in the second and third arms will last until unacceptable toxicity or until the end of the eighth cycle, which will be followed by planned radical prostatectomy.

**c) *BNT113: Our FixVac Cancer Immunotherapy for the Treatment of HPV+ Head and Neck Cancer***

We are developing BNT113 for the treatment of HPV+ head and neck cancer. BNT113 is currently being studied by the University of Southampton in an ongoing investigator-sponsored Phase 1/2 basket study in HPV+ cancers, including head and neck cancer.

***HPV+ Head and Neck Cancer***

Head and neck cancer defines a heterogeneous group of tumors originating in the squamous cells that line the moist, mucosal surfaces inside the head and neck. Head and neck cancer is the sixth most common malignancy worldwide, accounting for approximately 6% of all cancer cases, and is responsible for 1-2% of all cancer deaths. An increasing percentage of this cancer is now attributed to HPV infection in the United States and Europe, particularly those arising from the oropharynx. In the U.S., HPV-related oropharynx cancer, or OPC, is one of only five cancers with rising incidence and prevalence. The percentage of OPC related to HPV rose from approximately 16% in 1984 to 1989 to approximately 72% during 2000 to 2004. Early stage head and neck cancer is typically either treated with surgery or radiation alone, however approximately 66% of patients present with advanced disease and fewer than 30% of these are cured. The management of advanced disease consists of multiple-modality therapy with surgery, radiation and chemotherapy. Long-term survival rates in these patients have not increased significantly in the past 30 years: five-year survival rates are 60-80%.

***Our BNT113 Targets***

BNT113 is designed to elicit an immune response against the well-characterized HPV16-derived oncoproteins E6 and E7, which are strongly immunogenic, viral neoantigens that are found in HPV16+ solid cancers such as head and neck squamous cell carcinoma.

***Our BNT113 Clinical Trials***

***Ongoing Phase 1/2 Basket Study (Investigator-Sponsored)***

BNT113 is being studied in an investigator sponsored open-label, Phase 1/2 dose escalation basket study with two different arms in approximately 44 patients with HPV+ head and neck and other cancers. The first arm will perform dose escalation in patients with previously treated HPV+ head and neck cancer using two dose cohorts to establish a safe, tolerable and recommended dose of BNT113. The second arm will perform dose escalation in patients with advanced HPV+ cancers, including head and neck, anogenital, penile and cervical cancers, using a single cohort to establish a safe, tolerable and recommended dose.

***Next Steps***

We intend to initiate a Phase 2 trial with registrational potential of BNT113 in HPV+ cancers by the end of 2020.

**d) *BNT114: Our FixVac Cancer Immunotherapy for the Treatment of Triple Negative Breast Cancer***

## [Table of Contents](#)

We are currently studying antigens selected for BNT114 in a three-arm clinical trial as both a monotherapy and in combination with our RO7198457 (BNT122) individualized iNeST immunotherapy in patients with triple negative breast cancers.

### ***Triple Negative Breast Cancer (TNBC)***

Breast cancer is the most commonly occurring cancer in women and the second most common cancer overall with over two million new cases globally in 2018 with an expected 268,600 cases in 2019 in the United States alone. There are three broadly defined categories of breast cancer. About 80% of breast cancers are defined as ER+, meaning that they grow in response to the hormone estrogen, while 65% of these are also defined as PR+, as they also grow in response to another hormone, progesterone. Such cancers can be identified by the presence of estrogen receptors, or ER, and/or progesterone receptors, or PR, on the cancer cell surface and are more likely to be treatable by hormone therapies than cancers that are ER or PR negative. In about 20% of cancers, the tumor can be identified by its production of an excess of the HER2 protein. Such HER2+ cancers tend to be aggressive and fast moving. Breast cancers that neither express ER or PR, nor over-express HER2-, are known as triple negative breast cancers, or TNBCs. TNBC patients represent approximately 12-15% of all breast cancer cases, however it remains an area of high unmet medical need given it is typically the most aggressive form of breast cancer. There are currently no effective treatments for TNBC. While initial treatment options include surgery or chemotherapy, TNBC is characterized by rapid resistance to chemotherapy, and few remaining treatment options remain thereafter.

### ***Our BNT114 Targets***

BNT114 is designed to elicit an immune response to selected antigens that are found in breast cancers.

### ***Our BNT114 Clinical Trials***

#### *Ongoing Phase 1 Clinical Trial (BNT114 monotherapy and in combination with RO7198457 (BNT122))*

We are currently conducting an international, multi-center, open-label, three-arm Phase 1 study of BNT114 as a monotherapy and in combination with our RO7198457 (BNT122) individualized iNeST immunotherapy in 39 TNBC patients who had previously received the standard of care therapy (*i.e.*, surgery, chemotherapy and/or radiotherapy). The primary endpoints of the study are to assess safety and tolerability. Safety will be analyzed by adverse event documentation and clinical observation and tolerability will be analyzed based on patients' vital signs and clinical chemistry. The secondary endpoint of the study is the observation of the treatment-induced immune responses, expressed as treatment-induced T cell responses, resulting from multiple treatment cycles.

Patients in the first arm receive BNT114, patients in the second arm receive BNT114 in combination with RO7198457 (BNT122) and patients in the third arm receive BNT114 in combination with mRNA encoding tetanus-toxin help epitopes.

### ***Next Steps***

We expect to report a data update in the second half of 2020 and assess the immunogenicity of the selected antigens.

#### ***e) BNT115: Our FixVac Cancer Immunotherapy for the Treatment of Ovarian Cancer***

We are developing BNT115 for the treatment of ovarian cancer. BNT115 is currently being studied in an ongoing investigator-sponsored Phase 1 study in ovarian cancer.

### ***Our BNT115 Targets***

BNT115 is designed to elicit an immune response to selected antigens that are found in ovarian cancers.

## **Our BNT115 Clinical Trial**

### *Ongoing Phase 1 Trial (Investigator Sponsored)*

BNT115 is being studied in a 10 patient investigator sponsored, first-in-human, open label, Phase 1 dose escalation study in ovarian cancer patients eligible for standard-of-care treatment with neo-adjuvant chemotherapy. Eight doses of BNT115 will be administered prior to and in combination with the neo-adjuvant chemotherapy to induce an anti-tumor immune response. Systemic immune responses will be determined using peripheral blood mononuclear cells collected before, during and after vaccinations. Intratumoral accumulation of T-cells recognizing vaccine-encoded tumor associated antigens will be determined before vaccination in a tumor biopsy and after 3 cycles of chemotherapy and the 5th vaccination using tumor tissue derived from interval surgery.

#### **f) Other FixVac Indications**

We are also exploring FixVac development candidates in other cancer indications, including non-small cell lung cancer.

## **2. Individualized Neoantigen Specific Immunotherapy (iNeST)**

Our iNeST product candidate is an individualized cancer immunotherapy that targets specific neoantigens that are present on a patient's tumor. Our iNeST immunotherapies contain pharmacologically optimized uridine mRNA encoding up to 20 patient-specific neoantigens, as well as our proprietary RNA-LPX formulation. We are developing our iNeST cancer immunotherapy in collaboration with Genentech.

#### **a) BNT122: Our iNeST Cancer Immunotherapy for Multiple Potential Indications**

We and our collaborator Genentech are developing RO7198457 (BNT122) for the treatment of metastatic melanoma and other solid tumors. We are currently conducting a randomized Phase 2 trial of RO7198457 (BNT122) in collaboration with Genentech in first-line melanoma in combination with pembrolizumab. In collaboration with Genentech, we are also studying RO7198457 (BNT122) as a monotherapy and in combination with atezolizumab in a Phase 1a/1b study of patients with locally advanced or metastatic solid tumors (including in melanoma, non-small cell lung cancer, bladder cancer as well as other solid tumors). The Phase 1a/1b trial is a non-registrational, signal-seeking study recruiting mostly patients with late-stage advanced cancers including patients who failed multiple lines of prior treatment.

### **Our RO7198457 (BNT122) Targets**

RO7198457 (BNT122) is an individualized neoantigen-specific immunotherapy. Each RO7198457 (BNT122) dose includes up to 20 different neoepitopes selected on a patient-by-patient basis. We believe that neoepitope-specific T cells induced by RO7198457 (BNT122) can enhance the therapeutic efficacy of immune checkpoint blockade.

### **Our RO7198457 (BNT122) Clinical Trials**

#### *Ongoing Phase 2 Clinical Trial (First-line with pembrolizumab)*

In January 2019, we and Genentech initiated a Phase 2, open-label, multi-center, randomized clinical trial investigating the safety and efficacy of RO7198457 (BNT122) in combination with pembrolizumab in 132 patients with previously untreated metastatic melanoma. Patients in the experimental arm will receive pembrolizumab by intravenous infusion every three weeks, plus a selected dose of RO7198457 (BNT122) at defined intervals. Patients in the active comparator arm will receive 200mg of pembrolizumab by intravenous infusion every three weeks. Following treatment in the comparator arm, patients will be permitted to cross over to combination therapy with RO7198457 (BNT122).

## [Table of Contents](#)

The primary endpoint is:

- progression-free survival, or PFS, of patients treated with RO7198457 (BNT122) compared with patients receiving pembrolizumab alone, according to RECIST v1.1.

Secondary endpoints include:

- objective response rate, or ORR, in patients treated with RO7198457 (BNT122) compared with patients receiving pembrolizumab alone, defined as the proportion of participants with complete response, or CR, or partial response, or PR;
- overall survival, or OS, of patients treated with RO7198457 (BNT122) compared with patients receiving pembrolizumab only;
- duration of response according to RECIST v1.1 of patients treated with RO7198457 (BNT122) compared with patients receiving pembrolizumab only;
- mean change in health-related quality of life, scores of patients treated with RO7198457 (BNT122) compared with patients receiving pembrolizumab only;
- percentage of patients with CR or PR following cross-over from pembrolizumab monotherapy to combination therapy following cross-over, according to RECIST v1.1; and
- incidence and severity of adverse events.

### *Ongoing Phase 1 Clinical Trial*

The iNeST Phase 1a (monotherapy)/1b (in combination with atezolizumab) trial is a non-registrational, signal seeking study recruiting patients with locally advanced or metastatic solid tumors, including patients with melanoma, non-small cell lung cancer, bladder cancer, colorectal cancer, TNBC, renal cancer, head and neck cancer and sarcomas. The study is designed to enroll both patients with and without prior checkpoint inhibitor regimens.

The primary objective of the study was to assess safety (including dose-limiting toxicities), and additional objectives included evaluation of immunogenicity and preliminary assessment of anti-tumor activity. The trial included a Phase 1a (monotherapy) dose escalation, a Phase 1b (combination) dose escalation, and multiple Phase 1b expansion cohorts. Patients received nine doses of the vaccine administered I.V. in weekly and bi-weekly intervals during the induction phase and every eight cycles during the maintenance phase. In the Phase 1b portion of the trial, atezolizumab was administered on day one of each 21-day cycle.

BNT122 was manufactured on a per-patient basis including in-house determination of cancer mutation profiles, computational prediction of neoantigens, design, and manufacturing of the iNeST vaccine based on liposomally formulated RNA (RNA-LPX). Each vaccine contained up to 20 patient-specific neoepitopes. Importantly, the manufacturing of BNT122 for individual patients within clinical practice compatible turn-around times was shown to be feasible using clinical biopsies or routine clinical specimens across a range of tumor types including those with low or intermediate tumor mutational burden.

### June 2020 Data Updates

In June 2020, we presented data from a monotherapy dose-finding cohort of our RO7198457 (BNT122) Phase 1 trial in multiple solid tumors in which RO7198457 (BNT122) was observed to have a manageable safety profile and induced strong neoantigen-specific immune responses in patients with low and intermediate mutational load tumors types. This data related to 31 patients enrolled in cohorts with doses ranging from 25-100 $\mu$ g. Most patients enrolled had a low level of PD-L1 expression in the tumor as determined by immunohistochemistry. The majority of adverse events were Grade 1 or Grade 2 and those occurring in more

## [Table of Contents](#)

than 20% of patients included infusion related reaction (IRR), fatigue, cytokine release syndrome (CRS), nausea, and diarrhea. IRR and CRS were transient and reversible and presented primarily as Grade 1 or Grade 2 chills and fever. A single dose-limiting toxicity of Grade 3 CRS occurred at the 100µg dose level. None of the patients discontinued RO7198457 (BNT122) due to AEs. *Ex vivo* T cell responses were detected in approximately 86% of patients treated with RO7198457 (BNT122) as a monotherapy. RO7198457 (BNT122) induced T cells against multiple neoantigens were detected in post-treatment tumor biopsies. Of 26 patients that underwent at least one tumor assessment, one patient with gastric cancer and metastatic liver lesions had a durable best response of confirmed complete response and remains on study after 1.5 years (3.8%) and 12 patients had stable disease (46.2%).

Later in June 2020, we presented data from 132 patients enrolled in cohorts with doses ranging from 15µg to 50µg of RO7198457 (BNT122) in combination with 1200mg atezolizumab. The most common tumor types enrolled were NSCLC, TNBC, melanoma and colon cancer with a median of three lines of prior therapies (range 1-11). Most patients enrolled had low level of PD-L1 expression in the tumor as determined by immunohistochemistry (93% patients with <5% PD-L1 expression on tumor cells (TC0/1) and 79% patients with <5% PD-L1 expression on immune cell (IC0/1)). The majority of adverse events were Grade 1 or Grade 2 and those occurring in more than 15% of patients included infusion related reaction (IRR), fatigue, nausea, cytokine release syndrome (CRS) and diarrhea. IRR and CRS were transient and reversible and presented primarily as Grade 1 or Grade 2 chills and fever. There were no dose limiting toxicities. Eight patients (5.6%) discontinued due to AEs related to study drugs. RO7198457 (BNT122) induced a self-limiting increase of pro-inflammatory cytokines with each dose, consistent with the TLR agonist activity of RNA. *Ex vivo* T cell responses were observed in peripheral blood in 46 out of 63 (73%) patients. Induction of up to 5.7% MHC multimer-stained CD8+ T-cells with effector memory phenotype was observed in the peripheral blood. RO7198457 (BNT122) induced T cells against multiple neoantigens were detected in post-treatment tumor biopsies. Of 108 patients that underwent at least one tumor assessment, 1 patient had a complete response as their best response (0.9%), 8 patients had partial responses (7.4%), and 53 patients had stable disease (49.1%).

Based on data from our study of BNT121 as an adjunct to surgery in patients with metastatic melanoma, we believe that RO7198457 (BNT122) is potentially well suited to control metastatic relapses in patients with a lower tumor burden. Additionally, RO7198457 (BNT122) as a monotherapy and in combination with atezolizumab has been observed to have a manageable safety profile to date and to induce significant levels of neoantigen-specific immune responses, even in late-stage, heavily pre-treated patients. Accordingly, we and our collaborator, Genentech, intend to initiate two additional randomized Phase 2 trials in the second half of 2020 in early and adjuvant stage NSCLC and colorectal cancer, where we believe the mechanism of action of RO7198457 (BNT122) is best suited. We also continue to investigate RO7198457 (BNT122) in our ongoing Phase 2 trial in first line melanoma in combination with pembrolizumab.

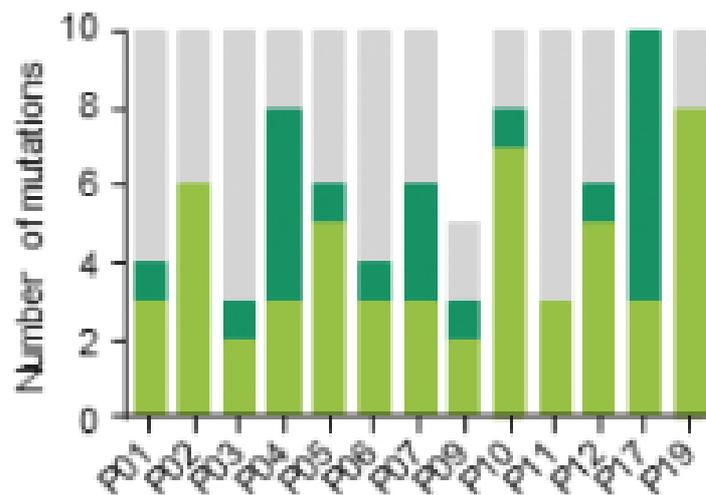
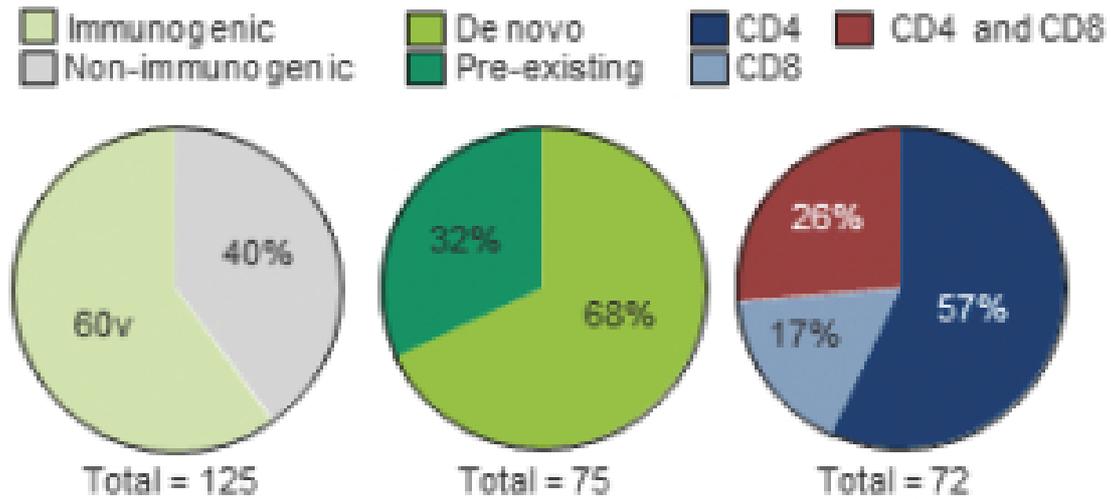
### *Completed Phase 1 Clinical Trial (BNT121 First Generation iNeST)*

In 2017, we published the results of a 13-patient, first-in-human trial of our first-generation intranodal iNeST product candidate, BNT121, in patients with late-stage malignant melanoma. The objective of this clinical trial was to study the feasibility, safety, tolerability, immunogenicity and potential anti-tumoral activity of iNeST. All patients had stable disease at enrollment with a high risk for relapse.

All 13 patients developed T cell immune responses against multiple immunotherapy neoepitopes at up to high single-digit percentages. As shown below, 60% of the selected neoepitopes elicited a T cell response. The detected immune response was elicited by both CD4+ and CD8+ T cells and the majority was induced *de novo*, which we believe to be an important requirement for an effective immune response and an added benefit beyond checkpoint inhibition alone.

[Table of Contents](#)

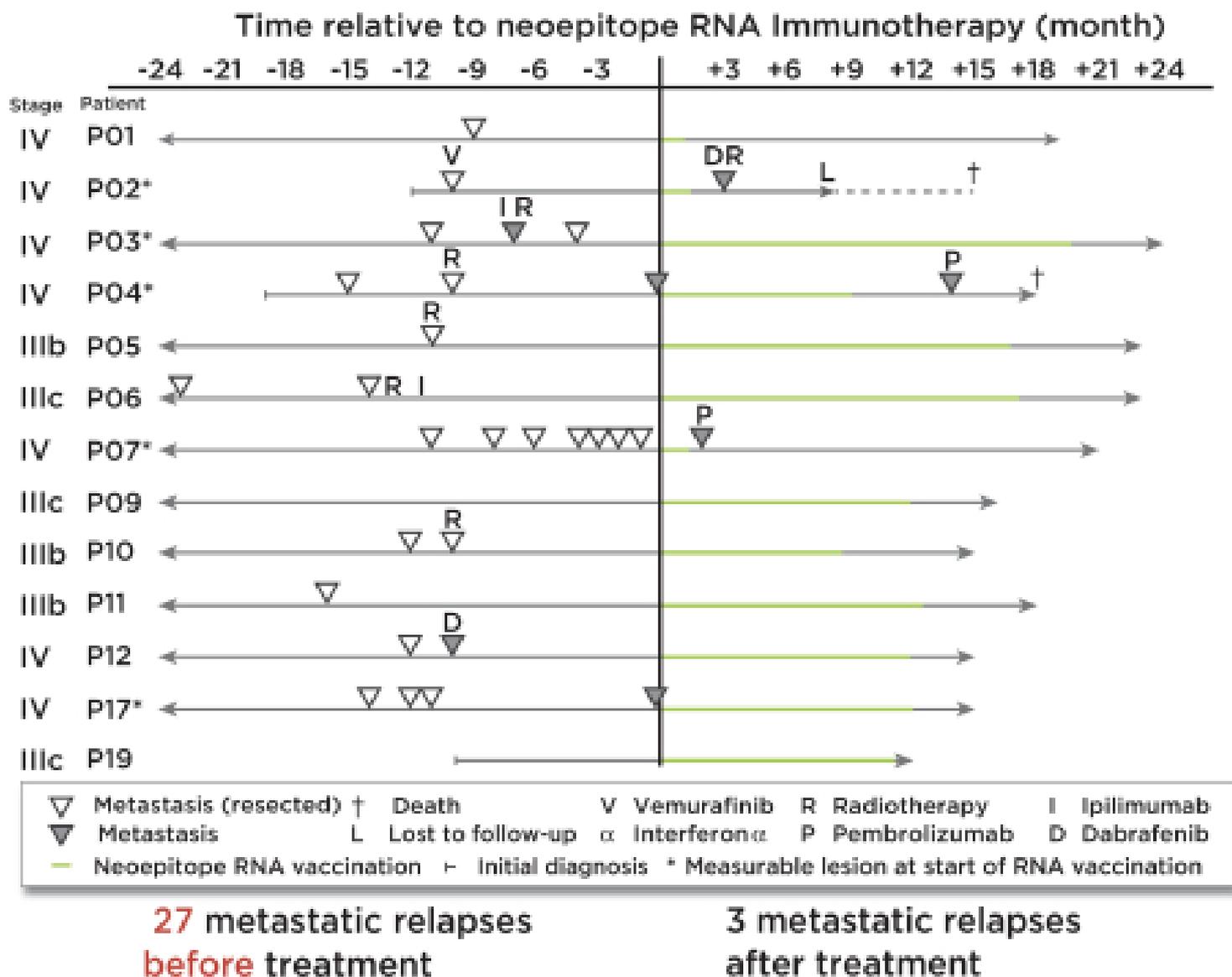
No severe adverse drug reactions were reported in the study. Common adverse events included flu-like symptoms.



**Immune responses documented in our prior BNT121 study.** Patients showed immune responses, including both CD4+ and CD8+ responses, against multiple neoantigens. Source: Nature 547, 222-226 (13 July 2017).

[Table of Contents](#)

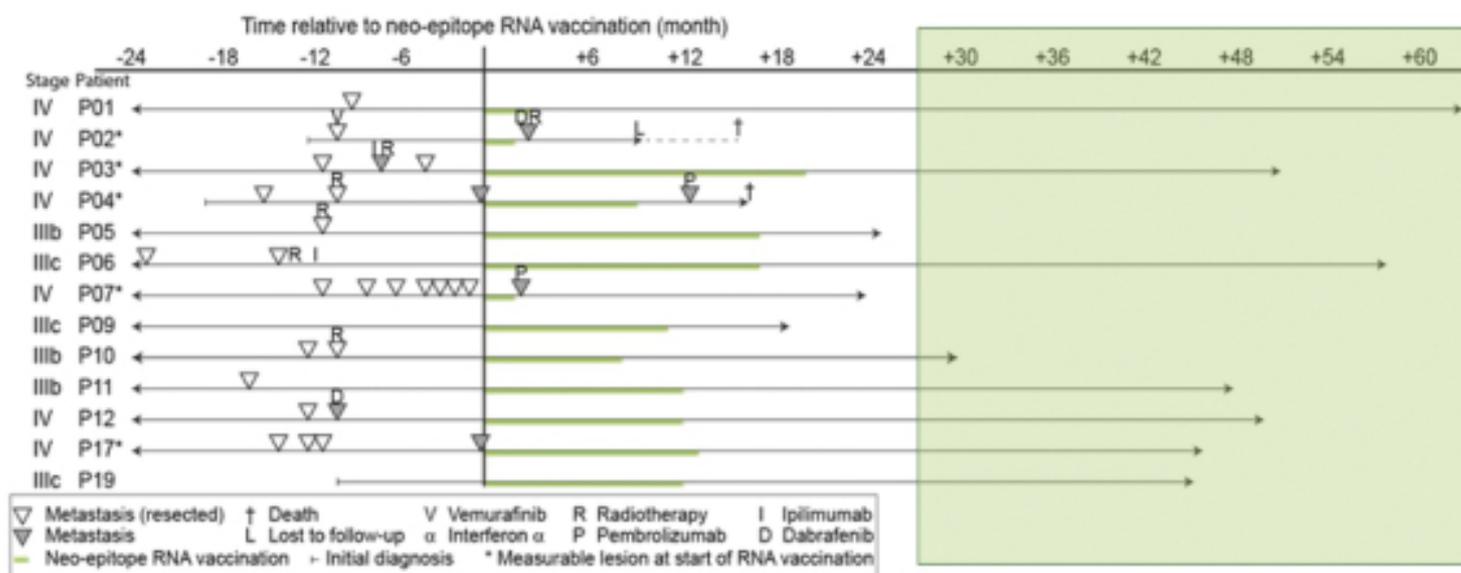
In addition, metastases resected from two patients following treatment with BNT121 demonstrated evidence of treatment-induced infiltration with BNT121-induced neoepitope-specific T cells and neoepitope-specific killing of tumor cells. The cumulative rate of metastatic events was significantly reduced after the start of treatment, resulting in a sustained progression-free survival. Of the 13 patients entering the trial, eight patients that had no radiologically detectable lesions at start of neo-epitope vaccination were relapse free and remained recurrence-free for the whole follow-up period (12 to 23 months). Five patients experienced melanoma relapses shortly after inclusion in the trial and despite initiation of standard treatment had progressing metastases at start of their neoepitope treatment. Of these, three patients developed neoepitope treatment-related objective clinical responses. One of these patients exhibited a complete response and remained relapse-free for 26 months. The second patient had an immunotherapy-related partial response. This patient had a late relapse owing to outgrowth of  $\beta$ 2-microglobulin-deficient melanoma cells as an acquired resistance mechanism. A third patient developed a complete response to treatment in combination with PD-1 blockade therapy.



**Metastatic relapses before and after treatment with BNT121.** The chart above shows the metastatic relapses of patients before and after treatment with BNT121. Each horizontal line represents the time course of a single patient. The vertical line indicates the treatment start of BNT121. Source: Nature 547, 222-226 (13 July 2017).

## Table of Contents

As of October 2019, nine out of 13 patients had remained recurrence-free through follow-up of up to 41 months post-vaccination.



### Next Steps

We expect to report an enrollment update from our RO7198457 (BNT122) first-line Phase 2 melanoma trial in the second half of 2020. We and Genentech plan to initiate two additional clinical trials for RO7198457 (BNT122) in 2020 in first-line solid cancers in the adjuvant setting, one in combination with atezolizumab and the other as a monotherapy.

### 3. Intratumoral Immunotherapy

We, in collaboration with Sanofi, are developing intratumoral immunotherapies utilizing our proprietary mRNA technology. These immunotherapies are designed to be administered directly into the tumor in order to alter the tumor microenvironment and enhance the immune system's ability to recognize and fight cancer within the tumor (proximal) as well as in other untreated locations (distal).

#### a) SAR441000 (BNT131): Our Initial Intratumoral Immunotherapy for the Treatment of Solid Tumors

We and Sanofi are developing SAR441000 (BNT131) as an intratumoral immunotherapy for the treatment of solid tumors. SAR441000 (BNT131) consists of modified mRNA that is injected directly into the tumor, where it is thought to express cytokines to alter the tumor microenvironment. SAR441000 (BNT131) is being studied in a Sanofi-sponsored Phase 1 clinical trial as a monotherapy in patients with advanced melanoma and in combination with an anti-PD-1/PD-L1 checkpoint inhibitor in patients with advanced melanoma and certain advanced solid tumors.

#### Our SAR441000 (BNT131) Targets

SAR441000 (BNT131) comprises mRNA that encodes the cytokines IL-12sc, IL-15sushi, IFN-α and GM-CSF. By expressing these cytokines in the tumor microenvironment, the immune system may more easily recognize and fight cancer.

#### Our SAR441000 (BNT131) Clinical Trials

*Ongoing Phase 1 Clinical Trial*

Sanofi, in collaboration with BioNTech, has commenced a first-in-human, multi-center, open-label, Phase 1, dose escalation and expansion trial to evaluate the safety, pharmacokinetics, pharmacodynamics and anti-tumor

## Table of Contents

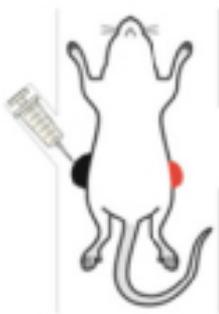
activity of SAR441000 (BNT131) administered intratumorally as monotherapy and in combination with cemiplimab, with an estimated enrollment of 264 patients with certain advanced solid tumors.

### Our SAR441000 (BNT131) Preclinical Studies

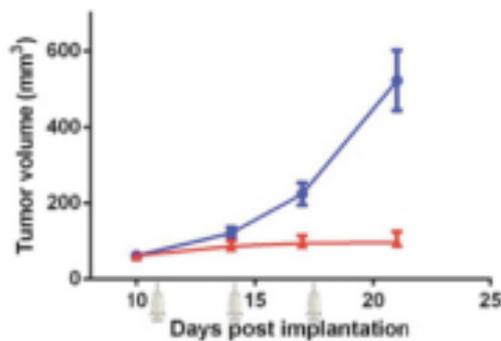
In collaboration with Sanofi, we conducted a preclinical study of SAR441000 (BNT131) in mouse tumor models. In these *in vivo* models, the anti-tumor activity of cytokines encoded by mRNA was driven by the action of T cells as well as NK cells and was accompanied by robust intratumoral induction of interferon gamma, systemic expansion of antigen-specific T cells and increased granzyme B positive CD8+ T cell infiltration.

SAR441000 (BNT131) was shown to form immunological memory toward both dominant and subdominant antigens, which protected long-term survivors from re-challenge with autologous tumors. Importantly, although cytokine mRNAs were administered intratumorally, resulting in local target expression, anti-tumor activity extended beyond the injected tumor to effectively control the growth of distal tumors in both a dual-tumor model and an experimental lung metastasis model. Finally, SAR441000 (BNT131) demonstrated improved overall survival and higher incidence of complete tumor regressions across several preclinical models.

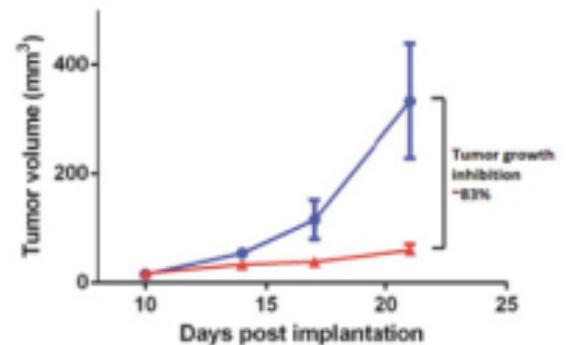
Dual flank tumor model  
(B16F10)



Treated tumor (proximal)



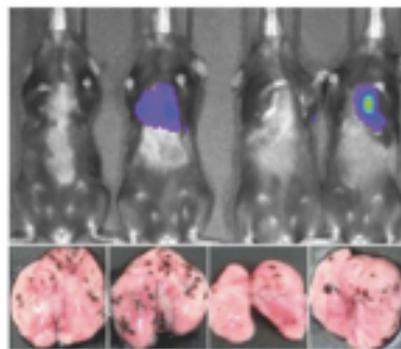
Untreated tumor (distal)



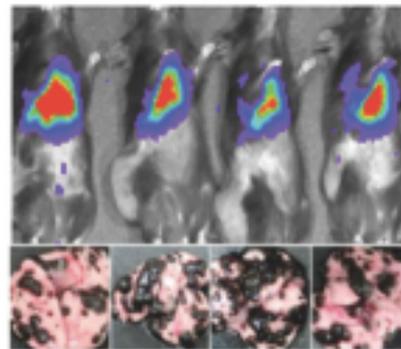
B16F10 tumor model  
With IV lung metastasis



Cytokine mRNA



Control mRNA



**Systemic anti-tumor effects in mouse model.** As shown above, BNT131 demonstrated local and systemic anti-tumor effects of intratumoral cytokine mRNA. In this study, mice were implanted with a tumor on each of the right and left flank. One tumor was injected with intratumoral cytokine mRNA (or control mRNA) while the other was not. The top center figure shows the tumor volume of the treated tumor (red line) against the control (blue line). The top right figure shows an anti-tumor effect on the untreated tumor (red line) against the control (blue line). The figures on the bottom show the abscopal effect of an intratumoral cytokine mRNA (center bottom) on distal lung metastases compared to the control mRNA (right bottom). Source: Wagenaar et al., Local immunotherapy with a mixture of mRNAs encoding pro-inflammatory cytokines promotes potent anti-tumor immunity and tumor eradication across multiple preclinical tumor models; poster presented at SITC 2018.

Based on these preclinical results, we intend to investigate whether our synthetic mRNA technology can potentially deliver localized cytokine-based cancer immunotherapy with broad anti-tumor activity against treated and untreated lesions.

### **Next Steps**

A data update from this trial may be reported in the second half of 2020. As the trial is sponsored and conducted by Sanofi, the timing of data updates is not under our control, and is subject to change by Sanofi.

## **4. RiboMabs**

Our RiboMab product candidates are designed to encode secreted antibodies for expression *in vivo* by the patient's cells. RiboMab product candidates consist of our proprietary nucleoside-modified mRNA that is designed to minimize the immunomodulatory activity of the mRNA, and these candidates are formulated using liver-targeting LNPs for intravenous delivery. RiboMabs potentially address the limitations of recombinant antibodies, including costly manufacturing processes and unfavorable pharmacokinetics, such as short plasma half-life. We are conducting preclinical studies for two development candidates, and have published compelling preclinical data.

### **RiboMab Preclinical Studies**

We have generated RiboMabs targeting different tumor antigens and tested their therapeutic potency in mice engrafted with human tumors that were repopulated with human immune cells. We demonstrated in preclinical studies that injection with a RiboMab product candidate encoding bispecific RiboMabs directed against CD3 and CLDN6 antigens resulted in elimination of aggressively growing, large tumors. Intravenously administering a microgram dose of mRNA encoding RiboMabs resulted in bispecific RiboMab production in the liver cells and rapid secretion into circulation, reaching peak plasma concentration within hours and remaining at therapeutically effective levels for one week. The dosage and frequency of dosing of recombinant bispecific antibodies required to produce similar effects was substantially greater. This was the first preclinical study to demonstrate *in vivo* application of mRNA-encoded antibodies for the successful treatment of cancer.

#### **a) BNT141: Our Initial RiboMab for the Treatment of Solid Tumors**

BNT141 is our RiboMab product candidate for the treatment of solid tumors. BNT141 is designed to encode secreted IgG antibodies.

#### **Our BNT141 Targets**

BNT141 is designed to encode secreted antibodies that target multiple epithelial solid tumors, including gastric and pancreatic cancers.

### **Next Steps**

We expect to initiate a Phase 1 basket trial of BNT141 for the treatment of various solid tumors, including gastrointestinal tumors, in the first half of 2021.

#### **b) BNT142: Our Second RiboMab for the Treatment of Solid Tumors**

BNT142 is our RiboMab product candidate for the treatment of solid tumors. BNT142 is designed to encode a secreted bispecific antibody that targets CD3 and CLDN6.

#### **Our BNT142 Targets**

BNT142 is designed to encode bispecific antibodies that target CD3, a T cell receptor that plays a key role in the activation of CD8+ and CD4+ T cells, and CLDN6, a highly specific oncofetal cell surface antigen that is found in solid tumors, but not in normal cells.

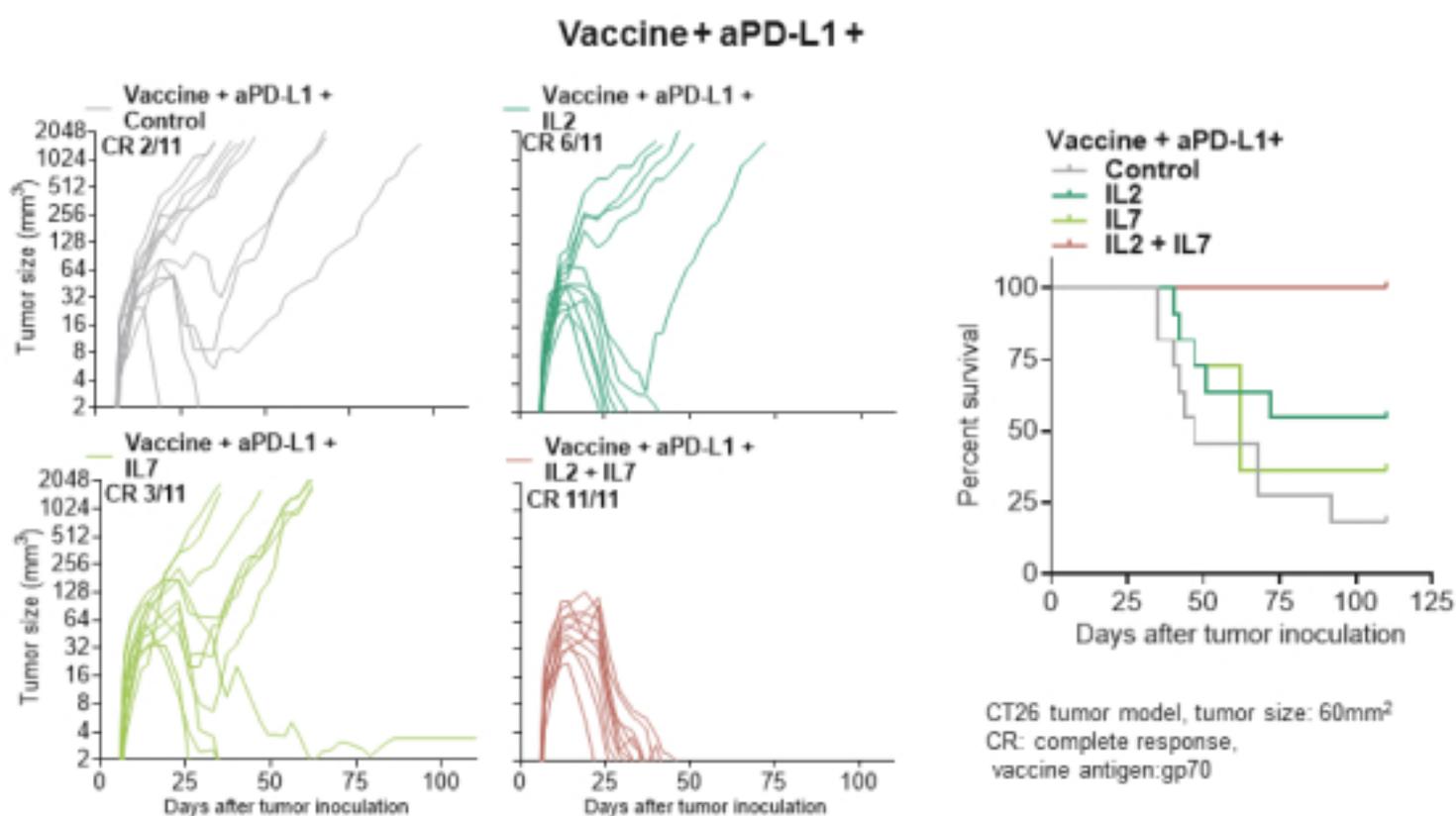
**Next Steps**

We expect to initiate a Phase 1 basket trial of BNT142 for the treatment of numerous solid tumors in the first half of 2021.

**5. RiboCytokines**

Our RiboCytokine product candidates utilize mRNA that encodes the desired cytokines for expression *in vivo* by the patient's cells. RiboCytokine product candidates consist of modified mRNA designed to encode secreted cytokines that are formulated to use liver-targeting LNP for intravenous delivery.

Our RiboCytokine product candidates are designed to address the limitations of recombinantly expressed cytokines, including limited serum half-life and production costs. We are developing RiboCytokines to be used primarily in combination with other drugs, including our other pipeline candidates.



In a preclinical mouse model, we observed RiboCytokines boost the activity of our RNA-LPX vaccination and a PD-L1 blockade in large tumors. Two out of 11 mice treated with our RNA-LPX vaccination and an anti PD-L1 alone achieved complete response. We observed three out of 11 mice achieve complete response with our RNA-LPX vaccination, an anti PD-L1 and IL7 RiboCytokine, six out of 11 mice with complete response after receiving our RNA-LPX vaccination, an anti PD-L1 and IL2 RiboCytokine and 11 out of 11 mice with complete response when given our RNA-LPX vaccination, an anti PD-L1 and both IL7 and IL2 RiboCytokines.

**a) BNT151: Our Initial RiboCytokine for the Treatment of Solid Tumors**

We are developing BNT151, our RiboCytokine designed to encode a modified version of the human interleukin-2, or optimized IL-2, cytokine for the treatment of solid tumors. BNT151 is designed to stimulate T cells without triggering immunosuppression in the tumor microenvironment.

**Our BNT151 Target**

BNT151 comprises our nucleoside-modified mRNA that encodes mRNA for a function-modified IL-2. IL-2 is a key cytokine in T cell immunity, supporting the differentiation, proliferation, survival and effector functions of T cells.



## [Table of Contents](#)

Recombinant IL-2, aldesleukin, was the first approved cancer immunotherapy, and has been marketed globally for the treatment of late stage melanoma and renal cell cancer for decades. Most patients with complete responses after IL-2 treatment remain regression free for more than 25 years after initial treatment, but overall response rates are low due in part to the limitations of recombinant cytokines. Recombinant IL-2 has a very short half-life, requiring high and frequent dosing and a partially unfavorable activity profile, which leads to increased side effects, thus limiting its utility as a cancer treatment.

### **Next Steps**

We expect to initiate a Phase 1 clinical basket trial of BNT151 for the treatment of multiple solid tumors in the first half of 2021.

#### **b) BNT152: Our Second RiboCytokine for the Treatment of Solid Tumors**

We are developing BNT152, our RiboCytokine designed to encode IL-7 for the treatment of solid tumors.

### **Next Steps**

We expect to initiate a Phase 1/2 clinical trial of BNT152 in combination with BNT153 for the treatment of multiple solid tumors in the first half of 2021.

#### **c) BNT153: Our IL-2 variant RiboCytokine for the Treatment of Solid Tumors**

We are developing BNT153, our RiboCytokine designed to secrete IL-2 for the treatment of solid tumors.

### **Next Steps**

We expect to initiate a Phase 1/2 clinical trial of BNT153 in combination with BNT152 for the treatment of multiple solid tumors in the first half of 2021.

## **B. Our Oncology Cell Therapy Product Candidates**

### **1. CAR-T**

We are advancing multiple CAR-T product candidates, the most advanced of which, BNT211, is targeting the novel and highly specific target CLDN6+ in solid tumors, and which we expect to enter the clinic in the second half of 2020 for the treatment of CLDN6+ solid tumors, including ovarian cancer. We plan to use our initial CAR-T cell product candidates in combination with a FixVac immunotherapy that encodes the same target as the CAR-T. The FixVac selectively targets dendritic cells, which leads to uptake, antigen expression and maturation of the dendritic cells. The co-stimulation provided by dendritic cell maturation has been shown in preclinical studies to amplify and expand CAR-T cells *in vivo*, leading to increased persistence of the CAR-T.

#### **a) BNT211: Our CAR-T Cell Therapy for the Treatment of CLDN6+ Solid Tumors**

BNT211 is our CAR-T cell therapy for the treatment of CLDN6+ solid tumors. BNT211 targets CLDN6 and will initially be evaluated in combination with a CARVac that encodes CLDN6.

### **Our BNT211 Target**

BNT211 targets Claudin 6, or CLDN6, a highly specific oncofetal cell surface antigen that is found in multiple cancers, including ovarian, testicular and lung cancers, but not in normal cells.

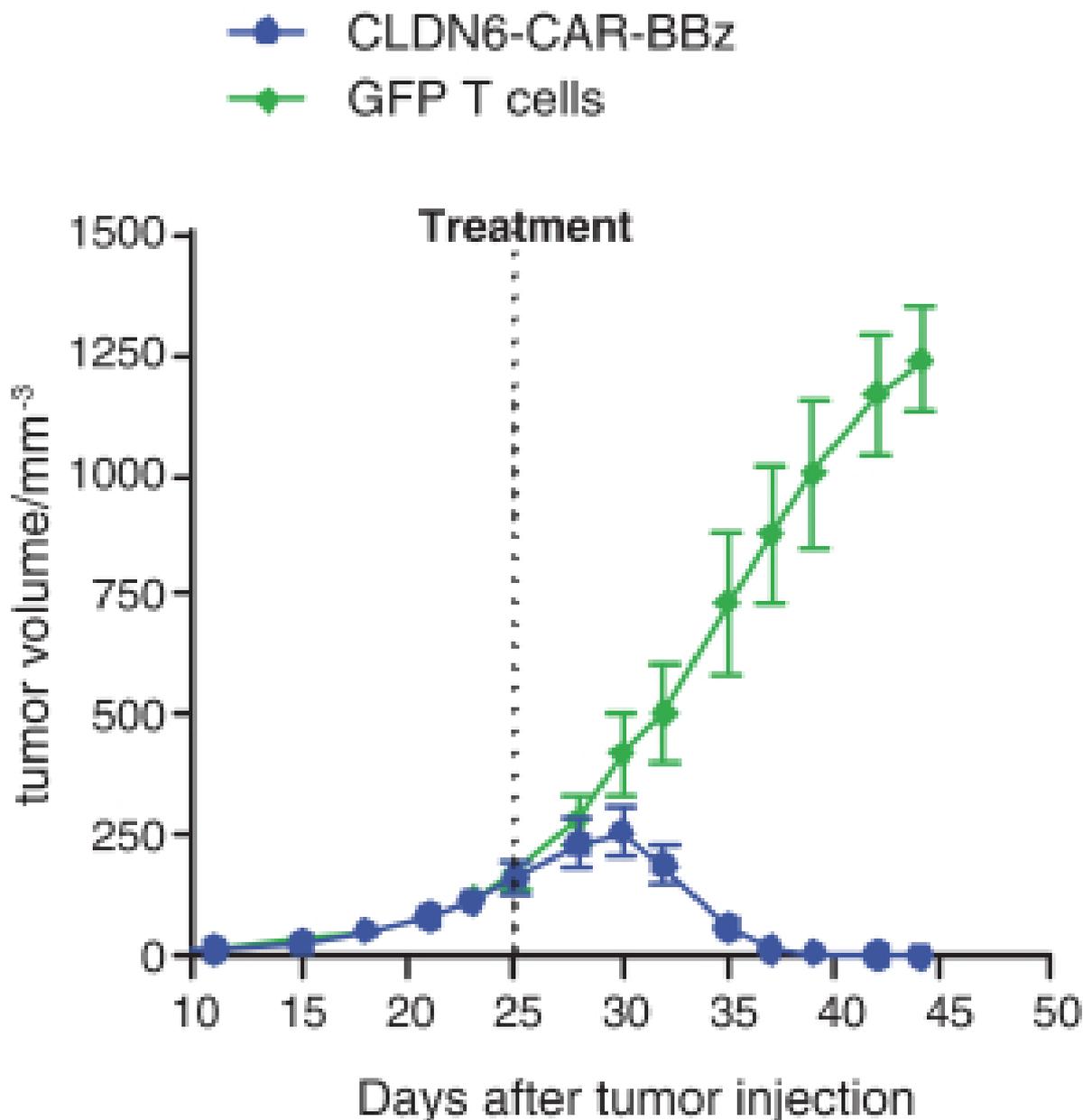
### Our BNT211 Trials

#### Planned Phase 1/2 Clinical Trial

We anticipate initiating a Phase 1/2 open-label, multi-center dose escalation and dose expansion basket study of BNT211 with or without a CLDN6 CARVac immunotherapy in the second half of 2020. We anticipate enrolling patients with advanced solid tumor malignancies who express CLDN6. While our preclinical focus has been on ovarian cancer, we expect patients with uterine, testicular, lung and gastric cancers may also be enrolled in our upcoming CAR-T trials.

#### Preclinical Studies

We have observed compelling preclinical data of BNT211 demonstrating potent anti-tumoral activity, including eradication of advanced tumors in an ovarian carcinoma xenograft model.



**Potent anti-tumoral activity.** As shown above, BNT211 demonstrated eradication of advanced tumors in a mouse model.

In January 2020, we published results for a preclinical study in which BNT211 was evaluated both in vitro in tumor cell lines and in vivo in mice with human ovarian cancer transplants. In mice, BNT211 demonstrated complete tumor regression of transplanted large human tumors within two weeks after treatment initiation. Furthermore, the combination with CARVac achieved improved engraftment, proliferation and expansion of CAR-T cells in vivo, resulting in tumor regression even at sub-therapeutic CAR-T doses. CARVac was also successfully applied for CAR-T cells targeting the pan-cancer antigen CLDN18.2 and CD19, the target of approved CAR-T cell therapies. The combination of CAR-T cell therapy with CARVac underlines the value of cross-platform synergies to address key development challenges in the treatment of cancer.

#### Next Steps

We are planning to initiate a Phase 1/2 clinical trial of the combination of BNT211 and a CLDN6-encoded CARVac in the second half of 2020 for the treatment of CLDN6+ solid tumors, including ovarian, testicular, uterine and lung cancer.

**b) BNT212: Our CAR-T Cell Therapy for the Treatment of CLDN18.2+ Solid Tumors**

BNT212 is our CAR-T cell therapy for the treatment of CLDN18.2-positive solid tumors. BNT212 will initially be evaluated in combination with a CARVac that encodes CLDN18.2.

**Our BNT212 Target**

BNT212 targets Claudin 18.2, or CLDN18.2, a highly specific target that is only expressed in cancer and in differentiated epithelial cells of the gastric mucosa, but it is absent from the gastric stem cell zone. CLDN18.2 is expressed in numerous epithelial solid tumors, including gastric, pancreatic, esophageal, ovarian and lung tumors.

**2. Neoantigen-Targeting T Cells.**

We are advancing multiple neoantigen-targeting T cell product candidates, the most advanced of which, NEO-PTC-01 (BNT221), is targeting individualized sets of selected neoantigens, and which we expect to enter the clinic in the second half of 2020 for the treatment of metastatic melanoma. We are also developing NEO-STC-01 (BNT222), targeting shared RAS neoantigens prevalent across many solid tumor types.

**a) NEO-PTC-01 (BNT221): Our Individualized Neoantigen-targeting T Cell Therapy for the Treatment of Cancer**

NEO-PTC-01 (BNT221) is our individualized neoantigen-targeting T cell therapy for the treatment of cancer. NEO-PTC-01 (BNT221) targets selected sets individualized neoantigens. The second planned indication for NEO-PTC-01 (BNT221) is metastatic ovarian cancer.

**Our NEO-PTC-01 (BNT221) Target**

NEO-PTC-01 (BNT221) targets sets of individualized neoantigens selected using our RECON bioinformatics engine.

**Our NEO-PTC-01 (BNT221) Trials**

*Planned Phase 1 Clinical Trial*

We are focusing the initial clinical development of NEO-PTC-01 (BNT221) in solid tumors where we believe we can generate *de novo* neoantigen T cell populations *ex vivo*. A CTA was filed with the Dutch Health Authority in December 2019 to evaluate NEO-PTC-01 (BNT221) in a first-in-human clinical trial in patients that are refractory to checkpoint inhibitors. We plan to initiate a Phase 1 dose escalation clinical trial in patients with metastatic melanoma who are refractory to checkpoint inhibitors in collaboration with the Netherlands Cancer Institute in the second half of 2020. The primary objectives of this trial will be to evaluate the safety and feasibility of administering NEO-PTC-01 (BNT221) to patients. Additional objectives will be to evaluate immunogenicity and clinical efficacy.

Based on the data from the first exploratory trial, we will decide how to best proceed with further clinical development of NEO-PTC-01 (BNT221), including expanding to other tumor types and potential development in the United States.

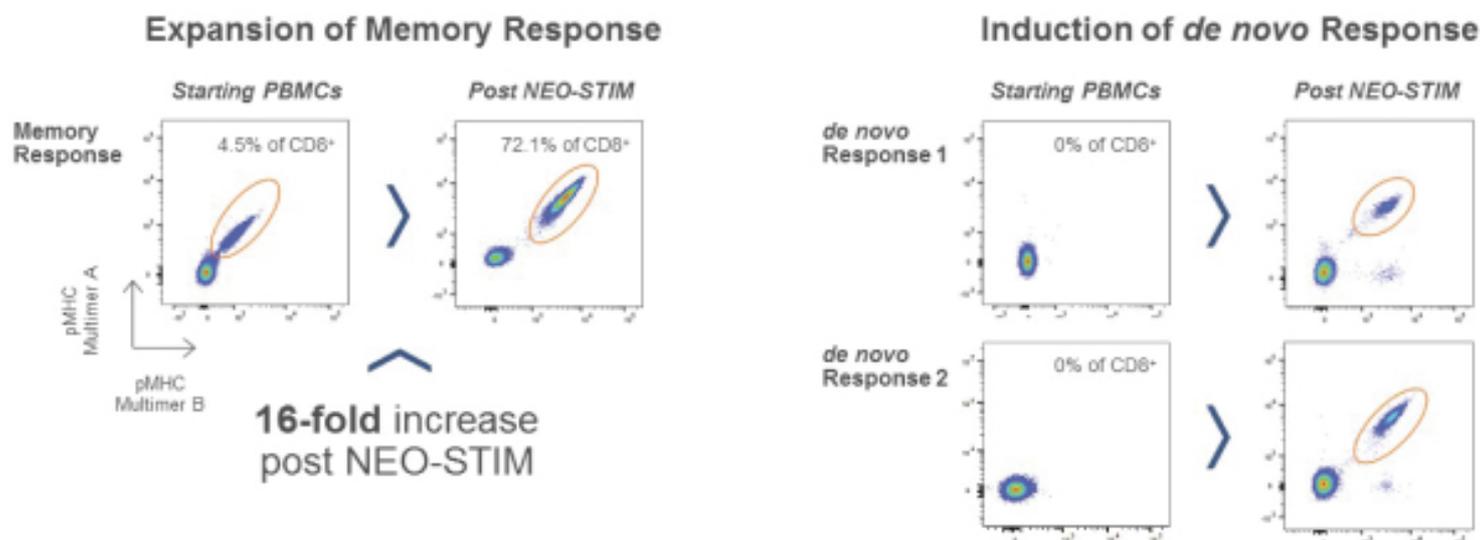
*Preclinical Studies*

Preclinical data relating to NEO-PTC-01 (BNT221) was presented at the Society of Immunotherapy of Cancer 2019 meeting, highlighting the proof of feasibility of our NEO-STIM induction protocol. These data demonstrated reproducibly across multiple patient samples, the ability to generate multiple CD8<sup>+</sup> and CD4<sup>+</sup> T

## [Table of Contents](#)

cell populations in each patient sample from the memory and naïve compartment. These T cells were highly functional and were specific for mutant neoantigens. In addition, these data showed that these cells were capable of *in vitro* cell killing and NEO-PTC-01-induced T cell cultures directly recognize autologous tumor sample material. We can now reproducibly generate these cell populations from patient material at a therapeutic manufacturing scale.

Our NEO-STIM induction protocol generates a polyclonal population of T cells. Once generated, we deeply characterize this cell product to understand the specificity and functionality of the induced cells. Data analyzed from a melanoma patient shows that NEO-STIM can induce CD8<sup>+</sup> T cell responses towards patient-specific neoantigens in autologous patient peripheral blood mononuclear cells, or PBMCs. Specifically, in this patient, as the charts below and to the left illustrate, a pre-existing memory response was expanded 16-fold, from 4.5% of CD8<sup>+</sup> T cells to 72.1% of CD8<sup>+</sup> T cells being specific for the selected neoantigen. Additionally, as the charts below and to the right illustrate, we induced two CD8<sup>+</sup> T cell responses from the naïve compartment, generating 6.5% and 13.4% of CD8<sup>+</sup> T cells, respectively. Finally, in this patient, we induced three neoantigen specific CD4<sup>+</sup> T cell responses as well.



### Next Steps

We are planning to initiate a Phase 1 dose escalation trial of NEO-PTC-01 (BNT221) in the second half of 2020 for the treatment of metastatic melanoma.

### C. Our Antibody Product Candidates in Oncology

#### 1. Next-Generation Checkpoint Immunomodulators

In our 50:50 collaboration program with Genmab, we are currently studying two bispecific antibody checkpoint immunomodulators.

- a) **GEN1046 (BNT311): Our Jointly Owned DuoBody® PD-L1x4-1BB Bispecific Antibody for the Treatment of Solid Tumors**

GEN1046 (BNT311), our jointly owned PD-L1x4-1BB product candidate, is a potential first-in-class bispecific antibody combining PD-L1 checkpoint inhibition with 4-1BB checkpoint activation. The first patient in a Phase 1/2a trial of GEN1046 (BNT311) for the treatment of malignant solid tumors was dosed in May 2019.

### ***Our GEN1046 (BNT311) Targets***

GEN1046 (BNT311) is a PD-L1x4-1BB bispecific antibody that induces conditional activation of T cells through 4-1BB stimulation which is dependent on simultaneous binding to PD-L1. In addition, the PD-L1-specific arm of DuoBody-PD-L1x4-1BB functions as a classical immune checkpoint inhibitor by blocking the PD-1/PD-L1 axis, also in the absence of 4-1BB binding. PD-L1 is a validated target that is expressed on tumor cells. 4-1BB is a trans-membrane receptor belonging to the TNF super-family and is expressed predominantly on activated T cells. DuoBody® is a registered trademark of Genmab.

### ***GEN1046 (BNT311) Trials***

#### ***Ongoing Phase 1/2a Clinical Trial***

The ongoing Phase 1/2a, open-label, single-arm GEN1046 (BNT311) trial with multiple expansion cohorts, conducted in collaboration with Genmab, is expected to enroll approximately 192 patients with malignant solid tumors. The trial consists of a dose escalation part and an expansion part. The dose escalation part will determine the safety profile of GEN1046 (BNT311) in subjects with certain relapsed or refractory, advanced and/or metastatic malignant solid tumors who are no longer candidates for standard therapy. The expansion part will be initiated once the recommended Phase 2 dose has been established in Phase 1. In the expansion part, GEN1046 (BNT311) will be administered intravenously once every 21 days. The primary endpoints of the trial are dose-limiting toxicities, adverse events and safety laboratory parameters, including hematology, biochemistry, coagulation and endocrinology.

#### ***Preclinical Studies***

In preclinical settings, GEN1046 (BNT311) induces conditional activation of T cells through 4-1BB stimulation which is dependent on simultaneous binding to PD-L1. In addition, the PD-L1-specific arm of DuoBody-PD-L1x4-1BB functions as a classical immune checkpoint inhibitor by blocking the PD-1/PD-L1 axis.

#### ***Next Steps***

We expect to report a data update for our ongoing Phase 1/2 trial in the second half of 2020.

### ***b) GEN1042 (BNT312): Our Jointly Owned DuoBody® CD40x4-1BB Bispecific Antibody for the Treatment of Solid Tumors***

GEN1042 (BNT312), our jointly owned CD40x4-1BB antibody product candidate, is a potential first-in-class bispecific antibody designed to induce conditional immune activation by crosslinking CD40 and 4-1BB positive cells. We and Genmab began recruitment and screening for a Phase 1/2a trial of GEN1042 (BNT312) for the treatment of malignant solid tumors in August 2019.

### ***GEN1042 (BNT312) Targets***

GEN1042 (BNT312) is a bispecific antibody designed to enhance an anti-tumor immune response through conditional CD40-mediated stimulation of antigen presenting cells cross-linked with conditional stimulation of 4-1BB+ T cells. It has demonstrated increased tumor infiltrating lymphocyte expansion in human tumor tissue cultures *ex vivo* and has induced tumor regression of murine tumors superior to pure PD-L1 blockage associated with an increase in tumor-specific CD8 T-cells. The cell surface molecule CD40 is a member of the tumor necrosis factor receptor superfamily.

### ***GEN1042 (BNT312) Preclinical Studies***

GEN1042 (BNT312) is designed to target CD40 and 4-1BB to enhance both dendritic cell and antigen-dependent T cell activation. In preclinical settings, GEN1042 (BNT312) activated antigen presenting cells and enhanced T cell activation. Preclinical studies also indicated the conditional activation and (clonal) expansion of previously activated CD8+ T cells and cytokine production resulting from GEN1042 (BNT312).

## 2. Targeted Cancer Antibodies

### a) MVT-5873 (BNT321): Our Targeted Cancer Antibody for the Treatment of Pancreatic Cancer

In May 2019, we acquired certain antibody assets from MabVax Therapeutics Holding, Inc., including MVT-5873 (BNT321), a clinical-stage targeted cancer antibody.

#### **Pancreatic Cancer**

In 2019, the American Cancer Society estimated that approximately 56,770 people will be diagnosed with pancreatic cancer in the United States annually. Pancreatic cancer is an aggressive cancer, with a five-year survival rate from diagnosis, across all stages combined, of 9%.

#### **Our MVT-5873 (BNT321) Target**

MVT-5873 (BNT321) is a fully human IgG1 monoclonal antibody targeting sialyl Lewis A (sLea), an epitope on CA19-9 that is expressed in pancreatic and other gastrointestinal cancers that plays a role in tumor adhesion and metastasis formation, and is a marker of an aggressive cancer phenotype.

#### **Our MVT-5873 (BNT321) Trials**

MVT-5873 (BNT321) is being investigated in an open-label, multi-center, non-randomized dose escalation Phase 1/2 study evaluating the safety and recommended Phase 2 dose of MVT-5873 (BNT321) both as a monotherapy and in combination with a standard of care chemotherapy in approximately 68 subjects with pancreatic and other CA19-9+ malignancies. Secondary objectives include evaluating tumor response rate by RECIST 1.1, duration of response, and determining pharmacokinetics. This study utilizes a conventional 3+3 design to identify the recommended Phase 2 dose.

Interim data for the combination cohort was reported in February 2018. In this cohort, MVT-5873 (BNT321) was given in combination with nab-paclitaxel and gemcitabine to patients newly diagnosed with CA19-9+ pancreatic cancer. MVT-5873 (BNT321) at a dose of 0.125mg/kg when added to first-line chemotherapy was generally well tolerated by all subjects. All six patients evaluated had measurable tumor reductions by RECIST, with four patients meeting the criteria for partial response and two patients meeting the criteria for stable disease.

We have resumed this trial and dosing has begun.

## D. Our Oncology Small Molecule Immunomodulator Product Candidates

### 1. BNT411: Our Small Molecule TLR7 Agonist for the Treatment of Solid Tumors, Including Small Cell Lung, Colorectal and Bladder Cancer

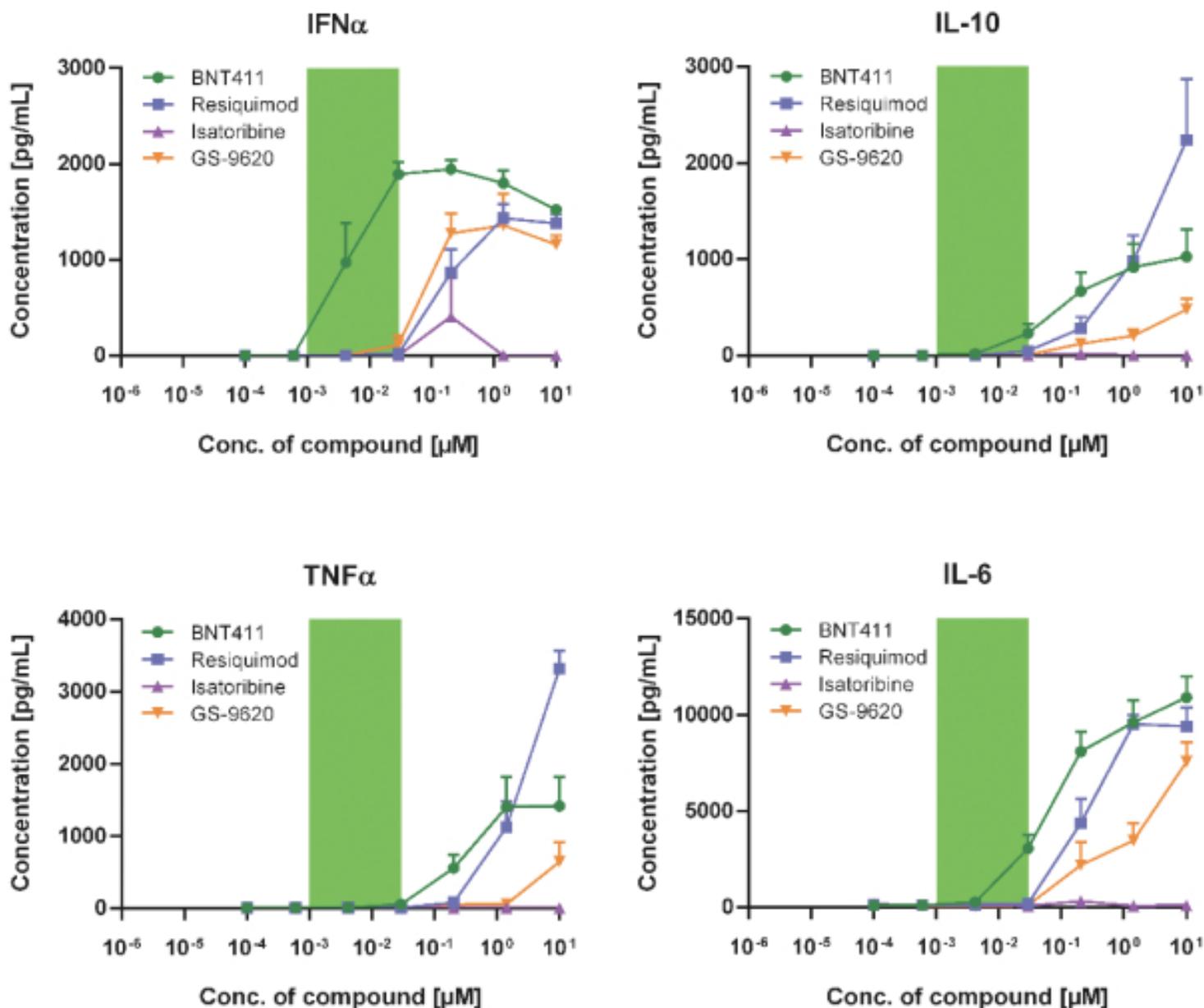
BNT411 is our novel small molecule TLR7 agonist product candidate. BNT411 is designed to activate both the adaptive and innate immune system through the TLR7 pathway. We are designing BNT411 to be used both as a monotherapy and in combination with chemotherapy and checkpoint inhibitors. We filed an IND for BNT411 in November 2019 and dosed the first patient in our Phase 1 trial in July 2020.

#### **Our BNT411 Target**

BNT411 is a TLR7 agonist that is designed to activate both the adaptive and innate immune system through the TLR7 pathway. This activity and the release of cytokines and chemokines are designed to result in the potent stimulation of antigen-specific CD8+ T cells, B cells and innate immune cells such as NK cells and macrophages.

**Our BNT411 Preclinical Studies**

In preclinical studies, BNT411 (SC1.2/Ago1.2) was shown to be more potent in the induction of IFN- $\alpha$  compared to the clinical competitor compound resiquimod (R848), even at lower concentrations (minimal effective concentration of BNT411 *in vitro* is 4nM). In contrast to the tested competitor compound, BNT411 was shown to induce at low concentrations especially IFN- $\alpha$  whereas other (pro-)inflammatory and CRS-related cytokines (IL-6, IL-10, TNF- $\alpha$ , IL-8) are only observed at higher concentrations.



**E. Our Infectious Disease mRNA Product Candidates**

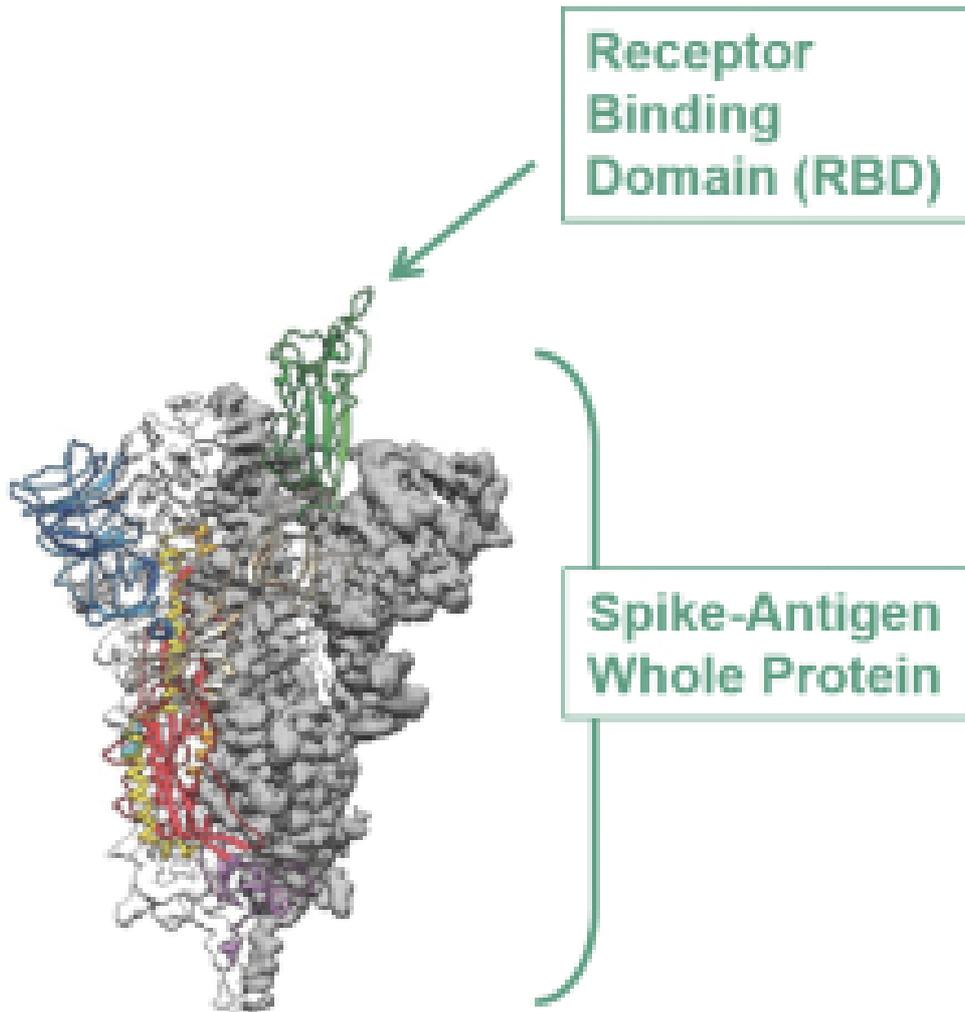
**1. Prophylactic Vaccine for the Prevention of COVID-19**

We are collaborating with Pfizer and Fosun Pharma for the development of a vaccine for the prevention of COVID-19 under our BNT162 program. We and Pfizer are jointly conducting clinical trials for the COVID-19 vaccine candidates initially in the United States and Europe across multiple sites.

We have begun development of four product candidate variants under our BNT162 program, including one prime-only and three prime-boost immunization strategies, utilizing different mRNA formats. In addition, we continue to develop additional product candidate variants and may bring additional candidates into the clinic if the preclinical data supports it.

**Our BNT162 Targets and mRNA Formats**

We are developing multiple vaccine candidate variants, some of which target the entire 2P-mutated full Spike protein antigen and others which target the more specific receptor binding domain subunit of the antigen protein.



**SARS-COV-2  
Spike Protein 3D Structure**  
(Wrapp et al., 2020, Science)

In addition, we are studying three different mRNA formats in our four vaccine candidate variants.

<u>BNT 162 Candidate</u>	<u>Target</u>	<u>mRNA Format</u>
162a1	RBD subunit	uRNA (prime/boost)
162b1	RBD subunit	modRNA (prime/boost)
162b2	2P-mutated full Spike protein	modRNA (prime/boost)
162c2	2P-mutated full Spike protein	saRNA (single injection)

The graphic below illustrates the potential benefits and rationale for each mRNA format used in our candidate variants.

### Uridine mRNA (uRNA)



#### Rationale

- Prime / boost
- Strong adjuvant effect
- Active at low doses
- Strong antibody response
- CD8 T-Cells > CD4 T-Cells

### Nucleoside-modified mRNA (modRNA)



#### Rationale

- Prime / boost
- Moderate adjuvant effect
- Very strong antibody response
- CD8 T-Cells > CD4 T-Cells

### Self-amplifying mRNA (saRNA)



#### Rationale

- Prime (1x injection)
- Long-term activity
- Very strong antibody response
- Very strong T-Cell response (CD8 and CD4)
- Potent immune protection at low doses (approx. 60x lower dosage required to induce immunity vs. uRNA observed in preclinical models)

### ***Our BNT162 Clinical Trial***

We are conducting a multi-site, open label, Phase 1/2, two-part, dose-escalation trial investigating the safety and immunogenicity of our four BNT162 candidate variants using different dosing regimens in healthy adults. The trial is being conducted in multiple locations in Germany and the United States. The trial has two parts: a dose-finding part (Part A) with four dose cohorts (treatment groups) for each vaccine candidate variant and one pre-defined and one optional dose level for a de-escalation approach and a second part (Part B) dedicated to recruit expansion cohorts with dose levels which are selected from data generated in Part A. The vaccine candidate variants BNT162a1, BNT162b1, and BNT162b2 will be administered using a prime/boost regimen. The vaccine candidate variant BNT162c2 will be administered using a single-dose regimen.

### ***July 2020 Data Announcements***

On July 1, 2020, we and Pfizer announced preliminary data from our ongoing U.S. Phase 1/2 trial of BNT162b1. The initial part of this randomized, placebo-controlled, observer-blinded study is evaluating the safety, tolerability and immunogenicity of escalating dose levels of BNT162b1, one of four vaccine candidate variants in development as part of our BNT162 program, in 45 healthy adults between 18 and 55 years of age.

The participants received two doses, 21 days apart, of placebo, 10µg or 30µg of BNT162b1, or received a single dose of 100µg of the vaccine candidate. Because of a strong vaccine booster effect, the highest neutralizing titers were observed seven days after the second dose of 10µg or 30µg on day 28 after vaccination. The neutralizing GMTs were 168 and 267 for the 10µg and 30µg dose levels, respectively, corresponding to 1.8- and 2.8-times the neutralizing GMT of 94 observed in a panel of 38 sera from subjects who had contracted SARS-CoV-2.

In all 24 subjects who received 2 vaccinations at 10µg and 30µg dose levels of BNT162b1, elevation of RBD-binding IgG concentrations was observed after the second injection with respective GMCs of 4,813 and 27,872 units/ml at day 28, seven days after immunization. These concentrations are 8- and 46.3-times the GMC of 602 units/ml in a panel of 38 sera from subjects who had contracted SARS-CoV-2.

At day 21 after a single injection, the 12 subjects who received 100µg of BNT162b1 had an RBD-binding IgG GMC of 1,778 units/ml and a SARS-CoV neutralizing GMT of 33, which are 3-times and 0.35-times, respectively, the GMC and GMT of the convalescent serum panel.

At the 10µg or 30µg dose levels, adverse reactions, including low grade fever, were more common after the second dose than the first dose. Following dose 2, 8.3% of participants who received 10µg and 75.0% of participants who received 30µg BNT162b1 reported fever <sup>3</sup> 38.0 °C. Local reactions and systemic events after injection with 10µg and 30µg of BNT162b1 were dose-dependent, generally mild to moderate, and transient. The most commonly reported local reaction was injection site pain, which was mild to moderate, except in one of 12 subjects who received a 100µg dose, which was severe. No serious adverse events were reported. Given higher numbers of subjects experiencing local reactions and systemic events after a single 100µg dose with no significant increases in immunogenicity compared to the 30µg dose level, the 12 participants in the 100µg group were not administered a second dose.

On July 20, 2020, we and Pfizer announced preliminary data from our ongoing German Phase 1/2 trial of BNT162b1. The initial part of this open-label, non-randomized, non-placebo-controlled study is evaluating the safety, tolerability and immunogenicity of escalating dose levels of BNT162b1, one of four vaccine candidate variants in development as part of our BNT162 program, in 60 healthy adults, between 18 and 55 years of age. The preliminary data we reported was from 12 subjects each who received two doses of 1µg, 10µg, 30µg and 50µg (except for one individual each in the 10µg and 50µg who discontinued due to non-study drug related reasons) and 12 subjects who received a single dose of 60µg. The two doses received by the participants were given 21 days apart.

## [Table of Contents](#)

In 34 of the 36 subjects who received two vaccinations at 10µg, 30µg, or 50µg dose levels of BNT162b1, RBD-specific CD4+ T cell responses were observed. All subjects but the two exceptions at the lowest dose level had cytokine profiling of the RBD-specific CD4+ T cells that demonstrated a TH1-dominant profile for these cells. While the magnitude varied between individuals, participants with the strongest CD4+ T cell responses to RBD had more than 10-fold of the memory responses observed in the same participants when stimulated with cytomegalovirus (CMV), Epstein Barr virus (EBV), influenza virus and tetanus toxoid-derived immunodominant peptide panels. The strength of RBD-specific CD4+ T cell responses correlated positively with both RBD-binding IgG and with SARS-CoV-2 neutralizing antibody titers. Among vaccine-induced CD8+ T cell responses, which were observed in 29 of 36 participants, strong responses were mounted by the majority of participants and were comparable with memory responses against CMV, EBV, influenza virus and tetanus toxoid in the same participants. The strength of RBD-specific CD8+ T cell responses correlated positively with vaccine-induced CD4+ T cell responses, but did not significantly correlate with SARS-CoV-2 neutralizing antibody titers. Additionally, although at 1µg the immunogenicity rate was lower (6 of 8 responding participants), the magnitude of vaccine-induced CD4+ and CD8+ T cells in some participants was almost as high as with 50µg BNT162b1.

Elevation of SARS-CoV-2 RBD-binding IgG concentrations was observed, with respective GMCs ranging from 265 units/ml to 1,672 units/ml at day 21. At day 29, seven days after the second dose, RBD-binding IgG GMCs ranged from 2,015 units/ml to 25,006 units/ml. At day 43, RBD-binding IgG GMCs ranged from 3,920 units/ml to 18,289 units/ml. These concentrations are 6.5- to 30.4-times the GMC of 602 units/ml in a panel of sera from 38 subjects who had contracted SARS-CoV-2. At day 29, the SARS-CoV-2 neutralizing GMTs reached 36 (1µg dose), 158 (10µg dose), 308 (30µg dose) and 578 (50µg dose) compared to neutralizing GMT of 94 observed in the convalescent serum panel. At day 43, SARS-CoV-2 neutralizing GMTs reached .7-fold (1µg dose) to 3.2-fold (50µg dose) compared to those of a panel of SARS-CoV-2 infection convalescent human sera. Furthermore, sera of vaccinated subjects displayed broadly neutralizing activity in pseudovirus neutralization assays across a panel of sixteen SARS-CoV-2 RBD variants represented in publicly available SARS-CoV-2 sequences and against the newly dominant D614G strain. In summary, antibody responses elicited by BNT162b1 in our German clinical trial largely mirrored those observed in our U.S. clinical trial.

At the 10µg, 30µg and 50µg dose levels, certain adverse reactions, including low grade fever, were more common after the second dose than the first dose. Following the second dose, 25.0%, 25.0% and 33.3% of participants who received the 10µg, 30µg and 50µg doses, respectively reported fever of at least 38.0 degrees Celsius. Local reactions and systemic events after injection with 10µg, 30µg and 50µg of BNT162b1 were dose-dependent, generally mild to moderate and transient, with occasional severe events (grade 3) of flu-like symptoms and injection site reactions. The most commonly reported local reaction was injection site pain, which was mild to moderate, except in one of 12 subjects who received a 60µg dose, which was severe. No serious adverse events were reported, and there were no withdrawals due to adverse events related to the vaccine. Based on the adverse reactions reported after the 50µg boost dose, a second 60µg dose was not administered to participants who had received an initial 60µg dose.

For additional information on these preliminary results, please review our reports on Form 6-K filed with the SEC on July 1, 2020 and July 20, 2020 and incorporated by reference herein.

### ***Next Steps***

Based on preclinical and clinical data observed to-date, we and Pfizer have decided to progress our BNT162 development program into a Phase 2b/3 trial, which is anticipated to commence in late July 2020, subject to input and approval from the appropriate regulatory bodies. For the initial Phase 2b/3 trial, we intend to select either BNT162b1 or BNT162b2. Both the BNT162b1 and the BNT162b2 vaccine candidates have received Fast Track status from the FDA. Since clinical evaluation of the BNT162b2 candidate started several weeks later than BNT162b1, only preliminary clinical data are currently available for the BNT162b2 candidate. A set of data obtained for a cohort of subjects 18-55 years of age immunized with 10µg of BNT162b2 indicates that BNT162b2 induces similar virus neutralizing antibody responses as observed for BNT162b1. The preliminary

observations are subject to further data collection and analysis. Assessment of dose dependent immune response and safety profile as well as analysis of T cell responses is currently pending. On the basis of additional data expected to be collected and analyzed for BNT162b1 and BNT162b2 in the coming days, along with input from the FDA, we intend to select a lead candidate to take into a Phase 2b/3 trial. We and Pfizer currently expect to inform the FDA of our selection of the BNT162 candidate variant before the closing of this offering. Based on clinical data from our ongoing Phase 1/2 trials of BNT162b1 in the United States and Germany, BNT162b1 appears to be a viable variant to advance into a Phase 2b/3 trial. However, given that additional information relating to BNT162b2 is becoming available over the next few days, we and Pfizer plan to make the ultimate decision on the final candidate based on multiple factors, including the overall observed safety, tolerability and immunogenicity profiles for each vaccine candidate at different dose levels, a full immunogenicity data set and feedback from the FDA on the data collected for each candidate. If we ultimately move forward with the BNT162b2 variant, it will be due to the fact that based on our scientific judgment in light of the totality of preclinical data and clinical data available to us at the time of selection and the other factors described above, the BNT162b2 variant has better potential for clinical and commercial success. We do not plan to disclose which BNT162 variant has been selected until we receive FDA approval to commence the Phase 2b/3 clinical trial, and we likely will not publish any data with respect to the BNT162b2 variant before we make our selection.

## **2. Prophylactic Vaccine for the Prevention of Influenza**

We are collaborating with Pfizer to develop an influenza vaccine based on our mRNA drug classes. The product candidate, BNT161, will encode influenza virus antigens selected by the WHO in advance of the flu season. We and Pfizer have moved the anticipated Phase 1 start for our mRNA flu vaccine program to 2021 due to the prioritization of our COVID-19 vaccine development efforts.

### **Next Steps**

We anticipate beginning a first clinical trial for BNT161 in 2021.

## **3. Other Infectious Diseases**

We have a research collaboration with Penn, under which we have the exclusive option to develop and commercialize prophylactic mRNA immunotherapies for the treatment of up to 10 infectious disease indications. On September 20, 2019, Penn announced positive preclinical results of a vaccine product candidate using its mRNA technology. The preclinical study vaccinated mice and guinea pigs against Herpes simplex virus type 2. Penn reported that the immunization led to “mostly sterilizing immunity” from the virus.

### **Next Steps**

We expect to initiate our first Phase 1 clinical trial under Penn collaboration in the first half of 2021.

## **F. Our Rare Disease Protein Replacement mRNA Product Candidates**

We are collaborating with Genevant, in order to combine our mRNA technology with Genevant’s LNP delivery technology, to create up to five mRNA protein replacement therapies for the treatment of rare diseases with high unmet medical needs. We expect our first compound from this collaboration to enter the clinic in the second half of 2021. The first product candidate under the Genevant collaboration, BNT171, is currently being developed for an undisclosed indication. Our mRNA replacement product candidate is associated with a favorable tolerability profile and good protein expression (in mice) and demonstrated phenotype rescue in a mouse disease model.

## G. Other

Our legacy commercial stage product, MammaTyper, is a molecular *in vitro* diagnostic test for the quantitative detection of the mRNA expression of ERBB2, ESR1, PGR and MKI67 in breast cancer tissue. MammaTyper has been shown in a variety of scientific publications to offer superior diagnostics insights compared to conventional immunohistochemical detection methods.

## XIII. Manufacturing

We are building a fully integrated biotechnology company, with operations spanning from research through clinical development, and manufacturing through sales and marketing. We operate three GMP-certified manufacturing facilities in Germany, where we manufacture mRNA therapeutics and engineered cell therapies for our own pipeline and for external customers. We operate a fourth facility in Germany where we manufacture custom peptides to support our extensive immunomonitoring activities within our development programs. Our subsidiary BioNTech Innovative Manufacturing Services GmbH, or BioNTech IMFS, has been manufacturing GMP-certified cellular products since 1999. It was granted its first GMP license for manufacturing mRNA in 2011 and has been manufacturing individualized mRNA products since 2014.

We have expanded our capability to produce and supply drug products to support clinical development of our, and our collaborators', product candidates. To date, we have manufactured about 1000 drug substance batches in our manufacturing facilities.

Our approach has been to proactively build capacity in anticipation of demand from internal research and development, as well as from our collaborators. We have done so by continuing to make significant investments in manufacturing infrastructure and increasingly expanding our capacity to manufacture mRNA, viral vectors, cellular products and peptides. We believe the development and optimization of our manufacturing processes in parallel to drug development is crucial to our success. We have also collaborated with Siemens to develop a process for a fully-automated, on-demand production of mRNA therapies.

### **Our Manufacturing Operations**

*mRNA.* We believe scaling up manufacturing for mRNA can best be executed as part of a proprietary manufacturing approach, not as part of an outsourcing strategy. We believe this approach allows us to maintain control of our proprietary processes and gives us the flexibility we need for scheduling batch production for our drug substances to match our development plans as they evolve. Our mRNA manufacturing is currently conducted at our in-house BioNTech IMFS facility and our BioNTech East Wing facility, the latter being dedicated to iNeST and bulk mRNA manufacturing. Our mRNA manufacturing process involves standardized production of all mRNA constructs and minimal restrictions in construct length. We have the capacity to undertake sterile filtration and final filling in up to 1,200 vials of various sizes. Batch sizes range from a few milligrams for individualized applications (*i.e.*, iNeST) to 10g for standard mRNA applications (*i.e.*, FixVac, intratumoral immunotherapies and infectious diseases, *e.g.*, COVID-19), with batch sizes of up to 250g planned for Q4 2020.

To date, we have produced about 1000 batches of mRNA drug substance to support our studies. We currently have infrastructure capable of producing more than 100 batches of mRNA drug substance and formulated drug product per month with a turnaround time of about 30 to 40 days from sequence identification to released product. We believe we currently have the capacity to supply needs of our product candidates in clinical trials up to registration.

In recent years, we have successfully decreased the time required to deliver individualized immunotherapy to patients. In 2014, it took us over three months to manually manufacture and deliver individualized immunotherapies to patients. Since December 2017, with the implementation of semiautomatic GMP

## [Table of Contents](#)

manufacturing in collaboration with Siemens, we have been consistently manufacturing and delivering individualized immunotherapies in under six weeks. This advancement represents significant progress toward our target commercial manufacturing turnaround time of less than 28 days. We believe this is achievable, and we plan to continue to develop additional process improvements, which we expect will further reduce our turnaround times as we progress through clinical development.

*Cell Therapy Products.* We have end-to-end capabilities and over 20 years of experience in cell therapy manufacturing. Our manufacturing process for cellular products involves the isolation of primary human cells and subpopulations, including CD34+ and CD3+ cells. We engage in the culturing, expansion and genetic modification of primary human cells as well as mammalian cell lines. Our processes include vector production for transfection of cells with CARs, cell banking and cryopreservation.

We have set up a broad range of quality control assays for the characterization of cell therapy products that allow us to certify the manufactured drug products in a short time. We are a leader in the production of gamma retroviral vectors. To date, we have produced more than 50 different cell therapy products.

*Peptides.* Our custom peptide synthesis business has developed unique technologies to produce several million peptides during the past three years to support our growing clinical pipeline. These include fast small-scale manufacturing of peptides for target and epitope discovery as well as for neoepitope characterization and production of high content arrays. It is important to synthesize highly purified peptides in order to avoid false positives in immunomonitoring in our mRNA immunotherapy trials. We also use these peptides as starting material in our engineered cell therapies. We have developed know-how to produce highly complex and purified peptide pools that consist of overlapping peptides spanning entire antigens or neoepitopes. We plan to establish a new production facility, which will roughly double our current capacity.

### **Our Manufacturing Facilities**

We operate four manufacturing and packaging facilities in Germany. In these facilities, we manufacture and package individualized mRNA, bulk mRNA, retroviral vectors, cellular products and peptides. In Mainz, we are currently constructing another facility for iNeST manufacturing at a commercial scale, which is planned to start manufacturing in 2022 and will supply markets mainly in Europe and the United States.

*BioNTech IMFS.* Our manufacturing operations for retroviral vectors, cell therapy products and mRNA are housed in our wholly owned subsidiary, BioNTech IMFS. Founded in 1997, BioNTech IMFS specializes in services for innovative therapeutic approaches. In 2009, BioNTech IMFS became our wholly owned subsidiary, giving us access to synergistic platforms and complementary expertise for development, testing and manufacturing services. BioNTech IMFS and its predecessors have had GMP-certified cell and gene therapy manufacturing capabilities since 1999, and obtained GMP manufacturing authorization for mRNA production in 2011. In 2017, BioNTech IMFS began automated manufacturing of the iNeST product candidate and entered into its first commercial supply contract for retroviral vectors. Located near Mainz, the BioNTech IMFS facility occupies over 30,000 square feet. Two hundred and twenty staff members are employed at this facility, with collective expertise in molecular biology, cell biology and virology.

*BioNTech iNeST and Bulk mRNA Clinical Manufacturing (East Wing).* We dedicate our GMP-certified manufacturing facility at our headquarters in Mainz, Germany to the production of iNeST immunotherapies and bulk mRNA. In 2015, our wholly owned subsidiary, BioNTech RNA Pharmaceuticals GmbH, or BioNTech RNA, and Siemens announced a collaboration for developing an automated, paperless and digitalized production site for individualized mRNA. We obtained our GMP manufacturing authorization for iNeST production at our East Wing facility in June 2018 and released our first drug product there the following month. We plan to expand our manufacturing license for bulk mRNA in Q3 2020.

This facility contains approximately 17,000 square feet of laboratory and office space, including 4,300 square feet of GMP facilities. About 200 staff members are employed at this facility and operate it seven days per

## [Table of Contents](#)

week. In its first year of operation the facility manufactured and released more than 250 batches of mRNA and has, since inception, manufactured and released more than 450 batches of mRNA.

*BioNTech Clinical Manufacturing.* Our GMP-certified manufacturing facility in Kupferbergterrasse, Mainz, Germany is authorized to conduct secondary packing, labeling, storage and batch release of primary packed investigational medicinal products. This facility contains approximately 11,500 square feet of laboratory and office space, including 1,250 square feet of GMP facilities.

*JPT.* JPT, our peptide manufacturing facility, was established in 2004 and became a wholly owned subsidiary of BioNTech in 2008. JPT is located in Berlin, Germany and occupies over 16,000 square feet of clean rooms, laboratory and office space.

### **Other Certifications**

BioNTech Diagnostics has a quality management system that is certified according to ISO 13485:2016 and JPT maintains a ISO 9001:2015 certified Quality Management System to allow production of European CE marked companion diagnostics.

### **Quality Assurance**

We have implemented and maintain several Quality Assurance systems. BioNTech IMFS, BioNTech Clinical Manufacturing and BioNTech iNeST Clinical Manufacturing have implemented GMP-certified quality assurance systems. BioNTech Diagnostics has a quality management system that is certified according to ISO 13485:2016 and JPT maintains a ISO 9001:2015 certified Quality Management System.

### **Manufacturing Financing**

In June 2020, we signed a second financing arrangement with the EIB. The purpose of this financing is to partially support the development of BNT162 and fund expansion of our manufacturing capacity to provide worldwide supply of BNT162 in response to the pandemic, or the Second Investment. Under this arrangement, the EIB has agreed to provide us with a credit in an amount of up to €100 million to partially finance the Second Investment, provided that the amount of credit does not exceed 50% of the cost of the Second Investment. The credit consists of (i) a term loan in the amount of €50 million that may be drawn in a single tranche upon the achievement of certain milestone events, not all of which have been achieved (Credit A), and (ii) a term loan in the amount of €50 million that may be drawn in a single tranche (Credit B). Credit B may only be drawn after Credit A has been drawn down and upon the achievement of certain milestone events. Each tranche under Credit A and Credit B must be repaid within six years from the date on which the tranche is disbursed.

## **XIV. Third-Party Collaborations**

We have forged productive collaborations with pharmaceutical companies and academic research institutions with area expertise and resources in an effort to advance and accelerate our discovery and development programs in oncology, and also to leverage our drug classes into additional disease indications while minimizing our incremental costs.

Our collaborations include:

- Genentech for our iNeST platform in our mRNA drug class;
- Sanofi for our intratumoral therapy platform in our mRNA drug class;
- Genmab for our next-generation checkpoint immunomodulator platform in our antibodies drug class;
- Pfizer for our COVID-19 and influenza vaccine programs, which leverage technology from our infectious disease mRNA-based platform;

## [Table of Contents](#)

- Fosun Pharma for our COVID-19 vaccine program;
- Penn for up to 10 prophylactic indications in our infectious disease mRNA-based platform; and
- Genevant for our rare disease protein replacement therapy platform in our mRNA drug class.

We either wholly own or retain significant rights to all of our clinical stage programs, either in the form of a global share of profit and co-commercialization rights with our collaborators in certain markets or significant royalties and milestones. We plan to continue to identify potential collaborators who can contribute meaningful resources and insights to our programs and allow us to more rapidly expand our impact to broader patient populations.

### ***Genentech-iNeST Collaboration***

#### *Collaboration Agreement*

On September 20, 2016, we and BioNTech RNA entered into a Collaboration Agreement with Genentech and F. Hoffman-La Roche Ltd, which, as amended on June 1, 2018 and December 6, 2019, we refer to as the Genentech Collaboration Agreement, to jointly research, develop, manufacture and commercialize certain pharmaceutical products that comprise neoepitope RNAs, or the Genentech Collaboration Products, which include our iNeST development candidates, for any use worldwide. Under the Genentech Collaboration Agreement, we and Genentech agreed to perform joint research under a research plan to further improve our technology platform for the manufacturing of Genentech Collaboration Products. Under the terms of the Genentech Collaboration Agreement, Genentech paid us \$310 million in upfront and near-term milestone payments.

We and Genentech must use commercially reasonable efforts to jointly develop one or more Genentech Collaboration Products in accordance with an agreed global development plan, with the costs of such development to be shared equally. We will continue certain clinical studies that were initiated prior to the execution of the Collaboration Agreement at our sole expense, and any future material changes in the operation of such clinical studies require Genentech's approval. Genentech may access and use any data generated in these ongoing clinical studies.

In addition to the clinical studies included in the global development plan, we may propose certain additional clinical studies for indications not included in the global development plan, and if the joint development committee formed by the parties does not elect to include the proposed studies in the global development plan, then we may conduct the study at our sole expense under certain conditions, and subject to certain restrictions. Genentech has the option to select any candidate in such studies for potential further joint development and/or commercialization by Genentech as a Genentech Collaboration Product. In the case that Genentech wishes to pursue the clinical development of a Genentech Collaboration Product in an indication that we are not interested in pursuing, then under certain conditions, we may opt out of the co-funding of such development and Genentech may continue do so at its own costs, except that we are obligated to repay Genentech's development costs in the event that such product subsequently receives regulatory approval.

Genentech has the sole right to commercialize the Genentech Collaboration Products on a worldwide basis, with all profits and losses from such commercialization to be split equally with us. If we exercise our right to opt out of sharing equally in future development costs for any Genentech Collaboration Products, then we will no longer split all such profits and losses for such Genentech Collaboration Products equally with Genentech and will instead receive a royalty on annual worldwide net sales of such Genentech Collaboration Products that are covered by a valid claim included in certain of our patents and certain joint patents that arise out of the collaboration. Furthermore, for certain Genentech Collaboration Products for which we share co-promotion rights with Genentech, we have the option to assume a percentage to be determined of the total sales force in the United States and certain other countries, including Germany and other major European markets. In addition,

## [Table of Contents](#)

under certain regulatory and other circumstances, we have the right to independently commercialize Genentech Collaboration Products in indications that the joint development committee declines to pursue and that Genentech does not subsequently elect to commercialize, provided that we market such Genentech Collaboration Products under a separate brand and trademark that is approved by the joint commercialization committee established by the parties as not confusingly similar to the Genentech Collaboration Products being commercialized by Genentech. Our ability to research, develop, co-promote and/or independently commercialize Genentech Collaboration Products may be terminated or limited in the event we undergo a change of control.

We granted to Genentech an exclusive license under certain of our intellectual property, and our interest in any jointly-owned intellectual property developed under this agreement, to research, develop, make, sell and import any pharmaceutical products that comprise neoepitope RNA. Genentech granted to us an exclusive, non-transferable, sublicensable licenses under certain Genentech intellectual property, our intellectual property exclusively licensed to Genentech, and their interest in any jointly-owned intellectual property developed under this agreement for the performance of our ongoing clinical studies and the exercise of our rights and obligations under the Genentech Collaboration Agreement.

Until the first marketing approval for a Genentech Collaboration Product, we have granted Genentech the first right to negotiate an exclusive license to develop, manufacture and commercialize combination therapies involving pharmaceutical products based on neoepitope RNA and pharmaceutical products based on non-neoepitope RNA for the treatment of cancer in humans.

The Genentech Collaboration Agreement will remain in effect so as long as Genentech Collaboration Products are in development or commercialization, or until the date of the expiration of the last royalty term if BioNTech has exercised its option to opt-out of joint development of Genentech Collaboration Products. If the agreement expires, the licenses granted to Genentech become fully-paid up, royalty-free and irrevocable. Genentech may terminate the Collaboration Agreement if we fail to achieve certain milestone targets or at any time for convenience with or without reason upon 60 days' prior written notice. In the event of any such termination, all rights to the development and commercialization of Genentech Collaboration Products developed under the collaboration would revert to us and Genentech would grant us licenses under its intellectual property to further develop and commercialize Genentech Collaboration Products. We would be required to pay certain royalties to Genentech for such license(s). In addition, either party may terminate the agreement upon the other party's uncured material breach or insolvency.

### *Manufacturing Development and Supply Agreement*

Concurrent with the Genentech Collaboration Agreement, we and BioNTech RNA entered into a Manufacturing Development and Supply Agreement with Genentech and F. Hoffman-La Roche Ltd, or the Genentech Manufacturing Agreement, which governs the manufacturing, related manufacturing development activities and supply of Genentech Collaboration Products. Pursuant to the Genentech Manufacturing Agreement, we are responsible for clinical manufacturing and supply, for developing and implementing manufacturing processes (including pursuant to specified target turnaround times), and for constructing, commissioning, qualifying and obtaining permits for the clinical facilities. We are permitted to subcontract certain steps in the clinical manufacturing process to our affiliate, BioNTech IMFS.

In addition, we are responsible for developing the commercial manufacturing process, which requires more stringent turnaround times than the clinical manufacturing process. Genentech will generally be responsible for commercial manufacturing. We are obligated to use commercially reasonable efforts to achieve certain predetermined clinical manufacturing capacity commitments.

Under the Genentech Manufacturing Agreement, we and Genentech will jointly develop a manufacturing network plan detailing the location, capacity, scale-out, associated timing and other appropriate details of the commercial manufacturing facilities. We may participate in commercial manufacturing through our right to

## [Table of Contents](#)

include as part of the commercial manufacturing network one of our own facilities in the European Union or the United States and one of our own facilities in another region to be agreed upon with Genentech (provided that in each region our facility is not the first facility to be included in the commercial manufacturing network).

### ***Sanofi-Intratumoral Therapy Collaboration***

On November 2, 2015, BioNTech RNA entered into a Collaboration and License Agreement with Sanofi, which we refer to as the Sanofi Agreement. Pursuant to the Sanofi Agreement, we and Sanofi will collaborate on intratumorally administered mRNA-based therapeutics for the treatment of solid tumors in humans.

The Sanofi Agreement contemplates: (i) research, (ii) development and commercialization and (iii) possible co-development and co-commercialization activities with us.

During the research phase, the parties seek to identify, characterize and validate up to five “mixtures” of two or more mRNAs encoding different proteins administered together in the same solution. Sanofi at its sole discretion may select up to five mixtures created under the research plan for further development and commercialization, which we refer to as Sanofi Collaboration Products.

After selection of a Sanofi Collaboration Product, Sanofi would be responsible for all development and commercialization activities involving that product. We have the option, by payment of an exercise fee, to co-develop and co-commercialize up to two Sanofi Collaboration Products primarily in the United States and in some European countries, including the United Kingdom, France, Germany, Italy and Spain. If we exercise such an option, the costs for co-development and co-commercialization of the chosen Sanofi Collaboration Products would be allocated between the parties. In turn, Sanofi has an option to co-develop and co-commercialize certain mixtures developed by us or with third parties that contain a certain amount of the mRNAs of a Sanofi Collaboration Product.

In March 2018, Sanofi selected the first Sanofi Collaboration Product for further development and commercialization and we exercised our option for co-development and co-commercialization of the Sanofi Collaboration Product. Effective as of March 2018, the parties entered into a separate development agreement for the co-development of this Sanofi Collaboration Product.

Under the Sanofi Agreement, Sanofi has paid upfront and near-term milestone payments of approximately €60 million. We are entitled to receive up to approximately €260 million per product upon achievement of certain development, regulatory and commercial milestones. If commercialized successfully, we would also be eligible for mid-single digit to very low double-digit tiered royalties on net sales on a country-by-country and product-by-product basis until the later of (i) expiration of the last relevant patent covering such product in such country, (ii) 10 years following first commercial sale of such product in such country, (iii) expiration of regulatory data exclusivity for such product in such country and (iv) the market entry of a generic biological product with a certain market share in relation to such product in such country.

The Sanofi Agreement will remain effective until the last-to-expire royalty term (or, when a co-development option has been exercised, the completion of all co-development and co-commercialization activities). The parties may terminate the Sanofi Agreement in its entirety or terminate certain co-development activities for convenience, with or without cause.

The Sanofi Agreement provides that we may not engage in certain research and development activities relating to the intratumoral injection of mRNAs.

### ***Genmab-Next-generation Immunomodulator Collaboration***

On May 19, 2015, we entered into a License and Collaboration Agreement with Genmab (together with all amendments and side letters thereto, collectively referred to as the Genmab Agreement) to jointly research,

## [Table of Contents](#)

develop and commercialize polypeptide-based bispecific antibodies against certain target combinations for the treatment of cancer in humans worldwide, or the Genmab Agreement Field, using certain Genmab technology. In connection with our entry into the Genmab Agreement, Genmab paid us an upfront fee of \$10 million.

Under the Genmab Agreement, we and Genmab must use commercially reasonable efforts to research and develop clinical candidates, including our next-generation checkpoint immunomodulators, with costs split equally during the research and evaluation phase. Our joint activities in this phase are governed by a research plan, which is subject to annual review and updates, and which specifies the clinical candidates to be developed. This research and evaluation phase is currently set to expire on May 19, 2022, but has in the past been extended.

During the research and evaluation phase, we and Genmab may propose clinical candidates for consideration by a joint research committee for further preclinical and clinical development. If a party, through the joint research committee, indicates that it is not interested in further development and commercialization of any clinical candidate, the other party may continue development and commercialization of such products on a unilateral basis, at its sole expense. The party that continues such development and commercialization is obligated to pay the other party certain development, regulatory and sales milestone payments and royalties on net sales of the applicable Unilateral Products. During either party's development and commercialization of a Unilateral Product, the other party must not develop or commercialize any bispecific antibody targeting the same target combination of such Genmab Unilateral Product if such bispecific antibody was generated as part of the collaboration under this agreement.

We and Genmab must use commercially reasonable efforts to develop candidates selected by the joint research committee, or the Genmab Collaboration Products, through preclinical and clinical development. In addition, the joint research committee may select an additional candidate, or the Genmab Back-up Candidate, as a back-up for each Genmab Collaboration Product and may decide at any time to replace the Genmab Collaboration Product with its Genmab Back-up Candidate. The preclinical and clinical development of the Genmab Collaboration Products would be performed pursuant to a development plan to be agreed upon by us and Genmab, with costs to be split equally. The joint steering committee may designate a third party as a manufacturer of a Genmab Collaboration Product or of any of its components.

We and Genmab must use commercially reasonable efforts to jointly commercialize all Genmab Collaboration Products and share equally all expenses and profits arising from such commercialization. We and Genmab, on a product-by-product basis and at least 12 months prior to the anticipated start of a pivotal clinical trial for a Genmab Collaboration Product, will jointly designate between the two of us a lead party responsible for establishing the distribution and marketing operations in each geographical region. Each party would be entitled to equally co-promote the products pursuant to a separately negotiated global commercialization agreement that the parties agree to negotiate.

Unless otherwise agreed by the joint steering committee established under the agreement, Genmab is responsible for all regulatory actions and shall own all regulatory approvals obtained for the Genmab Collaboration Products. Genmab is obligated to provide regular updates to us on regulatory activities.

Each party grants to the other party a worldwide, co-exclusive, sublicensable, royalty-free license under certain of such first party's intellectual property, including certain patents and know-how, to perform the research under this agreement and to research, develop, make, import, use and sell Genmab Collaboration Products in the Genmab Agreement Field pursuant to the terms of the Genmab Agreement. These licenses shall continue on a country-by-country and product-by-product basis for as long as development or commercialization activities are contemplated under the Genmab Agreement.

During the research and evaluation phase prior to the selection of a Genmab Collaboration Product, neither we nor Genmab may engage in any research and development activity in the Genmab Agreement Field relating to the development of any bispecific antibody which targets any combination that is the subject of our joint

## [Table of Contents](#)

research plan. During the preclinical and clinical development phase for any Genmab Collaboration Product, engagement in research and development activities in the Genmab Agreement Field unilaterally by a party relating to a Genmab Collaboration Product or its Genmab Back-up Candidate or any bispecific antibody which targets the same target combination for which such Genmab Collaboration Product or Genmab Back-up Candidate has been developed would require the other party's prior written consent.

Each party has the right to discontinue its participation in the further development and commercialization of a Genmab Collaboration Product at two points: (i) when an IND submission package has been agreed upon by the parties and (ii) when the draft clinical trial report from the first Phase 1/2 clinical trial becomes available. The party that wishes to opt out of such further development and commercialization may choose to permit the other party to continue the development and commercialization of the Genmab Collaboration Product or divest its interest in such Genmab Collaboration Product. If the opt-out party permits continued development and commercialization, the other party may elect to pursue development and commercialization of such Genmab Collaboration Product alone as a Unilateral Product, at its sole cost and subject to pre-defined milestone and royalty payments and certain additional pre-defined terms. If the other party wishes to not pursue such continued development and commercialization on such pre-defined payment and additional terms, then the parties will jointly divest their interest in such Genmab Collaboration Product to a third party, and if such divestiture fails, the parties will cease all development and commercialization of such Genmab Collaboration Product. Alternatively, if the opt-out party seeks to unilaterally divest its interest in the applicable Genmab Collaboration Product, the other party has the right of first exclusive negotiation to obtain exclusive, worldwide rights to develop and commercialize such Genmab Collaboration Product. If such unilateral divestiture fails after the other party's exercise of its right of first exclusive negotiation, the opt-out party may either continue development and commercialization of such Genmab Collaboration Product or offer the other party to continue such development and commercialization on such pre-defined payment and additional terms as set forth above.

The Genmab Agreement will remain in effect until the later of (i) the expiration of the last-to-expire royalty term for any Unilateral Product and (ii) the time when no Genmab Collaboration Products are being developed or commercialized under this agreement. Either party may terminate the agreement in its entirety or on a product-by-product basis with immediate effect upon the other party's uncured material breach or insolvency.

### ***Pfizer-COVID-19 Collaboration***

On April 9, 2020, effective as of March 17, 2020, we entered into a Collaboration Agreement with Pfizer for the research and development of immunogenic compositions comprising RNA encoding a SARS-CoV-2 polypeptide or fragment thereof for prophylaxis against SARS-CoV-2 in humans, which we refer to as the Pfizer Corona Field. We also entered into a binding term sheet for commercialization of the foregoing compositions, which we refer to, together with the Collaboration Agreement, as the Pfizer Corona Agreement. We plan to enter into a Commercialization Agreement based on such term sheet.

We and Pfizer agreed to collaborate on research and development in the Pfizer Corona Field worldwide excluding the Fosun Territory, which we refer to as the Pfizer Territory. The details of such activities are set forth in a research and development plan that is governed by a joint steering committee. Each party bears its own personnel and capital expenditures costs, but the parties will share the costs of all other agreed development activities (including the costs of manufacturing material for use in clinical trials) evenly. Each party will, in good faith, seek funding from government funds, non-governmental organizations and other third-party organizations to support their research and development activities. Under the Pfizer Corona Agreement, Pfizer will lead clinical development of and seek regulatory approval for any candidates or products in the USA and we will lead clinical development of and seek regulatory approval for any candidates or products in the EU, and we will agree on a strategy for all other countries.

If a vaccine candidate has been approved, we plan to hold the marketing authorizations for that vaccine throughout the Pfizer Territory and can solely commercialize the vaccine in Germany and Turkey, as well as

## [Table of Contents](#)

specified developing countries (collectively referred to as the BioNTech Territory) for so long as we or a third-party funding organization is conducting vaccine commercialization in such countries and subject to any future agreement with the third-party funding organization. We have the option to opt-out of commercializing the vaccine in Germany and/or Turkey, whereupon such countries will become part of the Pfizer Territory.

If a vaccine candidate is approved, Pfizer has the right to commercialize that vaccine and related products in the rest of the Pfizer Territory. On a country-by-country basis in relation to the United Arab Emirates and certain countries of southeast Asia, if we obtain funding from a third-party government, non-governmental organization or other organization that obligates us to commercialize an approved vaccine in such country, we are obligated to request from Pfizer in writing a decision as to whether Pfizer wishes to commercialize such vaccine in such country in accordance with the requirements agreed with the third-party funder. If Pfizer elects not to commercialize the vaccine in such country, then such country shall become a part of the BioNTech Territory.

If the Fosun Agreement expires or is otherwise terminated for any reason, as between us and any international pharmaceutical group headquartered outside of China, we granted Pfizer a right of first negotiation to expand the Pfizer Territory to include the Fosun Territory. See “—Fosun-COVID-19 Collaboration” below for more information on the Fosun Agreement.

We and Pfizer will share responsibilities for manufacturing and supplying a vaccine, if approved. If there is insufficient supply to satisfy the entire demand for a vaccine in the Pfizer Territory, we and Pfizer have agreed to determine by mutual consent the allocation of supplies on a fair and equitable basis, subject also to any applicable law, export controls, any government supply obligations, or supply obligations included in any agreement reached with a third-party funding organization.

Under the Pfizer Corona Agreement, we granted to Pfizer an exclusive, sublicensable license in the Pfizer Territory under certain of our intellectual property, including our patents and know-how, relating to uridine RNA, modified RNA and replicons in the Pfizer Corona Field as well as certain intellectual property in-licensed by us from third parties, to use, research, develop, manufacture, commercialize and otherwise exploit candidates and products selected under the Pfizer Corona Agreement. We undertake to maintain in full effect all intellectual property licenses held by us at the time we entered into the agreement and not to modify or amend any such license in a manner that would adversely affect any of the rights granted to Pfizer under the Pfizer Corona Agreement. We are obligated to notify Pfizer of any breach of our current licenses and may be obligated to take steps to maintain Pfizer’s access to any intellectual property licensed under such licenses.

During the term of the Pfizer Corona Agreement and a certain period thereafter, we and Pfizer have committed not to research, develop, manufacture, commercialize or otherwise exploit immunogenic compositions comprising RNA in the Pfizer Corona Field, or exploit vaccine candidates or products developed under the agreement for any use, other than pursuant to the Pfizer Corona Agreement, provided, however, that Pfizer shall have the right to work as a contract manufacturer for a third party and Pfizer shall not be precluded from acquiring a third party, or being acquired by a third party, that at the time of acquisition is active in the development or commercialization of an immunogenic composition comprising mRNA in the Pfizer Corona Field.

On April 9, 2020, Pfizer also subscribed for \$113 million of our ordinary shares under a separate investment agreement. In addition, under the Pfizer Corona Agreement, Pfizer made an upfront payment of \$72 million and agreed to make potential payments of up to \$563 million upon the achievement of specified regulatory and commercial milestones. We and Pfizer agreed to share development costs equally. However, Pfizer will fund 100 percent of the development costs, and we will repay Pfizer its 50 percent share of these costs as a deduction from the milestones and other payments we would otherwise be due to receive under the Pfizer Corona Agreement, or as a lump sum in the case we are acquired by certain entities or if Pfizer terminates the agreement for cause. Subject to this repayment obligation, we and Pfizer will share the cost of and profits from commercializing a vaccine evenly.

The Pfizer Corona Agreement ends on the later of (i) the completion of all development and manufacturing obligation of the parties and (ii) termination or expiry of a separately executed Commercialization Agreement, or, if the parties do not enter into such agreement, Pfizer ceases to commercialize vaccine products pursuant to the binding term sheet. In addition to termination rights granted to each party in the case of the other party's uncured material breach, Pfizer may terminate the agreement (i) upon our insolvency or (ii) for convenience and with or without reason at any time after the six-month anniversary of the commencement date upon 180 days' prior written notice.

### ***Pfizer-Influenza Collaboration***

On July 20, 2018, we and BioNTech RNA entered into a Research Collaboration and License Agreement with Pfizer, or the Pfizer Agreement, for the research, development and Pfizer's commercialization of immunogenic compositions comprising modified RNA and/or replicon technology for prophylaxis against influenza in humans, which we refer to as the Pfizer Agreement Field.

We and Pfizer agreed to collaborate on the research in the Pfizer Agreement Field for an initial period of three years. The details of such research were set forth in a research plan that is governed by a joint steering committee, with Pfizer holding the final decision-making right. Each party will bear its own costs under the research plan. The research term will be extended automatically by a reasonable amount of time if the activities or deliverables under the research plan are delayed due to our material breach of our research obligations under the research plan. In addition, Pfizer may unilaterally extend the research term by up to a year by making an additional payment to us.

After the research term expires, Pfizer has the sole responsibility, authority and control of the development, manufacturing and commercialization of all candidates and products. Pfizer undertakes to use commercially reasonable efforts to seek regulatory approval for one product in the United States and in two countries out of France, Germany, Italy, Spain, the United Kingdom and Japan, and to commercialize such product in such countries where such product has received regulatory approval.

Under the Pfizer Agreement, we grant to Pfizer an exclusive, worldwide, sublicensable license under certain of our intellectual property, including our patents and know-how, relating to replicons and modified RNA in the Pfizer Agreement Field as well as certain intellectual property in-licensed by us from third parties, to use, research, develop, manufacture, commercialize and otherwise exploit candidates and products selected under the Pfizer Agreement. We also grant to Pfizer a non-exclusive, royalty-free, sublicensable license under all intellectual property controlled by us or our affiliates to use, develop, manufacture, commercialize and otherwise exploit candidates and products selected under the Pfizer Agreement in the Pfizer Agreement Field. We undertake to maintain in full effect all intellectual property licenses held by us at the time we entered into the agreement and to not modify or amend any such license in a manner that would adversely affect any of the rights granted to Pfizer under the Pfizer Agreement. We are obligated to notify Pfizer of any breach of our current licenses and may be obligated to take steps to maintain Pfizer's access to any intellectual property licensed under such licenses.

We also granted Pfizer a right of first negotiation to acquire an exclusive worldwide license under certain intellectual property controlled by us for Pfizer to develop, manufacture and commercialize immunogenic products comprising RNA for prophylaxis against respiratory syncytial virus or human cytomegalovirus. The right of first negotiation may be exercised until the end of the research term.

In consideration of the rights granted to Pfizer under the agreement, Pfizer subscribed to shares in BioNTech AG under a separate investment agreement. In addition, under the Pfizer Agreement, Pfizer made an upfront payment of \$50 million and agreed to potential payments of up to \$325 million upon the achievement of specified development, regulatory and commercial milestones. Pfizer further agreed to a mid-single digit to very low double-digit tiered royalty on net sales if a product is commercialized. Royalties are subject to stacking

## [Table of Contents](#)

provisions. The obligation of Pfizer to pay royalties ends, on a country-by-country and a product-by-product, basis upon the later of (i) the expiration of the last valid licensed patent right covering such product category in such country, (ii) 10 years after the first commercial sale of a product of such product category in such country and (iii) the lapse of regulatory data exclusivity for the first product in such product category in such country. There are only two product categories: one for modified RNA and a second for replicon products.

During the term of the Pfizer Agreement, we have committed not to research, develop, manufacture, commercialize or otherwise exploit immunogenic compositions comprising RNA in the Pfizer Agreement Field other than pursuant to the Pfizer Agreement.

The Pfizer Agreement ends on a country-by-country basis upon expiration of the last royalty term for any product in that country. Thereafter, the licenses granted to Pfizer with respect to such product in such country will convert into a perpetual, exclusive, fully paid-up and royalty-free license. In addition to termination rights granted to each party in the case of the other party's uncured material breach, Pfizer may terminate the agreement, in whole or in part, for convenience and with or without reason at any time upon 60 days' prior written notice. In addition, Pfizer is entitled to terminate the agreement and initiate a technology transfer of certain intellectual property if one of its key competitors acquires control over us.

### ***Fosun-COVID-19 Collaboration***

On March 13, 2020, we entered into a Development and License Agreement with Shanghai Fosun Pharmaceutical Industrial Development, Co., Ltd, or Fosun Pharma, for the development and commercialization in People's Republic of China (including Hong Kong SAR, Macau SAR and Taiwan), or the Fosun Territory, of immunogenic compositions generated by BioNTech and comprising uridine RNA, modified RNA and/or replicon technology for prophylaxis against SARS-CoV-2 in humans. We refer to this agreement as the Fosun Agreement.

The details of the development activities to be undertaken by Fosun Pharma are to be set forth in a development plan that is overseen by a joint steering committee. Fosun Pharma's development activities are to be undertaken at its own cost and expense. Fosun Pharma is obligated to use commercially reasonable efforts to develop a vaccine candidate in accordance with the development plan with the goal to obtain regulatory approval for a vaccine candidate in the Fosun Territory in accordance with the timelines set forth in the development plan. Fosun Pharma has the sole responsibility to prepare, obtain and maintain regulatory approvals for the vaccine candidates in the Fosun Territory. We agreed to give Fosun Pharma reasonable assistance with the regulatory aspects of these activities.

Fosun Pharma has the sole responsibility, authority and control of the commercialization of a vaccine candidate in the Fosun Territory, but must use commercially reasonable efforts to do so in accordance with an agreed commercialization plan, including by launching a vaccine product in the Fosun Territory within three months after receiving marketing approval for it, provided sufficient quantities of the vaccine have been delivered.

We retain the sole right to manufacture (or have manufactured) and supply any vaccine candidates and products for development purposes and commercial sale in the Fosun Territory. We agreed to manufacture and supply all quantities of vaccine from a GMP-certified RNA manufacturing facility. As compensation for supply of the vaccine Fosun Pharma will reimburse us our manufacturing costs plus an administrative fee that is between 10 and 19 percent.

Under the Fosun Agreement, we granted to Fosun Pharma an exclusive license under certain of our owned or in-licensed intellectual property, including our patents relating to replicons, uridine RNA and modified RNA and other mRNA technology or a vaccine to use, develop, commercialize and otherwise exploit the vaccine candidates in the Fosun Territory. In the event of any failure of the development of a vaccine, we agreed to grant

## [Table of Contents](#)

Fosun Pharma a right of first negotiation on a separate competent vaccine for the prophylaxis of COVID-19 in the Fosun Territory.

In consideration of the rights granted to Fosun Pharma under the Fosun Agreement, Fosun Pharma subscribed for \$50 million of our ordinary shares under a separate investment agreement. In addition, under the Fosun Agreement, Fosun Pharma made an upfront payment of \$1 million and agreed to potential payments of up to \$14 million upon the achievement of specified development and regulatory milestones and up to \$70 million upon the achievement of specified sales milestones. Fosun Pharma further agreed to pay us a royalty rate that is between 30 and 39 percent of its profits on net sales of a vaccine product, if approved, for a period of 15 years from launch of that vaccine in the Fosun Territory.

The Fosun Agreement ends upon expiration of the royalty term. Fosun Pharma may elect to continue to pay royalties and extend the agreement and its rights thereunder. In addition to termination rights granted to each party in the case of the other party's uncured material breach or insolvency, Fosun Pharma may terminate the agreement, in whole, for convenience and with or without reason at any time upon 180 days' prior written notice. If the agreement is terminated by Fosun Pharma for cause, the licenses to Fosun Pharma survive, we will manufacture and deliver the vaccine candidate or product for one year and we will grant a non-exclusive license to a reasonably acceptable contract manufacturing organization for manufacturing of the vaccine candidate or product thereafter for development and commercialization by Fosun Pharma in the Fosun Territory.

During the term of the Fosun Agreement, we have committed not to, and not to license the licensed intellectual property to any third party to, develop or commercialize the same vaccine candidate or vaccine in the Fosun Territory.

### ***Bill & Melinda Gates Foundation-HIV and Tuberculosis Collaboration***

On August 30, 2019, we entered into a letter agreement and an investment agreement with the Bill & Melinda Gates Foundation, or BMGF, pursuant to which BMGF acquired 3,038,674 of our ordinary shares for \$55 million at the price of our Series B financing. The primary purpose of BMGF's investment is to further its charitable purposes, and the investment will be utilized to advance the development of products for the prevention and/or treatment of HIV and tuberculosis, or TB. About one-third of the investment will be used to help fund our infrastructure build-out; this expansion of the company's infectious disease capabilities is necessary to enable us to conduct BMGF projects.

In addition to the HIV and TB projects, BMGF has the right to initiate up to three additional projects focused on infectious diseases (from a list of mutually agreed upon diseases) within the first five years of the partnership. BMGF may also continue to fund certain projects beyond initial funding agreements. These additional activities may be funded through grants from BMGF of up to \$45 million. We must accept funding for the HIV and TB projects until the occurrence of defined event stamps and for the additional projects until the eighth anniversary of the closing of the investment. The event stamps involve the completion of Phase 1 safety and immunogenicity studies in healthy and/or infected individuals showing specific results.

If we elect not to proceed with any project following achievement of the event stamps, a new partner may further develop the project and manufacture any resulting products. Such partner will be identified through a series of defined steps and a technology transfer would take place. If a suitable manufacturing partner is not identified, we must manufacture the clinical and commercial supply of any product until a partner is identified. Such manufacturing may require us to increase our manufacturing capacities, which may be funded by BMGF. We retain the right to manufacture at any time.

The primary objective of BMGF is to provide funding to accelerate the development of lifesaving, low-cost drugs to reduce the burden of diseases in developing countries. This objective is known as global access commitments, or GAC. The projects in this partnership are separate and distinct from our current proprietary and

## [Table of Contents](#)

partnered product candidates; all BMGF programs, however, will utilize our proprietary technology platforms. We retain rights for commercialization of products in the developed world. We can also independently develop any of the project results under new proprietary projects. The results which are funded under this partnership are always accessible by BMGF and are subject to GAC.

We have granted a non-exclusive, perpetual, royalty-free license (with limited rights to sub-license) to our platform technology that is specifically used in the defined projects for the purpose of benefiting people in developing countries. This license is known as the global health license and only becomes exercisable upon the occurrence of a charitability default (as detailed below) or if we become insolvent. BMGF has granted us a de-blocking license to ensure freedom to operate of our platform technology. We will negotiate in good faith to expand the geographic scope of the global health license to include developed countries if requested by the new partner.

The objective is to generate products that are affordable and accessible for the developing world. The final price, however, will not fall below our full costs of manufacturing the product.

We are required to publish, in accordance with certain “open access” terms and conditions, results and information developed under the projects.

BMGF has a right to withdraw from its investment in certain specified circumstances, including if we become insolvent or in the event of a charitability default, namely material breach of the GAC or breach of other specified requirements in the agreement. If we do not cure the charitability default within a specified period of time (if curable), we must repurchase all of the shares held by BMGF, to the extent consistent with applicable law, if we have sufficient free reserves and available liquidity, or we must locate a third-party purchaser of those shares. If we are not able to repurchase the shares or find a third-party purchaser, we must use our best efforts to effect BMGF’s withdrawal right as soon as practicable, which may mean acquiring the shares in tranches over time. To the extent permitted by law, we must compensate BMGF for any shortfall if the price achieved on a sale to a third party is lower than its initial investment. During the period before a charitability default occurs, we can pay dividends on our shares, provided that our cash reserves exceed the price per share paid by BMGF times the number of shares BMGF holds (which is initially \$55 million), and to the extent permitted by law, we must contribute annual profits of that amount to the cash reserves. After a charitability default has occurred and until the withdrawal right has been satisfied in full, we may only pay dividends in excess of the aggregate minimum purchase price if BMGF has not exercised any option to require us to repurchase any remaining shares held by them. For any purchase resulting from a charitability default, the aggregate minimum purchase price of BMGF’s shares will be valued at the greater of the original purchase price of the shares or the fair market value of such shares.

The term of the letter agreement continues in perpetuity.

### ***Genevant-Rare Disease Protein Replacement Therapy Strategic Collaboration***

In July 2018, our wholly owned subsidiary BioNTech RNA Pharmaceuticals GmbH, or BioNTech RNA, entered into a license and co-development agreement with Genevant Sciences GmbH, or Genevant for the joint development of certain pharmaceutical products and the licensing of specified rights to Genevant’s lipid nanoparticle delivery technology to BioNTech RNA. We refer to this agreement as the Genevant Agreement.

Under the Genevant Agreement, BioNTech RNA and Genevant have agreed to collaborate to develop pharmaceutical products that contain any of five mRNA payloads created by BioNTech RNA encapsulated within a Genevant (or, if the parties agree, a third party) LNP, or the Co-Development Products, for the treatment, prevention and diagnosis of liver diseases, excluding any oncology diseases, or the Co-Development Field. Each party granted to the other party a worldwide, co-exclusive license or sublicense, with limited sublicensing rights, under certain of its patents and know-how to research, develop, make, have made, use,

## [Table of Contents](#)

distribute, sell, offer for sale, have sold, import, export and otherwise commercialize the Co-Development Products in the Co-Development Field as provided in development and commercialization plans approved by a joint steering committee and subject to certain restrictions under the Genevant Agreement.

In addition, BioNTech RNA obtained an exclusive, worldwide, royalty-bearing license or sublicense under Genevant's LNP delivery technology to research, develop, make, have made, use, distribute, sell, offer for sale, have sold, import, export and otherwise commercialize pharmaceutical products containing BioNTech mRNA payloads encapsulated within an LNP, or the BioNTech Products, for the treatment, prevention and diagnosis of illnesses in the field of oncology, or the BioNTech Field.

Each party retained certain rights to practice its intellectual property for all purposes outside of the Co-Development Field or in the Co-Development Field with any product that is not a Co-Development Product, subject to the next sentence as to BioNTech. During the term of the Genevant Agreement for each Co-Development Product or BioNTech Product, BioNTech RNA has agreed not to conduct or enable any clinical development, promotion or commercialization of any product involving the use of LNP with the BioNTech mRNA payload contained in the Co-Development Product or BioNTech Product other than in collaboration with Genevant pursuant to the Genevant Agreement. Genevant has also retained rights to practice its intellectual property for all purposes outside the BioNTech Field, or in the BioNTech Field with any product that is not a BioNTech Product.

The parties are jointly responsible for the development of, and must use commercially reasonable efforts to develop, the Co-Development Products in accordance with a development plan approved by a joint steering committee. Genevant is responsible for the preclinical, clinical and commercial manufacture of the Co-Development Products, and BioNTech RNA is obligated to supply the mRNA payloads for use in manufactured Co-Development Products. The parties share equally all costs for the development of Co-Development Products as well as any profits and losses. For each Co-Development Product, one or the other party will take the lead responsibility for commercialization of the Co-Development Product in the Co-Development Field. Each party must use commercially reasonable efforts to perform the commercialization activities allocated to it in a commercialization plan approved by a joint steering committee.

Each party may opt-out of the co-development of any Co-Development Product with 90 days' prior notice at any time after the filing of an IND or equivalent for the Co-Development Product. In such event, the other party may continue the development of the Co-Development Product on its own, at its sole cost and expense apart from specified obligations to support manufacturing and any ongoing clinical studies, but has to pay to the party that opted out pre-defined regulatory and sales milestones for the Co-Development Product of up to a low nine figure U.S. dollar amount in the aggregate and tiered low to mid-single digit percentage royalties on aggregate net sales of the Co-Development Product. In the event that a party opts out of the co-development of any Co-Development Product, the license granted by the party opting out to the other party shall become exclusive licenses, even as to the opting out party.

BioNTech RNA is solely responsible for the development and commercialization of the BioNTech Products, including the performance of preclinical and clinical trials, all regulatory activities, and marketing and sales, and bears all related costs. BioNTech RNA must use commercially reasonable efforts to develop and obtain regulatory approval for BioNTech Products in the BioNTech Field in the United States, Germany, United Kingdom, France, Spain and Italy. Genevant is responsible for the manufacturing of the BioNTech Products, and the details of such manufacturing are to be agreed in a separate manufacturing and supply agreement. BioNTech RNA is obligated to pay regulatory and sales milestone payments on each BioNTech Product, and royalties based on aggregate net sales of all BioNTech Products, to Genevant.

The Genevant Agreement continues until later of (i) the expiration of the last-to-expire royalty term for any BioNTech Product worldwide and (ii) the date on which all Co-Development Products cease being developed or commercialized. BioNTech RNA may terminate the agreement for convenience with respect to one or more

## [Table of Contents](#)

BioNTech Products at any time with 90 or 180 days' prior notice, depending on whether regulatory approval has been granted. The Genevant Agreement grants each party termination rights: if the other party challenges the validity, enforceability or scope of any patents licensed to it under the Genevant Agreement; for uncured material breaches of the other party; for the other party's insolvency; or if the other party undergoes a change of control through which it is controlled by a competitor, if specified by the parties at the time of the Genevant Agreement, before the earlier of July 4, 2021 or when the other party undergoes an initial public offering.

Under certain scenarios, if BioNTech RNA terminates the Genevant Agreement with respect to a particular BioNTech Product, before granting a license to a third party for the BioNTech mRNA payload included in the BioNTech Product, Genevant has the right of negotiation with BioNTech. Under certain scenarios, if Genevant terminates the Genevant Agreement, Genevant keeps all licenses and have certain rights, but not the obligation, to continue the development and commercialization of Co-Development Products, and BioNTech RNA has certain obligations to provide assistance, documentation, and certain know-how and inventions to enable Genevant's continued development and commercialization of Co-Development Products.

### **XV. Government Regulation**

Government authorities in the United States, at the federal, state and local levels, and in the European Union and other countries and jurisdictions, extensively regulate, among other things, the research, development, testing, manufacture, quality control, approval, packaging, storage, record-keeping, labeling, advertising, promotion, distribution, marketing, post-approval monitoring and reporting and import and export of pharmaceutical products, including biological products. In addition, some jurisdictions regulate the pricing of pharmaceutical products. The processes for obtaining marketing approvals in the United States and in foreign countries and jurisdictions, along with subsequent compliance with applicable statutes and regulations and other requirements of regulatory authorities, require the expenditure of substantial time and financial resources.

#### ***Regulation and Procedures Governing Approval of Drug and Biological Products in the United States***

In the United States, the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act, or the FDCA, and its implementing regulations and biologics under the FDCA, the Public Health Service Act, or the PHSA, and their implementing regulations. Both drugs and biologics also are subject to other federal, state and local statutes and regulations. The process of obtaining regulatory approvals and the subsequent compliance with applicable federal, state and local statutes and regulations requires the expenditure of substantial time and financial resources. Failure to comply with the applicable U.S. requirements at any time during the product development process, approval process or following approval may subject a sponsor to administrative or judicial sanctions. These sanctions could include, among other actions, the FDA's refusal to approve pending applications, withdrawal of an approval, license revocation, clinical hold, untitled or warning letters, voluntary or mandatory product recalls, market withdrawals, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement and civil or criminal penalties. Any agency or judicial enforcement action could have a material adverse effect on us.

A sponsor seeking approval to market and distribute a new drug or biological product in the United States generally must satisfactorily complete each of the following steps:

- preclinical laboratory tests, animal studies and formulation studies all performed in accordance with applicable regulations, including the FDA's good laboratory practices, or GLP, regulations;
- submission to the FDA of an IND application for human clinical testing, which must become effective before human clinical trials may begin;
- approval by the IRB representing each clinical site before each clinical trial may be initiated;
- performance of adequate and well-controlled human clinical trials to establish the safety, potency and purity of the product candidate for each proposed indication, in accordance applicable regulations, including with GCP, regulations;

## [Table of Contents](#)

- preparation and submission to the FDA of a NDA for a drug product, or a BLA for a biological product requesting marketing approval for one or more proposed indications, including submission of detailed information on the manufacture and composition of the product in clinical development, evidence of safety, purity and potency from preclinical testing and clinical trials, and proposed labeling;
- review of the product by an FDA advisory committee, if applicable;
- satisfactory completion of one or more FDA inspections of the manufacturing facility or facilities, including those of third parties, at which the product, or components thereof, are produced to assess compliance with current GMP requirements and to assure that the facilities, methods and controls are adequate to preserve the product's identity, strength, quality and purity;
- satisfactory completion of any FDA audits of the clinical study sites to assure compliance with GCPs, and the integrity of clinical data in support of the NDA or BLA;
- payment of user fees and securing FDA approval of the NDA or BLA; and
- compliance with any post-approval requirements, including the potential requirement to implement a REMS and to conduct any post-approval studies required by the FDA.

The preclinical and clinical testing and approval process requires substantial time, effort and financial resources, and we cannot be certain that any approvals for our investigational medicines and any future investigational medicines will be granted on a timely basis, or at all.

### *Preclinical Studies and Investigational New Drug Application*

Before testing any drug or biological product candidate in humans, the product candidate must undergo preclinical testing. Preclinical tests include laboratory evaluations of product chemistry, formulation and stability, as well as animal studies to evaluate the potential for activity and toxicity. The conduct of the preclinical tests and formulation of the compounds for testing must comply with federal regulations and requirements. The results of the preclinical tests, together with manufacturing information, analytical data, any available clinical data or literature and a proposed clinical protocol, are submitted to the FDA as part of an IND application. The IND automatically becomes effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions about the product or conduct of the proposed clinical trial, including concerns that human research subjects will be exposed to unreasonable health risks, and places the trial on a clinical hold. In that case, the IND sponsor and the FDA must resolve any outstanding FDA concerns before the clinical trial can begin.

As a result, submission of the IND may result in the FDA not allowing the trial to commence or not be conducted on the terms originally specified by the sponsor in the IND. If the FDA raises concerns or questions either during this initial 30-day period, or at any time during the IND process, it may choose to impose a partial or complete clinical hold. If the FDA imposes a clinical hold, trials may not recommence without FDA authorization and then only under terms authorized by the FDA. A clinical hold issued by the FDA may therefore delay either a proposed clinical study or cause suspension of an ongoing study, until all outstanding concerns have been adequately addressed and the FDA has notified the company that investigation may proceed. This could cause significant difficulties in completing planned clinical trials in a timely manner.

The FDA may impose clinical holds on a biological product candidate at any time before or during clinical trials due to safety concerns or non-compliance.

### *Human Clinical Trials in Support of an NDA or a BLA*

Clinical trials involve the administration of the investigational product candidate to healthy volunteers or patients with the disease to be treated under the supervision of qualified principal investigators, generally physicians not employed by or under the trial sponsor's control, in accordance with GCP requirements, which include the requirement that all research subjects provide their informed consent for their participation. Clinical

## [Table of Contents](#)

trials are conducted under study protocols detailing, among other things, the objectives of the study, inclusion and exclusion criteria, the parameters to be used in monitoring safety, dosing procedures and the effectiveness criteria to be evaluated. A protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND.

A sponsor who wishes to conduct a clinical trial outside the United States may, but need not, obtain FDA authorization to conduct the clinical trial under an IND. If a foreign clinical trial is not conducted under an IND, the sponsor may submit data from the clinical trial to the FDA in support of the NDA or BLA so long as the clinical trial is well-designed and well-conducted in accordance with GCP, including review and approval by an independent ethics committee, and the FDA is able to validate the study data through an onsite inspection, if necessary.

Further, each clinical trial must be reviewed and approved by an IRB either centrally or individually at each institution at which the clinical trial will be conducted. The IRB will consider, among other things, clinical trial design, patient informed consent, ethical factors and the safety of human subjects. An IRB must operate in compliance with FDA regulations. The FDA, IRB, or the clinical trial sponsor may suspend or discontinue a clinical trial at any time for various reasons, including a finding that the clinical trial is not being conducted in accordance with FDA requirements or that the subjects or patients are being exposed to an unacceptable health risk. Clinical testing also must satisfy extensive GCP rules and the requirements for informed consent. The IRB also approves the form and content of the informed consent that must be signed by each clinical trial subject or his or her legal representative and must monitor the clinical trial until completed. Additionally, some clinical trials are overseen by an independent group of qualified experts organized by the clinical trial sponsor, known as a data safety monitoring board or committee, or DSMB. This group may recommend continuation of the study as planned, changes in study conduct, or cessation of the study at designated check points based on access to certain data from the study.

Clinical trials typically are conducted in three sequential phases, but the phases may overlap or be combined. Additional studies may be required after approval.

- Phase 1 clinical trials (or Phase 1) are initially conducted in a limited population to test the product candidate for safety, including adverse effects, dose tolerance, absorption, metabolism, distribution, excretion and pharmacodynamics in healthy humans or, on occasion, in patients, such as in the case of some products for severe or life-threatening diseases, especially when the product may be too inherently toxic to ethically administer to healthy volunteers.
- Phase 2 clinical trials (or Phase 2) are generally conducted in a limited patient population to identify possible adverse effects and safety risks, preliminarily evaluate the efficacy of the product candidate for specific targeted indications and determine dose tolerance and optimal dosage. Multiple Phase 2 clinical trials may be conducted by the sponsor to obtain information prior to beginning larger Phase 3 clinical trials. When a drug is intended to treat life-threatening or severely debilitating illnesses, the FDA may accept well-controlled Phase 2 clinical trials as adequate to provide sufficient data on the drug's safety and effectiveness to support a decision on its approvability for marketing, in which case Phase 3 clinical trials would not be required.
- Phase 3 clinical trials (or Phase 3) proceed if the Phase 2 clinical trials demonstrate that a certain dose or dose range of the product candidate is potentially effective and has an acceptable safety profile. Phase 3 clinical trials are undertaken within an expanded patient population, often at geographically dispersed clinical trial sites, to gather additional information about safety and effectiveness necessary to evaluate the overall benefit-risk relationship of the product and to provide an adequate basis for product labeling.

In some cases, the FDA may approve an NDA or a BLA for a product candidate but require the sponsor to conduct additional clinical trials to further assess the product candidate's safety and effectiveness after approval. Such post-approval trials are typically referred to as Phase 4 clinical trials (or Phase 4). These studies may be used to gain additional experience from the treatment of patients in the intended therapeutic indication and to

document a clinical benefit in the case of biologics approved under accelerated approval regulations. If the FDA approves a product while a company has ongoing clinical trials that were not necessary for approval, a company may be able to use the data from these clinical trials to meet all or part of any Phase 4 clinical trial requirement or to request a change in the product labeling. Failure to exhibit due diligence with regard to conducting required Phase 4 clinical trials could result in withdrawal of approval for products.

During all phases of clinical development, regulatory agencies require extensive monitoring and auditing of all clinical activities, clinical data and clinical trial investigators. Annual progress reports detailing the results of the clinical trials must be submitted to the FDA. Written IND safety reports must be promptly submitted to the FDA and the investigators for serious and unexpected adverse events, any findings from other trials, tests in laboratory animals or *in vitro* testing that suggest a significant risk for human subjects, or any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. The sponsor must submit an IND safety report within 15 calendar days after the sponsor determines that the information qualifies for reporting. The sponsor also must notify the FDA of any unexpected fatal or life-threatening suspected adverse reaction within seven calendar days after the sponsor's initial receipt of the information. The FDA or the sponsor or its DSMB may suspend a clinical trial at any time on various grounds, including a finding that the research subjects or patients are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the new drug candidate or biological product candidate has been associated with unexpected serious harm to patients.

There are also requirements governing the reporting of ongoing clinical trials and completed clinical trial results to public registries. Sponsors of clinical trials of FDA-regulated products, including biologics, are required to register and disclose certain clinical trial information, which is publicly available at [www.clinicaltrials.gov](http://www.clinicaltrials.gov). Information related to the product, patient population, phase of investigation, trial sites and investigators, and other aspects of the clinical trial is then made public as part of the registration. Sponsors are also obligated to discuss the results of their clinical trials after completion. Disclosure of the results of these trials can be delayed until the new product or new indication being studied has been approved.

### *Compliance with GMP Requirements*

Before approving an NDA or a BLA, the FDA typically will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in full compliance with GMP requirements and adequate to assure consistent production of the product within required specifications. Among other things, the sponsor must develop methods for testing the identity, strength, quality, potency and purity of the final drug or biological product. Additionally, appropriate packaging must be selected and tested and stability studies must be conducted to demonstrate that the drug or biological product does not undergo unacceptable deterioration over its shelf life. In particular, the PHSA emphasizes the importance of manufacturing control for products like biologics whose attributes cannot be precisely defined.

Manufacturers and others involved in the manufacture and distribution of drugs and biological products must also register their establishments with the FDA and certain state agencies. Both domestic and foreign manufacturing establishments must register and provide additional information to the FDA upon their initial participation in the manufacturing process.

The manufacturing facilities may be subject to periodic unannounced inspections by government authorities to ensure compliance with GMPs and other laws. Manufacturers may have to provide, on request, electronic or physical records regarding their establishments. Delaying, denying, limiting or refusing inspection by the FDA may lead to a product being deemed to be adulterated.

*Review and Approval of an NDA or a BLA*

The results of product candidate development, preclinical testing and clinical trials, including negative or ambiguous results as well as positive findings, are submitted to the FDA as part of an NDA or a BLA requesting a license to market the product. These applications must contain extensive manufacturing information and detailed information on the composition of the product and proposed labeling. The FDA adjusts the Prescription Drug User Fee Act, or PDUFA, user fees on an annual basis. Fee waivers or reductions are available in certain circumstances, including a waiver of the application fee for the first application filed by a small business. Additionally, no user fees are assessed on NDAs or BLAs for products designated as orphan drugs, unless the product also includes a non-orphan indication.

The FDA has 60 days after submission of the application to conduct an initial review to determine whether the NDA or BLA is sufficient to accept for filing based on the agency's threshold determination that it is substantially complete so as to permit substantive review. Once the submission has been accepted for filing, the FDA begins an in-depth review of the application. Under the goals and policies agreed to by the FDA under PDUFA, the FDA aims to complete its initial review of a standard application and respond to the sponsor within ten months of the 60-day filing date, and for a priority review application within six months. The FDA does not always meet its PDUFA goal dates for standard and priority NDA or BLA applications, and its review goals are subject to change from time to time. The review process may often be significantly extended by FDA requests for additional information or clarification. The review process and the PDUFA goal date may also be extended by three months if the FDA requests or if the sponsor otherwise provides additional information or clarification regarding information already provided in the submission within the last three months before the PDUFA goal date.

The FDA reviews NDA and BLA applications to determine, among other things, whether the proposed product is safe and potent, or effective, for its intended use, and has an acceptable purity profile, and whether the product is being manufactured in accordance with GMP requirements to assure and preserve the product's identity, safety, strength, quality, potency and purity. On the basis of the FDA's evaluation of the application and accompanying information, including the results of the inspection of the manufacturing facilities and any FDA audits of clinical trial sites to assure compliance with GCPs, the FDA may issue an approval letter, denial letter or complete response letter. An approval letter authorizes commercial marketing of the product with specific prescribing information for specific indications. Under the FDCA, the FDA may approve an NDA if it determines that the product is safe and effective for its intended use, the benefits of the drug outweigh any risks, and the methods used in manufacturing the drug and the controls used to maintain the drug's quality are adequate to preserve the drug's identity, strength, quality and purity. Under the PHSA, the FDA may approve a BLA if it determines that the product is safe, pure and potent and the facility where the product will be manufactured meets standards designed to ensure that it continues to be safe, pure and potent. If the application is not approved, the FDA may issue a complete response letter, which will contain the conditions that must be met in order to secure final approval of the application, and when possible will outline recommended actions the sponsor might take to obtain approval of the application. If a complete response letter is issued, the sponsor may either resubmit the NDA or BLA, addressing all of the deficiencies identified in the letter, or withdraw the application.

Sponsors that receive a complete response letter who elect to address the deficiencies may submit to the FDA information that represents a complete response to the issues identified by the FDA in the response letter. Such resubmissions are classified under PDUFA as either Class 1 or Class 2, based on the information submitted by a sponsor in response to an action letter. Under the goals and policies agreed to by the FDA under PDUFA, the FDA aims to review and act on a Class 1 resubmission with two months of receipt and, with respect to a Class 2 resubmission, within six months of receipt. The FDA will not approve an application until issues identified in the complete response letter have been addressed.

The FDA may also refer the application to an Advisory Committee for review, evaluation and recommendation as to whether the application should be approved and under what conditions. In particular, the

## [Table of Contents](#)

FDA may refer applications for novel drug or biological products or drug or biological products that present difficult questions of safety or efficacy to an advisory committee. Typically, an Advisory Committee is a panel of independent experts, including clinicians and other scientific experts. The FDA is not bound by the recommendations of an Advisory Committee, but it considers such recommendations carefully when making decisions.

If the FDA approves a new product, it may limit the approved indications for use of the product, or limit the approval to specific dosages. It may also require that certain contraindications, warnings or precautions be included in the product labeling. In addition, the FDA may call for post-approval studies, including Phase 4 clinical trials, to further assess the product's safety after approval. The agency may also require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution restrictions or other risk management mechanisms, including risk evaluation and mitigation strategies, or REMS, to help ensure that the benefits of the product outweigh the potential risks. REMS can include medication guides, communication plans for healthcare professionals, and elements to assure safe use, or ETASU. ETASU can include, but are not limited to, special training or certification for prescribing or dispensing, dispensing only under certain circumstances, special monitoring and the use of patent registries. If the FDA concludes a REMS is needed, the sponsor of the NDA or BLA must submit a proposed REMS; the FDA will not approve the NDA or BLA without a REMS, if required. The FDA may prevent or limit further marketing of a product based on the results of post-marketing studies or surveillance programs. After approval, many types of changes to the approved product, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further testing requirements and FDA review and approval.

### *Fast Track, Breakthrough Therapy and Priority Review Designations*

The FDA may designate certain products for expedited review if they are intended to address an unmet medical need in the treatment of a serious or life-threatening disease or condition. These programs include fast track designation, breakthrough therapy designation and priority review designation.

The FDA may designate a product for fast track review if it is intended, whether alone or in combination with one or more other products, for the treatment of a serious or life-threatening disease or condition, and it demonstrates the potential to address unmet medical needs for such disease or condition. Fast track designation applies to the combination of the product and the specific indication for which it is being studied. The sponsor of a new drug or biologic may request that the FDA designate the drug or biologic as a fast track product at any time during the clinical development of the product. For fast track products, sponsors may have greater interactions with the FDA and the FDA may initiate review of sections of a fast track product's application before the application is complete. This rolling review may be available if the FDA determines, after preliminary evaluation of clinical data submitted by the sponsor, that a fast track product may be effective. The sponsor must also provide, and the FDA must approve, a schedule for the submission of the remaining information and the sponsor must pay applicable user fees. However, the FDA's time period goal for reviewing a fast track application does not begin until the last section of the application is submitted. Fast track designation may be withdrawn by the FDA if the FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

In 2012, Congress enacted the Food and Drug Administration Safety and Innovation Act, or the FDASIA. This law established a new regulatory scheme allowing for expedited review of products designated as "breakthrough therapies." A product may be designated as a breakthrough therapy if it is intended, either alone or in combination with one or more other products, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. The FDA may take certain actions with respect to breakthrough therapies, including holding meetings with the sponsor throughout the development process; providing timely advice to the product sponsor regarding development and approval; involving more senior staff in the review process; assigning a

cross-disciplinary project lead for the review team; and taking other steps to facilitate the design of clinical trials in an efficient manner.

The FDA may designate a product for priority review if it is a product that treats a serious condition and, if approved, would provide a significant improvement in safety or effectiveness. The FDA determines, on a case-by-case basis, whether the proposed product represents a significant improvement when compared with other available therapies. Significant improvement may be illustrated by evidence of increased effectiveness in the treatment of a condition, elimination or substantial reduction of a treatment-limiting product reaction, documented enhancement of patient compliance that may lead to improvement in serious outcomes and evidence of safety and effectiveness in a new subpopulation. A priority designation is intended to direct overall attention and resources to the evaluation of such applications, and to shorten the FDA's goal for taking action on a marketing application to six months (compared to 10 months under standard review).

Fast track designation, priority review and breakthrough therapy designation may expedite the development or approval process, but do not change the standards for approval.

#### *Accelerated Approval Pathway*

The FDA may grant accelerated approval to a product for a serious or life-threatening condition that provides meaningful therapeutic advantage to patients over existing treatments based upon a determination that the product has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit. The FDA may also grant accelerated approval for such a condition when the product has an effect on an intermediate clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality, or IMM, and that is reasonably likely to predict an effect on IMM or other clinical benefit, taking into account the severity, rarity or prevalence of the condition and the availability or lack of alternative treatments. Products granted accelerated approval must meet the same statutory standards for safety and effectiveness as those granted traditional approval.

For the purposes of accelerated approval, a surrogate endpoint is a marker, such as a laboratory measurement, radiographic image, physical sign or other measure that is thought to predict clinical benefit, but is not itself a measure of clinical benefit. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. An intermediate clinical endpoint is a measurement of a therapeutic effect that is considered reasonably likely to predict the clinical benefit of a product, such as an effect on IMM. The FDA has stated that although it has limited experience with accelerated approvals based on intermediate clinical endpoints, such endpoints generally may support accelerated approval where the therapeutic effect measured by the endpoint is not itself a clinical benefit and basis for traditional approval, if there is a basis for concluding that the therapeutic effect is reasonably likely to predict the ultimate clinical benefit of a product.

The accelerated approval pathway is most often used in settings in which the course of a disease is long and an extended period of time is required to measure the intended clinical benefit of a product. Thus, accelerated approval has been used extensively in the development and approval of products for treatment of a variety of cancers in which the goal of therapy is generally to improve survival or decrease morbidity and the duration of the typical disease course requires lengthy and sometimes large trials to demonstrate a clinical or survival benefit.

The accelerated approval pathway is usually contingent on a sponsor's agreement to conduct, in a diligent manner, additional post-approval confirmatory studies to verify and describe the product's clinical benefit. As a result, a product candidate approved on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or to confirm a clinical benefit during post-marketing studies, may lead the FDA to withdraw the product from the market. All promotional materials for product candidates approved under accelerated regulations are subject to prior review by the FDA.

## [Table of Contents](#)

Accelerated approval pathways are available for regenerative medicine therapies that meet certain conditions. Regenerative medicine therapies include cell therapies (both allogenic and autologous), therapeutic tissue engineering products, human cell and tissue products, and combination products using any such therapies or products, except those regulated under section 361 of the PHS Act. Human gene therapies, including genetically modified cells, that lead to a sustained effect on cells or tissues, may also meet the definition of a regenerative medicine therapy, as may xenogeneic cell products.

Regenerative medicine therapies designed to treat, modify, reverse or cure serious conditions are eligible for FDA's expedited programs, including fast track designation, breakthrough therapy designation, priority review and accelerated approval, if they meet the criteria for such programs. They may also be eligible for Regenerative Medicine Advanced Therapy Designation, or RMAT designation.

An investigational drug is eligible for RMAT designation if it meets the definition of regenerative medicine therapy, it is intended to treat, modify, reverse or cure a serious condition, and preliminary clinical evidence indicates that the regenerative medicine therapy has the potential to address unmet medical needs for such condition. An unmet medical need is a condition whose treatment or diagnosis is not addressed adequately by available therapy.

RMAT designation confers all the benefits of the fast track and breakthrough therapy designation programs, including early actions with the FDA. The FDA reviews each application on a case-by-case basis to determine whether the clinical evidence is sufficient to support RMAT designation, considering factors such as the rigor of data collection, the consistency and persuasiveness of the outcomes, the number of patients or subjects, and the severity, rarity or prevalence of the condition, among other factors. The FDA may decline to grant RMAT designation if it finds the clinical evidence insufficient.

RMAT designation may expedite the development or approval process, but it does not change the standards for approval.

### *Emergency Use Authorizations*

The Secretary of Health and Human Services has the authority to authorize unapproved medical products, including vaccines, to be marketed in the context of an actual or potential emergency that has been designated by government officials. The COVID-19 pandemic has been designated such a national emergency. After an emergency has been announced, the Secretary of Health and Human Services may authorize the issuance of, and the FDA Commissioner may issue, Emergency Use Authorizations, or EUAs, for the use of specific products based on criteria established by statute, including that the product at issue may be effective in diagnosing, treating, or preventing serious or life-threatening diseases when there are no adequate, approved, and available alternatives. An EUA is subject to additional conditions and restrictions and is product-specific. An EUA terminates when the emergency determination underlying the EUA terminates. An EUA is not a long-term alternative to obtaining FDA approval, licensure, or clearance for a product. FDA may revoke an EUA where it is determined that the underlying health emergency no longer exists or warrants such authorization, so it is not possible to predict how long an EUA may remain in place.

### *Post-Approval Regulation*

If regulatory approval for marketing of a product or for a new indication for an existing product is obtained, the sponsor will be required to comply with rigorous and extensive post-approval regulatory requirements as well as any post-approval requirements that the FDA has imposed on the particular product as part of the approval process. The sponsor will be required, among other things, to report certain adverse reactions and production problems to the FDA, provide updated safety and efficacy information and comply with requirements concerning advertising and promotional labeling. Manufacturers and certain of their subcontractors are required to register their establishments with the FDA and certain state agencies, and are subject to periodic unannounced

## [Table of Contents](#)

inspections by the FDA and certain state agencies for compliance with ongoing regulatory requirements, including GMP regulations, which impose certain procedural and documentation requirements upon manufacturers. Accordingly, the BLA holder and its third-party manufacturers must continue to expend time, money and effort in the areas of production and quality control to maintain compliance with GMP regulations and other regulatory requirements. In addition, changes to the manufacturing process or facility generally require prior FDA approval before being implemented, and other types of changes to the approved product, such as adding new indications and additional labeling claims, are also subject to further FDA review and approval.

Once an approval is granted, the FDA may withdraw the approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information; imposition of post-market study requirements or clinical trial requirements to assess new safety risks; or imposition of distribution restrictions or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- fines, untitled letters or warning letters or holds on post-approval clinical trials;
- adverse publicity;
- refusal of the FDA to approve pending applications or supplements to approved applications, or suspension or revocation of product license approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions, fines, debarment, disgorgement of profits or the imposition of civil or criminal penalties.

The FDA strictly regulates marketing, labeling, advertising and promotion of products that are placed on the market. Pharmaceutical products may be promoted only for the approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant liability.

### *Orphan Drug Designation*

Orphan drug designation in the United States is designed to encourage sponsors to develop products intended for rare diseases or conditions. In the United States, a rare disease or condition is statutorily defined as a disease or condition that affects fewer than 200,000 individuals in the United States or that affects more than 200,000 individuals in the United States but for which there is no reasonable expectation that the cost of developing and making available the product for the disease or condition will be recovered from sales of the product in the United States.

Orphan drug designation qualifies a company for certain financial incentives, including tax advantages and, if the product receives the first FDA approval for the indication for which it has orphan designation, market exclusivity for seven years following the date of the product's marketing approval. An application for designation as an orphan product can be made any time prior to the filing of an application for approval to market the product. Once a product receives orphan drug designation from the Office of Orphan Products Development at the FDA, the product must then go through the review and approval process like any other product.

In addition, a sponsor of a product that is otherwise the same product as an already approved orphan drug may seek and obtain orphan drug designation for the subsequent product for the same rare disease or condition if it can present a plausible hypothesis that its product may be clinically superior to the first product. More than one sponsor may receive orphan drug designation for the same product for the same rare disease or condition, but each sponsor seeking orphan drug designation must file a complete request for designation.

The period of exclusivity begins on the date that the marketing application is approved by the FDA and applies only to the indication for which the product has been designated. The FDA may approve a second application for the same product for a different use or a second application for a clinically superior version of the product for the same use. The FDA cannot, however, approve the same product made by another manufacturer for the same indication during the market exclusivity period unless it has the consent of the sponsor, the manufacturer makes a showing of clinical superiority over the product with orphan exclusivity, or the sponsor is unable to provide sufficient quantities.

Orphan product designation does not convey any advantage in or shorten the duration of the regulatory review and approval process.

### *Pediatric Studies and Exclusivity*

Under the Pediatric Research Equity Act of 2003, an NDA or a BLA or supplement thereto must contain data that are adequate to assess the safety and effectiveness of the product for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. Sponsors who are planning to submit a marketing application for a drug or biological product that includes a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration must also submit pediatric study plans prior to the assessment data, and no later than 60 calendar days following an end-of-Phase 2 meeting with the FDA or, if there is no such meeting, as early as practicable before the initiation of the Phase 3 or Phase 2/3 study. Pediatric study plans must contain an outline of the proposed pediatric study or studies the sponsor plans to conduct, including study objectives and design, any deferral or waiver requests and other information required by regulation. The sponsor, the FDA, and the FDA's internal review committee must then review the information submitted, consult with each other and agree upon a final plan. The FDA or the sponsor may request an amendment to the plan at any time.

The FDA may, on its own initiative or at the request of the sponsor, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults, or full or partial waivers from the pediatric data requirements. Additional requirements and procedures relating to deferral requests and requests for extension of deferrals are contained in FDASIA. Unless otherwise required by regulation, the pediatric data requirements do not apply to products with orphan designation.

Pediatric exclusivity is another type of non-patent marketing exclusivity in the United States and, if granted, provides for the attachment of an additional six months of marketing protection to the term of any existing regulatory exclusivity, including the non-patent and orphan exclusivity. This six-month exclusivity may be granted if an NDA or a BLA sponsor submits pediatric data that fairly respond to a written request from the FDA for such data. The data do not need to show the product to be effective in the pediatric population studied; rather, if the clinical trial is deemed to fairly respond to the FDA's request, the additional protection is granted. If reports of requested pediatric studies are submitted to and accepted by the FDA within the statutory time limits, whatever statutory or regulatory periods of exclusivity or patent protection cover the product are extended by six months. This is not a patent term extension, but it effectively extends the regulatory period during which the FDA cannot approve another application.

### *Biosimilars and Reference Product Exclusivity*

The Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively, the ACA, signed into law in 2010, includes a subtitle called the Biologics Price Competition and Innovation Act of 2009, or the BPCIA, which created an abbreviated approval pathway for biological products that are biosimilar to or interchangeable with an FDA-approved reference biological product. To date, a number of biosimilars have been licensed under the BPCIA, and numerous biosimilars have been approved in Europe.

Under the BPCIA, an application for a biosimilar product may not be submitted to the FDA until four years following the date that the reference product was first licensed by the FDA. In addition, the approval of a biosimilar product may not be made effective by the FDA until 12 years from the date on which the reference product was first licensed. During this 12-year period of exclusivity, another company may still market a competing version of the reference product if the FDA approves a full BLA for the competing product containing that sponsor's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity and potency of its product. The BPCIA also created certain exclusivity periods for biosimilars approved as interchangeable products. At this juncture, it is unclear whether products deemed "interchangeable" by the FDA will, in fact, be readily substituted by pharmacies, which are governed by state pharmacy law.

The FDA has issued several guidance documents outlining an approach to review and approval of biosimilars. Biosimilarity, which requires that there be no clinically meaningful differences between the biological product and the reference product in terms of safety, purity and potency, can be shown through analytical studies, animal studies, and a clinical study or studies. Interchangeability requires that a product is biosimilar to the reference product and the product must demonstrate that it can be expected to produce the same clinical results as the reference product in any given patient and, for products that are administered multiple times to an individual, the biologic and the reference biologic may be alternated or switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic. Complexities associated with the larger, and often more complex, structures of biological products, as well as the processes by which such products are manufactured, pose significant hurdles to implementation of the abbreviated approval pathway that are still being worked out by the FDA.

The BPCIA is complex and continues to be interpreted and implemented by the FDA. In addition, recent government proposals have sought to reduce the 12-year reference product exclusivity period. Other aspects of the BPCIA, some of which may impact the BPCIA exclusivity provisions, have also been the subject of recent litigation. As a result, the ultimate implementation and impact of the BPCIA is subject to significant uncertainty.

### ***Regulation of Combination Products in the United States***

Certain products may be comprised of components that would normally be regulated under different types of regulatory authorities and frequently by different centers at the FDA. These products are known as combination products. Specifically, under regulations issued by the FDA, a combination product may be:

- A product comprised of two or more regulated components that are physically, chemically or otherwise combined or mixed and produced as a single entity;
- Two or more separate products packaged together in a single package or as a unit and comprised of drug and device products, device and biological products, or biological and drug products;
- A drug, or device or biological product packaged separately that according to its investigational plan or proposed labeling is intended for use only with an approved individually specified drug, device or biological product where both are required to achieve the intended use, indication or effect and where upon approval of the proposed product the labeling of the approved product would need to be changed, *e.g.*, to reflect a change in intended use, dosage form, strength, route of administration or significant change in dose; or
- Any investigational drug, device or biological product packaged separately that according to its proposed labeling is for use only with another individually specified investigational drug, device or biological product where both are required to achieve the intended use, indication or effect.

Under the FDCA, the FDA is charged with assigning a center with primary jurisdiction, or a lead center, for review of a combination product. That determination is based on the "primary mode of action" of the combination product. Thus, if the primary mode of action of a device-biologic combination product is attributable to the biological product, the FDA center responsible for premarket review of the biological product

would have primary jurisdiction for the combination product. The FDA has also established an Office of Combination Products to address issues surrounding combination products and provide more certainty to the regulatory review process. That office serves as a focal point for combination product issues for agency reviewers and industry. It is also responsible for developing guidance and regulations to clarify the regulation of combination products, and for assignment of the FDA center that has primary jurisdiction for review of combination products where the jurisdiction is unclear or in dispute.

In order to market any product outside of the United States, a company must also comply with numerous and varying regulatory requirements of other countries and jurisdictions regarding quality, safety and efficacy governing, among other things, clinical trials, marketing authorization, commercial sales and distribution of products. Whether or not it obtains FDA approval for a product, an applicant will need to obtain the necessary approvals by the comparable foreign regulatory authorities before it can initiate clinical trials or market and sell the product in those countries or jurisdictions.

### ***Regulation and Procedures Governing Approval of Medicinal Products in the European Union***

The process governing approval of medicinal products, including biological medicinal products and advanced therapy medicinal products, or ATMPs, which comprise gene therapy products, somatic cell therapy products and tissue-engineered products, in the European Union generally follows the same lines as in the United States. It entails satisfactory completion of pharmaceutical development, nonclinical and clinical studies to establish the safety and efficacy of the medicinal product for each proposed indication. Moreover, an applicant must also demonstrate the ability to manufacture the product to a suitable quality.

#### *Clinical Trial Approval*

Pursuant to the currently applicable Clinical Trials Directive 2001/20/EC and the Directive 2005/28/EC on GCP, a system for the approval of clinical trials in the European Union has been implemented through national legislation of the member states.

Clinical trials must be conducted in accordance with European Union and national regulations and the International Conference on Harmonization, or ICH, guidelines on GCP. Additional GCP guidelines from the European Commission, focusing in particular on traceability, apply to clinical trials of advanced therapy medicinal products. If the sponsor of the clinical trial is not established within the European Union, it must appoint an entity within the European Union to act as its legal representative.

Under this system, a sponsor must obtain approval from the competent national authority of a European Union member state in which the clinical trial is to be conducted or in multiple member states if the clinical trial is to be conducted in a number of member states. Furthermore, the sponsor may only start a clinical trial at a specific study site after the independent ethics committee has issued a favorable opinion. The clinical trial application must be accompanied by a copy of the trial protocol and an investigational medicinal product dossier with supporting information prescribed by Directive 2001/20/EC and Directive 2005/28/EC and corresponding national laws of the member states and further detailed in applicable guidance documents. Moreover, the sponsor must take out a clinical trial insurance policy, and in most European Union countries the sponsor is liable to provide 'no fault' compensation to any study subject injured in the clinical trial.

In April 2014, the European Union adopted a new Clinical Trials Regulation (EU) No 536/2014, which is set to replace the current Clinical Trials Directive 2001/20/EC. It is expected that the new Clinical Trials Regulation will apply at earliest in 2020. It will overhaul the current system of approvals for clinical trials in the European Union. Specifically, the new regulation, which will be directly applicable in all member states, aims to simplify and streamline the approval of clinical trials in the European Union. For instance, the new Clinical Trials Regulation provides for a streamlined application procedure using a single entry point and strictly defined deadlines for the assessment of clinical trial applications. This means that one national authority takes the lead in

reviewing the application and the other national authorities have only a limited involvement. Any substantial changes to the trial protocol or other information submitted with the clinical trial applications must be notified to or approved by the relevant competent authorities and ethics committees.

The sponsor of a clinical trial must register the clinical trial in advance, and information related to the product, patient population, phase of investigation, study sites and investigators, and other aspects of the clinical trial will be made public as part of the registration. The results of the clinical trial must be submitted to the competent authorities, and certain information from those results, with the exception of non-pediatric Phase 1 trials, will then be made public at the latest within 12 months after the end of the trial.

During the development of a medicinal product, the European Medicines Agency, or EMA, and national medicines regulators within the European Union provide the opportunity for dialogue and guidance on the development program. At the EMA level, this is usually done in the form of scientific advice, which is given by the Scientific Advice Working Party of the Committee for Medicinal Products for Human Use, or CHMP. A fee is incurred with each scientific advice procedure. Advice from the EMA is typically provided based on questions concerning, for example, quality (chemistry, manufacturing and controls testing), nonclinical testing and clinical studies, and pharmacovigilance plans and risk-management programs. Advice is not legally binding with regard to any future marketing authorization application of the product concerned.

### *Marketing Authorization*

To obtain a marketing authorization for a product under the European Union regulatory system, a sponsor must submit a marketing authorization application, or MAA, either under a centralized procedure administered by the EMA or one of the procedures administered by competent authorities in European Union member states (decentralized procedure, national procedure or mutual recognition procedure).

All application procedures require an application in the common technical document, or CTD, format, which includes the submission of detailed information about the manufacturing and quality of the product, and nonclinical and clinical trial information. There is an increasing trend in the European Union toward greater transparency and, while the manufacturing or quality information is currently generally protected as confidential information, the EMA and national regulatory authorities are now liable to disclose much of the nonclinical and clinical information in marketing authorization dossiers, including the full clinical study reports, in response to freedom of information requests after the marketing authorization has been granted. In October 2014, the EMA adopted a policy under which clinical study reports would be posted on the agency's website following the grant, denial or withdrawal of a MAA, subject to procedures for limited redactions and protection against unfair commercial use. A similar requirement is contained in the new Clinical Trials Regulation that is currently expected to take effect at earliest in 2020.

A marketing authorization may be granted only to a sponsor established in the European Union. Regulation (EC) No. 1901/2006 on medicinal products for pediatric use provides that prior to obtaining a marketing authorization in the European Union in the centralized procedure, a sponsor must demonstrate compliance with all measures included in an EMA-approved Pediatric Investigation Plan covering all subsets of the pediatric population, unless the EMA has granted a product-specific waiver, class waiver or deferral for one or more of the measures included in the Pediatric Investigation Plan.

The centralized procedure provides for the grant of a single marketing authorization by the European Commission that is valid for all European Union member states. Pursuant to Regulation (EC) No. 726/2004, the centralized procedure is compulsory for specific products, including for medicines produced by certain biotechnological processes, products designated as orphan medicinal products, advanced therapy medicinal products and products with a new active substance indicated for the treatment of certain diseases, including products for the treatment of cancer. For products with a new active substance indicated for the treatment of other diseases and products that are highly innovative or for which a centralized process is in the interest of patients, the centralized procedure may be optional.

Under the centralized procedure, the CHMP established at the EMA is responsible for conducting the assessment of a product to define its risk/benefit profile. Under the centralized procedure, the maximum timeframe for the evaluation of an MAA is 210 days, excluding clock stops when additional information or written or oral explanation is to be provided by the applicant in response to questions from the CHMP. Accelerated evaluation may be granted by the CHMP in exceptional cases, when a medicinal product is of major interest from the point of view of public health determined by three cumulative criteria: (i) the seriousness of the disease (*e.g.*, heavy disabling or life-threatening diseases) to be treated, (ii) the absence or insufficiency of an appropriate alternative therapeutic approach, and (iii) anticipation of high therapeutic benefit.

If the CHMP accepts such a request, the time limit of 210 days will be reduced to 150 days, but it is possible that the CHMP may revert to the standard time limit for the centralized procedure if it determines that it is no longer appropriate to conduct an accelerated assessment.

The Committee for Advanced Therapies, or CAT, is responsible in conjunction with the CHMP for the evaluation of ATMPs. The CAT is primarily responsible for the scientific evaluation of ATMPs and prepares a draft opinion on the quality, safety and efficacy of each ATMP for which a MAA is submitted. The CAT's opinion is then taken into account by the CHMP when giving its final recommendation regarding the authorization of a product in view of the balance of benefits and risks identified. Although the CAT's draft opinion is submitted to the CHMP for final approval, the CHMP may depart from the draft opinion if it provides detailed scientific justification. The CHMP and CAT are also responsible for providing guidelines on ATMPs and have published numerous guidelines, including specific guidelines on gene therapies and cell therapies. These guidelines, which are not legally binding, provide additional guidance on the factors that the EMA will consider in relation to the development and evaluation of ATMPs and include, *inter alia*, the preclinical studies required to characterize ATMPs, the manufacturing and control information that should be submitted in a MAA; and post-approval measures required to monitor patients and evaluate the long term efficacy and potential adverse reactions of ATMPs.

The European Commission may grant a so-called "marketing authorization under exceptional circumstances." Such authorization is intended for products for which the applicant can demonstrate that it is unable to provide comprehensive data on the efficacy and safety under normal conditions of use, because the indications for which the product in question is intended are encountered so rarely that the applicant cannot reasonably be expected to provide comprehensive evidence, or in the present state of scientific knowledge, comprehensive information cannot be provided, or it would be contrary to generally accepted principles of medical ethics to collect such information. Consequently, marketing authorization under exceptional circumstances may be granted subject to certain specific obligations, which may include the following:

- the applicant must complete an identified program of studies within a time period specified by the competent authority, the results of which form the basis of a reassessment of the benefit/risk profile;
- the medicinal product in question may be supplied on medical prescription only and may in certain cases be administered only under strict medical supervision, possibly in a hospital, and in the case of a radio-pharmaceutical, by an authorized person; and
- the package leaflet and any medical information must draw the attention of the medical practitioner to the fact that the particulars available concerning the medicinal product in question are as yet inadequate in certain specified respects.

A marketing authorization under exceptional circumstances is subject to annual review to reassess the risk-benefit balance in an annual re-assessment procedure. Continuation of the authorization is linked to the annual reassessment and a negative assessment could potentially result in the marketing authorization being suspended or revoked. The renewal of the marketing authorization of a medicinal product under exceptional circumstances follows the same rules as a "normal" marketing authorization. After five years, the marketing authorization will then be renewed under exceptional circumstances for an unlimited period, unless the EMA decides, on justified grounds, to proceed with one additional five-year renewal.

The European Commission may also grant a so-called “conditional marketing authorization” prior to obtaining the comprehensive clinical data required for an application for a full marketing authorization. Such conditional marketing authorizations may be granted for product candidates (including medicines designated as orphan medicinal products) if the CHMP finds that all the following requirements are met:

- the benefit-risk balance of the product is positive;
- it is likely that the applicant will be able to provide comprehensive data;
- unmet medical needs will be fulfilled; and
- the benefit to public health of the medicinal product’s immediate availability on the market outweighs the risks due to need for further data.

A conditional marketing authorization may contain specific obligations to be fulfilled by the marketing authorization holder, including obligations with respect to the completion of ongoing or new studies, and with respect to the collection of pharmacovigilance data. Conditional marketing authorizations are valid for one year, and may be renewed annually, if the risk-benefit balance remains positive, and after an assessment of the need for additional or modified conditions and/or specific obligations. The timelines for the centralized procedure described above also apply with respect to the review by the CHMP of applications for a conditional marketing authorization. Once comprehensive data on the medicinal product have been obtained, the marketing authorization may be converted into a standard marketing authorization which is no longer subject to specific obligations. Initially, this is valid for five years, but can be renewed for unlimited validity.

The European Union medicines rules expressly permit the member states to adopt national legislation prohibiting or restricting the sale, supply or use of any medicinal products containing, consisting of or derived from a specific type of human or animal cell, such as embryonic stem cells.

### *Periods of Authorization and Renewals*

A marketing authorization is valid for five years, in principle, and it may be renewed after five years on the basis of a reevaluation of the risk benefit balance by the EMA or by the competent authority of the authorizing Member State. To that end, the marketing authorization holder must provide the EMA or the competent authority with a consolidated version of the file in respect of quality, safety and efficacy, including all variations introduced since the marketing authorization was granted, at least six months before the marketing authorization ceases to be valid. Once renewed, the marketing authorization is valid for an unlimited period, unless the European Commission or the competent authority decides, on justified grounds relating to pharmacovigilance, to proceed with one additional five-year renewal period. Any authorization that is not followed by the placement of the product on the European Union market (in the case of the centralized procedure) or on the market of the authorizing Member State within three years after authorization ceases to be valid.

### *Regulatory Requirements after Marketing Authorization*

Following approval, the holder of the marketing authorization is required to comply with a range of requirements applicable to the manufacturing, marketing, promotion and sale of the medicinal product. These include compliance with the European Union’s stringent pharmacovigilance or safety reporting rules, pursuant to which post-authorization studies and additional monitoring obligations can be imposed. The holder of a marketing authorization must establish and maintain a pharmacovigilance system and appoint an individual qualified person for pharmacovigilance who is responsible for oversight of that system. Key obligations include expedited reporting of suspected serious adverse reactions and submission of periodic safety update reports, or PSURs. All new MAAs must include a risk management plan, or RMP, describing the risk management system that the company will put in place and documenting measures to prevent or minimize the risks associated with the product. The regulatory authorities may also impose specific obligations as a condition of the marketing authorization. Such risk-minimization measures or post-authorization obligations may include additional safety

monitoring, more frequent submission of PSURs, or the conduct of additional clinical trials or post-authorization safety studies. RMPs and PSURs are routinely available to third parties requesting access, subject to limited redactions.

In addition, the manufacturing of authorized products, for which a separate manufacturer's license is mandatory, must also be conducted in strict compliance with the EMA's GMP requirements and comparable requirements of other regulatory bodies in the European Union, which mandate the methods, facilities and controls used in the manufacturing, processing and packing of products to assure their safety and identity. Specifically, medicinal products may only be manufactured in the European Union, or imported into the European Union from another country, by the holder of a manufacturing/import authorization from the competent national authority. The manufacturer or importer must have a qualified person who is responsible for certifying that each batch of product has been manufactured in accordance with European Union standards of good manufacturing practice, or GMP, before releasing the product for commercial distribution in the European Union or for use in a clinical trial. Manufacturing facilities are subject to periodic inspections by the competent authorities for compliance with GMP.

Finally, the marketing and promotion of authorized products, including industry-sponsored continuing medical education and advertising directed toward the prescribers of products and/or the general public, are strictly regulated in the European Union. In principle, all advertising and promotional activities for the product must be consistent with the approved summary of product characteristics, and therefore all off-label promotion is prohibited. Direct-to-consumer advertising of prescription medicines is also prohibited in the European Union. Although general requirements for advertising and promotion of medicinal products are established under Directive 2001/83/EC, as amended, the details are governed by regulations in each member state and can differ from one country to another.

### *Human Cells and Tissues*

Human cells and tissues that are intended for human applications but that do not fall within the scope of rules governing medicinal products or medical devices are not subject to premarket review and approval, nor do they require extensive preclinical and clinical testing. However, there are European Union rules governing the donation, procurement, testing and storage of human cells and tissues intended for human application, whether or not they are ATMPs. These rules also cover the processing, preservation and distribution of human cell and tissues that are not ATMPs. Establishments that conduct such activities must be licensed and are subject to inspection by regulatory authorities. Such establishments must implement appropriate quality systems and maintain appropriate records to ensure that cells and tissues can be traced from the donor to the recipient and vice versa. There are also requirements to report serious adverse events and reactions linked to the quality and safety of cells and tissues. More detailed rules may exist at the national level.

### *Named Patient Supplies*

The European Union medicines rules allow individual member states to permit the supply of a medicinal product without a marketing authorization to fulfill special needs, where the product is supplied in response to a bona fide unsolicited order, formulated in accordance with the specifications of a healthcare professional and for use by an individual patient under his direct personal responsibility. This may in certain countries also apply to products manufactured in a country outside the European Union and imported to treat specific patients or small groups of patients.

### *Orphan Drug Designation and Exclusivity*

Regulation (EC) No. 141/2000 and Regulation (EC) No. 847/2000 provide that a product can be designated as an orphan drug by the European Commission if its sponsor can establish: that the product is intended for the diagnosis, prevention or treatment of (i) a life-threatening or chronically debilitating condition affecting not more

than five in 10,000 persons in the European Union when the application is made, or (ii) a life-threatening, seriously debilitating or serious and chronic condition in the European Union and that without incentives it is unlikely that the marketing of the product in the European Union would generate sufficient return to justify the necessary investment. For either of these conditions, the sponsor must demonstrate that there exists no satisfactory method of diagnosis, prevention or treatment of the condition in question that has been authorized in the European Union or, if such method exists, the product has to be of significant benefit compared to products available for the condition.

An orphan drug designation provides a number of benefits, including fee reductions, regulatory assistance and the possibility to apply for a centralized European Union marketing authorization. Marketing authorization for an orphan drug leads to a 10-year period of market exclusivity. During this market exclusivity period, neither the EMA nor the European Commission or the member states can accept an application or grant a marketing authorization for a “similar medicinal product.” A “similar medicinal product” is defined as a medicinal product containing a similar active substance or substances as contained in a currently authorized orphan medicinal product, and which is intended for the same therapeutic indication. The market exclusivity period for the authorized therapeutic indication may, however, be reduced to six years if, at the end of the fifth year, it is established that the product no longer meets the criteria for orphan drug designation because, for example, the product is sufficiently profitable not to justify market exclusivity.

#### *European Data Collection and Data Protection Laws*

We are required to comply with strict data protection and privacy legislation in the jurisdictions in which we operate, including the General Data Protection Regulation (EU) 2016/679, or GDPR. The GDPR governs our collection and use of personal data in the European Union relating to individuals (e.g., patients). The GDPR imposes several requirements on organizations that process such data, including: to observe core data processing principles; to comply with various accountability measures; to provide more detailed information to individuals about data processing activities; to establish a legal basis to process personal data (including enhanced consent requirements); to maintain the integrity, security and confidentiality of personal data; and to report personal data breaches. The GDPR also restricts the transfer of personal data outside of the European Economic Area (e.g., to the United States and other countries that are not deemed to provide adequate protection under their domestic laws). The GDPR may impose additional responsibility and liability in relation to personal data that we process, and require us to put in place additional mechanisms ensuring compliance with the new data protection rules. This may be onerous and adversely affect our business, financial condition, results of operations and prospects. Failure to comply with the requirements of the GDPR and related national data protection laws of European Union member states may result in a variety of enforcement measures, including significant fines and other administrative measures. The GDPR has introduced substantial fines for breaches of the data protection rules, increased powers for regulators, enhanced rights for individuals, and new rules on judicial remedies and collective redress. We may be subject to claims by third parties, such as patients or regulatory bodies, that we or our employees or independent contractors inadvertently or otherwise breached GDPR and related data protection rules. Litigation may be necessary to defend against these claims. There is no guarantee of success in defending these claims, and if we do not prevail, we could be required to pay substantial fines and/or damages and could suffer significant reputational harm. Even if we are successful, litigation could result in substantial cost and be a distraction to management and other employees.

#### *Regulation of Diagnostic Products in the European Union*

In the European Union, *in vitro* diagnostic products are regulated as *in vitro* diagnostic medical devices, or IVDs. The marketing of IVDs is subject to compliance with the In Vitro Diagnostic Medical Devices Directive 98/79/EC (IVD Directive). An IVD may be placed on the market within the European Union only if it conforms to certain “essential requirements” and bears the CE Mark. The most fundamental and essential requirement is that an IVD must be designed and manufactured in such a way that it will not compromise the clinical condition or safety of patients, or the safety and health of users and others. In addition, the IVD must achieve the performance(s) stated by the manufacturer and be designed and manufactured in a suitable manner.

Manufacturers must demonstrate that their IVDs conform to the relevant essential requirements through a conformity assessment procedure. The nature of the assessment depends upon the classification of the device. For IVDs intended to determine certain conditions or detect certain diseases, conformity assessment procedures involve a notified body. Notified bodies are often private entities and are authorized or licensed to perform such assessments by government authorities. Conformity assessment procedures require an assessment of available clinical evidence, literature data for the product and post-market experience in respect of similar products already marketed. Notified bodies also may review the manufacturer's quality systems. If satisfied that the product conforms to the relevant essential requirements, the notified body issues a certificate of conformity, which the manufacturer uses as a basis for its own declaration of conformity and application of the CE Mark. For all other IVDs, the manufacturer performs its own conformity assessment procedure and self-declares conformity before applying the CE Mark. Application of the CE Mark allows the general commercializing of an IVD in the European Union. The manufacturer or, if the manufacturer is located outside the European Union, its authorized representative in the European Union must also register with the competent authority in the European Union member state in which it is located.

In May 2017, the European Union adopted a new In Vitro Diagnostic Medical Devices Regulation (EU) 2017/746, or the IVD Regulation, which will apply in the European Union from May 26, 2022. The IVD Regulation does not set out a radically new system, but clearly envisages, among other things, stricter controls of IVDs, including the involvement of notified bodies in conformity assessments of many more categories of IVD and increased expectations as regards clinical data for IVDs. The IVD Regulation also envisages greater control over notified bodies and their standards, increased transparency, more robust device vigilance requirements and clarification of the rules for clinical investigations. Under transitional provisions, IVDs with notified body certificates issued under the IVD Directive prior to May 26, 2022 may continue to be placed on the market for the remaining validity of the certificate, until May 27, 2024 at the latest. After the expiry of any applicable transitional period, only IVDs that have been CE marked under the IVD Regulation may be placed on the market in the European Union.

### ***Coverage, Pricing and Reimbursement***

Significant uncertainty exists as to the coverage and reimbursement status of any product candidates for which we may obtain regulatory approval. Even if our product candidates are approved for marketing, sales of such product candidates will depend, in part, on the extent to which third-party payors, including government health programs in the United States (such as Medicare and Medicaid), commercial health insurers and managed care organizations, provide coverage and establish adequate reimbursement levels for such product candidates. In the United States, the member states of the European Union and markets in other countries, patients who are prescribed treatments for their conditions and providers performing the prescribed services generally rely on third-party payors to reimburse all or part of the associated healthcare costs. Reimbursement rules and levels are not harmonized in the European Union and therefore differ from member state to member state. Patients are unlikely to use any product candidates we may develop unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of such product candidates. The process for determining whether a payor will provide coverage for a product may be separate from the process for setting the price or reimbursement rate that the payor will pay for the product once coverage is approved. Third-party payors are increasingly challenging the price and examining the medical necessity and cost-effectiveness of medical products and services and imposing controls to manage costs.

In order to secure coverage and reimbursement for any product that might be approved for sale, a company may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of the product, and the cost of these studies would be in addition to the costs required to obtain FDA or other comparable marketing approvals. Even after pharmacoeconomic studies are conducted, product candidates may not be considered medically necessary or cost effective. A decision by a third-party payor not to cover any product candidates we may develop could reduce physician utilization of such product candidates once approved and have a material adverse effect on our sales, results of operations and financial condition.

## [Table of Contents](#)

Additionally, a payor's decision to provide coverage for a product does not imply that an adequate reimbursement rate will be approved. For example, the payor may require co-payments that patients find unacceptably high. Further, one payor's determination to provide coverage for a product does not assure that such coverage will continue or that other payors will also provide coverage and reimbursement for the product, and the level of coverage and reimbursement can differ significantly from payor to payor. Third-party reimbursement and coverage may not be adequate to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development. The insurance coverage and reimbursement status of newly approved products for orphan diseases is particularly uncertain, and failure to obtain or maintain adequate coverage and reimbursement for any such product candidates could limit a company's ability to generate revenue.

The containment of healthcare costs also has become a priority of federal, state and foreign governments as well as other third-party payors such as statutory health insurance funds, and the prices of pharmaceuticals have been a focus in this effort. Governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit a company's revenue from the sale of any approved products. Coverage policies and third-party reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more products for which a company or its collaborators receive marketing approval, less favorable coverage policies and reimbursement rates may be implemented or coverage may be ended in the future.

Outside the United States, we will face challenges in ensuring and obtaining adequate coverage and payment for any product candidates we may develop. Pricing of prescription pharmaceuticals is subject to governmental control in many countries, including in particular the member states of the European Union. Pricing negotiations with governmental authorities or other third-party payors such as statutory health insurance funds can extend well beyond the receipt of regulatory marketing approval for a product and may require us to conduct a clinical trial that compares the cost effectiveness of any product candidates we may develop to other available therapies. The conduct of such a clinical trial could be expensive and result in delays in our commercialization efforts.

In the European Union, pricing and reimbursement schemes vary widely from country to country. Some countries provide that products may be marketed only after a reimbursement price has been agreed. Some countries may require the completion of additional studies that compare the cost effectiveness of a particular product candidate to currently available therapies (so called health technology assessments) in order to obtain reimbursement or pricing approval. Moreover, European Union member states may restrict the range of products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. Member states may approve a specific price for a product or may instead adopt a system of direct or indirect controls on the profitability of the company placing the product on the market. Other member states allow companies to fix their own prices for products, but monitor and control prescription volumes and issue guidance to physicians to limit prescriptions. Recently, many countries in the European Union have increased the amount of discounts required on pharmaceuticals and these efforts could continue as countries attempt to manage healthcare expenditures, especially in light of the severe fiscal and debt crises experienced by many countries in the European Union. The downward pressure on health care costs in general, particularly prescription products, has become intense. As a result, increasingly high barriers are being erected to the entry of new products in the marketplace. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after reimbursement has been obtained. Reference pricing used by various European Union Member States and parallel trade (arbitrage between low-priced and high-priced member states) can further reduce prices. Special pricing and reimbursement rules may apply to orphan drugs. Inclusion of orphan drugs in reimbursement systems tend to focus on the medical usefulness, need, quality and economic benefits to patients and the healthcare system as for any product. Acceptance of any medicinal product for reimbursement may come with cost, use and often volume restrictions, which again can

vary by country. In addition, results based rules of reimbursement may apply. There can be no assurance that any country that has price controls or reimbursement limitations for pharmaceutical products will allow favorable reimbursement and pricing arrangements for any of our products, if approved in those countries.

### ***Healthcare Law and Regulation***

Healthcare providers and third-party payors play a primary role in the recommendation and prescription of pharmaceutical products that are granted marketing approval. Our current and future arrangements with providers, researchers, consultants, third-party payors and customers are subject to broadly applicable federal and state fraud and abuse, anti-kickback, false claims, transparency and patient privacy laws and regulations and other healthcare laws and regulations that may constrain our business and/or financial arrangements. Restrictions under applicable federal and state healthcare laws and regulations include, without limitation, the following:

- the U.S. federal Anti-Kickback Statute, which prohibits, among other things, persons and entities from knowingly and willfully soliciting, receiving, offering or paying remuneration, directly or indirectly, in-cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made, in whole or in part, under a federal healthcare program such as Medicare and Medicaid. A person or entity does not need to have actual knowledge of the statute or a specific intent to violate it in order to have committed a violation. Moreover, the government may assert that a claim that includes items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act;
- the federal civil and criminal false claims laws, including the civil False Claims Act, and civil monetary penalties laws, which prohibit individuals or entities from, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false, fictitious, or fraudulent or knowingly making, using, or causing to be made or used a false record or statement to avoid, decrease, or conceal an obligation to pay money to the federal government;
- HIPAA, which created additional federal criminal laws that prohibit, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or a specific intent to violate it in order to have committed a violation;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, and their respective implementing regulations, including the Final Omnibus Rule published in January 2013, which impose obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information without the appropriate authorization by entities subject to the law, such as healthcare providers, health plans and healthcare clearinghouses and their respective business associates;
- the federal transparency requirements known as the federal Physician Payments Sunshine Act, under the ACA, which requires certain manufacturers of drugs, devices, biologics and medical supplies to report annually to the Centers for Medicare & Medicaid Services, or CMS, within the U.S. Department of Health and Human Services, information related to payments and other transfers of value made by that entity to physicians and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members;
- federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers;
- federal government price reporting laws, which require us to calculate and report complex pricing metrics to government programs and which may be used in the calculation of reimbursement and/or discounts on marketed products;

## [Table of Contents](#)

- the Foreign Corrupt Practices Act, a U.S. law which regulates certain financial relationships with foreign government officials (which could include, for example, certain medical professionals);
- the national anti-bribery laws and laws governing interactions with healthcare professionals of European Union Member States;
- the U.K. Bribery Act 2010; and
- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, which may apply to healthcare items or services that are reimbursed by non-governmental third-party payors, including private insurers.

Some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring pharmaceutical manufacturers to report information related to payments to physicians and other health care providers or marketing expenditures and pricing information. State and foreign laws also govern the privacy and security of health information in some circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of healthcare reform, especially in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry.

Violations of these laws can subject us to criminal, civil and administrative sanctions including monetary penalties, damages, fines, disgorgement, individual imprisonment and exclusion from participation in government funded healthcare programs, such as Medicare and Medicaid, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, reputational harm, and we may be required to curtail or restructure our operations. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found to be not in compliance with applicable laws, they may be subject to similar actions, penalties, and sanctions. Ensuring business arrangements comply with applicable healthcare laws, as well as responding to possible investigations by government authorities, can be time- and resource-consuming and can divert a company's attention from the business. Moreover, we expect that there will continue to be federal and state laws and regulations, proposed and implemented, that could impact our future operations and business.

### ***Current and Future Healthcare Reform Legislation***

In the United States and foreign jurisdictions, there have been a number of legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay marketing approval of our investigational medicines, restrict or regulate post-approval activities, and affect our ability to profitably sell any investigational medicines for which we obtain marketing approval. We expect that current laws, as well as other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and in additional downward pressure on the price that we, or any collaborators, may receive for any approved products.

The ACA, for example, contains provisions that subject biological products to potential competition by lower-cost biosimilars and may reduce the profitability of drug products through increased rebates for drugs reimbursed by Medicaid programs, extension of Medicaid rebates to Medicaid-managed care plans, mandatory discounts for certain Medicare Part D beneficiaries, and annual fees based on pharmaceutical companies' share of sales to federal health care programs. With the current presidential administration and Congress, there may be additional administrative or legislative changes, including modification, repeal or replacement of all, or certain

## [Table of Contents](#)

provisions of, the ACA, which may impact reimbursement for drugs and biologics. On January 20, 2017, an Executive Order was signed directing federal agencies with authorities and responsibilities under the ACA to waive, defer, grant exemptions from, or delay the implementation of any provision of the ACA that would impose a fiscal or regulatory burden on states, individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. On October 13, 2017, an executive order was signed terminating the cost-sharing subsidies that reimburse insurers under the ACA. Several state Attorneys General filed suit to stop the administration from terminating the subsidies, but their request for a restraining order was denied by a federal judge in California on October 25, 2017. In addition, CMS has recently proposed regulations that would give states greater flexibility in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the ACA for plans sold through such marketplaces. Further, each chamber of Congress has put forth multiple bills this year designed to repeal or repeal and replace portions of the ACA. While Congress has not passed repeal legislation, the TCJA includes a provision repealing the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the “individual mandate.” Congress may consider other legislation to repeal and replace elements of the ACA. Litigation and legislation over the ACA are likely to continue, with unpredictable and uncertain results.

Additionally, other federal health reform measures have been proposed and adopted in the United States since the ACA was enacted:

- The Budget Control Act of 2011, among other things, created measures for spending reductions by Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least \$1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation’s automatic reduction to several government programs. These changes included aggregate reductions to Medicare payments to providers of up to 2% per fiscal year, which went into effect in April 2013 and will remain in effect through 2025 unless additional Congressional action is taken.
- The American Taxpayer Relief Act of 2012, among other things, reduced Medicare payments to several providers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years.
- The Middle Class Tax Relief and Job Creation Act of 2012 required that CMS reduce the Medicare clinical laboratory fee schedule by 2% in 2013, which served as a base for 2014 and subsequent years. In addition, effective January 1, 2014, CMS also began bundling the Medicare payments for certain laboratory tests ordered while a patient received services in a hospital outpatient setting.

Further, there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products, which have resulted in several recent Congressional inquiries and proposed bills designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for products. In addition, the federal government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs, including price-controls, restrictions on reimbursement, and requirements for substitution of generic products for branded prescription drugs to limit the growth of government-paid health care costs. For example, the federal government has passed legislation requiring pharmaceutical manufacturers to provide rebates and discounts to certain entities and governmental payors to participate in federal healthcare programs. Individual states in the United States have also become increasingly aggressive in passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation, from other countries and bulk purchasing.

### ***Packaging and Distribution in the United States***

If our products are made available to authorized users of the Federal Supply Schedule of the General Services Administration, additional laws and requirements apply. Products must meet applicable child-resistant packaging requirements under the U.S. Poison Prevention Packaging Act. Manufacturing, sales, promotion and other activities also are potentially subject to federal and state consumer protection and unfair competition laws.

The distribution of pharmaceutical products is subject to additional requirements and regulations, including extensive record-keeping, licensing, storage and security requirements intended to prevent the unauthorized sale of pharmaceutical products.

The failure to comply with any of these laws or regulatory requirements subjects firms to possible legal or regulatory action. Depending on the circumstances, failure to meet applicable regulatory requirements can result in criminal prosecution, fines or other penalties, injunctions, exclusion from federal healthcare programs, requests for recall, seizure of products, total or partial suspension of production, denial or withdrawal of product approvals, or refusal to allow a firm to enter into supply contracts, including government contracts. Any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. Prohibitions or restrictions on sales or withdrawal of future products marketed by us could materially affect our business in an adverse way.

Changes in regulations, statutes, or the interpretation of existing regulations could impact our business in the future by requiring, for example, (i) changes to our manufacturing arrangements, (ii) additions or modifications to product labeling, (iii) the recall or discontinuation of our products or (iv) additional record-keeping requirements. If any such changes were to be imposed, they could adversely affect the operation of our business.

### ***Other U.S. Environmental, Health and Safety Laws and Regulations***

We may be subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. From time to time and in the future, our operations may involve the use of hazardous and flammable materials, including chemicals and biological materials, and may also produce hazardous waste products. Even if we contract with third parties for the disposal of these materials and waste products, we cannot completely eliminate the risk of contamination or injury resulting from these materials. In the event of contamination or injury resulting from the use or disposal of our hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties for failure to comply with such laws and regulations.

We maintain workers' compensation employers' liability insurance to cover us for costs and expenses we may incur due to injuries to our employees, but this insurance may not provide adequate coverage against potential liabilities.

In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. Current or future environmental laws and regulations may impair our research, development or production efforts. In addition, failure to comply with these laws and regulations may result in substantial fines, penalties or other sanctions.

## **XVI. Intellectual Property**

### **A. Introduction**

We pursue a layered intellectual property strategy to protect our various technology platforms and their application to the treatment of cancer and other serious diseases. One focus of our intellectual property strategy is to provide protection for our platforms and product candidates currently in development. We also pursue intellectual property protection for assets that may be used in future development programs and/or that may be of interest to our collaborators, or otherwise may prove valuable in the field.

## [Table of Contents](#)

Various aspects of our technology platforms and our product candidates are claimed by patent filings. We also pursue other modalities of protection, including trademark and trade secret protection, as appropriate. Many of our intellectual property assets were developed and are owned solely by us, some have been developed via collaboration and are jointly owned, and some have been acquired by acquisition and/or licensed from third parties. We expect that we will continue to make additional patent application filings, and will continue to pursue opportunities to acquire and license additional intellectual property assets, technologies, platforms or product candidates, as developments arise or are identified.

Regardless, given the early stage of development of our product candidates, we cannot be certain that any of the patent filings or other intellectual property rights that we have pursued or obtained will provide protection for any product candidates that may ultimately be commercialized. Our most advanced product candidates are currently in clinical testing, with no certainty that they will be successful, or that significant modification or adjustment may not be required for successful commercialization.

Our future commercial success depends, in part, on our ability to obtain and maintain patent and other proprietary protection for commercially important technology, inventions and know-how related to our business; defend and enforce our patents and other intellectual property; preserve the confidentiality of our trade secrets; and operate without infringing, misappropriating or violating the valid and enforceable patents and other intellectual property rights of third parties. Our ability to stop third parties from making, using, selling, offering to sell or importing our products may depend on the extent to which we have rights under valid and enforceable patents, trade secrets or other intellectual property rights that cover these activities. With respect to both our owned and licensed intellectual property, we cannot be sure that patents will issue with respect to any of the owned or licensed pending patent applications or with respect to any patent applications that we, our co-owners or our licensors may file in the future, nor can we be sure that any of our owned or licensed patents or any patents that may be issued in the future to us or our licensors will be commercially useful in protecting any products that, we ultimately attempt to commercialize, or any method of making or using such products. Moreover, we may be unable to obtain patent protection for certain of our product candidates generally as well as with respect to certain indications. See “Risk Factors—Risks Related to our Intellectual Property” in our Annual Report on Form 20-F incorporated by reference herein for a more comprehensive description of risks related to our intellectual property.

As of January 15, 2020, our overall owned and in-licensed patent portfolio included more than 200 patent families, each of which includes at least one filing in the United States or Europe, and several of which are pending or granted in multiple jurisdictions. The patent families include at least 100 patent families that are solely or jointly owned by BioNTech, including certain families acquired through our acquisitions of antibody assets and infrastructure from MabVax Therapeutics Holdings, Inc. as well as intellectual property assets acquired through our acquisition of Lipocalyx GmbH and Neon Therapeutics, Inc., and the rest that we have licensed from a third party.

An issued patent provides its owner (or possibly its licensee) with a right to exclude others from making, using or selling that which is claimed in the patent, for a specified period of time (the “term” of the patent), in the jurisdiction in which the patent is issued. In the United States, and in many other countries, patents have a presumptive term of 20 years from their effective filing date (which is the earliest non-provisional filing date to which the patent claims priority). However, many jurisdictions, including the United States, require the payment of periodic maintenance fees in order for patents to remain in force for the full 20-year term. The United States also has provisions that require a patent term to be shortened if its claims are too similar to another patent owned by the same party that has a shorter term. The United States and certain other jurisdictions also have provisions that permit extension of patent term for patents that claim a drug or drug product, or its approved use, if the patent was issued before clinical trials were completed and certain other requirements were satisfied. In the United States, such extension is called a Patent Term Extension, or PTE, and it is limited to a period of not more than five years, or the total patent term including the PTE cannot exceed 14 years after the date of regulatory approval; only one patent can be extended per product approval. The United States also offers a different form of

## [Table of Contents](#)

patent term extension, known as Patent Term Adjustment, or PTA, whereby a particular patent's term is automatically extended beyond the 20-year date if the United States Patent and Trademark Office, or the USPTO, caused delay during its examination; however, potentially available PTA is reduced by any amount of any delay caused by the patent applicant.

Below, we provide a summary of the contours of our current patent portfolio as it relates to different aspects of relevant technology, including noting ownership and 20-year terms for filings included in the portfolio that are directed to such aspects. Particularly given our pre-commercial state of development, we cannot be certain that any of the patent filings in our portfolio will provide meaningful protection for any product we ultimately attempt to commercialize.

### **B. Patent Portfolio**

The patent portfolios for our most advanced programs are summarized below. Patent prosecution is a lengthy process, during which the scope of the claims initially submitted for examination by the USPTO and its foreign equivalents can be significantly narrowed by the time they issue, if they issue at all. We expect this could be the case with respect to some of our pending patent applications referred to below.

#### **1. mRNA**

The patent portfolio for our mRNA therapeutic platforms and product candidates includes patent filings directed to features of therapeutic mRNA structures, some of which are included in current development candidates. Our patent portfolio also includes patent filings directed to mRNA formulations, including the lipoplex formulations currently utilized with our FixVac and iNeST platforms, and the lipid nanoparticles currently utilized with our RiboMab and RiboCytokine platforms, as well as patent filings directed to mRNA manufacturing, and to uses of mRNA therapeutics. We provide more detail below regarding the patent filings directed to these features.

#### **mRNA Structure**

Our patent portfolio includes patent filings directed to various features of mRNA structure, which may, for example, contribute to increased immunogenicity (*e.g.*, antigen presentation), translation efficiency, and/or stability of mRNA constructs that include them. Such features include, for example, antigen-MHC fusions, 5' cap structures, 3' UTR structures, polyA tails and reduced-uracil content mRNAs. Filings directed to each of these features, or collectively, the mRNA Structure Filings, have been made in the United States and various foreign jurisdictions. Some such mRNA Structure Filings are owned solely by BioNTech SE or BioNTech RNA which are referred to collectively in this section as BioNTech, some jointly by BioNTech and one or more third parties, and some by BioNTech licensors, such as Louisiana State University, or LSU, and the terms of the applicable agreement with LSU, are further summarized below in "—C. In-Licensing." Issued existing mRNA Structure Filings have, and pending existing mRNA Structure Filings, if issued, would have, 20-year terms that extend into the mid-2020s to the mid-2030s.

#### **mRNA Formulations**

Our patent portfolio includes patent filings directed to various formulations for mRNA delivery, some of which are utilized with current development candidates. For example, our portfolio includes patent filings directed to lipoplex formulations, with 20-year terms that extend into 2038, if issued, or collectively, the mRNA Lipoplex Filings, although none of these filings is currently an issued patent. Such mRNA Lipoplex Filings are solely owned by BioNTech RNA.

In addition, our portfolio includes U.S. and foreign patent filings directed to lipid nanoparticles and polyplex technologies, which are jointly owned by BioNTech RNA and TRON, or collectively, the mRNA Lipid

## [Table of Contents](#)

Nanoparticle/Polyplex Filings. Issued mRNA Lipid Nanoparticle/Polyplex Filings have, and pending mRNA Lipid Nanoparticle/Polyplex Filings, if issued, would have, 20 year terms that extend into the mid- to late-2030s. Some such mRNA Lipid Nanoparticle/Polyplex Filings were granted in certain foreign jurisdictions, but do not currently include any U.S. issued patents. The terms of the co-ownership of such patent filings with TRON are summarized below in “—C. In-Licensing.”

### ***mRNA Manufacturing***

As discussed below, we utilize trade secret protection for many aspects of our mRNA manufacturing technologies, including as currently utilized for production of certain of our development candidates. In addition, our patent portfolio includes certain patent filings relevant to mRNA manufacturing, or collectively, the mRNA Manufacturing Filings, which we believe may provide commercial value to protect product candidates and/or support collaborations or other licensing arrangements. For example, our mRNA Manufacturing Filings include U.S. and foreign patent filings relating to certain aspects of mRNA purification and production. These mRNA Manufacturing Filings are either solely owned by BioNTech RNA, or jointly owned by BioNTech RNA and TRON and, if issued, would have 20-year terms that would extend into mid to late 2030s, although none is currently an issued patent.

### ***mRNA Product Candidates***

Our most advanced mRNA product candidate development programs are in oncology and involve various platforms. Our pipeline also includes mRNA product candidates for treatment of certain infectious diseases and mRNA product candidates for protein replacement therapy in certain rare diseases.

#### *Oncology mRNA Product Candidates*

Our current clinical programs are all in oncology. The most advanced involve iNeST immunotherapy product candidates being developed with our collaborator, Genentech. We also have FixVac product candidates in Phase 1 clinical trials, and have initiated Phase 1 clinical trials of our mRNA-based intratumoral immunotherapy developed through our collaboration with Sanofi.

#### FixVac

Our FixVac product candidates share many of the structural elements involved in our iNeST product candidates. Thus, some or all of the mRNA Structure Filings relevant to our iNeST product candidates and discussed above are also relevant to our FixVac product candidates. These patent filings, or the FixVac Platform Filings, include mRNA Structure Filings relating to antigen-MHC fusions, certain 5' cap structures, 3' UTR structures containing a specific sequence element, and interrupted polyA tails, which are solely or jointly owned by BioNTech or BioNTech's licensors. Issued FixVAC Platform Filings have, and pending FixVac Platform Filings, if issued, would have, 20-year terms extending into the mid-2020s to the mid-2030s. While we have pursued or obtained patent protection covering components of FixVac product candidates, manufacturing-related methods and/or formulations, we do not currently have any claims in our owned or in-licensed issued patents that cover the overall construct used in our FixVac product candidates.

Our patent portfolio further includes U.S. and foreign patent filings relating to combined uses of our FixVac and iNeST product candidates. Such issued patent filings have, and such pending patent filings, if issued, would have, 20-year terms that extend into 2033, and are jointly owned by BioNTech RNA and TRON.

Our current Phase 1 clinical trials for FixVac product candidates are studying such product candidates in treatment of advanced melanoma, head and neck cancer, breast cancer (particularly triple negative breast cancer), prostate cancer, and ovarian cancer. While we do not currently have any claims in our owned or in-licensed issued patents that are directed to use of our FixVac product candidates in the indications of these clinical trials,

## [Table of Contents](#)

certain FixVac Platform Filings include specific reference to treatment of each of these indications. Additionally, our patent portfolio relevant to FixVac product candidates further includes U.S. and foreign patent filings relating to use of particular tumor antigens for treatment of triple negative breast cancer included in Phase 1 clinical trials, or the Triple Negative Breast Cancer FixVAC Filings. Issued Triple Negative Breast Cancer FixVac Filings have, and pending Triple Negative Breast Cancer FixVac Filings, if issued, would have, 20-year terms extending into the early- to mid-2030s, and are jointly owned by BioNTech SE and TRON.

### iNeST

Our patent filings relevant to our iNeST product candidates include mRNA Structure Filings relating to features for increasing antigen presentation (*e.g.*, antigen-MHC fusions) and features for increasing translation efficiency and/or stability of mRNA constructs (*e.g.*, certain 5' cap structures, 3' UTR structures containing a specific sequence element, and polyA tails of a particular length or interrupted polyA tails); mRNA Lipoplex Filings relating to negatively charged lipoplexes (*e.g.*, for spleen targeting); and mRNA Manufacturing Filings, or collectively, the iNeST mRNA Platform Filings. While we have pursued or obtained patent protection covering components of iNeST product candidates, manufacturing-related methods and/or formulations, we do not currently have any claims in our owned or in-licensed issued patents that cover the overall construct used in our iNeST product candidates.

Our patent portfolio further includes U.S. and foreign filings directed to the process of identifying neoantigens in patient samples and/or predicting those that will be immunoreactive in an iNeST immunotherapy product, or collectively, the Neoantigen Filings. Certain issued Neoantigen Filings have, and certain pending Neoantigen Filings, if issued, would have 20-year terms that extend into the 2030s, although none is a U.S. issued patent. Many of the Neoantigen Filings are solely owned by BioNTech RNA, or jointly owned by BioNTech RNA and TRON; our acquisition of Neon added various Neoantigen Filings, including both BioNTech US-owned and in-licensed filings. BioNTech RNA and TRON jointly own issued EP patent number 2714071, whose claims recite steps relating to neoantigen selection, that has recently been opposed by multiple third parties; claims in the related U.S. case have recently been allowed. If we are unsuccessful in these oppositions, the patent claims for our iNeST product candidates may be narrowed, or a patent may not issue at all. See “Risk Factors—Risks Related to our Intellectual Property” in our Annual Report on Form 20-F incorporated by reference herein for a more comprehensive description of these risks.

We are currently studying our iNeST product candidates for the treatment of metastatic melanoma in Phase 2 clinical trials and those for the treatment of various solid tumors in Phase 1 clinical trials. Certain iNeST mRNA Platform Filings and Neoantigen Filings cover treatment of each of these indications. However, we do not currently have any claims in our owned or in-licensed issued patents that are directed to use of iNeST product candidates in the indications of these clinical trials.

### Intratumoral Immunotherapies

Certain of the mRNA Structure Filings (including some that are relevant to iNeST and/or FixVac product candidates, as discussed above) are also directed to one or more features of our intratumoral immunotherapies, including our most advanced intratumoral immunotherapy, which we are developing through our collaboration with Sanofi, and which has recently entered Phase 1 clinical trials. For example, mRNA Structure Filings relating to 3' UTR structures containing a specific sequence element, interrupted polyA tail structures, and reduced-uracil content mRNAs, which, as noted above are solely or jointly owned by BioNTech and, if issued, would have 20-year terms extending into the mid-2030s, provide protection to our current intratumoral immunotherapy development candidate. However, these filings do not currently include any issued patents.

We have also obtained third-party licenses to technologies relating to certain features of the mRNA structure relevant to the intratumoral immunotherapies. These include two non-exclusive sublicenses—one from mRNA RiboTherapeutics, Inc., or MRT, and one from its affiliate CellScript, LLC (these licenses, together, the

## Table of Contents

MRT-CellScript Sublicenses). MRT-CellScript Sublicenses allow us to use, make and/or sell nucleoside-modified mRNA products that are covered by U.S. and European Patent Office patent filings owned by the Trustees of the University of Pennsylvania, or the Penn Modified RNA Patent Rights, which sublicenses are further summarized below in “—C. In-Licensing.”

Additionally, certain patent filings have arisen from our collaboration relating to compositions including mRNAs encoding particular cytokines for treatment of solid tumors, or the mRNA Cytokine Filings. Such mRNA Cytokine Filings, if issued, would have 20-year terms that would extend into 2038. However, these filings do not currently include any issued patents.

### RiboMabs and RiboCytokines

We own or license a number of patent filings directed to our RiboMab and RiboCytokine programs. Many are owned solely by us, some are jointly owned, and some have been acquired or licensed.

Patent filings relevant to our RiboMab and RiboCytokine programs include certain mRNA Structure Filings relevant to our iNeST and/or FixVac product candidates, specifically relating to 3' UTR structures containing a specific sequence element, interrupted polyA tail structures, and reduced-uracil content mRNAs; mRNA Lipid Nanoparticle/Polyplex Filings; and patent filings under the MRT-CellScript Sublicenses relating to nucleoside-modified mRNAs.

We have also recently acquired patent assets from MabVax Therapeutics, or the MabVax Filings, that relate to various antibodies, including certain antibodies targeting sialyl Lewis A and ganglioside GD2, as well as nucleic acid encoding them. Issued MabVax Filings have, and the pending MabVax Filings, if issued, would have, 20-year terms that extend into the mid-2030s.

### Infectious Diseases

As is discussed elsewhere, we have collaborated with third parties, including Pfizer, Penn and Fosun Pharma, to develop infectious disease mRNA vaccines, including COVID-19 mRNA vaccines.

Certain patent filings that might be useful to our infectious disease mRNA vaccines include certain of the mRNA Structure Filings and the mRNA Lipid Nanoparticle/Polyplex Filings as well as certain patent filings under the MRT-CellScript Sublicenses, which include patent filings directed to nucleotide-modified mRNAs. Certain patent filings relating to certain features of self-amplifying RNAs may also be relevant, including filings jointly owned by BioNTech RNA and TRON; such filings are collectively referred herein as Self-Amplifying RNA Filings. Such Self-Amplifying RNA Filings, if issued, would have 20-year terms that extend into the late-2030s. These Self-Amplifying RNA Filings currently include at least a granted patent in Europe.

We have also licensed technologies relating to certain lipids and/or lipid nanoparticles and formulations that may be useful for certain infectious disease mRNA vaccines, including COVID-19 mRNA vaccines.

### Rare Diseases

We are developing mRNA-based protein replacement therapy for several rare disease indications through our collaboration with Genevant.

Certain of the mRNA Structure Filings (including some that are relevant to iNeST and/or FixVac product candidates, as discussed above) and patent filings under the MRT-CellScript Sublicenses include patent filings directed to nucleoside-modified mRNAs also provide protection for one or more features of mRNA-based protein replacement product candidates. For example, mRNA Structure Filings include patent filings directed to 3' UTR structures containing a specific sequence element, interrupted poly A tail structures and reduced-uracil

content mRNAs, which, as noted above are solely or jointly owned by BioNTech, and, if issued, would have 20-year terms that would extend into the mid-2030s. However, these filings do not currently include any issued patents.

Our patent portfolio relating to our rare disease programs also include certain patent filings that we have licensed from Genevant, or the Genevant Filings. Specifically, the Genevant Filings are owned by Arbutus Biopharma Corporation, which is a Genevant affiliate, and relate primarily to lipid or non-liposomal formulations that might be useful in these programs, and have been filed primarily in the U.S. and Europe, with 20-year terms that extend into mid-2020s to mid-2030s for the issued Genevant Filings and the pending Genevant Filings, if issued.

## 2. Cell Therapy

### *Engineered Cell Therapy*

Our engineered cell therapy product class features use of chimeric antigen receptor, or CAR-, T cell or individualized T cell receptors for oncology therapy. Our patent filings relevant to these platforms and product candidates, or the CAR-T/TCR Filings, are generally co-owned by BioNTech Cell & Gene Therapies GmbH, or BioNTech C&GT, and TRON. For example, the CAR-T/TCR Filings include patent filings directed to various CAR-T formats and methods of enhancing CAR-T cells by nucleic acid vaccination, as well as patent filings directed to processes of identifying and/or making individualized T cell receptors. The CAR-T/TCR Patent Filings, if issued, would have 20-year terms that would extend into the mid- to late-2030s. However, these filings do not currently include any issued patents.

Certain CAR-T programs involve CAR-T cell product candidates that target different members of the claudin family. Our patent portfolio includes certain patent filings specifically relevant to our claudin-specific CAR-T cell product candidates and are jointly owned by BioNTech C&GT, TRON and Ganymed, or the Claudin-Specific CAR-T Cell Filings. The issued Claudin-Specific CAR-T Cell Filings have, and the pending Claudin-Specific CAR-T Cell Filings, if issued, would have, 20-year terms extending into the mid-2030s. However, these filings do not currently include any U.S. issued patents. The terms of our co-ownership of such patent filings with TRON and Ganymed are summarized below in “—C. In-Licensing.”

### *Activated T Cells*

Our acquisition of Neon included technologies for using peripheral blood mononuclear cells, or PBMCs, (*e.g.*, collected from apheresis material of patients) as a starting material to induce and/or expand *ex vivo* functional T cells specific for therapeutically-relevant neoantigens.

Neon’s NEO-PTC-01 program (now referred herein as BNT221) is a personalized adoptive T cell therapy, which uses multiple T cell populations expanded from an individual patient’s PBMCs that together target a set of neoantigens expressed by that patient’s tumor.

Patent filings relevant to BNT221, referred to herein as the T Cell Induction/Expansion Filings, are generally solely owned by BioNTech US, or co-owned by BioNTech US and the Netherlands Cancer Institute (NKI). For example, the T Cell Induction/Expansion Filings include patent filings directed to therapeutic T cell compositions and methods of *ex vivo* induction and/or expansion of antigen-specific T cells, for example, using T cells of specific phenotypes for induction/expansion. The T Cell Induction/Expansion Filings, if issued, would have 20-year terms that would extend into the late-2030s to early-2040s. These filings do not currently include any issued patents. The terms of co-ownership of certain such patent filings with NKI are summarized below in “—C. In-Licensing.”

Certain of the Neoantigens Filings may also be relevant to BNT221.

### **3. Antibodies**

Our antibodies product class features bispecific checkpoint immunomodulators for oncology therapy, which are developed through collaboration with Genmab. Our development candidates include bispecific antibodies that are designed to activate 4-1BB upon simultaneous binding to PD-L1 or CD-40. Our patent portfolio includes certain patent filings relevant to such bispecific antibodies, or the Bispecific Checkpoint Modulator Filings, co-owned by us and Genmab. Such Bispecific Checkpoint Modulator Filings, if issued, would have 20-year terms that would extend into the late-2030s and do not currently include any issued patents.

### **4. Small Molecule Immunomodulators**

Our small molecule therapeutics product class features oncology treatment using small molecule product candidates that activate the immune system via TLR7 agonism. Our patent portfolio includes patent filings relevant to these TLR7 agonists, or the TLR7 Agonist Filings. Certain TLR7 Agonist Filings are directed to substituted imidazoquinolines, and, if issued, would have 20-year terms that would extend into the late 2030s. However, these filings do not currently include any issued patents.

## **C. In-Licensing**

Some of our intellectual property assets have been acquired by acquisition and/or in-licensing.

We have pursued a strategy of identifying and in-licensing third-party patents that we believe are complementary to or otherwise interact synergistically with our own intellectual property portfolio. We have entered into material intellectual property licensing or option arrangements with Penn, TRON, Louisiana State University and MRT-CellScript.

The key terms of these arrangements are summarized below.

### ***Penn Agreement***

In October 2018, BioNTech RNA entered into a collaboration and license agreement with the Trustees of the University of Pennsylvania regarding the development and commercialization of certain mRNA vaccines and mRNA diagnostics for the diagnosis, detection, evaluation, prophylaxis and treatment of infectious diseases. We refer to this agreement as the Penn Agreement.

Under the Penn Agreement, BioNTech RNA and Penn agree to collaborate with respect to research and development activities and are obligated to use commercially reasonable efforts to develop products that use formulated mRNAs encoding one or more immunogens for 10 disease indications in the field of infectious diseases (each, a Penn Product). Penn is responsible for all research and development work up to completion of studies enabling an IND as well as IND-supporting preclinical work, and BioNTech RNA is responsible for the manufacture of mRNA amounts to support the preclinical and IND-enabling studies. If a Penn Product developed under the research program achieves certain acceptance criteria for a specified indication, BioNTech RNA has the right to obtain an exclusive worldwide license under Penn's patent rights (and a non-exclusive license under Penn's know-how and materials) to research, develop, make, use or commercialize Penn Products in such indication. Under the Penn Agreement, Penn retains certain rights to conduct and authorize non-commercial third-party research, educational and patient care activities under any licensed intellectual property. Moreover, the license granted by Penn is subject to certain rights granted to the U.S. government in connection with government funding provided by the United States, including the requirement that products that result from intellectual property funded by the U.S. government that are sold in the United States be substantially manufactured in the United States.

BioNTech RNA has an obligation to use commercially reasonable efforts to clinically develop, obtain regulatory approval for and commercialize at least one Penn Product for each indication licensed under the Penn

## [Table of Contents](#)

Agreement. Moreover, BioNTech RNA is obligated to achieve certain clinical and regulatory milestones within specified time periods, and its failure to do so would provide Penn the right to terminate the Penn Agreement on an indication-by-indication basis.

BioNTech RNA paid to Penn an upfront fee of \$5 million to fund research activities and has agreed to pay Penn additional funds through quarterly payments, not to exceed an aggregate of \$15 million, upon depletion of the previously advanced funds. Under the Penn Agreement, BioNTech RNA also agreed to pay Penn an annual alliance management fee. In addition, if any Penn Product is covered by a Penn patent, BioNTech RNA will pay to Penn development and commercialization milestone payments up to \$44.4 million for each Penn Product licensed under this agreement and royalties in a low-single digit percentage on net sales of all Penn Products licensed under the Penn Agreement. Further, Penn will receive a percentage of any income from sublicenses BioNTech RNA grants to third parties, subject to certain caps set forth in the Penn Agreement.

BioNTech RNA has the sole responsibility for and decision-making authority over clinical development and commercialization activities relating to any Penn Product arising from the collaboration. BioNTech RNA is also responsible for the manufacture of mRNA to support clinical development and commercialization efforts.

The Penn Agreement remains in effect until the expiration of the last Penn patent covering any licensed Penn Product or developmental product candidate. BioNTech RNA may terminate the Penn Agreement for convenience in its entirety or on an indication-by-indication basis upon 90 days' prior notice to Penn. The Penn Agreement also grants both parties termination rights for uncured material breaches, including for BioNTech RNA's failure to achieve its obligations to achieve certain diligence milestones, and insolvency.

### ***TRON Agreements***

In 2015, we and our subsidiaries BioNTech RNA, BioNTech Diagnostics GmbH, BioNTech Protein Therapeutics GmbH, BioNTech Cell & Gene Therapies GmbH, Eufets GmbH and JPT Peptide Technologies GmbH entered into a Master Agreement for Research Services with TRON. Concurrently with this Master Agreement for Research Services, or the TRON Research Agreement, we entered into a License Agreement with Ganymed, TRON, Johannes Gutenberg-Universität Mainz and Universitätsmedizin der Johannes Gutenberg-Universität Mainz, or the TRON License Agreement. The TRON Research Agreement and TRON License Agreement together replaced and superseded our 2008 Cooperation, Purchase and Licensing Agreement with the University Mainz, or the 2008 Cooperation Agreement. In 2019, we and our subsidiaries BioNTech RNA Pharmaceuticals GmbH, BioNTech Diagnostics GmbH, BioNTech Protein Therapeutics GmbH, BioNTech Cell & Gene Therapies GmbH, BioNTech Innovative Manufacturing Services GmbH and JPT Peptide Technologies GmbH, entered into a Framework Collaboration Agreement with TRON, or the TRON Collaboration Agreement.

### ***TRON Research Agreement***

Under the TRON Research Agreement, TRON from time to time performs certain services for us under work orders, which may comprise innovative applied research projects, pre-defined research and development or clinical research services. We and TRON meet at regular intervals, but no less than annually, to prepare an overall non-binding project plan, which sets the scope, period and costs for the relevant projects contemplated for that period. Individual work orders set the specific binding terms of each project or service. TRON is obligated to render services in accordance with the scientific standards, all applicable laboratory and legal provisions and with the care customary in the industry.

We are entitled to the exclusive rights to all inventions, methods, specifications, materials, documents, data, know-how and other results (together, the Results) developed or discovered by TRON or by us and TRON jointly under the TRON Research Agreement, except to the extent they constitute improvements of the technologies applied by TRON in the relevant projects. Under the TRON Research Agreement, TRON granted us a

## [Table of Contents](#)

non-exclusive, royalty-free license to use TRON Improvements if such TRON Improvements are necessary for the continued development and exploitation of the Results or the manufacture or marketing of products which contain any of the Results and are covered by a patent claiming any of the Results.

Under the TRON Research Agreement, TRON's services rendered in the field of applied research are invoiced at cost. For other services, fixed prices are to be set forth in the individual work orders. TRON invoices us monthly and our payments are due no later than 10 days thereafter. Additionally, we are obligated to pay to TRON low single-digit tiered royalties on net sales of any product developed under the TRON Research Agreement that is covered by a patent claiming any of the Results.

The TRON Research Agreement limits each party's liability to the other to intentional and grossly negligent actions and, in the case of gross negligence, liability for indirect and consequential damages and lost profits is excluded. We are obligated to indemnify TRON for all product liability claims in connection with the products and for third-party claims asserting that the Results violate third-party intellectual property rights.

The TRON Research Agreement has an indefinite term, but may be terminated by either party on six months' notice. If one of our subsidiaries terminates its role in the TRON Research Agreement, the agreement will survive and continue without that subsidiary.

In November 2017, we and TRON entered into an agreement to include certain research and development activities regarding neoepitope RNA immunotherapies as work included in the TRON Research Agreement.

### **TRON License Agreement**

The TRON License Agreement governs the ownership of and licenses under certain patents, inventions, know-how, technologies and other knowledge (together, the Development Results) filed and created before January 1, 2015 in the course of our collaboration with TRON, Johannes Gutenberg-Universität Mainz and Universitätsmedizin der Johannes Gutenberg-Universität Mainz (collectively, the University Parties) and Ganymed pursuant to the 2008 Cooperation Agreement.

The TRON License Agreement sets forth the parties' rights with respect to the Development Results, mainly depending on which parties have contributed to such Development Results. Ownership of the Development Results and any patents and other intellectual property in certain shares to TRON, on the one hand, and BioNTech and/or Ganymed, on the other hand included therein is allocated. Each party may assign its share in the co-owned Development Results to its affiliates provided that such party provide notice of the transfer and the identity of the new co-owner to the other co-owners. However, in case of an assignment of such share to a third party (except in case of a material asset sale), the assigning party must obligate the assignee to comply with the terms of the TRON License Agreement and the assigning party will remain bound by the obligations of the TRON License Agreement unless the other co-owners have consented to discharge the assigning party from such obligations.

The parties to the TRON License Agreement grant licenses to each other under their shares in the Development Results substantially as follows. Ganymed is exclusively entitled to use the Development Results for certain antibodies and antibody fragments that bind to certain defined targets, or the Ganymed Field of Use. We are exclusively entitled to use the Development Results in any other field of use (including immunological therapeutics, small molecule compounds, siRNA-based therapeutics, micro-proteins, antibody based *in vitro* (except for those in the Ganymed Field of Use), diagnostics and therapeutics based on long-chain RNA as well as other cell therapy applications, immune cells transgenized with recombinant directed against certain defined targets or chimeric antigene receptors and RNA-based pharmaceuticals). The University Parties may use the Development Results for internal research purposes only. We have an obligation to use reasonable efforts to develop and commercialize products in our field of use worldwide.

## [Table of Contents](#)

Under the TRON License Agreement, we and Ganymed must agree on which party will have the primary role in filing, prosecuting, maintaining and defending jointly owned patents. We and Ganymed each have the exclusive right to enforce the Development Results in our respective fields of use, subject to certain step-in rights of the other parties.

We are obligated to pay to the University Parties low single-digit tiered royalties on net sales on any product that is covered by certain of the patents including in the Development Results. If licenses are granted to third parties, we are obligated to pay to the University Parties a mid-single-digit share of all upfront payments, milestone payments and other remuneration we receive from such third parties in consideration for the license. Regarding upfront payments only, the University Parties' share will be offset against subsequent license fees on net sales. In addition, we are obligated to pay certain development and regulatory milestones up to a low seven-figure amount to Johannes Gutenberg-Universität Mainz.

The TRON License Agreement contains a limitation on liability as between the parties, wherein the parties will only be liable to each other for intentional and grossly negligent actions, and, in the case of gross negligence, liability for indirect and consequential damages and lost profits is excluded. We are obligated to indemnify the University Parties and Ganymed for third-party claims of product liability or violation of applicable law based on our distribution of our products or if we breach the TRON License Agreement or if we or one of our agents acts culpably.

The TRON License Agreement will remain in effect as long as there are any obligations on us or Ganymed to pay license fees. After expiry of the TRON License Agreement, each party will have a perpetual, non-exclusive, royalty-free license to use the Developments Results. The TRON License Agreement may be terminated by any party on six months' notice. The licenses granted between the parties will survive such termination. The TRON License Agreement also grants all parties termination rights for uncored material breaches. If only one party terminates its role in the Agreement, the Agreement will survive and continue between the other parties.

### ***TRON Collaboration Agreement***

Under the TRON Collaboration Agreement, TRON from time to time undertakes certain projects in collaboration with us under separate project specific agreements, comprising innovative non-clinical research and development projects. We and TRON meet regularly to review and update project plans, and no less than annually to agree the budget for the on-going projects for the coming calendar year. Individual project agreements set the specific binding terms of each project. TRON is obligated to perform its obligations in accordance with the scientific standards, all applicable technical laboratory and legal provisions and with the care customary in the non-clinical biotechnology research industry.

Except for the results of a particular research project which has been funded exclusively by TRON, or the RNT Project, all of the inventions, methods, specifications, materials, documents, data, know-how and other results (together, the Results) developed or discovered by TRON or by us and TRON jointly under the TRON Collaboration Agreement are jointly owned. The Results of the RNT Project are owned exclusively by TRON. Under the TRON Collaboration Agreement, TRON grants us an exclusive, worldwide, sublicensable license under its interest in the Results to research and have researched, develop and have developed, make and have made, use, and otherwise commercialize or have commercialized, and otherwise commercially exploit, products in a field that is specified in the corresponding project agreement. The field of use is either (a) the prophylaxis, diagnosis and treatment of all indications in humans and animals; (b) the prophylaxis, diagnosis and treatment of oncological diseases, infectious diseases and rare genetic diseases; or (c) in the case of the Results from the RNT Project only, the prophylaxis, diagnosis and treatment of rectal neuroendocrine tumors in humans. We are required to use our reasonable efforts to develop and commercialize products that exploit the Results.

Under the TRON Collaboration Agreement, TRON's activities are invoiced at cost. TRON invoices us monthly and our payments are due no later than 10 days thereafter. Additionally, we are obligated to pay to

## [Table of Contents](#)

TRON low single-digit tiered royalties on net sales of any product developed under the TRON Collaboration Agreement that is covered by a patent claiming any of the Results or, in certain circumstances, by a patentable invention forming part of the Results which we elect to maintain as a trade secret. If licenses under Results are granted to third parties, we are obligated to pay to TRON a mid-single-digit share of all upfront payments, milestone payments and other remuneration we receive from such third parties in consideration for the license. In addition, we are obligated to pay a one-time only milestone of a low seven-figure amount to TRON the first time annual sales of a product developed under the TRON Collaboration Agreement reach a low nine-figure number.

The TRON Collaboration Agreement limits each party's liability to the other to cases of willful misconduct and gross negligence and, in the case of gross negligence, liability for indirect and consequential damages and lost profits is excluded. We are obligated to indemnify TRON for all product liability claims in connection with the products and for third-party claims asserting that the Results violate third-party intellectual property rights.

The TRON Collaboration Agreement came into force with retroactive effect from January 2015 and has an indefinite term, but may be terminated by either party on nine months' notice. If one of our subsidiaries terminates its role in the TRON Collaboration Agreement, the agreement will survive and continue without that subsidiary.

### ***LSU License Agreement***

In May 2015, we entered into a Patent License Agreement with the Board of Supervisors of Louisiana State University and Agricultural and Mechanical College, or LSU, and the University of Warsaw, or UW. The agreement (which we refer to as the LSU Agreement) replaces and supersedes the earlier license agreement between the parties.

Under the LSU Agreement, UW and LSU granted to us an exclusive royalty-bearing license under certain patent rights relating to mRNA cap analogs and the synthesis and use of anti-reverse phosphorothioate analogs of the mRNA cap in the United States, certain jurisdictions in the European Union and other countries. As consideration for the license granted, we are obligated to pay running royalties in the low single digits on all net sales of products utilizing the licensed patents and to pay annual maintenance fees to LSU.

We are obligated to use commercially reasonable efforts to develop one or more marketable products utilizing the licensed patents, upon which we would owe additional milestone payments to LSU.

The LSU Agreement remains in effect until expiration of the licensed patents. We have the right to terminate the LSU Agreement for convenience with 60 days' prior notice, and LSU and UW may terminate for our uncured material breach.

### ***CellScript and mRNA Ribotherapeutics License Agreement***

BioNTech RNA entered into the two MRT-CellScript Sublicenses discussed above. Together, the MRT-CellScript Sublicenses grant BioNTech RNA worldwide, non-exclusive sublicenses under the Penn Modified mRNA Patent Rights (as defined in the MRT-CellScript Sublicenses) to research, develop, make, import, use and commercialize products for *in vivo* uses in humans and non-human animals, including therapeutic and prophylactic applications, and for certain uses in the diagnostic and prognostic field of use and certain laboratory research or screening uses. Under these sublicenses, BioNTech RNA has the right to grant sublicenses to affiliates and third parties.

BioNTech RNA must use reasonable efforts to develop and commercialize products under the sublicenses. Furthermore, BioNTech RNA is obliged to pay MRT and CellScript development milestone payments of up to approximately \$26 million as well as royalties in the low to mid-single digits on net sales of licensed products, depending on the field of use.

## [Table of Contents](#)

The agreements continue until the expiration or abandonment of the last licensed patent to expire or be abandoned. BioNTech RNA may terminate the agreement for convenience with respect to all or certain patent rights with 60 days' prior written notice. MRT or CellScript may terminate the respective sublicense agreement for payment default, uncured material breach or the bankruptcy of BioNTech RNA.

### ***License Agreement with the Broad Institute***

Through our acquisition of Neon Therapeutics, Inc., BioNTech US became a party to a license agreement with the Broad Institute, Inc., or Broad, entered into on November 13, 2015, and amended in January and November of 2018, as amended to date, the Broad Agreement. Under the Broad Agreement, BioNTech US has been granted an exclusive worldwide license to certain intellectual property rights owned or controlled by the Broad, Dana-Farber Cancer Institute, or DFCI and The General Hospital Corporation d/b/a Massachusetts General Hospital, or MGH, to develop and commercialize any diagnostic, prognostic, preventative or therapeutic product for humans, including any neoantigen vaccine product. In particular, BioNTech US has been granted both exclusive and non-exclusive licenses to a patent portfolio comprised of twelve patent families, including certain granted patents and pending patent applications in the U.S. and foreign jurisdictions.

Pursuant to the terms of the Broad Agreement, BioNTech US has also been granted (i) a non-exclusive license under each institution's respective interest in certain of its patent rights to exploit the licensed products in the field in the territory during the term of the license and (ii) a non-exclusive license under each institution's licensed know-how, to exploit any diagnostic, prognostic, preventative or therapeutic product in the field in the territory during the term of the license. BioNTech US is also entitled to sub-license the rights granted to it under the Broad Agreement. In connection with the Broad Agreement, BioNTech US has a non-exclusive software license with Broad under which it licenses certain object and source codes for several software programs. These licenses and rights are subject to certain limitations and retained rights, including field restrictions.

As consideration for the license, BioNTech US must pay Broad immaterial annual license maintenance fees. Under the Broad Agreement, BioNTech US agreed to reimburse Broad for future patent expenses related to the patents covered by the license agreement. BioNTech US could be obligated to make up to \$12.6 million of developmental milestone payments to Broad if certain development milestones are achieved over the term of the license agreement. Additionally, under the terms of the license agreement, BioNTech US could be obligated to make up to an aggregate of \$105 million of payments upon the achievement of specified sales milestones and to pay tiered royalties of low to mid single-digit percentages on net sales of products licensed under the agreement. BioNTech US is required to pay Broad a low double-digit percentage of any consideration received by BioNTech US from a sublicensee in consideration for a sublicense. No developmental or commercial milestones have been achieved to date. BioNTech US has the right to terminate the agreement for any reason, with or without cause.

### ***The Netherlands Cancer Institute***

#### ***Collaboration and License Agreements***

Through our acquisition of Neon, BioNTech US became a party to certain license and collaboration agreements with the Netherlands Cancer Institute, or NKI, that grant it certain license and/or assignment rights to intellectual property, including to intellectual property within the T Cell Induction/Expansion Filings.

#### ***Manufacturing Agreement***

Through our acquisition of Neon, BioNTech US also became a party to a manufacturing agreement, or the NKI Manufacturing Agreement with NKI, whereby NKI performs manufacturing, analytical testing and quality assurance services related to the manufacture of BioNTech US's autologous T cell therapy drug product NEO-PTC-01 (now BNT221) for use in preclinical and clinical activities. The NKI Manufacturing Agreement has a three-year term, which can be extended for an additional six months at BioNTech US's sole discretion, and can be terminated by BioNTech US for convenience with three-months' notice. All amounts incurred under the NKI Manufacturing Agreement are recognized as research and development expense as incurred.

#### **D. Trademark Portfolio**

Certain features of our business and our product candidates are protected by trademarks. Our trademark portfolio includes, but is not limited to, registrations for each of FixVac<sup>®</sup>, IVAC<sup>®</sup>, MammaTyper<sup>®</sup>, RiboCytokine<sup>®</sup> and RiboMab<sup>®</sup>. Our acquisition of Neon included registrations for certain trademarks, including NEON THERAPEUTICS<sup>®</sup>, RECON<sup>®</sup>, NEO-STIM<sup>®</sup>, Precision NEO-STIM<sup>®</sup> and MAPTAC<sup>®</sup>, as well as certain other trademarks, including design versions of some of these trademarks.

#### **E. Trade Secret Protection**

Certain of our technologies, including in particular certain proprietary manufacturing processes or technologies and/or neoantigen prediction technologies, are protected as trade secrets.

In addition to patent protection, we rely upon unpatented trade secrets and confidential know-how and continuing technological innovation to develop and maintain our competitive position. We protect certain of our technologies, including, in particular, certain proprietary manufacturing processes and technologies and/or neoantigen prediction technologies, as trade secrets. However, trade secrets and confidential know-how are difficult to protect. We seek to protect our proprietary information, in part, by using confidentiality agreements with any future collaborators, scientific advisors, employees and consultants, and invention assignment agreements with our employees. We also have agreements requiring assignment of inventions with selected consultants, scientific advisors and collaborators. These agreements may not provide meaningful protection. These agreements may also be breached, and we may not have an adequate remedy for any such breach. In addition, our trade secrets and/or confidential know-how may become known or be independently developed by a third party, or misused by any collaborator to whom we disclose such information. Despite any measures taken to protect our intellectual property, unauthorized parties may attempt to copy aspects of our products or to obtain or use information that we regard as proprietary. Although we take steps to protect our proprietary information, third parties may independently develop the same or similar proprietary information or may otherwise gain access to our proprietary information. As a result, we may be unable to meaningfully protect our trade secrets and proprietary information. See “Risk Factors—Risks Related to our Intellectual Property” in our Annual Report on Form 20-F incorporated by reference herein for a more comprehensive description of risks related to our intellectual property.

#### **XVII. Competition**

We compete in an industry characterized by rapidly advancing technologies, intense competition and a complex intellectual property landscape. We face substantial competition from many different sources, including large and specialty pharmaceutical and biotechnology companies, academic research institutions and governmental agencies and public and private research institutions.

Below is a description of competition surrounding each of our technologies.

*mRNA Therapies.* mRNA therapies are a new medical frontier, and we expect competition in this space to be robust across diverse therapeutic areas. We compete with a number of companies focused on developing mRNA technologies for a wide range of applications, including Moderna, CureVac, eTheRNA immunotherapies, Translate Bio, Arcturus Therapeutics, ethris, Genevant and GlaxoSmithKline.

*Oncology.* The oncology therapeutics landscape in general is highly competitive and includes large and specialty pharmaceutical and biotechnology companies, academic research institutions and governmental agencies and public and private research institutions. It includes both competition from marketed therapies as well as potential new therapeutics in development. We may compete with products with different mechanisms of action as well as against established standards of care. Companies such as AstraZeneca, Amgen, Bristol-Myers Squibb, Celgene, Eli Lilly, GlaxoSmithKline, Incyte, Janssen Pharmaceuticals, Merck & Co., Novartis, Pfizer, Roche and Sanofi are developing diversified immuno-oncology programs and have substantial resources. We

## [Table of Contents](#)

expect our intratumoral immunotherapy candidates for the treatment of solid tumors to face direct competition from companies such as Moderna and CureVac.

We also expect our FixVac and iNeST candidates to face competition from smaller specialized oncology companies such as Agenus, Gritstone, Moderna in collaboration with Merck & Co., Aduro Biotech, Advaxis Immunotherapies, Achilles Therapeutics, NousCom, ISA Pharmaceuticals, CureVac in collaboration with Eli Lilly, Genocera Biosciences, Vaccibody, PACT Pharma and ZIOPHARM Oncology in the antigen-based therapy space.

*Cell Therapy Drug Class.* We compete with a number of companies focused on adoptive cell therapies, including Novartis Pharmaceuticals, Gilead Sciences, Celgene, Allogene Therapeutics, CRISPR Therapeutics, bluebird bio, Medigene, Adaptimmune Therapeutics, Amgen, Atara Biotherapeutics, Autolus Limited, Collectis, PACT, Mustang Bio, Iovance Biotherapeutics, TCR2 Therapeutics, Editas Medicine, Celyad, Celularity, Unum Therapeutics, Intrexon, and Bellicum Pharmaceuticals and Precision Biosciences.

*Antibodies Drug Class.* We compete with a number of companies with operations focused on checkpoint immunomodulators, including AstraZeneca, Merck, Pfizer, Novartis, Roche and Bristol-Myers Squibb.

*Small Molecule Immunomodulator Drug Class.* We are aware of a number of other companies developing TLR agonists, including Checkmate Pharmaceuticals, Dynavax Technologies, Exicure, Gilead, GlaxoSmithKline, Hoffmann-La Roche, Mologen and Nektar Therapeutics.

*Infectious Diseases.* The infectious disease space includes general competition from well-established pharmaceutical companies such as AbbVie, Bayer, Gilead, Janssen Pharmaceuticals, Merck & Co. and Novartis. In addition, Seqirus UK, Sanofi Pasteur, GlaxoSmithKline, Biomedical Corp. of Quebec and AstraZeneca produce influenza vaccines.

Specifically, a large number of vaccine manufacturers, academic institutions and other organizations currently have programs to develop COVID-19 vaccine candidates. While we are not aware of all of our competitors' efforts, we believe that the University of Oxford/AstraZeneca plc, CanSino Biologics Inc., Sanofi/GlaxoSmithKline plc, Inovio Pharmaceuticals, Inc., China National Pharmaceutical Group (Sinopharm)/Beijing Institute of Biological Products and Wuhan Institute of Biological Products, Moderna, Inc., Johnson & Johnson, Novavax, Inc. and other companies are all in the early stages of developing vaccine candidates against COVID-19.

*Rare Diseases.* We compete with a number of companies focused on rare diseases, including Roche, Alexion Pharmaceuticals, Novartis, Bristol-Myers Squibb, Sanofi Novo Nordisk and Pfizer.

Many of our competitors and potential competitors, either alone or with their collaborators, have greater scientific, research and product development capabilities as well as greater financial, marketing, sales and human resources and experience than we do. In addition, smaller or early-stage companies, including immunotherapy-focused therapeutics companies, may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. Some of our collaborators, such as Genmab, Pfizer and Sanofi, may also be competitors within the same market or other markets. Accordingly, our competitors may be more successful than us in developing and potentially commercializing technologies and achieving widespread market acceptance. In addition, our competitors may design technologies that are more efficacious, safer or more effectively marketed than ours or have fewer side effects, or may obtain regulatory approvals more quickly than we are able, which could eliminate or reduce our commercial potential. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

We anticipate that the key competitive factors affecting our technologies will be efficacy, safety, cost and convenience, as well as our ability to build a fully-integrated biotechnology company. The availability of

## [Table of Contents](#)

reimbursement from government and other third-party payors will also significantly affect the pricing and competitiveness of our products. The timing of market introduction of our products and competitive products will also affect competition among products. We expect the relative speed with which we can develop our products, complete the clinical trials and approval processes, and supply commercial quantities of the products to the market to be important competitive factors. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market.

### **XVIII. Employees**

As of May 31, 2020, we had 1,474 full-time equivalent employees working for BioNTech, of whom 400 hold a doctoral degree or higher. The following tables provide breakdowns of our full-time equivalent employees as of May 31, 2020 by function and by region (full-time equivalent numbers are presented rounded to the nearest whole number and accordingly may not add up to 1,474):

<u>Function</u>	<u>Number</u>
Clinical Research & Development	113
Scientific Research & Development	523
Operations	440
Quality	166
Supporting Functions	203
Commercial & Business Development	29

<u>Region</u>	<u>Number</u>
Mainz (Headquarters)	1,037
Munich (Neuried, Martinsried)	40
Idar-Oberstein	222
Halle	9
Berlin	100
United States	65

Since December 2016, our workforce has grown by 300%. Within the next several years, two further new production sites are planned to be built in Mainz and Idar-Oberstein.

None of our employees has engaged in any labor strikes. We have no collective bargaining agreements with our employees, but we maintain a company agreement (Betriebsvereinbarungen) with respect to certain topics at our Idar-Obarstein site. We have a workers' council at our Idar-Oberstein and Mainz sites. However, we consider our relationship with our employees to be positive and have not experienced any major labor disputes.

### **XIX. Properties**

Our headquarters are located in Mainz, Germany, where we occupy:

- Approximately 9,416 square meters (equivalent to approximately 101,353 square feet) of laboratory, GMP manufacturing, storage and office space under a lease for the entire building located at An der Goldgrube 12, 55131 Mainz under a lease that has an initial term that expires on October 31, 2027, but which we have the option to extend until October, 2042.
- Approximately 1,069 square meters (equivalent to approximately 11,507 square feet) of office and GMP manufacturing space under a lease for part of the building located at Kupferbergterrasse 15, 17019, 44116 Mainz under a lease that expires in March 31, 2022.
- Approximately 4,882 square meters (equivalent to approximately 52,549 square feet) of flexible use space under a lease for the entire building at Adam-Opel-Strasse 10, 55129 Mainz-Hechtsheim that has

## [Table of Contents](#)

an initial term that expires on December 31, 2024, but which we have the option to extend until December 31, 2027. If the lease has not been terminated prior to December 31, 2024, and the option has not been exercised prior to this date, the lease will convert to an unlimited period terminable by either party on 12 months' prior written notice.

- Approximately 82,881 square meters (equivalent to approximately 892,124 square feet) of office space and a further area of land associated with this office space of approximately 12,600 square meters (equivalent to approximately 135,625 square feet), which is owned by BioNTech.
- We also own a plot of land of approximately 8,753 square meters (equivalent to 94,216 square feet) at Hechtsheimer Strasse, 55131 Mainz.

In addition, our BioNTech IMFS facility in Idar-Oberstein, Germany, occupies approximately 2,800 square meters (equivalent to approximately 30,140 square feet). This includes 650 square meters (approximately 7,000 square feet) of clean room area, and 700 square meters (approximately 7,500 square feet) of development and quality control laboratories. We occupy approximately 575 square meters (equivalent to approximately 6,200 square feet) of this space, which is used primarily for storage, under a lease that has an initial expiry date of October 1, 2021, but which we have the right to extend by an additional five years. We occupy approximately 100 square meters (equivalent to approximately 1,075 square feet) of this space, which is used primarily for storage, under a lease that can be terminated by either party on six months' written notice (but not earlier than May 1, 2020). We occupy approximately 80 square meters (equivalent to approximately 860 square feet) of this space, which is used as office space, under a lease that can be terminated by either party on three months' written notice. The rest of this facility, including the GMP-certified manufacturing suites, is owned by BioNTech. We also recently purchased a building of approximately 802 square meters (equivalent to 8,632 square feet) near our IMFS facility in Idar-Oberstein, which will be used as office space.

At our JPT facility in Berlin, Germany, we occupy approximately 1,794 square meters (equivalent to approximately 19,299 square feet) of office, laboratory and other space. Approximately 250 square meters of that space (equivalent to approximately 2,690 square feet) is occupied under a lease which has an expiry date of June 20, 2020 and will continue for further six-month periods, unless terminated by either party on three months' prior written notice. Approximately 1,523 square meters (equivalent to approximately 16,199 square feet) are occupied under a lease for an indeterminate period of time but which may be terminated by either party on 12 months' prior written notice. The remaining approximately 20 square meters (equivalent to approximately 215 square feet) of storage space is occupied under a lease on a monthly basis and can be terminated by either party giving two weeks' written notice.

In Martinsried, Germany, outside Munich, Germany, we occupy approximately 1,681 square meters (equivalent to approximately 18,100 square feet) under a lease that has an initial term that expires on December 31, 2020, but which we have the option to extend until December 31, 2022.

In Neuried, Germany, outside Munich, Germany, we occupy approximately 725 square meters (equivalent to approximately 7,800 square feet) of laboratory and office space under a lease that expires on December 31, 2021, but which we have the option to extend until December 31, 2026. If the lease is not terminated before December 31, 2021 (where the option is not exercised) or December 31, 2026 (where the option is exercised) the lease will renew automatically for an additional one-year period until terminated by either party on 12 months' prior written notice.

In Halle (Saale), Germany, we have since the beginning of 2020 occupied approximately 415 square meters (equivalent to approximately 4,467 square feet) of office and other space under a lease that expires on February 28, 2022. We further occupy 90 square meters (equivalent to approximately 968 square feet) of laboratory space under a lease that also expires on February 28, 2022. Each lease will renew automatically for an additional one-year period until terminated by either party on six months' prior written notice to expire at the end of the lease period (or any extension thereof).

## [Table of Contents](#)

In San Diego, we occupy approximately 14,971 square feet of laboratory and office space under a lease to part of a building located at 11535 Sorrento Valley Road, San Diego, California, that expires on February 28, 2022.

We intend to expand our capacity as follows:

- In the third quarter of 2020, we anticipate completing the construction of two new buildings at our BioNTech IMFS facility in Idar-Oberstein, Germany, which we will own, and as a result of which we will occupy an additional 780 square meters (equivalent to approximately 8,395 square feet) of clean room space and 550 square meters (equivalent to approximately 5,900 square feet) of laboratory space, expanding our capacity for GMP cell therapy manufacturing and 650 square meters (equivalent to approximately 7,000 square feet) of office space.
- We anticipate completing the construction of a new complex of building for our JPT business in Berlin, Germany, possibly as early as 2023. Upon completion of the construction project we will occupy up to approximately 5,000 additional square meters (equivalent to approximately 53,820 square feet) of useable floor space split between laboratories, offices and storage.

We are committed to the continued development of world-class laboratory as well as manufacturing operations to support our research and development as well as clinical manufacturing needs, to prepare for commercial scale manufacturing of our product candidates, and to realize external commercial opportunities. We expect to commit approximately an additional €250 million through 2023. Our planned laboratory and manufacturing investments include:

- two new buildings at our BioNTech IMFS facility, including three floors each of clean rooms and additional development and quality control laboratories;
- our planned commercial scale facility in Mainz, which will occupy more than 100,000 square feet and will house cleanrooms, laboratories and offices;
- an expansion of our JPT facility, which is designed to more than double our capacity; and
- an expansion of our laboratory space for research and development on our Mainz campus.

## **XX. Legal Proceedings**

From time to time, we may be involved in legal proceedings in the ordinary course of business. We are currently not a party to any material legal or administrative proceedings. In addition, we are not aware of any material legal or administrative proceedings contemplated to be brought against us. Regardless of outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources and other factors.

## PRINCIPAL AND SELLING SHAREHOLDERS

The following table presents information, as of June 30, 2020, regarding the beneficial ownership of our ordinary shares (i) prior to the consummation of the Global Offering, (ii) as adjusted to reflect the sale of the ADSs in the Underwritten Offering and (iii) as further adjusted to reflect full subscription of the Rights Offering, for:

- each person, or group of affiliated persons, known by us to own beneficially 5% or more of our outstanding ordinary shares;
- each member of our Supervisory Board;
- each member of our Management Board;
- all members of our Supervisory Board and Management Board as a group; and
- the Selling Shareholder for purposes of the underwriters' option to purchase additional ADSs.

The number of ordinary shares beneficially owned by each entity, person, and member of our Supervisory Board and our Management Board is determined in accordance with the rules of the SEC, and the information is not necessarily indicative of beneficial ownership for any other purpose. Under such rules, beneficial ownership includes any ordinary shares over which the individual has sole or shared voting power or investment power as well as any ordinary shares that the individual has the right to acquire within 60 days of June 30, 2020 through the exercise of any option, warrant or other right. Except as otherwise indicated, and subject to applicable community property laws, the persons named in the table have sole voting and investment power with respect to all ordinary shares held by that person.

The percentage of outstanding ordinary shares before the Global Offering is computed on the basis of 232,673,455 ordinary shares outstanding as of June 30, 2020. This amount excludes 5,524,506 shares held in treasury and does not reflect the issuance of 2,595,996 of our ordinary shares to be issued in the June 2020 Private Placement, which is expected to close in August 2020.

The percentage of shares beneficially owned on an adjusted basis after the Underwritten Offering is based on shares to be outstanding after the Underwritten Offering after giving effect to the completion of the Underwritten Offering. The percentage of shares beneficially owned on an adjusted basis after the Global Offering is based on 240,062,644 shares to be outstanding after the Global Offering after giving effect to the completion of the Underwritten Offering and assuming full subscription of the Rights Offering. Ordinary shares that a person has the right to acquire within 60 days of June 30, 2020 are deemed outstanding for purposes of computing the percentage ownership of the person holding such rights, but are not deemed outstanding for purposes of computing the percentage ownership of any other person, except with respect to the percentage ownership of all members of our Supervisory Board and our Management Board as a group. Unless otherwise indicated, the address for each beneficial owner is An der Goldgrube 12, D-55131 Mainz, Germany.

## Table of Contents

Shareholder	Shares Beneficially Owned Before the Global Offering		Shares Beneficially Owned After the Global Offering, Assuming Full Subscription <sup>(1)</sup> in the Rights Offering	
	Number	Percent	Number	Percent
<b>5% Shareholders</b>				
ATHOS KG <sup>(2)</sup>	114,141,520	49.06%	114,141,520	47.55%
Medine GmbH <sup>(3)</sup>	41,690,970	17.92%	41,690,970	17.37%
<b>Members of the Supervisory Board and the Management Board</b>				
Prof. Ugur Sahin, M.D. <sup>(4)</sup>	41,690,970	17.92%	41,690,970	17.37%
Sean Marett <sup>(5)</sup>	1,091,502	*	1,091,502	*
Dr. Sierk Poetting <sup>(6)</sup>	711,828	*	711,828	*
Dr. Özlem Türeci	—	—	—	—
Ryan Richardson	—	—	—	—
Helmut Jeggle <sup>(7)</sup>	116,798,941	50.20%	116,798,941	48.65%
Michael Motschmann	—	—	—	—
Prof. Christoph Huber, M.D. <sup>(8)</sup>	2,552,040	1.10%	2,552,040	1.06%
Dr. Ulrich Wandschneider <sup>(9)</sup>	4,680	*	4,680	*
All members of our Supervisory Board and Management Board, as a group	162,849,961	69.99%	162,849,961	67.84%
<b>Selling Shareholder<sup>(10)</sup></b>	<b>10,268,124</b>	<b>4.41%</b>	<b>9,443,124</b>	<b>3.93%</b>

\* Less than one percent

- (1) Excluding rights attributable to holders that have irrevocably agreed not to transfer or exercise rights. Assumes no exercise of rights in the Rights Offering by any person listed in this section.
- (2) Consists of 114,141,520 ordinary shares held by AT Impf GmbH. The sole member of AT Impf GmbH is ATHOS KG, and, as a result, ATHOS KG is deemed to be the beneficial owner of the securities held by AT Impf GmbH. Helmut Jeggle and Thomas Maier are each general partners (*Komplementär*) of ATHOS KG and may be deemed to be beneficial owners of the securities held by AT Impf GmbH. Each of Messrs. Jeggle and Maier disclaim beneficial ownership of such shares except to the extent of their pecuniary interest therein.
- (3) The sole shareholder of Medine GmbH is Prof. Sahin, and, as a result, Prof. Sahin is deemed to be the beneficial owner of the securities held by Medine GmbH.
- (4) Consists of the shares described in note 3 above. Prof. Sahin is the sole shareholder of Medine GmbH.
- (5) Consists of 1,091,502 ordinary shares held by RLG GmbH. Mr. Marett is the sole shareholder of RLG GmbH.
- (6) Consists of 711,828 ordinary shares held by Tofino GmbH. Dr. Poetting is the sole shareholder of Tofino GmbH.
- (7) Consists of (a) the shares described in note 2 above, (b) 332,316 ordinary shares held directly by Mr. Jeggle, (c) 2,273,886 ordinary shares held by Salvia GmbH and (d) 51,219 ordinary shares held by Nils GmbH. Mr. Jeggle is the sole shareholder of Salvia GmbH and Mr. Jeggle and his wife are the sole shareholders of Nils GmbH. Mr. Jeggle has no voting or dispositive power with regard to such shares described in note 1 above and disclaims beneficial ownership of such shares except to the extent of his pecuniary interest therein.
- (8) Consists of 2,552,040 ordinary shares held by CHuber 2008 GmbH. Prof. Huber and his wife are the shareholders of CHuber 2008 GmbH.
- (9) Consists of 4,680 shares held by beebusy capital gmbh.
- (10) Consists of (a) 4,162,321 ordinary shares held by MIG GmbH & Co. Fonds 7 KG, Munich, (b) 1,348,268 ordinary shares held by MIG GmbH & Co. Fonds 8 KG, Munich and (c) 4,757,535 ordinary shares held by MIG GmbH & Co. Fonds 9 KG, Munich. The underwriters have an option to purchase 825,000 ADSs to be sold by funds associated with MIG Verwaltungs AG, Ismaninger Strasse 102. D-81675 Munich, Germany. If the underwriters exercise in full their option to purchase additional ADSs from funds associated with MIG

---

[Table of Contents](#)

Verwaltungs AG, MIG Verwaltungs AG will hold 9,443,124 ordinary shares, or 3.93% beneficial ownership of our outstanding ordinary shares (including those held in the form of ADSs) after the Global Offering.

**Holdings by U.S. Shareholders**

Prior to the completion of the Global Offering, we estimate that approximately 23.89% of our outstanding ordinary shares were held by three U.S. record holders.

## DESCRIPTION OF SHARE CAPITAL AND ARTICLES OF ASSOCIATION (*SATZUNG*)

### General

We were incorporated as a German stock corporation (*Aktiengesellschaft*) with the legal name Petersberg 91. V V AG under the laws of the Federal Republic of Germany on June 2, 2008. We changed our name to BioNTech AG on December 11, 2008. Effective as of March 8, 2019, the date on which the change of legal form and company was registered with the commercial register (*Handelsregister*) of the local court (*Amtsgericht*) of Mainz, Germany, we converted to a *Societas Europaea* with the legal name BioNTech SE. We completed our initial public offering in October 2019. The principal legislation under which we operate and our shares are issued are the Council Regulation (EC) No 2157/2001 of October 8, 2001 on the Statute for a European company (SE), the German Law on the Implementation of Council Regulation (EC) No 2157/2001 of October 8, 2001 on the Statute for a European company (SE) (*Gesetz zur Ausführung der Verordnung (EG) NR. 2157/2001 des Rates vom 8. Oktober 2001 über das Statut der Europäischen Gesellschaft (SE) (SE-Ausführungsgesetz—SEAG)*) and the German Stock Corporation Act (*Aktiengesetz*), in each case as amended.

We are registered with the commercial register (*Handelsregister*) of the local court (*Amtsgericht*) in Mainz, Germany, under number HRB 48720. Our statutory seat is in Mainz, Germany, and our registered office is An der Goldgrube 12, 55131 Mainz, Germany. Copies of our Articles of Association (*Satzung*) will be publicly available from the commercial register (*Handelsregister*) at the local court of Mainz, Germany, electronically at [www.unternehmensregister.de](http://www.unternehmensregister.de) and as an exhibit to the registration statement of which this prospectus forms a part.

### Share Capital

We have share capital registered in the commercial register (*Handelsregister*) in the amount of €238,197,961.00, which is divided into 238,197,961 registered shares (*Namensaktien*). All shares are shares with no par value (*Stückaktien ohne Nennbetrag*) with a notional amount attributable to each ordinary share of €1.00. Each issued ordinary share is fully paid.

### Form, Certification and Transferability of Shares

The form and contents of our share certificates, collective share certificates and global share certificates are determined by our Management Board. A shareholder's right to certification of its shares is excluded, to the extent permitted by law and to the extent that certification is not required by the stock exchange on which the shares or rights or certificates representing them are admitted to trading. We are permitted to issue collective share certificates and global share certificates that represent multiple or all of our shares.

Our shares are freely transferable under German law.

### Changes in Our Share Capital During the Last Three Fiscal Years

Our share capital as registered with the commercial register (*Handelsregister*) amounts to 238,197,961. Since January 1, 2017, (up until and including the capital increase of August 16, 2019, without giving effect to the 18-to-1 stock split which became effective on September 18, 2019), our share capital has changed as follows:

- On September 14, 2017, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 9,083,000 shares;
- On February 1, 2018, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 1,254,884 shares;
- On September 12, 2018, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 32,373 shares;

## Table of Contents

- On October 18, 2018, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 186,715 shares;
- On January 29, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 282,678 shares;
- On April 24, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 131,933 shares against contributions in kind (swap of shares in our company against shares in one of our subsidiary companies);
- On June 26, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 666,123 shares;
- On August 16, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 333,310 shares;
- On September 18, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 206,595,492 shares by way of a capital increase from our funds; thus, no contribution by investors was made;
- On September 26, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 3,038,674 shares;
- On October 14, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 10,000,000 shares;
- On November 6, 2019, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 517,408 shares;
- On April 23, 2020, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 1,580,777 shares;
- On May 5, 2020, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 2,377,446 shares; and
- On May 8, 2020, our share capital as registered with the commercial register (*Handelsregister*) was increased by issuing 1,935,488 shares.

### **Anti-takeover Provisions of Our Charter Documents**

Our Articles of Association (*Satzung*) do not include any provisions that would have a direct effect of delaying, deferring or preventing a change of control. However, in the event of a hostile takeover, we could use our authorized capital to increase our share capital to issue new shares to an investor at a premium. An increase in the number of shares outstanding could have a negative effect on a party's ability to carry out a hostile takeover. The provisions of German law relating to public bids and takeovers that require any such bids to be carried out in a manner designed to safeguard equal and fair treatment to all shareholders and give them a right to be bought out at an adequate compensation where a party acquires "control" (as such term is defined in such provisions) over the relevant company do not apply.

### **Future Changes to the Share Capital**

#### ***Authorized Capital***

Under the relevant law, the general meeting of a European stock corporation (*Societas Europaea*) governed by German law can authorize the Management Board to, with the consent of the Supervisory Board, issue shares in a specified aggregate nominal amount of up to 50% of the issued share capital of such company at the time the resolution becomes effective. The shareholders' authorization becomes effective upon registration in the commercial register (*Handelsregister*) and may extend for a period of no more than five years thereafter. Under

## Table of Contents

§ 4(5) of our Articles of Association (*Satzung*), the Management Board is authorized to increase our share capital, on one or more occasions, by a total of up to €99,924,291.00 by issuing, on one or more occasions, up to 99,924,291 new, registered shares with no par value (*Genehmigtes Kapital*), in each case with consent of the Supervisory Board. This authorization expires on August 18, 2024.

Any new shares issued from the authorized capital will participate in the profits starting with the fiscal year for which the annual financial statements have not yet been submitted to the general meeting at the time of registration of the implementation of the capital increase. Further details of a capital increase from the authorized capital may be specified by the Management Board.

### **Conditional Capital**

Pursuant to § 4(6) of our Articles of Association (*Satzung*), our share capital is conditionally increased by €21,874,806.00 through issuance of new, registered shares with no par value (*Bedingtes Kapital ESOP 2017/2019*). The conditional capital may only be used to issue shares to the holders of option rights granted under our ESOP to members of our Management Board and to certain of our employees.

The conditional capital increase will only be implemented to the extent that stock options under our ESOP are exercised and said stock options are not serviced by our providing treasury shares or through cash payments. Any new shares issued under the conditional capital pursuant to the said § 4(6) of our Articles of Association (*Satzung*) shall be entitled to dividends from the beginning of the previous financial year in case they are created by the exercise of subscription rights until the start of the annual general meeting of the Company and otherwise from the beginning of the financial year in which they are created as a result of the exercise of the stock options.

Pursuant to § 4(7) of our Articles of Association (*Satzung*), our share capital is conditionally increased by €87,499,260.00 through issuance of new, registered shares with no par value (*Bedingtes Kapital WSV 2019*). The conditional capital may only be used to issue shares to the holders or creditors of option rights or conversion rights or those under an obligation to convert under warrant-linked or convertible bonds avail of their option rights or conversion rights or where they are under an obligation to convert, to the extent they satisfy their obligation to convert, or to the extent that we exercise a right to choose to grant our shares, in whole or in part instead of paying a monetary amount due, and to the extent cash compensation is not granted in each relevant case or treasury shares or shares of another stock-listed company are not utilized for servicing.

Any new shares issued under the said conditional capital pursuant to the said § 4(7) of our Articles of Association shall carry an entitlement to dividends from the beginning of the financial year in which they are created; however, as far as the law permits, the Management Board can confer dividend rights for new shares in derogation of the foregoing.

### **Preemptive Rights**

German law generally provides shareholders with preemptive rights when new shares convertible bonds, bonds with warrants, profit participation rights or participating bonds are issued. This requirement, however, may also be satisfied by way of a credit institution subscribing for the securities and then offering them to the shareholders for purchase (*mittelbares Bezugsrecht*).

Further, it is possible for a shareholder resolution approved by three-quarters of the share capital voting on the resolution to exclude preemptive rights both where the general meeting itself resolves that the new securities to be issued and in relation to the authorized capital, *i.e.*, an authorization to the Management Board to, with the consent of the Supervisory Board, resolve on the issuance of new securities; provided, however, that in each case the exclusion or the authorization to so exclude preemptive rights, respectively, must be justified by specific facts, in accordance with established case law of the German Federal Court of Justice (*BGH*). The German Federal Court of Justice (*BGH*) considers the exclusion of subscription rights justified if it (i) serves a purpose in

## [Table of Contents](#)

the company's interests, (ii) is suitable for attaining such purpose, and (iii) is necessary and appropriate. Additionally, the management board must submit a written report to the shareholders' meeting in which it presents the reasons for the exclusion of the subscription rights.

Accordingly, under our Articles of Association (*Satzung*), the Management Board may, with the consent of the Supervisory Board, exclude such preemptive rights in a capital increase from the authorized capital in the following circumstances:

- to exclude fractional amounts from the subscription right;
- in the case of a capital increase against cash contributions, if the issue price of the new shares is not significantly lower than the market price of the company's shares already listed on the stock exchange at the time the issue price is finally determined. However, this authorization shall only apply subject to the provision that the shares issued excluding subscription rights in accordance with Section 186(3) Sentence 4 AktG may not exceed a total of 10% of the share capital either at the time this authorization takes effect or, if this amount is lower, at the time this authorization is exercised. This limit of 10% of the share capital includes shares which are issued or disposed of during the term of this authorization until the date of its exercise in direct or equivalent application of Section 186(3) Sentence 4 AktG. Shares which are used to service bonds with convertible or option rights or convertible obligations are to be offset against the 10% limit if these bonds were issued under exclusion of shareholder subscription rights in accordance with Section 186(3) Sentence 4 AktG during the entitlement period. Treasury shares are to be offset against the 10% limit, where they were disposed of by the company during the term of this authorization with the exclusion of subscription rights pursuant to or in analogous application of Section 186(3) Sentence 4 AktG;
- in the case of capital increases in exchange for contributions in kind, in particular in order to be able to offer the shares to third parties when purchasing companies, parts of companies or interests in companies as well as licenses or industrial property rights;
- in order to grant subscription rights to new shares to holders of conversion or option rights in respect of bonds issued by the company or its subordinated domestic or foreign Group companies, to the extent to which they would be entitled after exercising their conversion or option rights or after fulfilling an agreed conversion obligation;
- to implement an election dividend by which shareholders are given the option to contribute their dividend entitlements (either in whole or part) as a contribution in kind against issuance of our new shares;
- in case shares are to be issued to a member of our Management Board or to another person who is employed by us or one of our affiliates and a minimum holding period of at least one year and the obligation to transfer back the shares in the event that the beneficiary is not employed by us or one of our affiliated companies for the entire duration of the holding period or any other agreed period is agreed upon. Additional restrictions with regard to the shares issued may be agreed upon;
- after listing on Nasdaq, if excluding subscription rights, according to the written declaration of an internationally renowned investment bank, is expedient to the shares' successful placement in view of the requirements of eligible investors and if the discount by which the issue price of the shares may be below the current stock exchange price at the time the Management Board adopts the resolution on using authorized capital, according to such declaration, does not exceed the extent necessary for a successful placement; and
- in order to be able to satisfy an option to acquire additional ordinary shares or American Depositary Shares that has been agreed with the issuing banks in connection with a public offering of our shares in the form of American Depositary Shares.

The total number of new shares issued from the authorized capital and under exclusion of subscription rights pursuant to bullets one through three and seven above may not exceed 20% of the share capital, either at the time

## [Table of Contents](#)

this authorization becomes effective or, if lower, at the time it is utilized. To be counted against the aforementioned 20% limit are: (i) those shares issued or to be issued to service conversion or option rights or conversion or option obligations or tender rights of the issuer under bonds, if the bonds have been issued during the term of this authorization up to the time of its exercise, excluding the subscription rights of shareholders, as well as, to a certain extent (ii) treasury shares that have been disposed under exclusion of subscription rights during the term of this authorization (except in the case of certain exceptions of the resolution to item no. 8 of the general meeting of August 19, 2019).

With the registration with the commercial register (*Handelsregister*) of the change to our Articles of Association (*Satzung*) resolved upon by our shareholders on June 26, 2020, the list of authorizations to exclude subscription rights would be modified as follows:

- The second-to-last bullet of the list above would be deleted; and
- an authorization would be added to exclude subscription rights in capital increases, in each case if excluding subscription rights, according to the assessment by the Management Board, is expedient to the shares' successful placement in view of the requirements of eligible investors and if the discount by which the issue price of the shares may be below the current stock exchange price at the time the Management Board adopts the resolution on using authorized capital, according to the assessment by the Management Board, does not exceed the extent necessary for a successful placement and in any case does not exceed 10% of either the latest available closing price at the time when the issue price is fixed or the volume-weighted average price over a period of up to five trading days ending on the day on which the issue price is so fixed.

For the purposes of limiting the amount of shares to be issued under exclusion of subscription rights to 20% (as described above), this newly introduced authorization would, effective upon registration with the commercial register (*Handelsregister*), replace the one that will be deleted. Also, in order to calculate the actual maximum number of shares in this regard (as described above), the Articles of Association (*Satzung*) would no longer reference the share capital at the time the authorization originally came into effect, but the share capital at the time this amendment to the Articles of Association (*Satzung*), resolved upon by the general meeting of June 26, 2020, will come into effect by way of registration with the commercial register (*Handelsregister*).

### **Corporate Purpose of our Company**

Our business objective, as described in § 2 of our Articles of Association (*Satzung*), is to research and develop, as well as to manufacture and market immunological and RNA-based drugs and test methods for the diagnosis, prevention and treatment of cancer, infectious diseases and other serious diseases.

### **Shareholders' Meetings and Voting Rights**

Pursuant to our Articles of Association (*Satzung*), shareholders' meetings may be held at our seat or in any municipality in Germany with more than 500,000 inhabitants. Generally, shareholders' meetings are convened by our Management Board, or our Supervisory Board. Shareholders representing in the aggregate at least five percent of our ordinary shares may, subject to certain formal prerequisites, request that a shareholders' meeting be convened. Shareholders representing in the aggregate at least five percent of our ordinary shares or owning shares with an aggregate nominal value of at least €500,000.00 may request the addition of one or several items to the agenda of any shareholders' meeting. Shareholders' meetings may be summoned either via publication in the German Federal Gazette (*Bundesanzeiger*) or via mail or (after the pertinent amendment of our articles of association resolved upon by our annual general meeting of 2020 becoming effective) even via email, in each case generally at least 36 days before the meeting.

Shareholders may participate in and vote in the shareholders' meeting if they are registered as a shareholder with the Company's share register. A shareholder who wishes to attend the shareholders' meeting—either in

## [Table of Contents](#)

person or by proxy, which may also be appointed by us (*Stimmrechtsvertreter*)—must register for the meeting, which registration must occur no later than six days before the meeting (or at a later date, if so determined by our Management Board).

Each share carries one vote at a shareholders' meeting. Resolutions are, in accordance with our Articles of Association (*Satzung*), generally taken by simple majority of the votes cast. However, under applicable German and European law, a number of resolutions must be passed by either a three-quarter majority of the votes cast or a three-quarter majority of the share capital represented at the meeting. The fact that in these cases the quorum is determined in relation to the share capital or shares present (as opposed to, for example, all shares eligible to vote) means that holders of a minority of our shares could potentially control the outcome of resolutions.

### **Claims against Directors and Shareholders' Derivative Actions**

Under German law, generally, the company, rather than its shareholders, is the proper claimant in an action with respect to a wrong committed against the company, or in cases where there is an irregularity in the company's internal management or supervision. Therefore, such claims may only be raised by the company represented by its management board, or, in the case of a wrong committed by a member of the Management Board, by the Supervisory Board. This concerns, in particular, claims against members of the Management Board or the Supervisory Board.

However, pursuant to German case law, the Supervisory Board is obliged to pursue the company's claims against the Management Board, unless the interest of the company keeps them from doing so. Further, the Management Board, or, if a claim is against a member of the Management Board, the Supervisory Board, is obliged to pursue the company's claims against the designated individuals if so resolved by a simple majority of votes cast during a shareholders' meeting. With a simple majority of votes, shareholders can also request that a representative pursue the claim on behalf of the company. The court may appoint such a representative upon the request of shareholders holding at least 10% of the company's share capital or a participation of at least €1,000,000 in the share capital.

If the company is unable to fulfill its third-party obligations, the company's creditors may pursue the company's damage claims against members of the Management Board for certain wrongdoings.

Under certain circumstances, shareholders can bring forward damage claims of the company against its management on their own behalf. In order to bring forward such a claim one shareholder alone or together with other shareholders needs to hold at least 1% of the company's share capital or a participation of €100,000 in the share capital. Additionally, the claimant(s) must comply with special claim approval procedures conducted before a competent court which will allow the pertinent request only if there are circumstances justifying the assumption that damage has been afflicted on the company by improper conduct or a gross breach of the law or the articles of association.

### **Dividend Rights**

Under German law, distributions of dividends on shares for a given fiscal year are generally determined by a process in which the Management Board and Supervisory Board submit a proposal to the company's annual general shareholders' meeting held in the subsequent fiscal year and such annual general shareholders' meeting adopts a resolution.

German law provides that a resolution concerning dividends and distribution thereof may be adopted only if the company's unconsolidated financial statements prepared in accordance with German law show net retained profits. In determining the profit available for distribution, the result for the relevant year must be adjusted for profits and losses brought forward from the previous year and for withdrawals from or transfers to reserves. Certain reserves are required by law and must be deducted when calculating the profit available for distribution.

Shareholders generally participate in profit distributions in proportion to the number of shares they hold. Dividends on shares resolved by the general shareholders' meeting are paid annually, shortly after the general shareholders' meeting, in compliance with the rules of the respective clearing system. Dividend payment claims are subject to a three-year statute of limitation in the company's favor.

### **Authorization to Purchase and Sell Our Own Shares**

We may not purchase our own shares unless authorized by the shareholders' meeting or in other very limited circumstances as set out in the German Stock Corporation Act. The Company's shareholders' meeting held on August 19, 2019 authorized the Management Board until August 18, 2024, provided it complies with the legal requirement of equal treatment, to acquire treasury shares up to a total of 10% of the Company's share capital at the time of the relevant resolution or at the time the authorization is exercised. These shares held by the Company (including shares attributable to it pursuant to the AktG) must never exceed 10% of the share capital. The shares may be purchased (i) through the stock exchange, (ii) by means of a public offer directed to all shareholders of the Company, (iii) by means of a public invitation to the shareholders to make a sales offer or (iv) from the Bill & Melinda Gates Foundation under very limited circumstances as specified in the authorization. Such shares may not be purchased for trading purposes. The Management Board is authorized to use the shares only as specified in the authorization.

### **Squeeze-Out of Minority Shareholders**

Under German law, the shareholders' meeting of a stock corporation may resolve, upon request of a shareholder that holds at least 95% of the share capital, that the shares held by any remaining minority shareholders be transferred to the majority shareholder against payment of "adequate cash compensation" (*Ausschluss von Minderheitsaktionären*). This amount must take into account the full value of the company at the time of the resolution, which is generally determined using the future earnings value method (*Ertragswertmethode*).

A squeeze-out in the context of a merger (*umwandlungsrechtlicher Squeeze-Out*) only requires a majority shareholder to hold at least 90% of the share capital.

### **Liquidation Rights**

Apart from liquidation, e.g., as a result of insolvency proceedings, we may be liquidated with a vote of the holders of at least three-quarters of the share capital represented at the shareholders' meeting at which such a vote is taken. If we are liquidated, any assets remaining after all of our liabilities have been paid off would be distributed among our shareholders in proportion to their holdings in accordance with German statutory law. The German Stock Corporation Act provides certain protections for creditors which must be observed in the event of liquidation.

### **Differences in Corporate Law**

The applicable provisions of the SE Regulation in conjunction with the German Stock Corporation Act as applied to a European stock corporation that has its legal seat in Germany differ from laws applicable to U.S. corporations and their shareholders. Set forth below is a summary of certain differences between the provisions of the SE Regulation in conjunction with the German Stock Corporation Act applicable to us and the General Corporation Law of the State of Delaware relating to shareholders' rights and protections. This summary is not intended to be a complete discussion of the respective rights and it is qualified in its entirety by reference to Delaware law and European and German law.

**European Union/Federal Republic of Germany**

**Delaware**

Board System

A European stock corporation may choose to have a two-tier board structure composed of the Management Board (*Vorstand*) and the Supervisory Board (*Aufsichtsrat*). We have chosen this structure.

The Management Board is responsible for running the company's affairs and representing the company in dealings with third parties.

The Supervisory Board of a European stock corporation under German law has a control and supervisory function. The Supervisory Board does not actively manage the company but certain Management Board actions require the approval of the Supervisory Board.

Under Delaware law, a corporation has a unitary board structure, and it is the responsibility of the board of directors to appoint and oversee the management of the corporation on behalf of and in the best interests of the stockholders of the corporation.

Management is responsible for running the corporation and overseeing its day-to-day operations.

Appointment and  
Number of Directors

Under applicable European and German law, a European stock corporation governed by German law with a share capital of at least €3 million generally must have at least two members on its Management Board and the number of members shall be determined by or in the manner provided in the company's articles of association.

The Supervisory Board must consist of at least three but—depending on the share capital—no more than 21 Supervisory Board members, whereby the number of Supervisory Board members must be divisible by three if this is necessary for the fulfilment of co-determination requirements. The articles of association of the company must specify if the Supervisory Board has more than three members.

Supervisory Board members are either appointed by the shareholders' meeting or delegated by one or more individual shareholders if so provided for in the company's articles of association. If the Supervisory Board consists of fewer members than is required to meet the quorum for resolutions (either statutory or pursuant to the company's articles of association), a competent court may appoint additional members as needed to meet the quorum. The provisions of German law in relation to employees' co-determination do not apply to the Company.

Under Delaware law, a corporation must have at least one director and the number of directors shall be fixed by or in the manner provided in the bylaws.

**European Union/Federal Republic of Germany**

**Delaware**

Removal of Directors

Members of the Management Board of a European stock corporation are appointed by the Supervisory Board for a maximum period of six years with an opportunity to be reelected. The articles of association may provide for a shorter term, which in our case is up to five years. The members of the Management Board may be reelected, even repeatedly. The Supervisory Board may remove a member of the Management Board prior to the expiration of his or her term only for cause, such as gross breach of duties (*grobe Pflichtverletzung*), the inability to manage the business properly (*Unfähigkeit zur ordnungsgemäßen Pflichtausübung*) or a vote of no-confidence during the shareholders' meeting (*Vertrauensentzug*). The shareholders themselves are not entitled to appoint or dismiss the members of the Management Board.

Under Delaware law, any director or the entire board of directors may be removed, with or without cause, by the holders of a majority of the shares then entitled to vote at an election of directors, except (i) unless the certificate of incorporation provides otherwise, in the case of a corporation whose board of directors is classified, stockholders may effect such removal only for cause; or (ii) in the case of a corporation having cumulative voting, if less than the entire board of directors is to be removed, no director may be removed without cause if the votes cast against his removal would be sufficient to elect him if then cumulatively voted at an election of the entire board of directors, or, if there are classes of directors, at an election of the class of directors of which he is a part.

Under European law, a member of the Supervisory Board of a company may be elected for a term of up to six years. The articles of association may provide for a shorter term. Our Supervisory Board members are, if the general meeting does not resolve on a shorter term, elected for a period up to the end of the general meeting deciding on the discharge for the fourth financial year after the election. Reelection, including repeated reelection, is permissible. Members of the Supervisory Board may be removed with or without cause by way of a general meeting resolution, with the applicable majority requirement depending on the relevant company's articles of association.

Vacancies on the Board of Directors

Under the law, vacant positions on the Management Board are filled by the Supervisory Board in accordance with the general rules of appointment, which provide that vacancies are filled by the simple majority of votes of Supervisory Board members present or represented by proxy at the vote (with, under certain circumstances, the chairman having a casting vote), unless otherwise provided by the company's articles of association. In case of emergencies, a vacant position on the Management Board

Under Delaware law, vacancies and newly created directorships may be filled by a majority of the directors then in office (even though less than a quorum) or by a sole remaining director unless (i) otherwise provided in the certificate of incorporation or by-laws of the corporation or (ii) the certificate of incorporation directs that a particular class of stock is to elect such director, in which case a majority of the other directors elected by such class, or a sole

	<u>European Union/Federal Republic of Germany</u>	<u>Delaware</u>
	may be filled by an individual appointed by the court.	remaining director elected by such class, will fill such vacancy.
	Vacant positions on the Supervisory Board are filled in accordance with the general rules of appointment.	
Annual General Meeting	A European stock corporation which is governed by German law must hold an annual shareholders' meeting within six months of the end of its fiscal year. The annual shareholders' meeting must be held at a location determined by the articles of association. If the articles of association do not provide for a specific location, the shareholders' meeting shall be held at the company's seat or, if applicable, at the venue (in Germany) where its shares are listed.	Under Delaware law, the annual meeting of stockholders shall be held at such place, on such date and at such time as may be designated from time to time by the board of directors or as provided in the certificate of incorporation or by the bylaws.
General Meeting	Under the law, extraordinary shareholders' meetings, in addition to the annual shareholders' meetings, may be called by either the Management Board, or by the Supervisory Board. Shareholders holding at least 5% of the company's share capital are entitled to request that an extraordinary shareholders' meeting be convened. In the event that the meeting is not then so convened, a competent court may order that the meeting be convened or authorize the shareholders or their representative to convene the meeting themselves.	Under Delaware law, special meetings of the stockholders may be called by the board of directors or by such person or persons as may be authorized by the certificate of incorporation or by the bylaws.
Notice of General Meetings	<p>Under applicable European and German law, unless a longer period is otherwise provided for in the articles of association or applies because of registration requirements stipulated in the articles of association, the shareholders must be given at least 30 days' advance notice of the shareholders' meeting. Such notices must at least specify the name of the company, the statutory seat of the company, and the location, date and time of the shareholders' meeting. In addition, the invitation must contain the agenda items as well as the Management Board's and the Supervisory Board's voting proposal for each agenda item and, depending on the circumstances, certain further information.</p> <p>If all shareholders entitled to attend the shareholders' meeting are present or represented and do not object to the meeting</p>	Under Delaware law, unless otherwise provided in the certificate of incorporation or bylaws, written notice of any meeting of the stockholders must be given to each stockholder entitled to vote at the meeting not less than ten nor more than 60 days before the date of the meeting and shall specify the place, date, hour, and purpose or purposes of the meeting.

**European Union/Federal Republic of Germany**

**Delaware**

being held, the formalities of calling and holding of a shareholders' meeting do not apply.

Proxy

A shareholder may designate another person to attend, speak and vote at a shareholders' meeting of the company on such shareholder's behalf by proxy.

With respect to Management Board meetings, a Management Board member may transmit its (written or verbal) vote via another Management Board member.

With respect to Supervisory Board meetings, a Supervisory Board member may participate in voting by issuing a written vote to another Supervisory Board member or any third party entitled to attend the Supervisory Board meeting.

Preemptive Rights

Under the law applicable to European stock corporations governed by German law, existing shareholders have a statutory subscription right for any additional issue of shares or any security convertible into shares pro rata to the nominal value of their respective holdings in the company, unless (i) shareholders representing three-quarters of the registered share capital present at the shareholders' meeting have resolved upon the whole or partial exclusion of the subscription right and (ii) there exists good and objective cause for such exclusion. No separate resolution on the exclusion of subscription rights is required if all shareholders waive their statutory subscription rights.

Authority to Allot

Under applicable European and German law, the Management Board may not allot shares, grant rights to subscribe for or to convert any security into shares unless a shareholder resolution to that effect has been passed at the company's shareholders' meeting granting the Management Board with such authority—subject to the approval of the Supervisory Board—in each case in accordance with the provisions of the German Stock Corporation Act.

Under Delaware law, at any meeting of stockholders, a stockholder may designate another person to act for such stockholder by proxy, but no such proxy shall be voted or acted upon after three years from its date, unless the proxy provides for a longer period. A director of a Delaware corporation may not issue a proxy representing the director's voting rights as a director.

Under Delaware law, stockholders have no preemptive rights to subscribe to additional issues of stock or to any security convertible into such stock unless, and except to the extent that, such rights are expressly provided for in the certificate of incorporation.

Under Delaware law, if the corporation's certificate of incorporation so provides, the board of directors has the power to authorize the issuance of stock. It may authorize capital stock to be issued for consideration consisting of cash, any tangible or intangible property or any benefit to the corporation or any combination thereof. It may determine the amount of such consideration by approving a formula. In the absence of actual fraud in the transaction, the judgment of the directors as to the value of such consideration is conclusive.

	<u>European Union/Federal Republic of Germany</u>	<u>Delaware</u>
Liability of Directors and Officers	<p>Under German law, any provision, whether contained in the company's articles of association or any contract or otherwise, that purports to exempt a Management or Supervisory Board member from any liability that would otherwise attach to such board member in connection with any negligence, default, breach of duty or breach of trust in relation to the company is void.</p> <p>Under German law, members of both the Management Board and members of the Supervisory Board are liable to the company, and in certain cases to third parties or shareholders, for any damage caused to them due to a breach of such member's duty of care. Apart from insolvency or special circumstances, only the company has the right to claim damages from members of either board. The company may waive claims for damages against a negligent Management or Supervisory Board member only after the expiry of three years.</p>	<p>Under Delaware law, a corporation's certificate of incorporation may include a provision eliminating or limiting the personal liability of a director to the corporation and its stockholders for damages arising from a breach of fiduciary duty as a director. However, no provision can limit the liability of a director for:</p> <ul style="list-style-type: none"><li>• any breach of the director's duty of loyalty to the corporation or its stockholders;</li><li>• acts or omissions not in good faith or that involve intentional misconduct or a knowing violation of law;</li><li>• intentional or negligent payment of unlawful dividends or stock purchases or redemptions; or</li><li>• any transaction from which the director derives an improper personal benefit.</li></ul>
Voting Rights	<p>Under the relevant European and German law, each share, except for statutory non-voting preferred shares (<i>nicht stimmberechtigte Vorzugsaktien</i>), entitles its holder to vote at the shareholders' meeting with, in the case of no-par value shares, each share conferring one vote. While German law does not provide for a minimum attendance quorum for shareholders' meetings, the company's articles of association may so provide. In general, resolutions adopted at a shareholders' meeting may be passed by a simple majority of votes cast, unless a higher majority is required by law or under the company's articles of association.</p>	<p>Delaware law provides that, unless otherwise provided in the certificate of incorporation, each stockholder is entitled to one vote for each share of capital stock held by such stockholder.</p>
Shareholder Vote on Certain Transactions	<p>Under applicable European and German law, certain shareholders' resolutions of fundamental importance require the vote of at least three-quarters of the share capital present or represented in the voting at the time of adoption of the resolution. Resolutions of fundamental importance include, in particular, capital increases with exclusion of subscription rights, capital decreases, the creation of authorized or</p>	<p>Generally, under Delaware law, unless the certificate of incorporation provides for the vote of a larger portion of the stock, completion of a merger, consolidation, sale, lease or exchange of all or substantially all of a corporation's assets or dissolution requires:</p> <ul style="list-style-type: none"><li>• the approval of the board of directors; and</li></ul>

**European Union/Federal Republic of Germany**

conditional share capital, the dissolution of a company, a merger into or with another company, split-offs and split-ups, the conclusion of inter-company agreements (*Unternehmensverträge*), in particular domination agreements (*Beherrschungsverträge*) and profit and loss transfer agreements (*Ergebnisabführungsverträge*).

Under applicable European and German law, both Management and Supervisory Board members must conduct their affairs with “the care and diligence of a prudent business man” and act in the best interest of the company. The scope of the fiduciary duties of Management and Supervisory Board members is generally determined by European and German legislation and by the courts.

Statutory and fiduciary duties of members of the Management Board to the company include, among others:

- to act in accordance with the law, the company’s articles of association and the rules of procedure for the Management Board, if any;
- to report to the Supervisory Board on a regular basis as well as on certain important occasions;
- to exercise reasonable care, skill and diligence;
- to maintain a proper accounting system;
- to not compete, directly or indirectly, with the company without permission by the supervisory board; and
- to secure that no further transactions are made in case of insolvency.

Statutory and fiduciary duties of members of the Supervisory Board to the company include, among others:

- to effectively supervise the Management Board’s handling of the company’s affairs;

**Delaware**

- approval by the vote of the holders of a majority of the outstanding stock or, if the certificate of incorporation provides for more or less than one vote per share, a majority of the votes of the outstanding stock of a corporation entitled to vote on the matter.

Delaware law does not contain specific provisions setting forth the standard of conduct of a director. The scope of the fiduciary duties of directors is generally determined by the courts of the State of Delaware. In general, directors have a duty to act without self-interest, on a well-informed basis and in a manner they reasonably believe to be in the best interest of the stockholders.

Directors of a Delaware corporation owe fiduciary duties of care and loyalty to the corporation and to its stockholders. The duty of care generally requires that a director act in good faith, with the care that an ordinarily prudent person would exercise under similar circumstances. Under this duty, a director must inform himself of all material information reasonably available regarding a significant transaction. The duty of loyalty requires that a director act in a manner he reasonably believes to be in the best interests of the corporation. He must not use his corporate position for personal gain or advantage. In general, but subject to certain exceptions, actions of a director are presumed to have been made on an informed basis, in good faith and in the honest belief that the action taken was in the best interests of the corporation. However, this presumption may be rebutted by evidence of a breach of one of the fiduciary duties. Delaware courts have also imposed a heightened standard of conduct upon directors of a Delaware corporation who take any action designed to defeat a threatened change in control of the corporation. In addition, under Delaware law, when the board of directors of a Delaware

Standard of Conduct for Directors

**European Union/Federal Republic of Germany**

**Delaware**

- to evaluate and issue a resolution on certain transactions which can only be conducted by the Management Board after approval of the Supervisory Board;
- to approve the company's financial statements;
- to appoint the Management Board members and to represent the company in transactions between the company and members of the Management Board; and
- to approve service contracts between individual members of the Supervisory Board and the company.

corporation approves the sale or break-up of a corporation, the board of directors may, in certain circumstances, have a duty to obtain the highest value reasonably available to the stockholders.

Stockholder Actions

Under German law, generally, the company, rather than its shareholders, is the proper claimant in an action with respect to a wrong committed against the company, or in cases where there is an irregularity in the company's internal management or supervision. Therefore, such claims may only be raised by the company represented by its Management Board, or, in the case of a wrong committed by a member of the Management Board, by the Supervisory Board.

Additionally, pursuant to German case law, the Supervisory Board is obliged to pursue the company's claims against the Management Board, unless the interest of the company keeps them from doing so.

The Management Board, or, if a claim is against a member of the Management Board, the Supervisory Board, is obliged to pursue the company's claims against the designated individuals if so resolved by a simple majority of votes cast during a shareholders' meeting. With a simple majority of votes, shareholders can request that a representative pursues the claim on behalf of the company.

If the company is unable to fulfill its third-party obligations, the company's creditors may pursue the company's damage claims against members of the Management Board for certain wrongdoings.

Under Delaware law, a stockholder may initiate a derivative action to enforce a right of a corporation if the corporation fails to enforce the right itself. The complaint must:

- state that the plaintiff was a stockholder at the time of the transaction of which the plaintiff complains or that the plaintiff's shares thereafter devolved on the plaintiff by operation of law; and
- either (i) allege with particularity the efforts made by the plaintiff to obtain the action the plaintiff desires from the directors and the reasons for the plaintiff's failure to obtain the action, or (ii) state the reasons for not making the effort.

Additionally, the plaintiff must remain a stockholder through the duration of the derivative suit. The action will not be dismissed or compromised without the approval of the Delaware Court of Chancery.

**European Union/Federal Republic of Germany**

**Delaware**

Under certain circumstances, shareholders can bring forward damage claims of the company against its management on their own behalf. In order to bring forward such a claim one shareholder alone or together with other shareholders needs to hold at least one percent of the company's share capital or a participation of €100,000 in the share capital. Additionally, the claimant(s) need(s) to pass through special claim approval procedures.

**Stock Exchange Listing**

ADSs representing our ordinary shares are listed on the Nasdaq Global Select Market under the symbol "BNTX."

## DESCRIPTION OF AMERICAN DEPOSITARY SHARES

### American Depositary Shares

The Bank of New York Mellon, as depositary, will register and deliver the American Depositary Shares, or the ADSs. Each ADS will represent one share (or a right to receive one share) deposited with The Bank of New York Mellon SA/NV as custodian for the depositary in Germany. Each ADS will also represent any other securities, cash or other property which may be held by the depositary. The deposited shares together with any other securities, cash or other property held by the depositary are referred to as the deposited securities. The depositary's office at which the ADSs will be administered and its principal executive office are located at 240 Greenwich Street, New York, New York 10286.

You may hold ADSs either (i) directly (a) by having an American Depositary Receipt, or an ADR, which is a certificate evidencing a specific number of ADSs registered in your name, or (b) by having uncertificated ADSs registered in your name, or (ii) indirectly by holding a security entitlement in ADSs through your broker or other financial institution that is a direct or indirect participant in The Depository Trust Company, or DTC. If you hold ADSs directly, you are a registered ADS holder, or an ADS holder. This description assumes you are an ADS holder. If you hold the ADSs indirectly, you must rely on the procedures of your broker or other financial institution to assert the rights of ADS holders described in this section. You should consult with your broker or financial institution to find out what those procedures are.

Registered holders of uncertificated ADSs will receive statements from the depositary confirming their holdings.

As an ADS holder, we will not treat you as one of our shareholders and you will not have shareholder rights. European and German law governs shareholder rights. The depositary will be the holder of the shares underlying your ADSs. As a registered holder of ADSs, you will have ADS holder rights. A deposit agreement among us, the depositary, ADS holders and all other persons indirectly or beneficially holding ADSs sets out ADS holder rights as well as the rights and obligations of the depositary. New York law governs the deposit agreement and the ADSs.

The following is a summary of the material provisions of the deposit agreement. For more complete information, you should read the entire deposit agreement and the form of ADR. Those documents are filed as exhibits to the registration statement of which this prospectus forms a part.

### Dividends and Other Distributions

#### *How will ADS holders receive dividends and other distributions on the shares?*

The depositary has agreed to pay or distribute to ADS holders the cash dividends or other distributions it or the custodian receives on shares or other deposited securities, upon payment or deduction of its fees and expenses. You will receive these distributions in proportion to the number of shares your ADSs represent.

*Cash.* The depositary will convert any cash dividend or other cash distribution we pay on the shares into U.S. dollars, if it can do so on a reasonable basis and can transfer the U.S. dollars to the United States. If that is not possible or if any government approval is needed and cannot be obtained, the deposit agreement allows the depositary to distribute the foreign currency only to those ADS holders to whom it is possible to do so. It will hold the foreign currency it cannot convert for the account of the ADS holders who have not been paid. It will not invest the foreign currency and it will not be liable for any interest.

Before making a distribution, any withholding taxes, or other governmental charges that must be paid will be deducted. See "Taxation" included elsewhere in this prospectus. The depositary will distribute only whole U.S. dollars and cents and will round fractional cents to the nearest whole cent. *If the exchange rates fluctuate during a time when the depositary cannot convert the foreign currency, you may lose some of the value of the distribution.*

## [Table of Contents](#)

*Shares.* The depositary may distribute additional ADSs representing any shares we distribute as a dividend or free distribution. The depositary will only distribute whole ADSs. It will sell shares which would require it to deliver a fraction of an ADS (or ADSs representing those shares) and distribute the net proceeds in the same way as it does with cash. If the depositary does not distribute additional ADSs, the outstanding ADSs will also represent the new shares. The depositary may sell a portion of the distributed shares (or ADSs representing those shares) sufficient to pay its fees and expenses in connection with that distribution.

*Rights to purchase additional shares.* If we offer holders of our securities any rights to subscribe for additional shares or any other rights, the depositary may (i) exercise those rights on behalf of ADS holders, (ii) distribute those rights to ADS holders or (iii) sell those rights and distribute the net proceeds to ADS holders, in each case after deduction or upon payment of its fees and expenses. To the extent the depositary does not do any of those things, it will allow the rights to lapse. **In that case, you will receive no value for them.** The depositary will exercise or distribute rights only if we ask it to and provide satisfactory assurances to the depositary that it is legal to do so. If the depositary will exercise rights, it will purchase the securities to which the rights relate and distribute those securities or, in the case of shares, new ADSs representing the new shares, to subscribing ADS holders, but only if ADS holders have paid the exercise price to the depositary. U.S. securities laws may restrict the ability of the depositary to distribute rights or ADSs or other securities issued on exercise of rights to all or certain ADS holders, and the securities distributed may be subject to restrictions on transfer.

*Other Distributions.* The depositary will send to ADS holders anything else we distribute on deposited securities by any means it thinks is legal, fair and practical. If it cannot make the distribution in that way, the depositary has a choice. It may decide to sell what we distributed and distribute the net proceeds, in the same way as it does with cash. Or, it may decide to hold what we distributed, in which case ADSs will also represent the newly distributed property. However, the depositary is not required to distribute any securities (other than ADSs) to ADS holders unless it receives satisfactory evidence from us that it is legal to make that distribution. The depositary may sell a portion of the distributed securities or property sufficient to pay its fees and expenses in connection with that distribution. U.S. securities laws may restrict the ability of the depositary to distribute securities to all or certain ADS holders, and the securities distributed may be subject to restrictions on transfer.

The depositary is not responsible if it decides that it is unlawful or impractical to make a distribution available to any ADS holders. We have no obligation to register ADSs, shares, rights or other securities under the Securities Act. We also have no obligation to take any other action to permit the distribution of ADSs, shares, rights or anything else to ADS holders. **This means that you may not receive the distributions we make on our shares or any value for them if it is illegal or impractical for us to make them available to you.**

## **Deposit, Withdrawal and Cancellation**

### *How are ADSs issued?*

The depositary will deliver ADSs if you or your broker deposits shares or evidence of rights to receive shares with the custodian. Upon payment of its fees and expenses and of any taxes or charges, such as stamp taxes or stock transfer taxes or fees, the depositary will register the appropriate number of ADSs in the names you request and will deliver the ADSs to or upon the order of the person or persons that made the deposit.

### *How can ADS holders withdraw the deposited securities?*

You may surrender your ADSs to the depositary for the purpose of withdrawal. Upon payment of its fees and expenses and of any taxes or charges, such as stamp taxes or stock transfer taxes or fees, the depositary will deliver the shares and any other deposited securities underlying the ADSs to the ADS holder or a person the ADS holder designates at the office of the custodian. Or, at your request, risk and expense, the depositary will deliver the deposited securities at its office, if feasible. However, the depositary is not required to accept surrender of ADSs to the extent it would require delivery of a fraction of a deposited share or other security. The depositary may charge you a fee and its expenses for instructing the custodian regarding delivery of deposited securities.

***How do ADS holders interchange between certificated ADSs and uncertificated ADSs?***

You may surrender your ADR to the depository for the purpose of exchanging your ADR for uncertificated ADSs. The depository will cancel that ADR and will send to the ADS holder a statement confirming that the ADS holder is the registered holder of uncertificated ADSs. Upon receipt by the depository of a proper instruction from a registered holder of uncertificated ADSs requesting the exchange of uncertificated ADSs for certificated ADSs, the depository will execute and deliver to the ADS holder an ADR evidencing those ADSs.

**Voting Rights**

***How do ADS holders vote?***

ADS holders may instruct the depository how to vote the number of deposited shares their ADSs represent. If we request the depository to solicit your voting instructions (and we are not required to do so), the depository will notify you of a shareholders' meeting and send or make voting materials available to you. Those materials will describe the matters to be voted on and explain how ADS holders may instruct the depository how to vote. For instructions to be valid, they must reach the depository by a date set by the depository. The depository will try, as far as practical, subject to the laws of the State of New York and the provisions of our articles of association or similar documents, to vote or to have its agents vote the shares or other deposited securities as instructed by ADS holders. If we do not request the depository to solicit your voting instructions, you can still send voting instructions, and, in that case, the depository may try to vote as you instruct, but it is not required to do so.

**Except by instructing the depository as described above, you won't be able to exercise voting rights unless you surrender your ADSs and withdraw the shares. However, you may not know about the meeting enough in advance to withdraw the shares.** In any event, the depository will not exercise any discretion in voting deposited securities and it will only vote or attempt to vote as instructed or as described in the following sentence. If (i) we asked the depository to solicit your instructions at least 30 days before the meeting date, (ii) the depository does not receive voting instructions from you by the specified date and (iii) we confirm to the depository that:

- we wish the depository to vote uninstructed shares;
- we reasonably do not know of any substantial shareholder opposition to a particular question; and
- the particular question is not materially adverse to the interests of shareholders,

the depository will consider you to have authorized and directed it to vote the number of deposited securities represented by your ADSs in favor of any resolution that we proposed in the invitation to the shareholders' meeting.

We cannot assure you that you will receive the voting materials in time to ensure that you can instruct the depository to vote your shares. In addition, the depository and its agents are not responsible for failing to carry out voting instructions or for the manner of carrying out voting instructions. **This means that you may not be able to exercise voting rights and there may be nothing you can do if your shares are not voted as you requested.**

In order to give you a reasonable opportunity to instruct the depository as to the exercise of voting rights relating to deposited securities, if we request the depository to act, we agree to give the depository notice of any such meeting and details concerning the matters to be voted upon at least 30 days in advance of the meeting date.

## [Table of Contents](#)

### Fees and Expenses

<i>Persons depositing or withdrawing shares or ADS holders must pay:</i>	<i>For:</i>
\$5.00 (or less) per 100 ADSs (or portion of 100 ADSs)	Issuance of ADSs, including issuances resulting from a distribution of shares or rights or other property
	Cancellation of ADSs for the purpose of withdrawal, including if the deposit agreement terminates
\$.05 (or less) per ADS	Any cash distribution to ADS holders
A fee equivalent to the fee that would be payable if securities distributed to you had been shares and the shares had been deposited for issuance of ADSs	Distribution of securities distributed to holders of deposited securities (including rights) that are distributed by the depositary to ADS holders
\$.05 (or less) per ADS per calendar year	Depositary services
Registration or transfer fees	Transfer and registration of shares on our share register to or from the name of the depositary or its agent when you deposit or withdraw shares
Expenses of the depositary	Cable and facsimile transmissions (when expressly provided in the deposit agreement)
	Converting foreign currency to U.S. dollars
Taxes and other governmental charges the depositary or the custodian has to pay on any ADSs or shares underlying ADSs, such as stock transfer taxes, stamp duty or withholding taxes	As necessary
Any charges incurred by the depositary or its agents for servicing the deposited securities	As necessary

The depositary collects its fees for delivery and surrender of ADSs directly from investors depositing shares or surrendering ADSs for the purpose of withdrawal or from intermediaries acting for them. The depositary collects fees for making distributions to investors by deducting those fees from the amounts distributed or by selling a portion of distributable property to pay the fees. The depositary may collect its annual fee for depositary services by deduction from cash distributions or by directly billing investors or by charging the book-entry system accounts of participants acting for them. The depositary may collect any of its fees by deduction from any cash distribution payable (or by selling a portion of securities or other property distributable) to ADS holders that are obligated to pay those fees. The depositary may generally refuse to provide fee-attracting services until its fees for those services are paid.

From time to time, the depositary may make payments to us to reimburse us for costs and expenses generally arising out of establishment and maintenance of the ADS program, waive fees and expenses for services provided to us by the depositary or share revenue from the fees collected from ADS holders. In performing its duties under the deposit agreement, the depositary may use brokers, dealers, foreign currency dealers or other service providers that are owned by or affiliated with the depositary and that may earn or share fees, spreads or commissions.

The depositary may convert currency itself or through any of its affiliates and, in those cases, acts as principal for its own account and not as agent, advisor, broker or fiduciary on behalf of any other person and earns revenue, including, without limitation, transaction spreads, that it will retain for its own account. The

## [Table of Contents](#)

revenue is based on, among other things, the difference between the exchange rate assigned to the currency conversion made under the deposit agreement and the rate that the depository or its affiliate receives when buying or selling foreign currency for its own account. The depository makes no representation that the exchange rate used or obtained in any currency conversion under the deposit agreement will be the most favorable rate that could be obtained at the time or that the method by which that rate will be determined will be the most favorable to ADS holders, subject to the depository's obligations under the deposit agreement. The methodology used to determine exchange rates used in currency conversions is available upon request.

### **Payment of Taxes**

You will be responsible for any taxes or other governmental charges payable on your ADSs or on the deposited securities represented by any of your ADSs. The depository may refuse to register any transfer of your ADSs or allow you to withdraw the deposited securities represented by your ADSs until those taxes or other charges are paid. It may apply payments owed to you or sell deposited securities represented by your ADSs to pay any taxes owed and you will remain liable for any deficiency. If the depository sells deposited securities, it will, if appropriate, reduce the number of ADSs to reflect the sale and pay to ADS holders any proceeds, or send to ADS holders any property, remaining after it has paid the taxes.

### **Tender and Exchange Offers; Redemption, Replacement or Cancellation of Deposited Securities**

The depository will not tender deposited securities in any voluntary tender or exchange offer unless instructed to do by an ADS holder surrendering ADSs and subject to any conditions or procedures the depository may establish.

If deposited securities are redeemed for cash in a transaction that is mandatory for the depository as a holder of deposited securities, the depository will call for surrender of a corresponding number of ADSs and distribute the net redemption money to the holders of called ADSs upon surrender of those ADSs.

If there is any change in the deposited securities such as a sub-division, combination or other reclassification, or any merger, consolidation, recapitalization or reorganization affecting the issuer of deposited securities in which the depository receives new securities in exchange for or in lieu of the old deposited securities, the depository will hold those replacement securities as deposited securities under the deposit agreement. However, if the depository decides it would not be lawful and practical to hold the replacement securities because those securities could not be distributed to ADS holders or for any other reason, the depository may instead sell the replacement securities and distribute the net proceeds upon surrender of the ADSs.

If there is a replacement of the deposited securities and the depository will continue to hold the replacement securities, the depository may distribute new ADSs representing the new deposited securities or ask you to surrender your outstanding ADRs in exchange for new ADRs identifying the new deposited securities.

If there are no deposited securities underlying ADSs, including if the deposited securities are cancelled, or if the deposited securities underlying ADSs have become apparently worthless, the depository may call for surrender or of those ADSs or cancel those ADSs upon notice to the ADS holders.

### **Amendment and Termination**

#### ***How may the deposit agreement be amended?***

We may agree with the depository to amend the deposit agreement and the ADRs without your consent for any reason. If an amendment adds or increases fees or charges, except for taxes and other governmental charges or expenses of the depository for registration fees, facsimile costs, delivery charges or similar items, or prejudices a substantial right of ADS holders, it will not become effective for outstanding ADSs until 30 days after the

## [Table of Contents](#)

depository notifies ADS holders of the amendment. **At the time an amendment becomes effective, you are considered, by continuing to hold your ADSs, to agree to the amendment and to be bound by the ADRs and the deposit agreement as amended.**

### ***How may the deposit agreement be terminated?***

The depository will initiate termination of the deposit agreement if we instruct it to do so. The depository may initiate termination of the deposit agreement if:

- 60 days have passed since the depository told us it wants to resign but a successor depository has not been appointed and accepted its appointment;
- we delist the ADSs from an exchange in the United States on which they were listed and do not list the ADSs on another exchange in the United States or make arrangements for trading of ADSs on the U.S. over-the-counter market;
- we delist our ordinary shares from an exchange outside the United States on which they were listed and do not list the shares on another exchange outside the United States;
- the depository has reason to believe the ADSs have become, or will become, ineligible for registration on Form F-6 under the Securities Act of 1933;
- we appear to be insolvent or enter insolvency proceedings
- all or substantially all the value of the deposited securities has been distributed either in cash or in the form of securities;
- there are no deposited securities underlying the ADSs or the underlying deposited securities have become apparently worthless; or
- there has been a replacement of deposited securities.

If the deposit agreement will terminate, the depository will notify ADS holders at least 90 days before the termination date. At any time after the termination date, the depository may sell the deposited securities. After that, the depository will hold the money it received on the sale, as well as any other cash it is holding under the deposit agreement, unsegregated and without liability for interest, for the pro rata benefit of the ADS holders that have not surrendered their ADSs. Normally, the depository will sell as soon as practicable after the termination date.

After the termination date and before the depository sells, ADS holders can still surrender their ADSs and receive delivery of deposited securities, except that the depository may refuse to accept a surrender for the purpose of withdrawing deposited securities or reverse previously accepted surrenders of that kind that have not settled if it would interfere with the selling process. The depository may refuse to accept a surrender for the purpose of withdrawing sale proceeds until all the deposited securities have been sold. The depository will continue to collect distributions on deposited securities, but, after the termination date, the depository is not required to register any transfer of ADSs or distribute any dividends or other distributions on deposited securities to the ADSs holder (until they surrender their ADSs) or give any notices or perform any other duties under the deposit agreement except as described in this paragraph.

### **Limitations on Obligations and Liability**

#### ***Limits on our Obligations and the Obligations of the Depository; Limits on Liability to Holders of ADSs***

The deposit agreement expressly limits our obligations and the obligations of the depository. It also limits our liability and the liability of the depository. We and the depository:

- are only obligated to take the actions specifically set forth in the deposit agreement without negligence or bad faith, and the depository will not be a fiduciary or have any fiduciary duty to holders of ADSs;

## Table of Contents

- are not liable if we are or it is prevented or delayed by law or by events or circumstances beyond our or its ability to prevent or counteract with reasonable care or effort from performing our or its obligations under the deposit agreement;
- are not liable if we or it exercises discretion permitted under the deposit agreement;
- are not liable for the inability of any holder of ADSs to benefit from any distribution on deposited securities that is not made available to holders of ADSs under the terms of the deposit agreement, or for any special, consequential or punitive damages for any breach of the terms of the deposit agreement;
- have no obligation to become involved in a lawsuit or other proceeding related to the ADSs or the deposit agreement on your behalf or on behalf of any other person;
- may rely upon any documents we believe or it believes in good faith to be genuine and to have been signed or presented by the proper person;
- are not liable for the acts or omissions of any securities depository, clearing agency or settlement system; and
- the depository has no duty to make any determination or provide any information as to our tax status, or any liability for any tax consequences that may be incurred by ADS holders as a result of owning or holding ADSs or be liable for the inability or failure of an ADS holder to obtain the benefit of a foreign tax credit, reduced rate of withholding or refund of amounts withheld in respect of tax or any other tax benefit.

In the deposit agreement, we and the depository agree to indemnify each other under certain circumstances.

### **Requirements for Depository Actions**

Before the depository will deliver or register a transfer of ADSs, make a distribution on ADSs, or permit withdrawal of shares, the depository may require:

- payment of stock transfer or other taxes or other governmental charges and transfer or registration fees charged by third parties for the transfer of any shares or other deposited securities;
- satisfactory proof of the identity and genuineness of any signature or other information it deems necessary; and
- compliance with regulations it may establish, from time to time, consistent with the deposit agreement, including presentation of transfer documents.

The depository may refuse to deliver ADSs or register transfers of ADSs when the transfer books of the depository or our transfer books are closed or at any time if the depository or we think it advisable to do so.

### **Your Right to Receive the Shares Underlying your ADSs**

ADS holders have the right to cancel their ADSs and withdraw the underlying shares at any time except:

- when temporary delays arise because (i) the depository has closed its transfer books or we have closed our transfer books, (ii) the transfer of shares is blocked to permit voting at a shareholders' meeting or (iii) we are paying a dividend on our shares;
- when you owe money to pay fees, taxes and similar charges; or
- when it is necessary to prohibit withdrawals in order to comply with any laws or governmental regulations that apply to ADSs or to the withdrawal of shares or other deposited securities.

This right of withdrawal may not be limited by any other provision of the deposit agreement.

### **Direct Registration System**

In the deposit agreement, all parties to the deposit agreement acknowledge that the Direct Registration System, or DRS, and Profile Modification System, or Profile, will apply to the ADSs. DRS is a system administered by DTC that facilitates interchange between registered holding of uncertificated ADSs and holding of security entitlements in ADSs through DTC and a DTC participant. Profile is a feature of DRS that allows a DTC participant, claiming to act on behalf of a registered holder of uncertificated ADSs, to direct the depository to register a transfer of those ADSs to DTC or its nominee and to deliver those ADSs to the DTC account of that DTC participant without receipt by the depository of prior authorization from the ADS holder to register that transfer.

In connection with and in accordance with the arrangements and procedures relating to DRS/Profile, the parties to the deposit agreement understand that the depository will not determine whether the DTC participant that is claiming to be acting on behalf of an ADS holder in requesting registration of transfer and delivery as described in the paragraph above has the actual authority to act on behalf of the ADS holder (notwithstanding any requirements under the Uniform Commercial Code). In the deposit agreement, the parties agree that the depository's reliance on and compliance with instructions received by the depository through the DRS/Profile system and in accordance with the deposit agreement will not constitute negligence or bad faith on the part of the depository.

### **Shareholder Communications; Inspection of Register of Holders of ADSs**

The depository will make available for your inspection at its office all communications that it receives from us as a holder of deposited securities that we make generally available to holders of deposited securities. The depository will send you copies of those communications or otherwise make those communications available to you if we ask it to. You have a right to inspect the register of holders of ADSs, but not for the purpose of contacting those holders about a matter unrelated to our business or the ADSs.

### **Jury Trial Waiver**

The deposit agreement provides that, to the extent permitted by law, ADS holders waive the right to a jury trial of any claim they may have against us or the depository arising out of or relating to our shares, the ADSs or the deposit agreement, including any claim under the U.S. federal securities laws. If we or the depository opposed a jury trial demand based on the waiver, the court would determine whether the waiver was enforceable in the facts and circumstances of that case in accordance with applicable case law.

You will not, by agreeing to the terms of the deposit agreement, be deemed to have waived our or the depository's compliance with U.S. federal securities laws and the rules and regulations promulgated thereunder.

## SHARES AND ADSs ELIGIBLE FOR FUTURE SALE

Prior to our initial public offering, there was no market for our ordinary shares or ADSs representing our ordinary shares. Future sales of substantial amounts of our ordinary shares or ADSs representing our ordinary shares in the public market, or the perception that such sales may occur, could adversely affect prevailing market prices of our ordinary shares or ADSs representing our ordinary shares.

Based on the 226,779,744 ordinary shares that were outstanding on March 31, 2020, upon the closing of the Underwritten Offering, 238,173,455 ordinary shares, including 63,796,755 ADSs representing 63,796,755 of those ordinary shares, will be outstanding, and also including (i) the issuance of 1,935,488 ADSs representing our ordinary shares in connection with our acquisition of Neon, (ii) the issuance of 1,580,777 of our ordinary shares in a private placement to Fosun Pharma for proceeds of €45.6 million (\$50.0 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)) and (iii) the issuance of 2,377,446 of our ordinary shares in a private placement to Pfizer for proceeds of €103.9 million (\$113.0 million, using the exchange rate then in effect as published by the German Central Bank (*Deutsche Bundesbank*)). The 5,500,000 ADSs sold in the Underwritten Offering will be freely tradable without restriction or further registration under the Securities Act of 1933, as amended, or the Securities Act, except for any ADSs purchased by our “affiliates,” as that term is defined in Rule 144 under the Securities Act, or Rule 144, whose sales would be subject to the Rule 144 resale restrictions described below. The 216,262,336 ordinary shares we issued prior to our initial public offering may only be sold in the public market if registered or sold pursuant to an exemption from registration, such as Rule 144 or Rule 701 under the Securities Act, or Rule 701.

### Rule 144

In general, under Rule 144, a person who is not an affiliate of ours and has held their ordinary shares for at least six months, including the holding period of any prior owner other than one of our affiliates, may sell those shares without restriction, subject to the availability of current public information about us. In addition, under Rule 144, any person who is not an affiliate of ours and has not been an affiliate of ours at any time during the preceding three months and has held their ordinary shares for at least one year, including the holding period of any prior owner other than one of our affiliates, would be entitled to sell an unlimited number of shares immediately upon the closing of the Underwritten Offering without regard to whether current public information about us is available.

A person who is an affiliate of ours or who was an affiliate of ours at any time during the preceding three months and who has beneficially owned restricted securities for at least six months, including the holding period of any prior owner other than one of our affiliates, is entitled to sell within any three-month period only a number of securities that does not exceed the greater of either of:

- 1% of the number of our ordinary shares then outstanding, including ordinary shares represented by ADSs, which will equal approximately 2,381,734 ordinary shares immediately after the Underwritten Offering; and
- the average weekly trading volume of the ADSs on the Nasdaq Global Select Market during the four calendar weeks preceding the filing of a notice on Form 144 with respect to the sale.

Such sales both by affiliates and by non-affiliates must also comply with the manner-of-sale, current public information and notice provisions of Rule 144, to the extent applicable. Rule 144 also requires that affiliates relying on Rule 144 to sell securities that are not restricted securities must nonetheless comply with the same restrictions applicable to restricted securities, other than the holding period requirement.

## **Regulation S**

Regulation S under the Securities Act provides that ordinary shares or ADSs owned by any person may be sold without registration in the United States, provided that the sale is effected in an offshore transaction and no directed selling efforts are made in the United States (as these terms are defined in Regulation S), subject to certain other conditions. In general, this means that our shares or ADSs may be sold outside the United States without registration in the United States being required.

## **Rule 701**

In general, under Rule 701, any of our employees, board members, executive management, consultants or advisors who purchased ordinary shares from us in connection with a compensatory share or option plan or other written agreement before the closing of the Underwritten Offering is entitled to resell such shares.

The SEC has indicated that Rule 701 will apply to typical share options granted by an issuer before it becomes subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, along with the shares acquired upon exercise of such options, including exercises after the date of this prospectus. Securities issued in reliance on Rule 701 are restricted securities and may be sold in reliance on Rule 144 by:

- persons other than affiliates, without restriction, subject only to the manner-of-sale provisions of Rule 144; and
- affiliates, subject to the manner-of-sale, current public information and filing requirements of Rule 144, in each case, without compliance with the six-month holding period requirement of Rule 144.

## **Lock-up Agreements**

For a description of the lock-up agreements that we, members of our Supervisory Board and Management Board and certain significant shareholders have entered into in connection with the Underwritten Offering, see “Underwriting.”

## **Options and Form S-8 Registration Statement**

As of March 31, 2020, options to purchase a total of 16,338,305 ordinary shares were issued and outstanding. Of the total number of issued and outstanding options, 2,101,842 have vested. Certain of our ordinary shares issuable under these options are subject to contractual lock-up agreements with us or the underwriters. For a description of the lock-up agreements that we, members of our Supervisory Board and Management Board and certain significant shareholders have entered into in connection with the Underwritten Offering, see “Underwriting.”

We intend to file a registration statement on Form S-8 under the Securities Act to register ordinary shares, issued or reserved for issuance under the ESOP. The registration statement on Form S-8 will become effective automatically upon filing. Ordinary shares issued upon exercise of a share option and registered pursuant to the Form S-8 registration statement will, subject to vesting provisions and Rule 144 volume limitations applicable to our affiliates, be available for sale in the open market immediately unless they are subject to the 90-day lock-up period in connection with the Underwritten Offering.

## TAXATION

### German Taxation

The following discussion addresses certain German tax consequences of acquiring, owning or disposing of the ADSs. With the exception of “—Taxation of Holders Tax Resident in Germany” below, which provides an overview of dividend taxation and of capital gains taxation with respect to holders that are residents of Germany, this discussion applies only to U.S. treaty beneficiaries (defined below) that acquire ADSs in the offering.

This discussion is based on domestic German tax laws, including, but not limited to, circulars issued by German tax authorities, which, e.g., are not binding on the German courts, and the Treaty (defined below). It is based upon tax laws in effect at the time of filing of this prospectus. These laws are subject to change, possibly with retroactive effect. For example, certain member states of the European Union are considering introducing a financial transaction tax (*Finanztransaktionssteuer*) which, if and when introduced, may also be applicable on sales and/or transfer of ADSs. In addition, in Germany, for example, there are currently ongoing discussions on an increase of the top tax rate, which may also have an effect on the German tax consequences of acquiring, owning and disposing of the ADSs. There is no assurance that German tax authorities will not challenge one or more of the tax consequences described in this section.

In addition, this discussion is based upon the assumption that each obligation in the deposit agreement and any related agreement will be performed in accordance with its terms. It does not purport to be a comprehensive or exhaustive description of all German tax considerations that may be of relevance in the context of acquiring, owning and disposing of ADSs.

The tax information presented in this prospectus is not a substitute for tax advice. Prospective holders of ADSs should consult their own tax advisors regarding the German tax consequences of the purchase, ownership, disposition, donation or inheritance of ADSs in light of their particular circumstances, including the effect of any state, local, or other foreign or domestic laws or changes in tax law or interpretation. The same applies with respect to the rules governing the refund of any German dividend withholding tax (*Kapitalertragsteuer*) withheld. Only an individual tax consultation can appropriately account for the particular tax situation of each investor.

### General

Based on the circular issued by the German Federal Ministry of Finance (*BMF-Schreiben*), dated May 24, 2013, reference number IV C 1-S2204/12/10003, as amended by the circular dated December 18, 2018 (reference number IV C 1 – S 2204/12/10003), in respect of the taxation of American Depositary Receipts, or ADRs, on domestic shares, or the ADR Tax Circular, for German tax purposes, the ADSs should represent a beneficial ownership interest in the underlying shares of BioNTech and qualify as ADRs for the purpose of the ADR Tax Circular. If the ADSs qualify as ADRs under the ADR Tax Circular, dividends will accordingly be attributable to holders of the ADSs for German tax purposes, and not to the legal owner of the ordinary shares (*i.e.*, the financial institution on behalf of which the ordinary shares are stored at a domestic depository for the ADS holders). Furthermore, holders of the ADSs should, in light of the ADR Tax Circular, be treated as beneficial owners of the capital of BioNTech with respect to capital gains (see below in section “—German Taxation of Capital Gains of the U.S. Treaty Beneficiaries of the ADSs”). However, investors should note that circulars published by the German tax authorities (including the ADR Tax Circular) are not, e.g., binding on German courts, including German tax courts, and it is unclear whether a German court would follow the ADR Tax Circular in determining the German tax treatment of the ADSs. For the purpose of this German tax section, it is assumed that the ADSs qualify as ADRs within the meaning of the ADR Tax Circular.

### Taxation of Holders Not Tax Resident in Germany

The following discussion describes selected German tax consequences of acquiring, owning and disposing of the ADSs to a holder that is a U.S. treaty beneficiary. For purposes of this discussion, a “U.S. treaty

## Table of Contents

beneficiary” is a resident of the United States for purposes of the Convention between the Federal Republic of Germany and United States of America for the Avoidance of Double Taxation and the Prevention of Fiscal Evasion with respect to Taxes on Income and on Capital and Certain Other Taxes of 1989, as amended by the Protocol as of June 4, 2008 (*Abkommen zwischen der Bundesrepublik Deutschland und den Vereinigten Staaten von Amerika zur Vermeidung der Doppelbesteuerung und zur Verhinderung der Steuerverkürzung auf dem Gebiet der Steuern vom Einkommen und vom Vermögen und einiger anderer Steuern in der Fassung vom 4. Juni 2008*), hereinafter referred to as the “Treaty,” who is eligible for relevant benefits under the Treaty.

A holder will be a U.S. treaty beneficiary entitled to full Treaty benefits in respect of the ADSs if it is, inter alia:

- the beneficial owner of the ADSs (and the dividends paid with respect thereto);
- a U.S. tax resident corporation or individual;
- not also a resident of Germany for German tax purposes; and
- not subject to the limitation on benefits (*i.e.*, anti-treaty shopping) article of the Treaty that applies in limited circumstances.

Special rules apply to pension funds and certain other tax-exempt investors.

This discussion does not address the treatment of ADSs that are (i) held in connection with a permanent establishment or fixed base through which a U.S. treaty beneficiary carries on business or performs personal services in Germany or (ii) part of business assets for which a permanent representative in Germany has been appointed.

### **General Rules for the Taxation of Holders Not Tax Resident in Germany**

Non-German resident holders of ADSs are subject to German taxation with respect to German source income (*beschränkte Steuerpflicht*). According to the ADR Tax Circular, income from the shares should be attributed to the holder of the ADSs for German tax purposes. As a consequence, income from the ADSs should be treated as German source income.

### **German Withholding Taxation of Dividends of the U.S. Treaty Beneficiaries of the ADSs**

Generally, the full amount of a dividend distributed by BioNTech to a non-German resident holder which does not maintain a permanent establishment or other taxable presence in Germany is subject to (final) German withholding tax at an aggregate rate of 26.375% (that amount consists of 25% on dividends distributed plus solidarity surcharge of 5.5% on the amount of the withholding tax). The basis for the withholding tax is the dividend approved for distribution by our general shareholder’s meeting.

German withholding tax is withheld and remitted to the German tax authorities by (i) the disbursing agent (*i.e.*, the German credit institution, financial services institution, securities trading enterprise or securities trading bank (each as defined in the German Banking Act (*Kreditwesengesetz*) and in each case including a German branch of a foreign enterprise, but excluding a foreign branch of a German enterprise)) that holds or administers the underlying shares in custody and (a) disburses or credits the dividend income from the underlying shares, (b) disburses or credits the dividend income from the underlying shares on delivery of the dividend coupons or (c) disburses such dividend income to a foreign agent; or (ii) the central securities depository (*Wertpapiersammelbank*) in terms of the German Depository Act (*Depotgesetz*) holding the underlying shares in a collective deposit, if such central securities depository disburses the dividend income from the underlying shares to a foreign agent, regardless of whether a holder must report the dividend for tax purposes and regardless of whether or not a holder is a resident of Germany. Dividend payments, to the extent funded from BioNTech’s tax-recognized contribution account (*steuerliches Einlagekonto*), do not, subject to certain prerequisites, form part of the taxable dividend income but should lower the holder’s acquisition costs for the ADSs.

Pursuant to the Treaty, the German withholding tax may generally not exceed (i) 15% of the gross amount of the dividends received by a U.S. treaty beneficiary other than a company holding ADSs which represent 10% or more of the voting shares in BioNTech, and (ii) 5% of the gross amount of the dividends received by a U.S. treaty beneficiary that is a company holding ADSs which represent 10% or more of the voting shares in BioNTech. The excess of the total withholding tax, including the solidarity surcharge, over the maximum rate of withholding tax permitted by the Treaty is refunded to U.S. treaty beneficiaries upon application. For example, for a declared dividend of 100, a U.S. treaty beneficiary initially receives 73.625 (100 minus the 26.375% withholding tax including solidarity surcharge). The U.S. treaty beneficiary is entitled to a partial refund from the German tax authorities in the amount of 11.375% of the gross dividend (of 100). As a result, the U.S. treaty beneficiary ultimately receives a total of 85 (85% of the declared dividend) following the refund of the excess withholding. However, it should be noted that there is uncertainty as to how the German tax authorities will apply the refund process to dividends on the ADSs with respect to non-German resident holders. Further, such refund is subject to the German anti-avoidance treaty shopping rule (as described below in “—Withholding Tax Refund for U.S. Treaty Beneficiaries”).

#### ***German Withholding Taxation of Capital Gains of the U.S. Treaty Beneficiaries of the ADSs***

The capital gains from the disposition of the ADSs realized by a non-German resident holder which does not maintain a permanent establishment or other taxable presence in Germany would be treated as German source income and be subject to German tax if the ADSs qualify as a Qualifying Participation. A Qualifying Participation exists if a holder at any time during the five years preceding the disposition, directly or indirectly, owned at least 1% of BioNTech’s share capital, irrespective of whether through the ADSs or shares of BioNTech. If such holder had acquired the ADSs without consideration, the previous owner’s holding period and quota would be taken into account.

Pursuant to the Treaty, capital gains from the disposal of a Qualifying Participation realized by a U.S. treaty beneficiary are, however, generally exempt from German taxation. Pursuant to the Treaty, U.S. treaty beneficiaries are not subject to German tax in relation to capital gains from the disposal of a Qualifying Participation even under the circumstances described in the preceding paragraph and therefore should not be subject to German taxation on capital gains from the disposition of the ADSs.

German statutory law requires the disbursing agent to levy withholding tax on capital gains from the sale of ADSs or other securities held in a custodial account in Germany. With regard to the German taxation of capital gains, disbursing agent means a German credit institution, financial services institution, securities trading enterprise or securities trading bank (each as defined in the German Banking Act and, in each case including a German branch if a foreign enterprise, but excluding a foreign branch of a German enterprise) that holds the ADSs in custody or administers the ADSs for the investor or conducts sales or other dispositions and disburses or credits the income from the ADSs to the holder of the ADSs. The German statutory law does not explicitly condition the obligation to withhold taxes on capital gains being subject to taxation in Germany under German statutory law or on an applicable income tax treaty permitting Germany to tax such capital gains.

However, a circular issued by the German Federal Ministry of Finance, dated January 18, 2016, reference number IV C 1-S2252/08/10004 :017, as most recently amended by circular dated September 16, 2019, reference number IV C 1-S2252/08/10004 :027, provides that taxes need not be withheld when the holder of the custody account is not a resident of Germany for tax purposes and the income is not subject to German taxation. The circular further states that there is no obligation to withhold such tax even if the non-resident holder owns at least 1% of the share capital of a German corporation. While circulars issued by the German Federal Ministry of Finance are only binding on the German tax authorities but not on the German courts, in practice, the disbursing agents nevertheless typically rely on guidance contained in such circulars. Therefore, a disbursing agent would only withhold tax at 26.375% on capital gains derived by a U.S. treaty beneficiary from the sale of ADSs held in a custodial account in Germany in the event that the disbursing agent did not follow the abovementioned guidance. In this case, the U.S. treaty beneficiary may be entitled to claim a refund of the withholding tax from

the German tax authorities under the Treaty, as described below in “—Withholding Tax Refund for U.S. Treaty Beneficiaries.” A refund of taxes withheld on capital gains from the disposition of the ADSs which do not qualify as Qualifying Participations may also be claimed based on German statutory domestic law.

### ***Withholding Tax Refund for U.S. Treaty Beneficiaries***

U.S. treaty beneficiaries are generally eligible for treaty benefits under the Treaty, as described above in “—Taxation of Holders Not Tax Resident in Germany.” Accordingly, U.S. treaty beneficiaries are in general entitled to claim a refund of (i) the portion of the otherwise applicable 26.375% German withholding tax (*Kapitalertragsteuer*) on dividends that exceeds the applicable Treaty rate and (ii) the full amount of German withholding tax (*Kapitalertragsteuer*) on capital gains from the disposition of ADSs. The application for such claim is generally to be filed with the Federal Central Office of Taxation (*Bundeszentralamt für Steuern*).

However, in respect of dividends, the refund described in the preceding paragraph is only possible if, due to special rules on the restriction of withholding tax credit, the following three cumulative requirements are met: (i) the holder must qualify as beneficial owner of the ADSs for an uninterrupted minimum holding period of 45 days within a period starting 45 days prior to and ending 45 days after the due date of the dividends, (ii) the holder has to bear at least 70% of the change in value risk related to the ADSs during the minimum holding period as described under (i) of this paragraph and has not entered into (acting by itself or through a related party) hedging transactions which lower the change in value risk by more than 30%, and (iii) the holder must not be obliged to fully or largely compensate directly or indirectly the dividends to third parties. If these requirements are not met, then for a holder not being tax-resident in Germany who applied for a full or partial refund of the withholding tax pursuant to a double taxation treaty, no refund is available. This restriction generally does only apply if (a) the tax underlying the refund application is below a tax rate of 15% based on the gross amount of the dividends and (b) the holder does not directly own 10% or more of the shares of BioNTech and is subject to income taxes in its state of residence, without being tax-exempt. The restriction of the withholding tax credit does not apply if the holder has beneficially owned the ADSs for at least one uninterrupted year until receipt (*Zufluss*) of the dividends.

In general, as previously discussed, investors should note that it is unclear how the German tax administration will apply the refund process to dividends on the ADSs. Further, such refund is subject to the German anti-avoidance treaty shopping rule. Generally, this rule requires that the U.S. treaty beneficiary (in case it is a non-German resident company) maintains its own administrative substance and conducts its own business activities. In particular, a foreign company has no right to a full or partial refund to the extent persons holding ownership interests in BioNTech would not be entitled to the refund if they derived the income directly and the gross income realized by the foreign company is not caused by the business activities of the foreign company, and there are either no economic or other considerable reasons for the interposition of the foreign company, or the foreign company does not participate in general commerce by means of a business organization with resources appropriate to its business purpose. However, this shall not apply if the foreign company’s principal class of stock is regularly traded in substantial volume on a recognized stock exchange, or if the foreign company is subject to the provisions of the German Investment Tax Act (*Investmentsteuergesetz*). Whether or not and to which extent the anti-avoidance treaty shopping rule applies to the ADSs has to be analyzed on a case by case basis taking into account all relevant tests. In addition, the interpretation of these tests is disputed and to date no published decisions of the German Federal Finance Court exist in this regard.

Due to the legal structure of the ADSs, only limited guidance from the German tax authorities exists on the practical application of the procedure with respect to the ADSs and the respective limitations.

Recently, the German tax authorities have indicated that for ADR programs (which are considered comparable to ADS programs) a collective tax certificate may no longer be issued by the domestic depository of the shares upon request of the foreign depository agents. Moreover, the simplified refund procedure based on electronic data exchange (*Datenträgerverfahren*) for claims for reimbursement based on ADRs has been temporarily suspended by the tax authorities.

### **Taxation of Holders Tax Resident in Germany**

This subsection provides an overview of dividend taxation and of capital gains taxation with regard to the general principles applicable to ADS holders that are tax resident in Germany. A holder is a German tax resident if, in case of an individual, he or she maintains a domicile (*Wohnsitz*) or a usual residence (*gewöhnlicher Aufenthalt*) in Germany or if, in case of a corporation, it has its place of management (*Geschäftsleitung*) or registered seat (*Sitz*) in Germany.

The German dividend and capital gains taxation rules applicable to German tax residents require a distinction between ADSs held as private assets (*Privatvermögen*) and such held as business assets (*Betriebsvermögen*).

#### **ADSs as Private Assets (*Privatvermögen*)**

If the ADSs are held as private assets by a German tax resident, dividends and capital gains (other than capital gains from the disposition of a Qualifying Participation) are taxed as investment income and are principally subject to 25% German flat income tax on capital income (*Abgeltungsteuer*) (plus a 5.5% solidarity surcharge (*Solidaritätszuschlag*) thereon, resulting in an aggregate rate of 26.375%), which is levied in the form of withholding tax (*Kapitalertragsteuer*). In other words, once deducted, the holder's income tax liability on the dividends will be settled. Dividend payments to the extent funded from BioNTech's tax-recognized contribution account (*steuerliches Einlagekonto*), do not, subject to certain prerequisites, form part of the taxable dividend income but lower the holder's acquisition costs for the ADSs.

Holders of ADSs may apply to have their capital investment income assessed in accordance with the general rules and with an individual's personal income tax rate if this would result in a lower tax burden in which case actually incurred expenses are not deductible. The holder would be taxed on gross personal investment income (including dividends or gains with respect to ADSs), less the saver's allowance of €801 for an individual or €1,602 for a married couple and a registered civil union (*eingetragene Lebenspartnerschaft*) filing taxes jointly. The deduction of expenses related to the investment income (including dividends or gains with respect to ADSs) is generally not possible for private investors.

Losses resulting from the disposal of ADSs can only be offset against capital gains from the sale of any shares (*Aktien*) and other ADSs. If, however, a holder holds a Qualifying Participation, 60% of any capital gains resulting from the sale and transfer are taxable at the holder's personal income tax rate (plus 5.5% solidarity surcharge thereon). Conversely, 60% of any capital losses are recognized for tax purposes.

Church tax generally has to be withheld, if applicable, based on an automatic data access procedure, unless the holder of ADSs has filed a blocking notice (*Sperrvermerk*) with the Federal Central Tax Office. Where church tax is not levied by way of withholding, it is determined by means of income tax assessment.

#### **ADSs as Business Assets (*Betriebsvermögen*)**

In case the ADSs are held as business assets, the taxation depends on the legal form of the holder (*i.e.*, whether the holder is a corporation or an individual).

Irrespective of the legal form of the holder, dividends are subject to the aggregate withholding tax rate of 26.375%. The withholding tax is generally creditable against the respective holder's corporate income tax or income tax liability. Due to special rules on the restriction of withholding tax credits in respect of dividends, a full withholding tax credit requires that the following three cumulative requirements are met: (i) the holder must qualify as beneficial owner of the ADSs for an uninterrupted minimum holding period of 45 days occurring within a period starting 45 days prior to and ending 45 days after the due date of the dividends, (ii) the holder has to bear at least 70% of the change in value risk related to the ADSs during the minimum holding period as

described under (i) of this paragraph and has not entered into (acting by itself or through a related party) hedging transactions which lower the change in value risk for more than 30%, and (iii) the holder must not be obliged to fully or largely compensate directly or indirectly the dividends to third parties. If these requirements are not met, three-fifths of the withholding tax imposed on the dividends must not be credited against the holder's corporate income tax or income tax liability, but may, upon application, be deducted from the holder's tax base for the relevant tax assessment period. A holder that is generally subject to German income tax or corporate income tax and that has received gross dividends without any deduction of withholding tax due to a tax exemption without qualifying for a full tax credit under the aforementioned requirements has to notify the competent local tax office accordingly and has to make a payment in the amount of the omitted withholding tax deduction. The special rules on the restriction of withholding tax credit do not apply to a holder whose overall dividend earnings within an assessment period do not exceed €20,000 or that has been the beneficial owner of the ADSs for at least one uninterrupted year until receipt (*Zufluss*) of the dividends.

To the extent the amount withheld exceeds the income tax liability, the withholding tax will be refunded, provided that certain requirements are met (including the aforementioned requirements).

Special rules apply to credit institutions (*Kreditinstitute*), financial services institutions (*Finanzdienstleistungsinstitute*), financial enterprises (*Finanzunternehmen*), life insurance and health insurance companies, and pension funds.

In principle, dividends that a corporation receives from German or foreign corporations are subject to corporate tax (and solidarity surcharge thereon) at a rate of 15.825% and also subject to trade tax of between 7.0% and generally 19.0% depending on the multiplier applied by the relevant municipality. However, with regard to holders in the legal form of a corporation, capital gains are in general effectively 95% tax exempt from corporate income tax (including solidarity surcharge). Dividends are also generally 95% tax exempt from corporate income tax (including solidarity surcharge), inter alia, if the holder held at least 10% of the registered share capital (*Grundkapital oder Stammkapital*) of BioNTech at the beginning of the calendar year, or Qualifying Dividends. Five percent of the capital gains and five percent of the Qualifying Dividends are treated as non-deductible business expenses, respectively, and, as such, are subject to corporate income tax (including solidarity surcharge); actual business expenses incurred to generate dividends may be deducted. The acquisition of a participation of at least 10% in the course of a calendar year is deemed to have occurred at the beginning of such calendar year for the determination of whether a dividend is a Qualifying Dividend. Participations in the share capital of BioNTech held through a partnership, including co-entrepreneurships (*Mitunternehmenschaften*), are attributable to the respective partner only on a pro rata basis at the ratio of its entitlement to the profits of the partnership.

Further, capital gains and dividend income of a German tax resident corporation are generally subject to German trade tax. The aforementioned 95% exemption for capital gains generally applies also for trade tax purposes.

However, the amount of any dividends after deducting business expenses related to the dividends is not subject to trade tax if the corporation held at least 15% of BioNTech's registered share capital at the beginning of the relevant tax assessment period. In the latter case, the aforementioned exemption of 95% of the dividend income also applies for trade tax purposes. Losses from the sale of ADSs are generally not tax deductible for corporate income tax and trade tax purposes.

With regard to individuals holding ADSs as business assets, 60% of dividends and capital gains are taxed at the individual's personal income tax rate (plus 5.5% solidarity surcharge thereon). Correspondingly, only 60% of business expenses related to the dividends and capital gains as well as losses from the sale of ADSs are principally deductible for income tax purposes. The dividend income and 60% of the capital gains are generally subject to trade tax, which is fully or partly creditable against the individual's personal income tax by a lump-sum method. Dividends (after deduction of business expenses economically related thereto) are exempt from trade tax if the holder held at least 15% of BioNTech's registered share capital at the beginning of the relevant tax assessment period.

### **German Inheritance and Gift Tax (Erbschaft- und Schenkungsteuer)**

The transfer of ADSs to another person by inheritance or gift generally should be subject to German inheritance and gift tax only if:

- (i) the decedent or donor or heir, beneficiary or other transferee (a) maintained his or her domicile or a usual residence in Germany, (b) had its place of management or registered office in Germany at the time of the transfer, (c) is a German citizen who has spent no more than five consecutive years outside of Germany without maintaining a domicile in Germany or (d) is a German citizen who serves for a German entity established under public law and is remunerated for his or her service from German public funds (including family members who form part of such person's household, if they are German citizens) and is only subject to estate or inheritance tax in his or her country of domicile or usual residence with respect to assets located in such country (special rules apply to certain former German citizens who neither maintain a domicile nor have their usual residence in Germany);
- (ii) at the time of the transfer, the ADSs are held by the decedent or donor as business assets forming part of a permanent establishment in Germany or for which a permanent representative in Germany has been appointed; or
- (iii) the ADSs subject to such transfer form part of a portfolio that represents at the time of the transfer 10% or more of the registered share capital of BioNTech and that has been held directly or indirectly by the decedent or donor, either alone or together with related persons.

The Agreement between the Federal Republic of Germany and the United States of America for the avoidance of double taxation with respect to taxes on inheritances and gifts as of December 21, 2000 (*Abkommen zwischen der Bundesrepublik Deutschland und den Vereinigten Staaten von Amerika zur Vermeidung der Doppelbesteuerung auf dem Gebiet der Nachlass-, Erbschaft- und Schenkungssteuern in der Fassung vom 21. Dezember 2000*), hereinafter referred to as the "United States-Germany Inheritance and Gifts Tax Treaty," provides that the German inheritance tax or gift tax can, with certain restrictions, only be levied in the cases of (i) and (ii) above. Special provisions apply to certain German citizens living outside of Germany and former German citizens.

### **Other Taxes**

No German transfer tax, value-added tax, stamp duty or similar taxes are assessed on the purchase, sale or other transfer of ADSs. Provided that certain requirements are met, an entrepreneur may, however, opt for value-added tax on transactions that are otherwise tax-exempt. Net wealth tax (*Vermögensteuer*) is currently not imposed in Germany.

### **Material United States Federal Income Tax Considerations**

The following discussion describes material U.S. federal income tax considerations relating to the acquisition, ownership and disposition of ADSs by a U.S. Holder (as defined below) that acquires the ADSs representing our ordinary shares and holds them as a capital asset. This discussion is based on the tax laws of the United States, including the Internal Revenue Code of 1986, as amended, or the Code, Treasury regulations promulgated or proposed thereunder, and administrative and judicial interpretations thereof, all as in effect on the date hereof. These tax laws are subject to change, possibly with retroactive effect, and subject to differing interpretations that could affect the tax consequences described herein. This section does not address the treatment of a non-U.S. holder, nor does it address the tax treatment under the laws of any state, local or foreign taxing jurisdiction.

## [Table of Contents](#)

For purposes of this discussion, a “U.S. Holder” is a beneficial owner of the ADSs representing our ordinary shares that, for U.S. federal income tax purposes, is:

- an individual who is a citizen or resident of the United States;
- a domestic corporation (or other entity taxable as a corporation);
- an estate the income of which is subject to U.S. federal income taxation regardless of its source; or
- a trust if (i) a court within the United States is able to exercise primary supervision over the trust’s administration and one or more U.S. persons have the authority to control all substantial decisions of the trust or (ii) a valid election under the Treasury regulations is in effect for the trust to be treated as a U.S. person.

This discussion does not address all aspects of U.S. federal income taxation that may be applicable to U.S. Holders in light of their particular circumstances or status (including, for example, banks and other financial institutions, insurance companies, broker and dealers in securities or currencies, traders that have elected to mark securities to market, regulated investment companies, real estate investment trusts, partnerships or other pass-through entities, corporations that accumulate earnings to avoid U.S. federal income tax, tax-exempt organizations, pension plans, persons that hold more than 10% of our stock (by vote or by value), persons that hold the ADSs representing our ordinary shares as part of a straddle, hedge or other integrated investment, persons subject to alternative minimum tax or whose “functional currency” is not the U.S. dollar).

If a partnership (including any entity or arrangement treated as a partnership for U.S. federal income tax purposes) holds the ADSs representing our ordinary shares, the tax treatment of a person treated as a partner in the partnership for U.S. federal income tax purposes generally will depend on the status of the partner and the activities of the partnership. Partnerships (and other entities or arrangements so treated for U.S. federal income tax purposes) and their partners should consult their own tax advisors.

In general, and taking into account the earlier assumptions, for U.S. federal income tax purposes, a holder of ADSs will be treated as the owner of the shares represented by those ADSs. Exchanges of shares for ADSs, and ADSs for shares, generally will not be subject to U.S. federal income or to German tax.

***This discussion addresses only U.S. Holders and does not discuss any tax considerations other than U.S. federal income tax considerations. Prospective investors are urged to consult their own tax advisors regarding the U.S. federal, state and local, and foreign tax consequences of the purchase, ownership, and disposition of ADSs.***

### ***Dividends***

Under the U.S. federal income tax laws, and subject to the passive foreign investment company, or PFIC, rules discussed below, the gross amount of any dividend we pay out of our current or accumulated earnings and profits (as determined for U.S. federal income tax purposes) is includible in income for a U.S. Holder and subject to U.S. federal income taxation. Dividends paid to a noncorporate U.S. Holder that constitute qualified dividend income will be taxable at a preferential tax rate applicable to long-term capital gains, provided that the U.S. Holder holds the ADSs for more than 60 days during the 121-day period beginning 60 days before the ex-dividend date and meets other holding period requirements. Dividends we pay with respect to the ADSs generally will be qualified dividend income.

A U.S. Holder must include any German tax withheld from the dividend payment, as described above under “—German Taxation—General Rules for the Taxation of Holders Not Tax Resident in Germany,” in the gross amount of dividend paid even though the holder does not in fact receive it. The dividend is taxable to the holder when the depository receives the dividend, actually or constructively. Because we are not a U.S. corporation, the dividend will not be eligible for the dividends-received deduction generally allowed to U.S. corporations in

respect of dividends received from other U.S. corporations. The amount of the dividend distribution includible in U.S. Holder's income will be the U.S. dollar value of the Euro payments made, determined at the spot Euro/U.S. dollar rate on the date the dividend distribution is includible in income, regardless of whether the payment is in fact converted into U.S. dollars. Generally, any gain or loss resulting from currency exchange fluctuations during the period from the date the dividend payment is included in income to the date the payment is converted into U.S. dollars will be treated as ordinary income or loss and will not be eligible for the special tax rate applicable to qualified dividend income. The gain or loss generally will be income or loss from sources within the United States for foreign tax credit limitation purposes.

To the extent a distribution with respect to ADSs exceeds our current or accumulated earnings and profits, as determined under U.S. federal income tax principles, the distribution will be treated, first, as a tax-free return of the U.S. Holder's investment, up to the holder's adjusted tax basis in its ADSs, and, thereafter, as capital gain, which is subject to the tax treatment described below in "—Gain on Sale, Exchange or Other Taxable Disposition."

Subject to certain limitations, the German tax withheld in accordance with the Treaty and paid over to the German taxing authority will be creditable or deductible against a U.S. Holder's U.S. federal income tax liability. To the extent a refund of the tax withheld is available to a U.S. Holder under German law or under the Treaty, the amount of tax withheld that is refundable will not be eligible for credit against a U.S. Holder's U.S. federal income tax liability. See "—German Taxation—Withholding Tax Refund for U.S. Treaty Beneficiaries" above for the procedures for obtaining a tax refund.

### ***Gain On Sale, Exchange or Other Taxable Disposition***

Subject to the PFIC rules described below under "—Passive Foreign Investment Company Considerations", a U.S. Holder that sells, exchanges or otherwise disposes of ADSs in a taxable disposition generally will recognize capital gain or loss for U.S. federal income tax purposes equal to the difference between the U.S. dollar value of the amount realized and the holder's tax basis, determined in U.S. dollars, in the ADSs. Gain or loss recognized on such a sale, exchange or other disposition of ADSs generally will be long-term capital gain if the U.S. Holder's holding period in the ADSs exceeds one year. Long-term capital gains of non-corporate U.S. Holders are generally taxed at preferential rates. The gain or loss generally will be income or loss from sources within the United States for foreign tax credit limitation purposes. A U.S. Holder's ability to deduct capital losses is subject to limitations.

### ***Passive Foreign Investment Company Considerations***

We do not believe that we should be treated as, and do not expect to become, a PFIC. Because the determination of our PFIC status is made annually based on the factual tests described below, however, we cannot provide any assurances regarding our PFIC status for the current or future taxable years or that the IRS will agree with our conclusion regarding our PFIC status.

If we were classified as a PFIC in any taxable year, a U.S. Holder would be subject to special rules with respect to distributions on and sales, exchanges and other dispositions of the ADSs. We will be treated as a PFIC for any taxable year in which at least 75% of our gross income is "passive income" or at least 50% of our gross assets during the taxable year (based on the average of the fair market values of the assets determined at the end of each quarterly period) are assets that produce or are held for the production of passive income. Passive income for this purpose generally includes, among other things, dividends, interest, rents, royalties, gains from commodities and securities transactions, and gains from assets that produce passive income. However, rents and royalties received from unrelated parties in connection with the active conduct of a trade or business are not considered passive income for purposes of the PFIC test. In determining whether we are a PFIC, a pro rata portion of the income and assets of each corporation in which we own, directly or indirectly, at least a 25% interest (by value) is taken into account.

If we were a PFIC with respect to a U.S. Holder, then unless such U.S. Holder makes one of the elections described below, a special tax regime would apply to the U.S. Holder with respect to (i) any “excess distribution” (generally, aggregate distributions in any year that are greater than 125% of the average annual distribution received by the holder in the shorter of the three preceding years or the holder’s holding period for the ADSs) and (ii) any gain realized on the sale or other disposition of the ADSs. Under this regime, any excess distribution and realized gain will be treated as ordinary income and will be subject to tax as if (a) the excess distribution or gain had been realized ratably over the U.S. Holder’s holding period, (b) the amount deemed realized in each year had been subject to tax in each year of that holding period at the highest marginal rate for such year (other than income allocated to the current period or any taxable period before we became a PFIC, which would be subject to tax at the U.S. Holder’s regular ordinary income rate for the current year and would not be subject to the interest charge discussed below), and (c) the interest charge generally applicable to underpayments of tax had been imposed on the taxes deemed to have been payable in those years. If we were determined to be a PFIC, this tax treatment for U.S. Holders would apply also to indirect distributions and gains deemed realized by U.S. Holders in respect of stock of any of our subsidiaries determined to be PFICs. In addition, dividend distributions would not qualify for the lower rates of taxation applicable to long-term capital gains discussed above under “—Taxation of Dividends.”

A U.S. Holder that holds the ADSs at any time during a taxable year in which we are classified as a PFIC generally will be required to continue to treat such ADSs as ADSs in a PFIC, even if we no longer satisfy the income and asset tests described above, unless the U.S. Holder elects to recognize gain, which will be taxed under the excess distribution rules as if such ADSs had been sold on the last day of the last taxable year for which we were a PFIC.

Certain elections may be available to a U.S. Holder if we were a PFIC that might alleviate some of the adverse consequences of PFIC status and would result in an alternative treatment of the ADSs.

***U.S. Holders are urged to consult their tax advisors as to our status as a PFIC, and the tax consequences to them if we were a PFIC, including the reporting requirements and the desirability of making, and the availability of, a qualified electing fund election or a mark-to-market election with respect to the ADSs.***

#### ***Net Investment Income Tax***

Non-corporate U.S. Holders that are individuals, estates or trusts and whose income exceeds certain thresholds generally are subject to a 3.8% tax on all or a portion of their net investment income, which may include their gross dividend income and net gains from the disposition of ADSs. A U.S. person that is an individual, estate or trust is encouraged to consult its tax advisors regarding the applicability of this net investment income tax to its income and gains in respect of any investment in ADSs.

#### ***Information Reporting with Respect to Foreign Financial Assets***

Individual U.S. Holders may be subject to certain reporting obligations on IRS Form 8938 (Statement of Specified Foreign Financial Assets) with respect to the ADSs for any taxable year during which the U.S. Holder’s aggregate value of these and certain other “specified foreign financial assets” exceed a threshold amount that varies with the filing status of the individual. This reporting obligation also applies to domestic entities formed or availed of to hold, directly or indirectly, specified foreign financial assets, including the ADSs. Significant penalties can apply if U.S. Holders are required to make this disclosure and fail to do so.

U.S. Holders who acquire ADSs for cash may be required to file IRS Form 926 (Return by a U.S. Transferor of Property to a Foreign Corporation) with the IRS and to supply certain additional information to the IRS if (i) immediately after the transfer, the U.S. Holder owns directly or indirectly (or by attribution) at least 10% of our total voting power or value or (ii) the amount of cash transferred to us in exchange for ADSs, when aggregated with all related transfers under applicable regulations, exceeds \$100,000. Substantial penalties may be imposed on a U.S. Holder that fails to comply with this reporting requirement.

***Information Reporting and Backup Withholding***

In general, information reporting, on IRS Form 1099, will apply to dividends in respect of ADSs and the proceeds from the sale, exchange or redemption of ADSs that are paid to a holder of ADSs within the United States (and in certain cases, outside the United States), unless such holder is an exempt recipient such as a corporation. Backup withholding (currently at a 24% rate) may apply to such payments if a holder of ADSs fails to provide a taxpayer identification number (generally on an IRS Form W-9) or certification of other exempt status or fails to report in full dividend and interest income.

Backup withholding is not an additional tax. A U.S. Holder generally may obtain a refund of any amounts withheld under the backup withholding rules that exceed the U.S. Holder's income tax liability by filing a refund claim with the IRS.

## UNDERWRITING

We are offering ordinary shares represented by ADSs described in this prospectus through a number of underwriters. J.P. Morgan Securities LLC, BofA Securities, Inc. and Berenberg Capital Markets LLC are acting as representatives of the underwriters. We and the Selling Shareholder have entered into an underwriting agreement with the underwriters. Subject to the terms and conditions of the underwriting agreement, we have agreed to sell to the underwriters, and each underwriter has severally agreed to purchase, at the public offering price less the underwriting discounts and commissions set forth on the cover page of this prospectus, the number of ADSs listed next to its name in the following table:

<u>Name</u>	<u>Number of ADSs</u>
J.P. Morgan Securities LLC	1,915,100
BofA Securities, Inc.	1,689,600
Berenberg Capital Markets LLC	1,013,650
UBS Securities LLC	394,350
Canaccord Genuity LLC	177,100
COMMERZBANK Aktiengesellschaft	133,100
WR Securities, LLC	110,550
Bryan, Garnier & Co. Limited	66,550
<b>Total</b>	<b>5,500,000</b>

The underwriters are committed to purchase all the ADSs offered by us if they purchase any ADSs. The underwriting agreement also provides that if an underwriter defaults, the purchase commitments of non-defaulting underwriters may also be increased or the Underwritten Offering may be terminated.

The underwriters propose to offer the ADSs directly to the public at the public offering price set forth on the cover page of this prospectus and to certain dealers at that price less a concession not in excess of \$2.89596 per ADS. After the initial offering of the ADSs to the public, if all of the ADSs are not sold at the public offering price, the underwriters may change the offering price and the other selling terms. Sales of ADSs made outside of the United States may be made by affiliates of the underwriters.

The underwriters have an option to buy up to 825,000 additional ADSs from the Selling Shareholder to cover sales of ADSs by the underwriters which exceed the number of ADSs specified in the table above. The underwriters have 30 days from the date of this prospectus to exercise this option to purchase additional ADSs. If any ADSs are purchased with this option to purchase additional ADSs, the underwriters will purchase ADSs in approximately the same proportion as shown in the table above. If any additional ADSs are purchased, the underwriters will offer the additional ADSs on the same terms as those on which the ADSs are being offered.

For reasons of German law, Joh. Berenberg, Gossler & Co. KG will initially subscribe for all of the new ordinary shares represented by the new ADSs on behalf of and for the account of the underwriters, at an issue price of €1.00 per new ordinary share. This issue price will be credited against the amount due from the underwriters at closing.

## [Table of Contents](#)

The underwriting fee is equal to the public offering price per ADS less the amount paid by the underwriters to us per ADS. The underwriting fee is \$5.29161 per ADS for the ADSs offered by us and \$0.23250 per ADS for the ADSs offered by the Selling Shareholder. The following table shows the per ADS and total underwriting discounts and commissions to be paid to the underwriters assuming both no exercise and full exercise of the underwriters' option to purchase additional ADSs.

	<b>Without exercise of the option to purchase additional ADSs</b>	<b>With full exercise of option to purchase additional ADSs</b>
Per ADS	\$ 5.29161	\$ 4.63173
Total	\$ 29,103,855.00	\$ 29,295,668.00

We estimate that the total expenses of the Global Offering, including registration, filing and listing fees, printing fees and legal and accounting expenses, but excluding the underwriting discounts and commissions, will be approximately \$4.4 million. We have agreed to reimburse the underwriters up to \$40,000 for expenses relating to clearance of the Underwritten Offering with the Financial Industry Regulatory Authority.

A prospectus in electronic format may be made available on the web sites maintained by one or more underwriters, or selling group members, if any, participating in the Underwritten Offering. The underwriters may agree to allocate a number of ADSs to underwriters and selling group members for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters and selling group members that may make Internet distributions on the same basis as other allocations.

We have agreed that we will not (i) offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly, or submit to or file with the SEC a registration statement under the Securities Act relating to, any ordinary shares or ADSs representing our ordinary shares or securities convertible into or exchangeable or exercisable for any of our ordinary shares or ADSs representing our ordinary shares, or publicly disclose the intention to undertake any of the foregoing, or (ii) enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of any ADSs representing our ordinary shares, ordinary shares or any such other securities (regardless of whether any of the transactions described in clause (i) or (ii) above is to be settled by the delivery of ADSs representing our ordinary shares, ordinary shares or such other securities, in cash or otherwise), without the prior written consent of J.P. Morgan Securities LLC and BofA Securities, Inc. for a period of 90 days after the date of this prospectus, other than (A) the ordinary shares and ADSs representing our ordinary shares to be sold in the Global Offering, (B) any of our ordinary shares or ADSs representing our ordinary shares issued upon the exercise of options granted under our existing share-based compensation plans, (C) the filing by us of any registration statement on Form S-8 or a successor form thereto relating to a company share plan and (D) any ADSs representing our ordinary shares or other securities issued in connection with a transaction with an unaffiliated third party that includes a bona fide commercial relationship (including joint ventures, marketing or distribution arrangements, collaboration agreements or licensing agreements) or any acquisition of assets of not less than a majority or controlling portion of the equity of another entity, provided that the aggregate number of the shares issued pursuant to this clause (D) shall not exceed more than five percent (5%) of the total number of outstanding ordinary shares immediately following the issuance and sale of the ADSs representing our ordinary shares hereunder.

Our directors and executive officers, and certain of our significant shareholders (including the Selling Shareholder), collectively representing approximately 74% of our outstanding ordinary shares (including ordinary shares represented by ADSs), have entered into lock-up agreements with the underwriters prior to the commencement of the Global Offering pursuant to which each of these persons or entities, with limited exceptions, for a period of 90 days (or 30 days in the case of the Selling Shareholder) after the date of this prospectus, may not, without the prior written consent of J.P. Morgan Securities LLC and BofA Securities, Inc., (1) offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend, or otherwise transfer or dispose of, directly or indirectly,

## [Table of Contents](#)

any of our ordinary shares or ADSs representing our ordinary shares or any securities convertible into or exercisable or exchangeable for our ordinary shares (including, without limitation, ordinary shares, ADSs representing our ordinary shares, restricted shares, share options or such other securities which may be deemed to be beneficially owned by such directors, executive officers, and shareholders in accordance with the rules and regulations of the SEC and securities which may be issued upon exercise of a stock option or warrant), or publicly disclose the intention to undertake any of the foregoing, (2) enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of the ADSs representing our ordinary shares, ordinary shares or such other securities, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of ADSs representing our ordinary shares, ordinary shares or such other securities, in cash or otherwise, or (3) make any demand for or exercise any right with respect to the registration of any of our ordinary shares or ADSs representing our ordinary shares or any security convertible into or exercisable or exchangeable for ADSs representing our ordinary shares or ordinary shares.

Notwithstanding the foregoing, the terms of the lock-up agreements do not apply to or prohibit, among others, the items described below:

- transactions relating to our ordinary shares or ADSs representing our ordinary shares acquired in the Global Offering or open market transactions on or after the date of this prospectus, provided that no filing by any party (donor, donee, transferor or transferee) under the Exchange Act (or the equivalent thereof in non-U.S. jurisdictions) (other than a filing on a Schedule 13F or 13G) or other public announcement shall be required or shall be made voluntarily;
- the exercise of a warrant or the exercise of a stock option granted under an existing or future stock incentive plan for our ordinary shares or ADSs representing our ordinary shares through a “cashless” exercise;
- transfers or dispositions of our ordinary shares or ADSs representing our ordinary shares in connection with the conversion of any security convertible or exercisable into securities in accordance with their terms (including the settlement of restricted stock units), provided that any such ordinary shares or ADSs representing our ordinary shares received by such party shall be subject to the lock-up restrictions, and provided, further, that no public announcement or voluntary filing shall be made and if a filing by any party (donor, donee, transferor or transferee) under the Exchange Act (or the equivalent thereof in non-U.S. jurisdictions) is required to be made, such filing shall indicate that any disposition of ordinary shares or ADSs representing our ordinary shares was made solely to us in connection with a conversion;
- transfers or dispositions of our ordinary shares or ADSs representing our ordinary shares pursuant to (i) any outstanding equity award or any current or future employee benefit plan or (ii) any contractual arrangement that provides for the repurchase of the party subject to the lock-up restrictions or a right of first refusal with respect to transfers of such ordinary shares or ADSs representing our ordinary shares, provided that no public announcement or voluntary filing shall be made and if a filing by any party (donor, donee, transferor or transferee) under the Exchange Act (or the equivalent thereof in non-U.S. jurisdictions) is required to be made, such filing shall indicate that any disposition of ordinary shares or ADSs representing our ordinary shares was made solely to us;
- the establishment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of our ordinary shares or ADSs representing our ordinary shares, provided that (i) such plan does not provide for the transfer of our ordinary shares and ADSs representing our ordinary shares during the lock-up period and (ii) the entry into such plan is not publicly disclosed, included in any filings under the Exchange Act (or the equivalent thereof in non-U.S. jurisdictions) or otherwise, during the lock-up period; and
- pursuant to a bona fide third-party tender offer for all our outstanding ordinary shares or ADSs representing our ordinary shares, merger, consolidation or other similar transaction approved by our Supervisory Board and made to all holders of our ordinary shares or ADSs representing our ordinary

## [Table of Contents](#)

shares involving a change of control (including, without limitation, the entering into of any lock-up, voting or similar agreement pursuant to which the party subject to the lock-up restrictions may agree to transfer, sell, tender or otherwise dispose of our ordinary shares or ADSs representing our ordinary shares in connection with such transaction, or vote any ordinary shares or ADSs representing our ordinary shares in favor of any such transaction), provided that in the event that such tender offer, merger, consolidation or other such transaction is not completed, such ordinary shares or ADSs representing our ordinary shares shall remain subject to the lock-up restrictions.

In addition, pursuant to the terms of our share options, holders of share options are restricted from exercising such share options for a period of at least one year following our initial public offering without our consent.

We and the Selling Shareholder have agreed to indemnify the underwriters against certain liabilities, including liabilities under the Securities Act of 1933.

ADSs representing our ordinary shares are listed on the Nasdaq Global Select Market under the symbol “BNTX.”

In connection with the Underwritten Offering, the underwriters may engage in stabilizing transactions, which involves making bids for, purchasing and selling ADSs in the open market for the purpose of preventing or retarding a decline in the market price of the ADSs while the Underwritten Offering is in progress. These stabilizing transactions may include making short sales of the ADSs, which involves the sale by the underwriters of a greater number of ADSs than they are required to purchase in the Underwritten Offering, and purchasing ADSs on the open market to cover positions created by short sales. Short sales may be “covered” shorts, which are short positions in an amount not greater than the underwriters’ option to purchase additional ADSs referred to above, or may be “naked” shorts, which are short positions in excess of that amount. The underwriters may close out any covered short position either by exercising their option to purchase additional ADSs, in whole or in part, or by purchasing ADSs in the open market. In making this determination, the underwriters will consider, among other things, the price of ADSs available for purchase in the open market compared to the price at which the underwriters may purchase ADSs through the option to purchase additional ADSs. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the ADSs in the open market that could adversely affect investors who purchase in the Underwritten Offering. To the extent that the underwriters create a naked short position, they will purchase ADSs in the open market to cover the position.

The underwriters have advised us that, pursuant to Regulation M of the Securities Act of 1933, they may also engage in other activities that stabilize, maintain or otherwise affect the price of the ADSs, including the imposition of penalty bids. This means that if the representatives of the underwriters purchase ADSs in the open market in stabilizing transactions or to cover short sales, the representatives can require the underwriters that sold those shares as part of the Underwritten Offering to repay the underwriting discount received by them.

These activities may have the effect of raising or maintaining the market price of the ADSs or preventing or retarding a decline in the market price of the ADSs, and, as a result, the price of the ADSs may be higher than the price that otherwise might exist in the open market. If the underwriters commence these activities, they may discontinue them at any time. The underwriters may carry out these transactions on the Nasdaq Global Select Market, in the over-the-counter market or otherwise.

Other than in the United States, no action has been taken by us or the underwriters that would permit a public offering of the securities offered by this prospectus in any jurisdiction where action for that purpose is required. The securities offered by this prospectus may not be offered or sold, directly or indirectly, nor may this prospectus or any other offering material or advertisements in connection with the offer and sale of any such securities be distributed or published in any jurisdiction, except under circumstances that will result in compliance with the applicable rules and regulations of that jurisdiction. Persons into whose possession this

## [Table of Contents](#)

prospectus comes are advised to inform themselves about and to observe any restrictions relating to the offering and the distribution of this prospectus. This prospectus does not constitute an offer to sell or a solicitation of an offer to buy any securities offered by this prospectus in any jurisdiction in which such an offer or a solicitation is unlawful.

Certain of the underwriters and their affiliates have provided to us and our affiliates and may provide from time to time in the future, certain commercial banking, financial advisory, investment banking and other services for us and such affiliates in the ordinary course of their business, for which they have received and may continue to receive customary fees and commissions. For instance, certain of the underwriters and their affiliates will serve as dealer-managers or subscription agents in the Rights Offering. In addition, from time to time, certain of the underwriters and their affiliates may effect transactions for their own account or the account of customers, and hold on behalf of themselves or their customers, long or short positions in our debt or equity securities or loans, and may do so in the future.

COMMERZBANK Aktiengesellschaft as an underwriter is not a broker-dealer registered with the SEC. COMMERZBANK Aktiengesellschaft will only make sales of ADS in the United States, or to nationals or residents of the United States (including its territories and possessions), through one or more SEC registered broker-dealers in compliance with applicable securities laws and the rules of FINRA.

The address of the Selling Shareholder is Ismaninger Strasse 102. D-81675 Munich, Germany.

### **The Global Offering**

The Underwritten Offering is part of a Global Offering consisting of a rights offering and the Underwritten Offering. Certain holders of our ordinary shares (representing 74.83% of our outstanding ordinary shares (including ordinary shares represented by ADSs)) have entered into irrevocable, binding agreements not to transfer or exercise their rights to subscribe for new ordinary shares in the Rights Offering. Under German law, the law of our jurisdiction of organization, we are permitted to offer new ordinary shares in an amount equal to the percentage of securities represented by the irrevocable agreements not to transfer or exercise rights to new investors in advance of the Rights Offering. We intend to accomplish this through the Underwritten Offering. Following the Underwritten Offering, our shareholders and ADS holders as of the respective record dates who have not agreed to forego exercising their rights will have the opportunity in the Rights Offering to subscribe for up to 1,889,189 new ordinary shares or new ADSs (representing approximately 0.81% of our outstanding ordinary shares (including ordinary shares by ADSs)) at a subscription price equal to the price to the public in the Underwritten Offering. **ADSs PURCHASED IN THE UNDERWRITTEN OFFERING ARE NOT ENTITLED TO RECEIVE RIGHTS TO SUBSCRIBE FOR NEW ORDINARY SHARES OR NEW ADSs IN THE RIGHTS OFFERING.** Accordingly, a total of up to 7,389,189 ordinary shares (including ordinary shares represented by ADSs) may be sold by us in the Global Offering.

### **Notice to Prospective Investors in the European Economic Area and the United Kingdom**

In relation to each Member State of the European Economic Area and the United Kingdom (each a “Relevant State”), no ADSs have been offered or will be offered pursuant to the offering to the public in that Relevant State prior to the publication of a prospectus in relation to the ADSs which has been approved by the competent authority in that Relevant State or, where appropriate, approved in another Relevant State and notified to the competent authority in that Relevant State, all in accordance with the Prospectus Regulation, except that offers of ADSs may be made to the public in that Relevant State at any time under the following exemptions under the Prospectus Regulation:

- (a) to any legal entity which is a qualified investor as defined under the Prospectus Regulation;

## [Table of Contents](#)

- (b) to fewer than 150 natural or legal persons (other than qualified investors as defined under the Prospectus Regulation), subject to obtaining the prior consent of the representatives; or
- (c) in any other circumstances falling within Article 1(4) of the Prospectus Regulation,

*provided* that no such offer of ADSs shall require us or any representative to publish a prospectus pursuant to Article 3 of the Prospectus Regulation or supplement a prospectus pursuant to Article 23 of the Prospectus Regulation and each person who initially acquires any ADSs or to whom any offer is made will be deemed to have represented, acknowledged and agreed to and with each of the representatives and the Company that it is a “qualified investor” within the meaning of Article 2(e) of the Prospectus Regulation. In the case of any ADSs being offered to a financial intermediary as that term is used in the Prospectus Regulation, each such financial intermediary will be deemed to have represented, acknowledged and agreed that the ADSs acquired by it in the offer have not been acquired on a non-discretionary basis on behalf of, nor have they been acquired with a view to their offer or resale to, persons in circumstances which may give rise to an offer of any ADSs to the public other than their offer or resale in a Relevant State to qualified investors as so defined or in circumstances in which the prior consent of the representatives have been obtained to each such proposed offer or resale.

For the purposes of this provision, the expression an “offer to the public” in relation to ADSs in any Relevant State means the communication in any form and by any means of sufficient information on the terms of the offer and any ADSs to be offered so as to enable an investor to decide to purchase or subscribe for any ADSs, and the expression “Prospectus Regulation” means Regulation (EU) 2017/1129.

### **Notice to Prospective Investors in the United Kingdom**

In addition, in the United Kingdom, this document is being distributed only to, and is directed only at, and any offer subsequently made may only be directed at, persons who are “qualified investors” (as defined in the Prospectus Regulation) (i) who have professional experience in matters relating to investments falling within Article 19 (5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, as amended (the “Order”) and/or (ii) who are high net worth companies (or persons to whom it may otherwise be lawfully communicated) falling within Article 49(2)(a) to (d) of the Order (all such persons together being referred to as “relevant persons”) or otherwise in circumstances which have not resulted and will not result in an offer to the public of the ADSs in the United Kingdom within the meaning of the Financial Services and Markets Act 2000.

Any person in the United Kingdom that is not a relevant person should not act or rely on the information included in this document or use it as a basis for taking any action. In the United Kingdom, any investment or investment activity that this document relates to may be made or taken exclusively by relevant persons.

### **Notice to Prospective Investors in Canada**

The ADSs may be sold only to purchasers purchasing, or deemed to be purchasing, as principal that are accredited investors, as defined in National Instrument 45-106 Prospectus Exemptions or subsection 73.3(1) of the Securities Act (Ontario), and are permitted clients, as defined in National Instrument 31-103 Registration Requirements, Exemptions and Ongoing Registrant Obligations. Any resale of the ADSs must be made in accordance with an exemption from, or in a transaction not subject to, the prospectus requirements of applicable securities laws.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this prospectus (including any amendment thereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser’s province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser’s province or territory for particulars of these rights or consult with a legal advisor.

Pursuant to section 3A.3 of National Instrument 33-105 Underwriting Conflicts (NI 33-105), the underwriters are not required to comply with the disclosure requirements of NI 33-105 regarding underwriter conflicts of interest in connection with the Underwritten Offering.

#### **Notice to Prospective Investors in Switzerland**

The ADSs may not be publicly offered in Switzerland and will not be listed on the SIX Swiss Exchange, or SIX, or on any other stock exchange or regulated trading facility in Switzerland. This document does not constitute a prospectus within the meaning of, and has been prepared without regard to the disclosure standards for issuance prospectuses under art. 652a or art. 1156 of the Swiss Code of Obligations or the disclosure standards for listing prospectuses under art. 27 ff. of the SIX Listing Rules or the listing rules of any other stock exchange or regulated trading facility in Switzerland. Neither this document, nor any other offering or marketing material relating to the ADSs or the offering, may be publicly distributed or otherwise made publicly available in Switzerland. Neither this document nor any other offering or marketing material relating to the offering, the Company or the ADSs have been or will be filed with or approved by any Swiss regulatory authority. In particular, this document will not be filed with, and the offer of the ADSs will not be supervised by, the Swiss Financial Market Supervisory Authority, or FINMA, and the offer of the ADSs has not been and will not be authorized under the Swiss Federal Act on Collective Investment Schemes (“CISA”). The investor protection afforded to acquirers of interests in collective investment schemes under the CISA does not extend to acquirers of ADSs.

#### **Notice to Prospective Investors in Hong Kong**

The ADSs have not been offered or sold and will not be offered or sold in Hong Kong, by means of any document other than (a) to “professional investors” as defined in the Securities and Futures Ordinance (Cap. 571 of the Laws of Hong Kong) (the “SFO”) of Hong Kong and any rules made thereunder; or (b) in other circumstances which do not result in the document being a “prospectus” as defined in the Companies (Winding Up and Miscellaneous Provisions) Ordinance (Cap. 32 of the Laws of Hong Kong) (the “CO”) or which do not constitute an offer to the public within the meaning of the CO. No advertisement, invitation or document relating to the ADSs has been or may be issued or has been or may be in the possession of any person for the purposes of issue, whether in Hong Kong or elsewhere, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than with respect to ADSs which are or are intended to be disposed of only to persons outside Hong Kong or only to “professional investors” as defined in the SFO and any rules made thereunder.

#### **Notice to Prospective Investors in Japan**

The ADSs have not been and will not be registered pursuant to Article 4, Paragraph 1 of the Financial Instruments and Exchange Act. Accordingly, none of the ADSs nor any interest therein may be offered or sold, directly or indirectly, in Japan or to, or for the benefit of, any “resident” of Japan (which term, as used herein means any person resident in Japan, including any corporation or other entity organized under the laws of Japan), or to others for re-offering or resale, directly or indirectly, in Japan or to or for the benefit of a resident of Japan, except pursuant to an exemption from the registration requirements of, and otherwise in compliance with, the Financial Instruments and Exchange Act and any other applicable laws, regulations and ministerial guidelines of Japan in effect at the relevant time.

#### **Notice to Prospective Investors in Singapore**

Each representative has acknowledged that this prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, each representative has represented and agreed that it has not offered or sold any ADSs or caused the ADSs to be made the subject of an invitation for subscription or purchase and will not offer or sell any ADSs or cause the ADSs to be made the subject of an invitation for subscription or

## Table of Contents

purchase and has not circulated or distributed, nor will it circulate or distribute, this prospectus or any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the ADSs, whether directly or indirectly, to any person in Singapore other than:

- to an institutional investor (as defined in Section 4A of the Securities and Futures Act (Chapter 289) of Singapore, as modified or amended from time to time (the “SFA”)) pursuant to Section 274 of the SFA;
- to a relevant person (as defined in Section 275(2) of the SFA) pursuant to Section 275(1) of the SFA, or any person pursuant to Section 275(1A) of the SFA, and in accordance with the conditions specified in Section 275 of the SFA; or
- otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Where the ADSs are subscribed or purchased under Section 275 of the SFA by a relevant person which is:

- a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or
- a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor,

securities or securities-based derivatives contracts (each term as defined in Section 2(1) of the SFA) of that corporation or the beneficiaries’ rights and interest (howsoever described) in that trust shall not be transferred within six months after that corporation or that trust has acquired the ADSs pursuant to an offer made under Section 275 of the SFA except:

- to an institutional investor or to a relevant person, or to any person arising from an offer referred to in Section 275(1A) or Section 276(4)(i) (B) of the SFA;
- where no consideration is or will be given for the transfer;
- where the transfer is by operation of law;
- as specified in Section 276(7) of the SFA; or
- as specified in Regulation 37A of the Securities and Futures (Offers of Investments) (Securities and Securities-based Derivatives Contracts) Regulations 2018.

Singapore Securities and Futures Act Product Classification: Solely for the purposes of our obligations pursuant to sections 309B(1)(a) and 309B(1)(c) of the SFA, we have determined, and hereby notify all relevant persons (as defined in Section 309A of the SFA), that the ADSs are “prescribed capital markets products” (as defined in the Securities and Futures (Capital Markets Products) Regulations 2018) and Excluded Investment Products (as defined in MAS Notice SFA 04-N12: Notice on the Sale of Investment Products and MAS Notice FAA-N16: Notice on Recommendations on Investment Products).

### **Notice to Prospective Investors in the United Arab Emirates**

The ADSs have not been, and are not being, publicly offered, sold, promoted or advertised in the United Arab Emirates (including the Dubai International Financial Centre) other than in compliance with the laws of the United Arab Emirates (and the Dubai International Financial Centre) governing the issue, offering and sale of securities. Further, this prospectus does not constitute a public offer of securities in the United Arab Emirates (including the Dubai International Financial Centre) and is not intended to be a public offer. This prospectus has not been approved by or filed with the Central Bank of the United Arab Emirates, the Securities and Commodities Authority or the Dubai Financial Services Authority.

**Notice to Prospective Investors in Israel**

This document does not constitute a prospectus under the Israeli Securities Law, 5728-1968, and has not been filed with or approved by the Israel Securities Authority. In Israel, this prospectus is being distributed only to, and is directed only at, and any offer of the ADSs is directed only at (i) a limited number of persons in accordance with the Israeli Securities Law and (ii) investors listed in the first addendum, or the Addendum, to the Israeli Securities Law, consisting primarily of joint investment in trust funds, provident funds, insurance companies, banks, portfolio managers, investment advisors, members of the Tel Aviv Stock Exchange, underwriters, venture capital funds, entities with equity in excess of NIS 50 million and “qualified individuals,” each as defined in the Addendum (as it may be amended from time to time), collectively referred to as qualified investors (in each case, purchasing for their own account or, where permitted under the Addendum, for the accounts of their clients who are investors listed in the Addendum). Qualified investors are required to submit written confirmation that they fall within the scope of the Addendum, are aware of the meaning of same and agree to it.

**EXPENSES OF THE GLOBAL OFFERING**

The following table sets forth the total costs and expenses, other than underwriting discounts and commissions and fees, that we expect to incur in connection with the offer and sale of the ordinary shares and ADSs in the Global Offering, constituting our costs and expenses in the Underwritten Offering and our costs and expenses in the Rights Offering. All of these amounts, except for the Securities and Exchange Commission registration fee and the FINRA filing fee, are estimates:

<u>Expenses</u>	<u>Amount</u>
Securities and Exchange Commission registration fee	\$ 166,955
FINRA filing fee	193,937
Printing and engraving expenses	450,000
Legal fees and expenses	1,900,000
Accounting fees and expenses	300,000
Depositary's fees	700,000
Miscellaneous costs	689,108
<b>Total</b>	<b>\$ 4,400,000</b>

## LEGAL MATTERS

The validity of the ordinary shares and certain other matters of German law will be passed upon for us by Freshfields Bruckhaus Deringer LLP, Hamburg, Germany. Certain matters of U.S. law will be passed upon for us by Covington & Burling LLP, New York, New York. Legal counsel to the underwriters in connection with the Underwritten Offering are Skadden, Arps, Slate, Meagher & Flom LLP, Frankfurt, Germany with respect to German law and Davis Polk & Wardwell LLP, New York, New York with respect to U.S. law. Members of Freshfields Bruckhaus Deringer LLP are the beneficial owners of less than 1% of our ordinary shares.

## EXPERTS

The consolidated financial statements of BioNTech SE incorporated by reference from BioNTech SE's Annual Report on Form 20-F as of December 31, 2019 and 2018 and for each of the years in the three-year period ended December 31, 2019 have been audited by Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft, independent registered public accounting firm, as set forth in their report thereon included therein, and are incorporated herein by reference. Such consolidated financial statements are incorporated herein by reference in reliance upon such report given on the authority of said firm as experts in accounting and auditing. The registered business address of Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft is Börsenplatz 1, 50667 Cologne, Germany.

The financial statements of Neon Therapeutics, Inc. incorporated in this Prospectus by reference to Neon Therapeutics, Inc.'s Annual Report on Form 10-K for the year ended December 31, 2019 have been so incorporated in reliance on the report (which contains an explanatory paragraph relating to Neon Therapeutics, Inc.'s ability to continue as a going concern as described in Note 1 to the financial statements) of PricewaterhouseCoopers LLP, an independent registered public accounting firm, given on the authority of said firm as experts in auditing and accounting.

## SERVICE OF PROCESS AND ENFORCEMENT OF LIABILITIES

We are incorporated and currently existing under European laws and the laws of the Federal Republic of Germany. In addition, all of our directors and officers reside outside of the United States and our assets and those of our non-U.S. subsidiaries are located outside of the United States. As a result, it may not be possible for investors to effect service of process on us or those persons in the United States or to enforce in the United States judgments obtained in U.S. courts against us or those persons based on the civil liability or other provisions of the U.S. securities laws or other laws.

Awards of punitive damages in actions brought in the United States or elsewhere may be unenforceable in Germany. In addition, actions brought in a German court against BioNTech or the members of our supervisory Board and Management Board, our senior management and the experts named herein to enforce liabilities based on U.S. federal securities laws may be subject to certain restrictions; in particular, German courts generally do not award punitive damages. An award for monetary damages under the U.S. securities laws would be considered punitive if it does not seek to compensate the claimant for loss or damage suffered and is intended to punish the defendant. The enforceability of any judgment in Germany will depend on the particular facts of the case as well as the laws and treaties in effect at the time.

Litigation in the Federal Republic of Germany is also subject to rules of procedure that differ from the U.S. rules, including with respect to the taking and admissibility of evidence, the conduct of the proceedings and the allocation of costs. Proceedings in Germany would have to be conducted in the German language, and all documents submitted to the court would, in principle, have to be translated into German. For these reasons, it may be difficult for a U.S. investor to bring an original action in a German court predicated upon the civil

---

[Table of Contents](#)

liability provisions of the U.S. federal securities laws against us, certain members of our Management and Supervisory Boards and senior management and the experts named in this prospectus. The United States and Germany do not currently have a treaty providing for recognition and enforcement of judgments (other than arbitration awards) in civil and commercial matters, though recognition and enforcement of foreign judgments in Germany is possible in accordance with applicable German laws. Even if a judgment against our company, the members of our Management Board, Supervisory Board, senior management or the experts named in this prospectus based on the civil liability provisions of the U.S. federal securities laws is obtained, a U.S. investor may not be able to enforce it in U.S. or German courts.

## WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a registration statement on Form F-1 under the Securities Act relating to the Underwritten Offering. This prospectus, which constitutes part of the registration statement, does not include all of the information contained in the registration statement and the exhibits, schedules and amendments to the registration statement. For further information with respect to us and our ordinary shares and the ADSs representing our ordinary shares, we refer you to the registration statement and the exhibits and schedules included and incorporated by reference in the registration statement. Statements made in this prospectus concerning the contents of any contract, agreement or other document are summaries of all material information about the documents summarized, but are not complete descriptions of all terms of these documents. If we file or incorporate by reference any of these documents as an exhibit to the registration statement, we refer you to the copy of the document that has been filed for a complete description of its terms. Each statement in this prospectus relating to a document filed or incorporated by reference as an exhibit is qualified in all respects by the filed exhibit.

We are subject to the information reporting requirements of the Exchange Act that are applicable to foreign private issuers. Accordingly, we are required to file reports and other information with the SEC, including annual reports on Form 20-F and reports on Form 6-K. The SEC maintains a website that contains reports, proxy and information statements and other information regarding registrants that file electronically with the SEC. These filings and our filings with the SEC are available to the public through the SEC's website at <http://www.sec.gov>.

As a foreign private issuer, we are exempt under the Exchange Act from, among other things, the rules prescribing the furnishing and content of proxy statements, and our board members, executive officers and principal shareholders are exempt from the reporting and short-swing profit recovery provisions contained in Section 16 of the Exchange Act. In addition, we are not required under the Exchange Act to file periodic reports and financial statements with the SEC as frequently or as promptly as U.S. companies whose securities are registered under the Exchange Act.

We will send our transfer agent a copy of all notices of our general meetings of shareholders and other reports, communications and information that are made generally available to shareholders. The transfer agent has agreed to mail to all shareholders a notice containing the information (or a summary of the information) contained in any notice of a meeting of our shareholders received by the transfer agent and will make available to all shareholders such notices and all such other reports and communications received by the transfer agent.

We maintain a corporate website at <https://www.biontech.de>. Information contained on, or that can be accessed through, our website does not constitute a part of this prospectus and our website address is included in this prospectus as an inactive textual reference only.

## INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

We file annual and special reports and other information with the SEC (File Number 001-39081). These filings contain important information that does not appear in this prospectus. The SEC allows us to “incorporate by reference” information into this prospectus, which means that we can disclose important information to you by referring you to other documents which we have filed or will file with the SEC. We are incorporating by reference in this prospectus the documents listed below:

- Our Annual Report on [Form 20-F](#) for the fiscal year ended December 31, 2019, filed with the SEC on March 31, 2020;
- Our [Form 6-K](#) filed with the SEC on May 12, 2020, containing our unaudited interim condensed consolidated financial statements as of and for the three months ended March 31, 2020, our Forms 6-K filed with the SEC on [July 1, 2020](#), [July 20, 2020](#) and [July 20, 2020](#);
- Neon Therapeutics, Inc.’s audited consolidated financial statements as of December 31, 2019 and 2018 and for the years then ended and the audit report of the independent registered public accounting firm, included on pages F-1 through F-28 of Neon Therapeutics, Inc.’s [Form 10-K](#) filed with the SEC on March 2, 2020;
- Neon Therapeutics, Inc.’s unaudited interim condensed consolidated financial statements as of March 31, 2020 and for the three-month periods ended March 31, 2020 and 2019 included in Item 1 of Neon Therapeutics, Inc.’s [Form 10-Q](#) filed with the SEC on May 1, 2020; and
- The description of the ADSs and ordinary shares contained in our [Form 8-A](#) filed with the SEC on October 7, 2019, including any amendment or report filed for the purpose of updating such description.

If you find inconsistencies between the documents and this prospectus, you should rely on the statements made in this prospectus. All information appearing in this prospectus is qualified in its entirety by the information and financial statements, including the notes thereto, contained in the documents incorporated by reference herein.

We will provide to each person, including any beneficial owner, to whom this prospectus is delivered, a copy of these filings, at no cost, upon written or oral request to us at the following address:

BioNTech SE  
An der Goldgrube 12  
D-55131 Mainz  
Germany

Attention: James Ryan, Vice President, Legal and IP

Our SEC filings are also available (free of charge) from our web site at [www.biontech.de](http://www.biontech.de). The information contained on, or that can be accessed from, our website does not form part of this prospectus.

You should rely only on the information contained or incorporated by reference in this prospectus. We have not authorized any other person to provide you with different information. If anyone provides you with different or inconsistent information, you should not rely on it. We are not making an offer to sell these securities in any jurisdiction where the offer or sale is not permitted. You should assume that the information appearing in this prospectus is accurate only as of the date on the front cover of this prospectus, or such earlier date, that is indicated in this prospectus. Our business, financial condition, results of operations and prospects may have changed since that date.

**5,500,000 American Depositary Shares**

**BIONTECH**

**Representing 5,500,000 Ordinary Shares**

---

**PROSPECTUS**

---

**J.P. Morgan**

**UBS Investment Bank  
COMMERZBANK**

**BofA Securities**

**Wolfe Capital Markets and Advisory**

**Berenberg**

**Canaccord Genuity  
Bryan, Garnier & Co.**

July 22, 2020

---