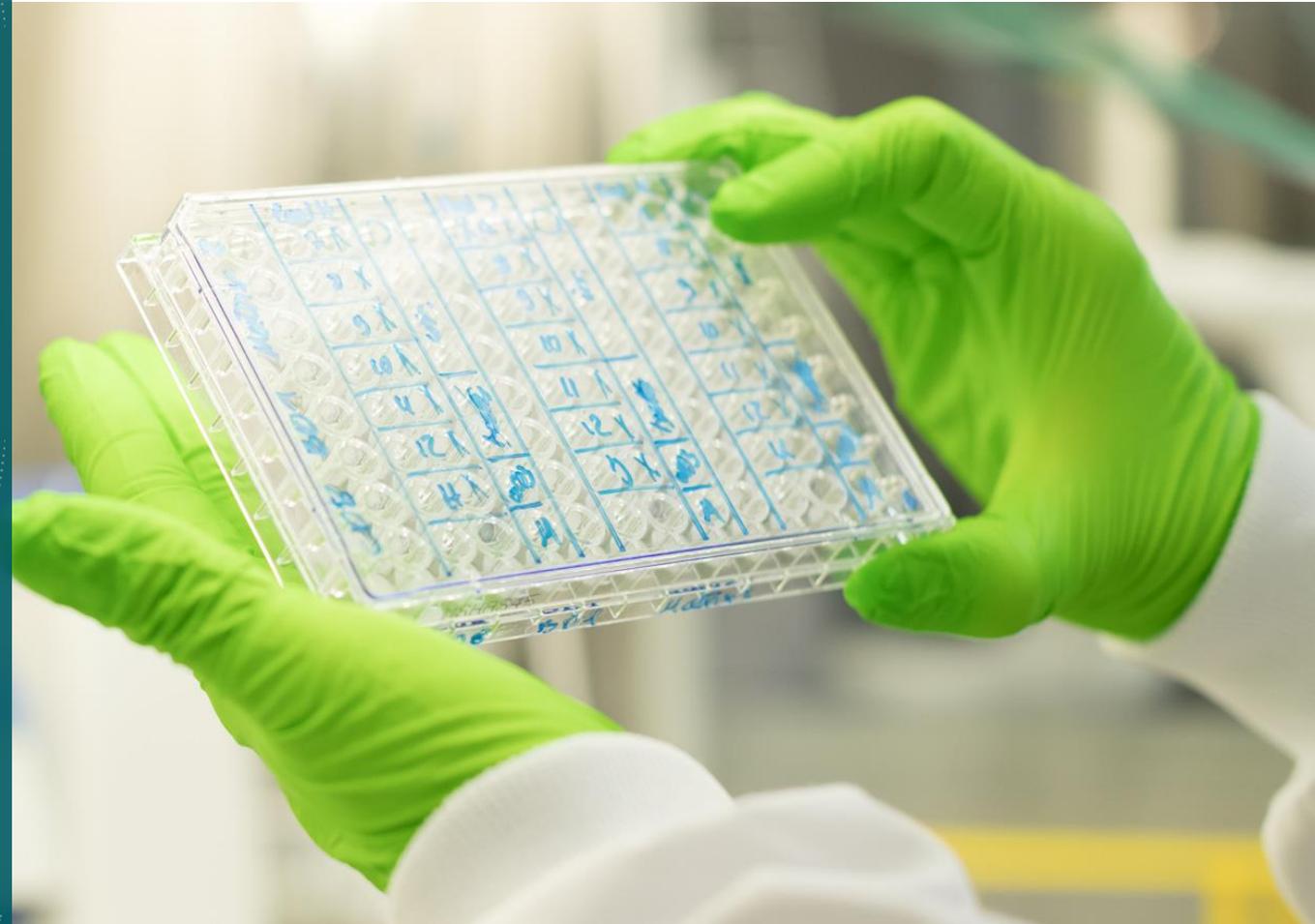


**BIONTECH**

# Next Generation Immunotherapy

August 2021



# This slide presentation includes forward-looking statements



This presentation contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, as amended including BioNTech's efforts to combat COVID-19; the collaboration between BioNTech and Pfizer regarding a COVID-19 vaccine; our expectations regarding the potential characteristics of BNT162b2 in our continuing trials and/or in commercial use based on data observations to date, including real-world data gathered; the ability of BNT162b2 to prevent COVID-19 caused by emerging virus variants; the expected time point for additional readouts on trial data of BNT162b2 in our ongoing trials; the timing for submission of data for, or receipt of, any marketing approval or Emergency Use Authorization; our contemplated shipping and storage plan, including our estimated product shelf life at various temperatures; the ability of BioNTech to supply the quantities of BNT162 to support clinical development and market demand, including our production estimates and targets for 2021 and 2022;; BioNTech's target vaccine production for 2021; the planned next steps in BioNTech's pipeline programs and specifically including, but not limited to, statements regarding plans to initiate clinical trials of BioNTech's product candidates; BioNTech's plans for expansion in southeast Asia and China, including its planned regional headquarters and manufacturing facility in Singapore as well as the JV with Fosun Pharma; and expectations for data announcements with respect to BioNTech's clinical trials. In some cases, forward-looking statements can be identified by terminology such as “will,” “may,” “should,” “expects,” “intends,” “plans,” “aims,” “anticipates,” “believes,” “estimates,” “predicts,” “potential,” “continue,” or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words. The forward-looking statements in this quarterly report are neither promises nor guarantees, and you should not place undue reliance on these forward-looking statements because they involve known and unknown risks, uncertainties, and other factors, many of which are beyond BioNTech’s control and which could cause actual results to differ materially from those expressed or implied by these forward-looking statements. You should review the risks and uncertainties described under the heading “Risk Factors” in our quarterly report and in subsequent filings made by BioNTech with the SEC, which are available on the SEC’s website at <https://www.sec.gov/>. Except as required by law, BioNTech disclaims any intention or responsibility for updating or revising any forward-looking statements contained in this quarterly report in the event of new information, future developments or otherwise. These forward-looking statements are based on BioNTech’s current expectations and speak only as of the date hereof.

# Safety Information

## **AUTHORIZED USE IN THE U.S.:**

The Pfizer-BioNTech COVID-19 Vaccine is authorized for use under an Emergency Use Authorization (EUA) for active immunization to prevent coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in individuals 12 years of age and older.

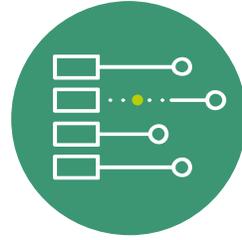
## **IMPORTANT SAFETY INFORMATION FROM U.S. FDA EMERGENCY USE AUTHORIZATION PRESCRIBING INFORMATION:**

- Do not administer Pfizer-BioNTech COVID-19 Vaccine to individuals with known history of a severe allergic reaction (e.g., anaphylaxis) to any component of the Pfizer-BioNTech COVID-19 Vaccine.
- Appropriate medical treatment used to manage immediate allergic reactions must be immediately available in the event an acute anaphylactic reaction occurs following administration of Pfizer- BioNTech COVID-19 Vaccine.
- Monitor Pfizer-BioNTech COVID-19 Vaccine recipients for the occurrence of immediate adverse reactions according to the Centers for Disease Control and Prevention guidelines (<https://www.cdc.gov/vaccines/covid-19/>).
- Immunocompromised persons, including individuals receiving immunosuppressant therapy, may have a diminished immune response to the Pfizer-BioNTech COVID-19 Vaccine.
- The Pfizer-BioNTech COVID-19 Vaccine may not protect all vaccine recipients.
- In clinical studies, adverse reactions in participants 16 years of age and older included pain at the injection site (84.1%), fatigue (62.9%), headache (55.1%), muscle pain (38.3%), chills (31.9%), joint pain (23.6%), fever (14.2%), injection site swelling (10.5%), injection site redness (9.5%), nausea (1.1%), malaise (0.5%), and lymphadenopathy (0.3%).
- Severe allergic reactions, including anaphylaxis, have been reported following the Pfizer-BioNTech COVID-19 Vaccine during mass vaccination outside of clinical trials.
- Additional adverse reactions, some of which may be serious, may become apparent with more widespread use of the Pfizer-BioNTech COVID-19 Vaccine.
- Available data on Pfizer-BioNTech COVID-19 Vaccine administered to pregnant women are insufficient to inform vaccine-associated risks in pregnancy.
- Data are not available to assess the effects of Pfizer-BioNTech COVID-19 Vaccine on the breastfed infant or on milk production/excretion.
- There are no data available on the interchangeability of the Pfizer-BioNTech COVID-19 Vaccine with other COVID-19 vaccines to complete the vaccination series. Individuals who have received one dose of Pfizer-BioNTech COVID-19 Vaccine should receive a second dose of Pfizer-BioNTech COVID-19 Vaccine to complete the vaccination series.
- Vaccination providers must report Adverse Events in accordance with the Fact Sheet to VAERS at <https://vaers.hhs.gov/reportevent.html> or by calling 1-800-822-7967. The reports should include the words "Pfizer-BioNTech COVID-19 Vaccine EUA" in the description section of the report.
- Vaccination providers should review the Fact Sheet for Information to Provide to Vaccine Recipients/Caregivers and Mandatory Requirements for Pfizer-BioNTech COVID-19 Vaccine Administration Under Emergency Use Authorization.

Please see Emergency Use Authorization (EUA) Fact Sheet for Healthcare Providers Administering Vaccine (Vaccination Providers) including Full EUA Prescribing Information available at [www.cvdvaccine-us.com](http://www.cvdvaccine-us.com).

# Next generation Immunotherapy

Harnessing the full  
potential of the  
immune system



**Building a fully integrated  
biopharmaceutical company**



**Immunotherapies for cancer &  
infectious diseases and beyond**

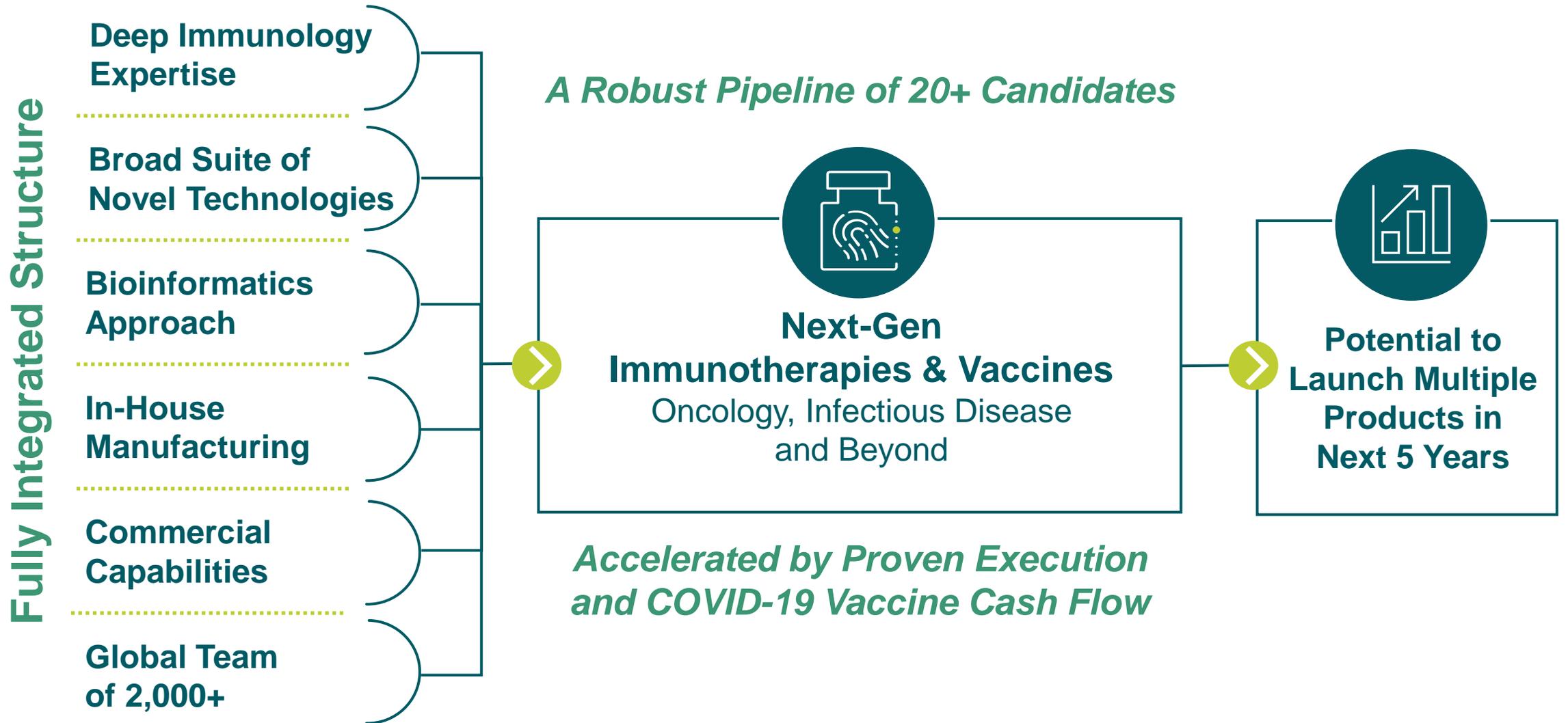


**Broad suite of novel  
technologies**



**Industry-leading global  
collaborations**

# Transformed into a fully integrated, global immunotherapy company



# We collaborate with global leaders in our industry

## Collaborations for clinical stage programs

**Covid-19 Vaccine**  
50:50 gross profit share<sup>1</sup>

**FixVac Melanoma**  
Each company to keep 100%  
of rights to own product

**iNeST**  
50:50 cost & profit share

**Bispecific mABs**  
50:50 cost & profit share

**Intra-tumoral mRNA**  
cost & profit share



REGENERON

Genentech



SANOFI

## Pre-clinical collaborations

**Seasonal Influenza**  
royalties & milestones

**Up to 10 Infectious  
Disease Indications**  
worldwide opt-in right

**HIV, Tuberculosis**  
developed world rights

**5 Rare Disease  
Indications**  
50:50 cost & profit share

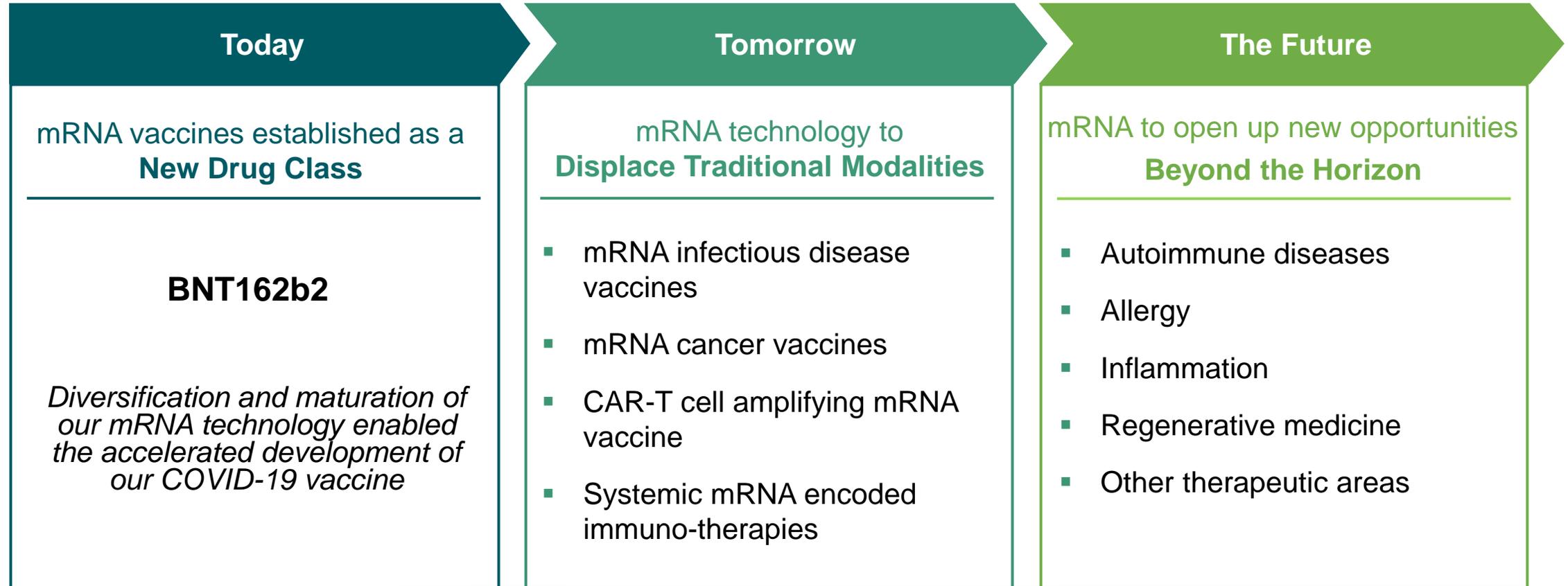


University of  
Pennsylvania

BILL & MELINDA  
GATES foundation

GENEVANT

# mRNA technology poised to revolutionize immunotherapy



uRNA

modRNA

saRNA

taRNA

**Broad IP portfolio covering technologies, targets and formulations.  
Deep expertise and know-how built over the course of more than a decade.**

# Infectious diseases represent a long-term growth pillar

## Unmet Medical Needs

- Increasing number of highly unaddressed indications
- Only 7 infectious disease vaccines approved by the FDA from 2017 to 2020
- Many high incident infections with no vaccine or therapy approved
- Efficacy of multiple approved vaccines is suboptimal

## BioNTech infectious diseases portfolio

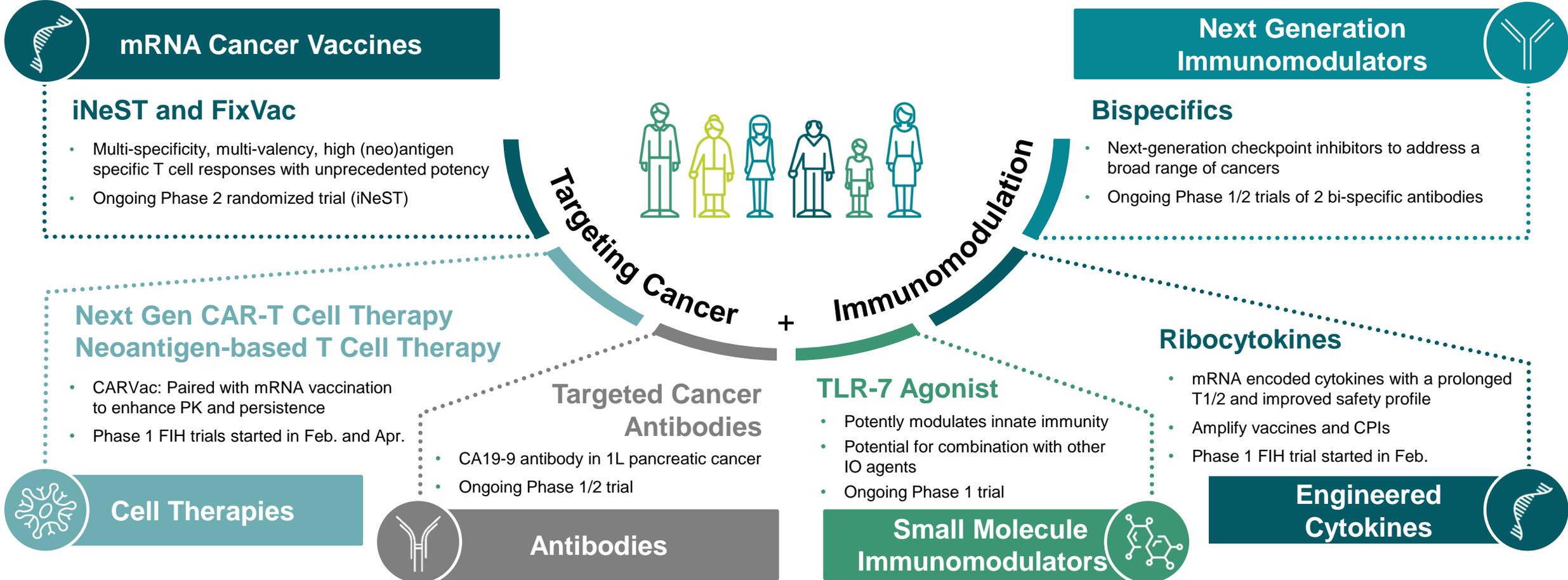
COVID-19 vaccine

Next generation COVID-19 vaccines

Influenza, HIV and TB vaccines

6 undisclosed programs

# Oncology: Tackling multiple diseases with different therapeutic modalities



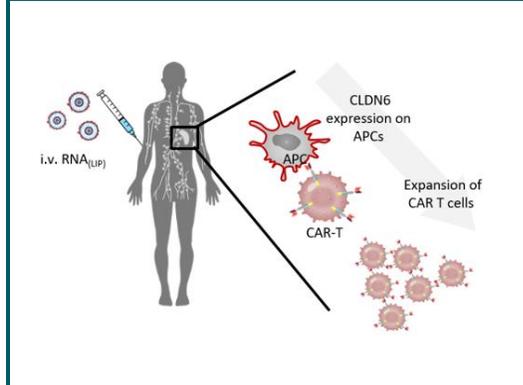
Multiple blockbuster opportunities with synergistic combinations

# A technology agnostic approach targets a broader addressable cancer market

Cancer segment	Patient Population	Challenge	Our Therapeutic Strategies
<b>High mutational burden/ adjuvant stage cancers</b>	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>
<b>Low mutational burden cancers</b>	>60% of cancers	Poor response to checkpoint inhibitors	<ul style="list-style-type: none"> <li>• <b>Shared Antigens</b> (FixVac, CAR-T cells, Neoantigen-targeted T cells, Antibodies)</li> </ul>
<b>“Immune desert” cancers</b>	>40% of high-mutational cancers	Poor infiltration and activation of T-cells in TME <sup>1</sup>	<ul style="list-style-type: none"> <li>• <b>RNA Immunotherapy</b></li> <li>• <b>Immunostimulatory Compounds</b> (intratumoral, RiboCytokines)</li> </ul>
<b>Cancers with MHC / B2M loss</b>	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>
<b>Refractory tumors</b>	Patients with large tumors and multiple resistance mechanisms	Few treatment options	<ul style="list-style-type: none"> <li>• <b>Cell Therapies</b></li> <li>• <b>Combination Therapies</b></li> </ul>

# Next wave oncology advancing innovation beyond current boundaries

## CARVac CAR-T cell amplifying mRNA therapy for solid tumors<sup>1</sup>

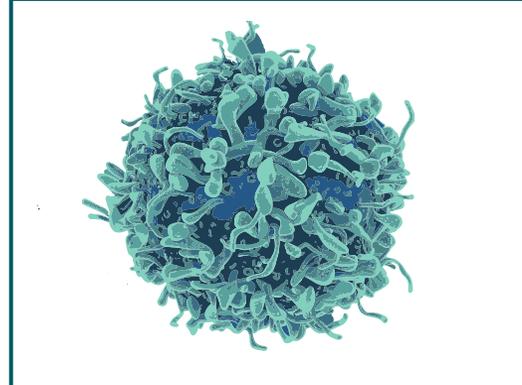


- **BNT211 (CLDN 6 CAR)**  
Next generation CAR-T  
targeting CLDN6 with  
CARVac

Wholly owned:

FIH start: **FPD Feb. 2021**

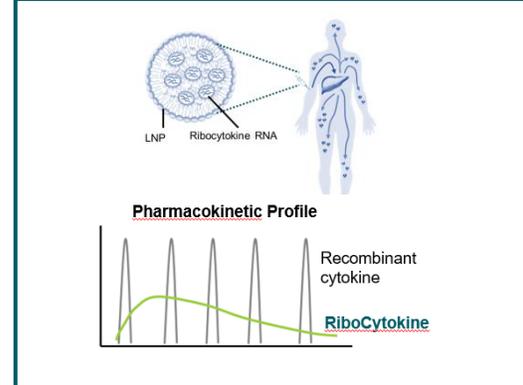
## NEOSTIM T cell therapy Individualized Neoantigen specific T cell therapy



- **BNT221**  
PBMC derived ex  
vivo T cell therapy

**FPD Apr. 2021**

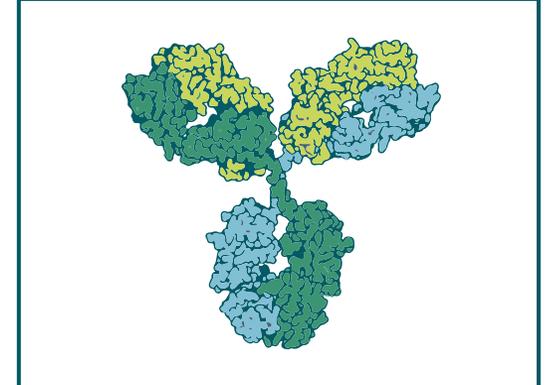
## RiboCytokines mRNA encoded Cytokines



- **BNT151**  
(modified IL-2)
- **BNT152 + BNT153**  
(IL-2/IL-7)

**BNT151: FPD Feb. 2021**

## RiboMabs<sup>2</sup> mRNA encoded Antibodies



- **BNT141**  
(undisclosed)
- **BNT142**  
(CD3xCLDN6)

**2H 2021**

11 FPD, first patient dosed; CLDN6, Claudin-6, CAR-T cells, chimeric antigen receptor T cells; IL-2, interleukin 2; IL-7, Interleukin 7; PBMC, peripheral blood mononuclear cells; FIH, first in human  
<sup>1</sup> Reinhard K, et al. Cancer Immunotherapy 2020; 367:446-453; <sup>2</sup> Stadler et al, Oncoimmunology 2018

# Significant pipeline milestones expected in 2021

## 5+ Trial Updates



- **BNT162b2:** Multiple updates
- **BNT311:** Bi-specific CPI: PD-L1 x 4-1bb in solid tumors
- **BNT312:** Bi-specific checkpoint immunomodulator CD40 x 4-1bb in solid tumors
- **BNT211:** CLDN-6 CAR-T + CARVac in solid tumors
- **BNT411:** TLR-7 agonist +/- CPI in solid tumors

## 3 Randomized Phase 2 Trial Starts



- **BNT111:** FixVac + CPI in refractory melanoma
- **BNT113:** FixVac HPV16+ + CPI in 1L HNSCC
- **BNT122:** iNeST (autogene cevumeran) + CPI in adjuvant mCRC

## 7 First-in-human Phase 1 Trial Starts



- ✓ **BNT211:** CLDN-6 CAR-T + CARVac in solid tumors
- ✓ **BNT151:** Ribocytokine (modified IL-2)
- ✓ **BNT221:** NEOSTIM individualized neoantigen-T cell therapy in melanoma
- **BNT152+153:** RiboCytokine IL-2 / IL-7 combo in solid tumors
- **BNT141:** RiboMab (undisclosed)
- **BNT142:** RiboMab bi-specific CPI in solid tumors (CD3xCLDN6)
- **BNT161:** Influenza vaccine

# Building a 21st Century Global Immunotherapy Powerhouse



## Increase global footprint

- New regional headquarters planned in Singapore
- Commercial subsidiaries established in Germany and Turkey
- Offices established in the United States



## Expand integrated infrastructure

- Continue investment in innovation to support future product launches
- Invest in clinical, commercial and manufacturing, and digital capabilities
- Attract and retain top talent



## Rapidly advance pipeline

- 14 product candidates in 15 ongoing clinical trials
- 3 potentially registrational phase 2 trials initiating this year
- Advance innovations into first-in-human studies
- Strategic in-licensing to complement internal R&D

# Agenda

Overview and business outlook



Pipeline

Deeper dive on our key programs

COVID-19 vaccine program (project “Lightspeed”)

mRNA vaccines – FixVac and iNeST

Antibodies

Small Molecule Immunomodulators

Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

# Oncology pipeline: 14 product candidates in 15 ongoing clinical trials

Drug class	Platform	Product Candidate	Indication (Targets)	Preclinical	Phase 1	Phase 2	Phase 3	Rights Collaborator	Milestones
mRNA	FixVac (fixed combination of shared cancer antigens)	BNT111	advanced melanoma	▶				fully-owned	
		BNT112	prostate cancer	▶				fully-owned	
		BNT113	HPV16+ head and neck cancer <sup>1</sup>	▶				fully-owned	FPD <sup>4</sup> phase 2: 1H 2021
		BNT114	triple negative breast cancer	▶				fully-owned	
		BNT115	ovarian cancer <sup>1</sup>	▶				fully-owned	
	iNeST (patient specific cancer antigen therapy)	autogene cevumeran (BNT122)	1L melanoma	▶				Genentech (global 50:50 profit/loss)	Phase 2 trial planned in adjuvant CRC: FPD <sup>4</sup> in 2H 2021
			solid tumors	▶					
	Intratumoral Immunotherapy	SAR441000 (BNT131)	solid tumors ( <i>IL-12sc, IL-15sushi, GM-CSF, IFN<math>\alpha</math></i> )	▶				Sanofi (global profit/loss share)	
RiboCytokines (mRNA-encoded Cytokines)	BNT151	solid tumors (optimized IL-2)	▶				fully-owned		
Antibodies	Next-Gen CP <sup>2</sup> Immunomodulators	GEN1046 (BNT311)	solid tumors ( <i>PD-L1<math>\times</math>4-1BB</i> )	▶				Genmab (global 50:50 profit/loss)	Data update 2H 2021
		GEN1042 (BNT312)	solid tumors ( <i>CD40<math>\times</math>4-1BB</i> )	▶					Data update 2H 2021
	Targeted Cancer Antibodies	BNT321 (MVT-5873)	pancreatic cancer (sLea)	▶				fully-owned	
SMIM <sup>3</sup>	Toll-Like Receptor Binding	BNT411	solid tumors ( <i>TLR7</i> )	▶				fully-owned	Data update 2H 2021
Cell Therapies	CAR-T Cells	BNT211	solid tumors (CLDN6)	▶				fully-owned	Data update 2H 2021
	Neoantigen-based T cell therapy	BNT221 (NEO-PTC-01)	solid tumors	▶				fully-owned	

15 <sup>1</sup>BNT113 and BNT115 are currently being studied in investigator-initiated Phase 1 trials.  
<sup>2</sup>Checkpoint Inhibitor.

<sup>3</sup>Small Molecule Immunomodulators.  
<sup>4</sup>FPD = First Patient Dosed

# Early-stage oncology pipeline: 3 additional FIH<sup>1</sup> trials to begin in 2021

Drug class	Platform	Product Candidate	Indication (Targets)	Rights Collaborator	Milestones
mRNA	FixVac	BNT116	NSCLC	fully-owned	
	RiboMabs (mRNA-encoded antibodies)	BNT141	solid tumors	fully-owned	Phase 1 start in 2H 2021
		BNT142	solid tumors ( <i>CD3+CLDN6</i> )	fully-owned	Phase 1 start in 2H 2021
	RiboCytokines (mRNA-encoded Cytokines)	BNT152, BNT153	solid tumors ( <i>IL-7, IL-2</i> )	fully-owned	Phase 1 start in 1H 2021
Cell Therapies	CAR-T Cells	BNT212	pancreatic, other cancers ( <i>CLDN18.2</i> )	fully-owned	
	TCRs	to be selected	all tumors	fully-owned	

<sup>1</sup>first-in-human

# Broad infectious disease pipeline

Drug Class	Product Candidate	Indication (Targets)	Pre-clinical	Phase 1	Phase 2	Phase 3	Commercial	Rights / Collaborator
mRNA Vaccine	COMIRNATY	COVID-19						Pfizer/Fosun
	BNT162b3 (modRNA)	COVID-19						Pfizer/Fosun
	BNT161	Seasonal Influenza						Pfizer
	Un-named program	Tuberculosis						BMGF*
	Un-named program	HIV						BMGF*
	5 un-named programs	Undisclosed indications						Fully-owned
Antibodies	Undisclosed program	COVID-19						Fully-owned

\*BMGF= Bill & Melinda Gates Foundation

# Agenda

## Overview and business outlook

Pipeline

## Deeper dive on our key programs

### COVID-19 vaccine program (project “Lightspeed”)

mRNA vaccines – FixVac and iNeST

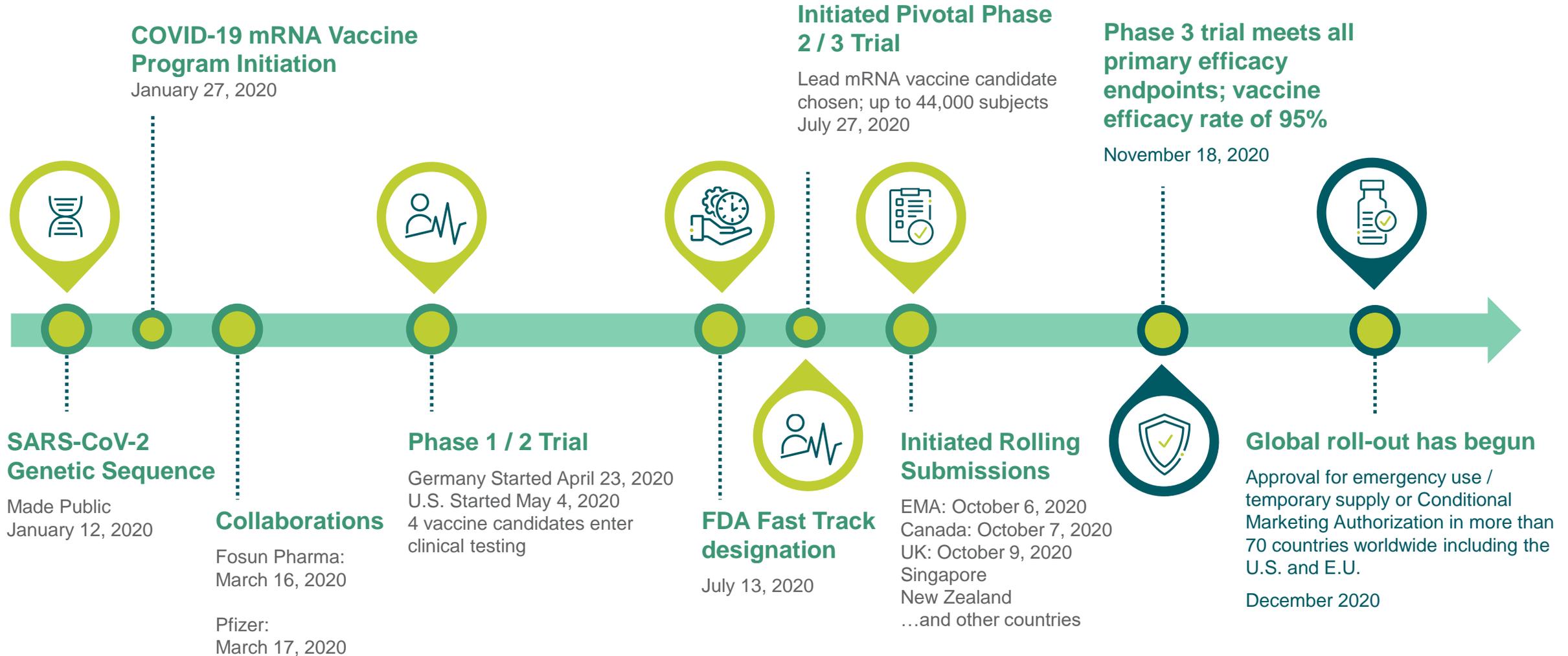
Antibodies

Small Molecule Immunomodulators

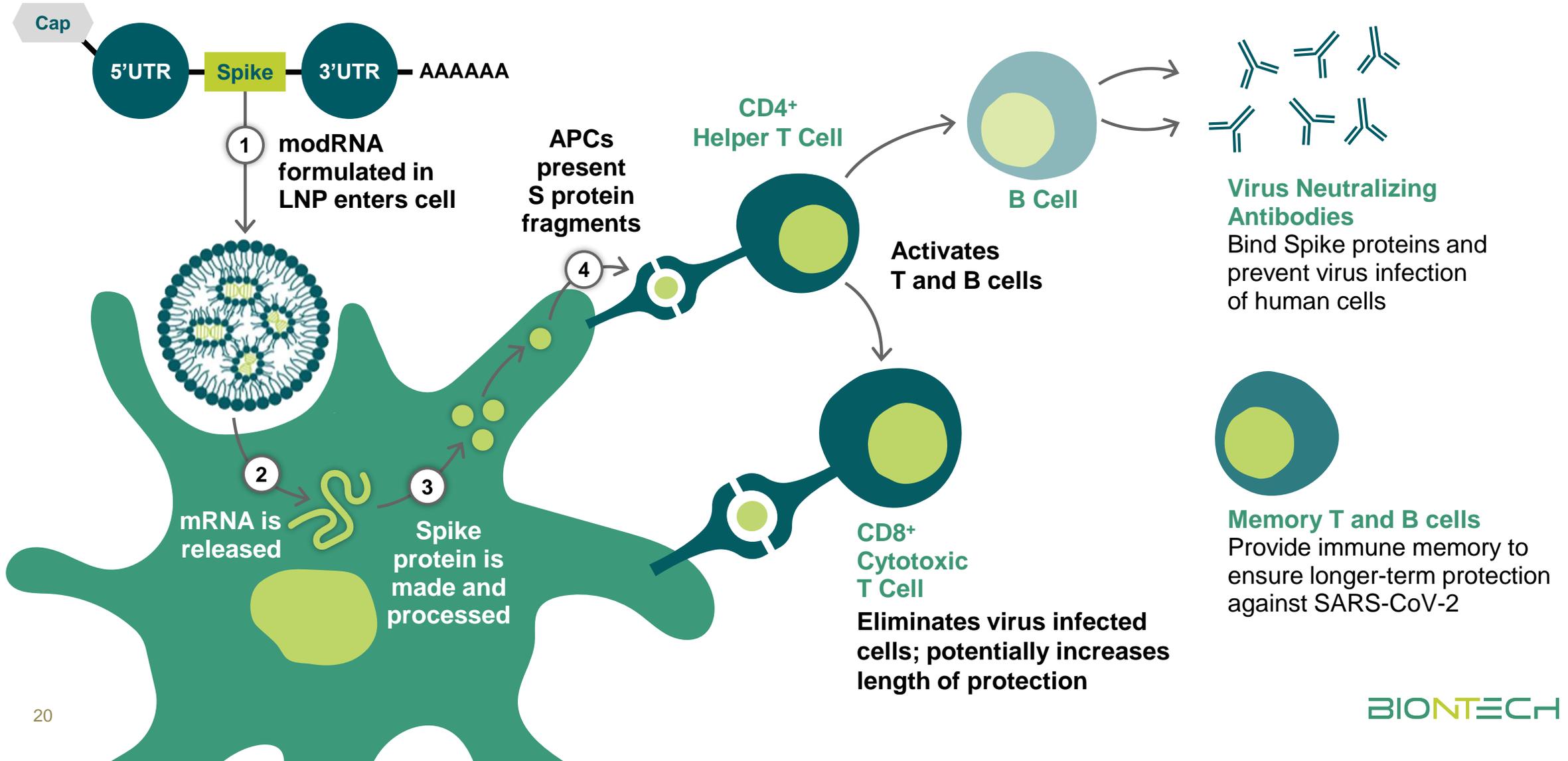
Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

# Project Lightspeed – a 10-month journey to an effective and safe vaccine



# How mRNA vaccines work – training the immune system for a real infection



# mRNA is a natural solution for vaccines especially in a pandemic

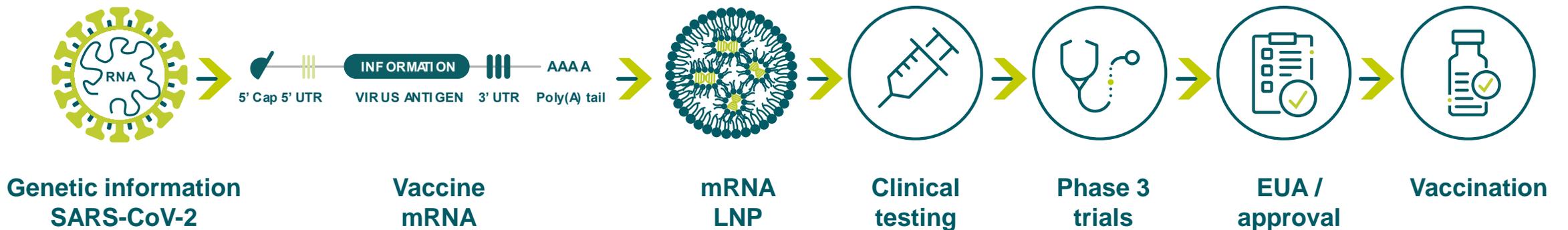
Natural molecule with well-characterized **bio-safety properties**

Does not require addition of adjuvants or use of a vector for administration

Highly scalable production

High purity and animal free

non-integrating into DNA and non-infectious unlike attenuated live virus and DNA based vaccines



# Strong clinical results



## Clinical profile

- 95% effective against symptomatic COVID-19 infections<sup>1</sup>
- 94% efficacy in participants >65 years
- Well tolerated safety profile
- High titers of neutralizing antibodies
- Robust and poly-epitopic CD8+ and Th1 CD4+ T-cell responses<sup>2</sup>



# Compelling real-world evidence



Real-world data from  
observational study  
conducted by  
Israel Ministry of Health

Two weeks post-dose 2

- About 97% effective in preventing
  - symptomatic COVID-19
  - severe/critical COVID 19
  - Hospitalizations
  - Deaths
- 94% effective against asymptomatic infection
- Protective against B.1.1.7 variant

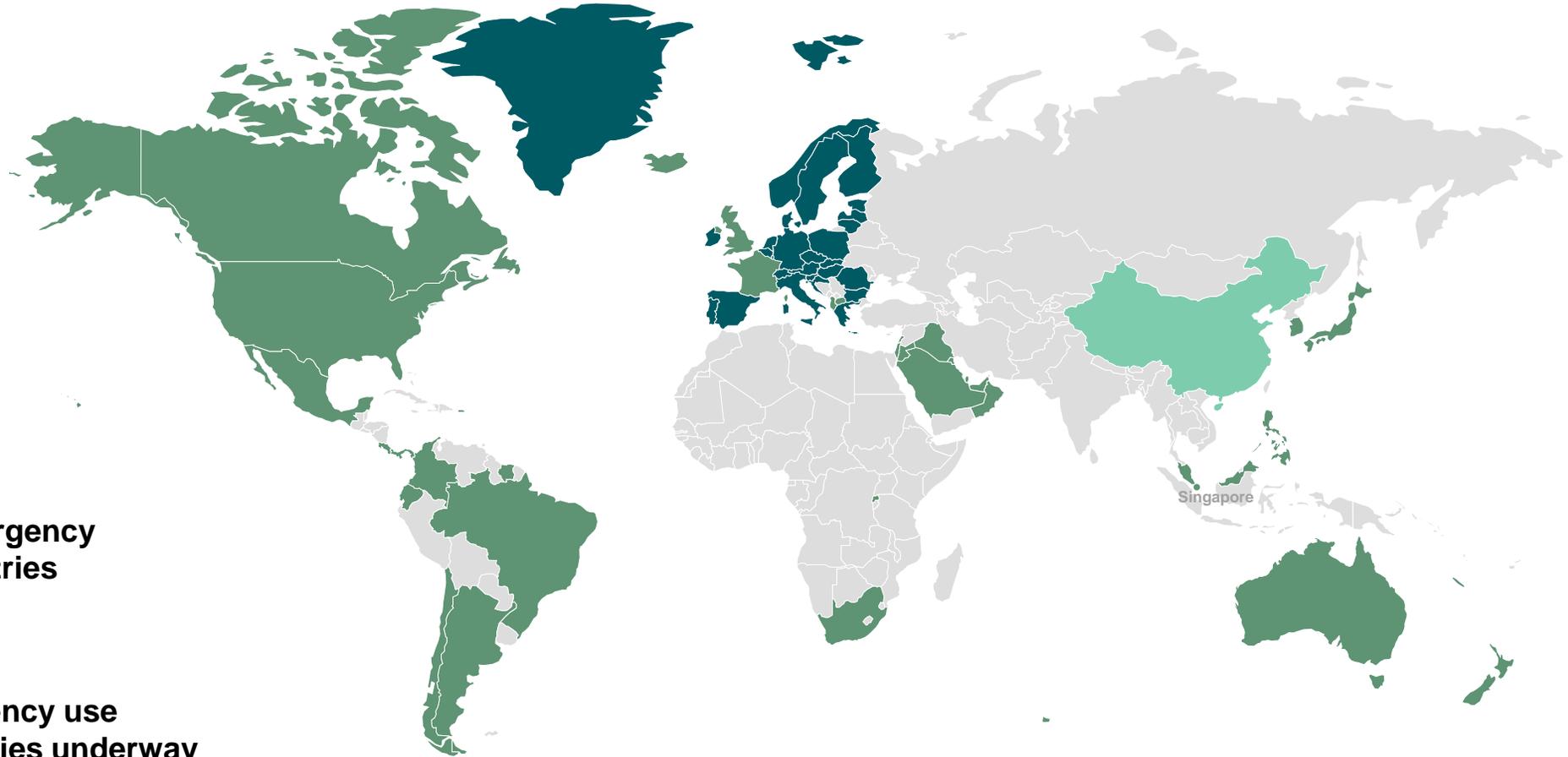


# Project Lightspeed: A concerted and large-scale global effort

- Conditional Marketing Authorization in the EU and Switzerland<sup>1</sup>
- Approved Emergency Use Authorization / Temporary Use Approval
- Ongoing Phase 2 trial in China

Conditional marketing or emergency use authorization in **>70** countries with **>450M** doses delivered<sup>2</sup>

Rolling application for emergency use authorization in further countries underway



# COVID-19 will likely become endemic. Re-vaccination may also be required.

## *Observation*

## *Implication*

**1** Waning immune responses

Re-boostings may be required

**2** Variants are driving new infections

Variant-specific vaccines may be needed

**3** New mRNA vaccines can be rapidly designed and produced at scale

mRNA vaccines are well suited for long-term challenge

# Focused on six key levers to expand COVID-19 vaccine reach

## Increased Manufacturing Capacity



- Up to 3 billion doses by end of 2021; more than 3 billion doses in 2022
- First shipments from Marburg facility delivered mid April
- New regional headquarters in Singapore to house mRNA manufacturing facility

## Additional Populations



- FDA amended EUA to include adolescents 12 to 15 years
- EMA expanded label to include adolescents 12 to 15 years
- Ongoing study in children 6 months to 11 years of age; first data expected in Q3

## Additional Geographies



- Authorized or approved for emergency authorization in more than 70 countries worldwide
- Shipped to 91 counties and territories
- Regulatory submission for BLA in China underway

## Broadened & Decentralized Vaccine Access



- U.S. rolling BLA submission initiated
- Initiated Phase 3 trial to evaluate lyophilized and a ready-to use formulation; data expected in Q3
- FDA and EMA updated storage conditions to include 4-week storage at 2°C to 8°C

## Addressing SARS-CoV-2 Variants

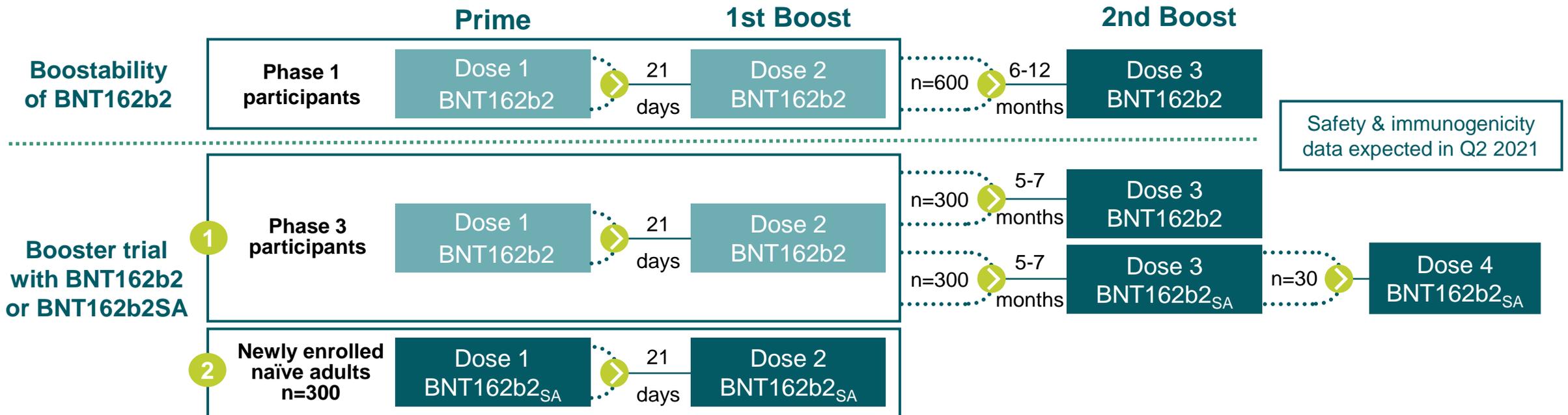


- Ongoing trial to evaluate variant-specific version BNT162b2SA in naïve and vaccinated individuals as well as third dose of BNT162b2 at 6 – 12 months post dose 2
  - Effect on waning immune response against original strain
  - Effect on immune response against variant strains

## Addressing Waning Immune Responses

# Preemptive strategy to be prepared for addressing SARS-CoV-2 variants

- **No evidence that adaptation of BNT162b2 is needed to date**
  - Sera of BNT162b2 vaccinated individuals neutralize B.1.1.7 (UK), B.1.351 (SA), and P.1 (brazilian) lineage\* in *in vitro* studies
- **Expansion of global Phase 1/2/3 trials:**
  - 3<sup>rd</sup> dose to evaluate safety, magnitude and duration of immunity and variant protection
  - Variant specific booster to evaluate safety and immunogenicity of B.1.351 Spike version of BNT162b2 (BNT162b2<sub>SA</sub>)
  - “Blueprint“ approach informs regulatory path and manufacturing



# Scaling up manufacturing capacity to address pandemic demand

**1.8 billion doses contracted to date for 2021<sup>1</sup>**

Selected Regions	Current Orders 2021
EU	600 million
US	300 million
Japan	194 million
UK	90 million
Other	~680 million

## First orders contracted for 2022 and beyond

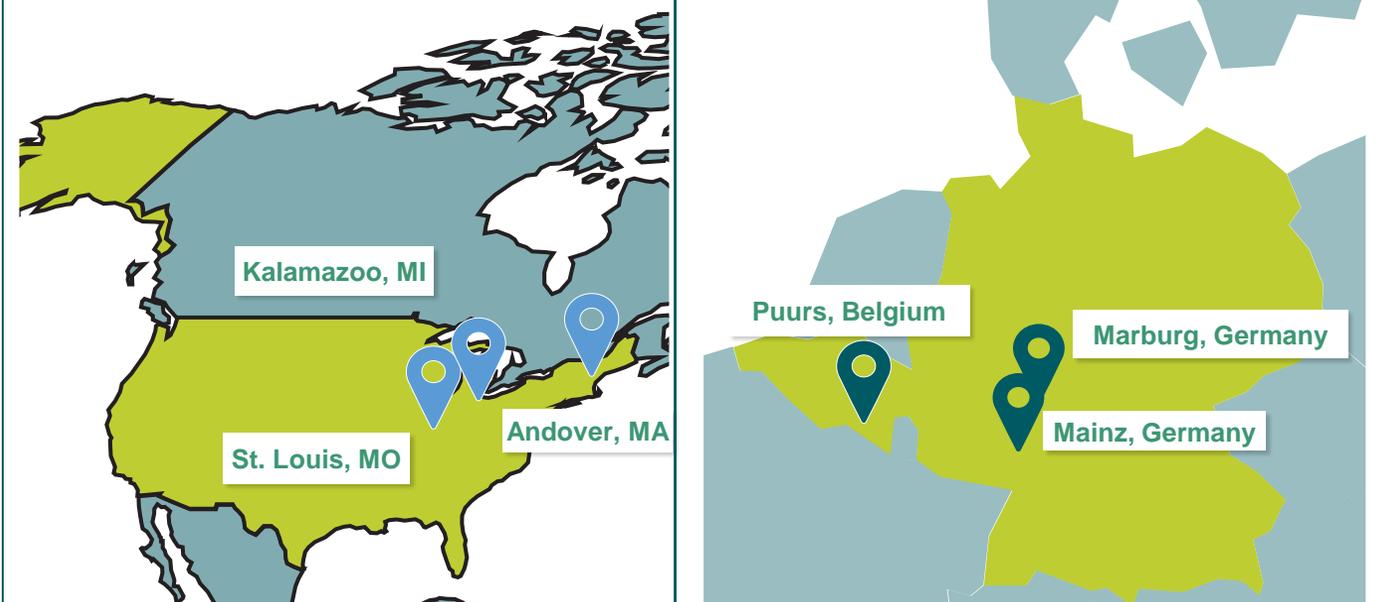
900 million doses for the EU in 2022/2023 with option for an additional 900 million

125 million doses for Canada in 2022/2023 with option for 60 million in 2024

Millions of doses to be supplied to Israel in 2022

**Ongoing discussions in other regions for additional doses in 2021 and beyond**

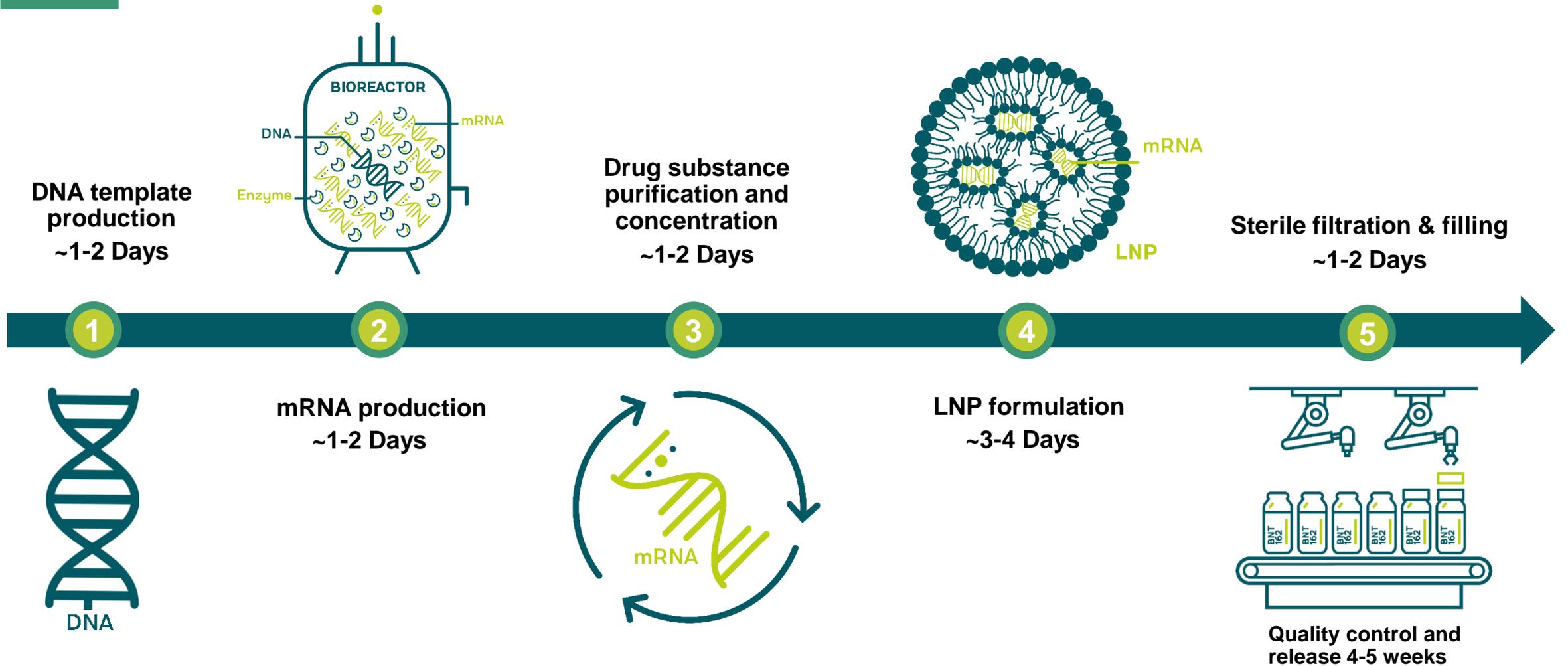
Targeting up to **3.0 billion doses** capacity in 2021\*  
Targeting more than **3.0 billion doses** capacity in 2022



## Marburg facility

- Up to **1 billion doses** in annual run-rate capacity
- First site batch of vaccine delivered in April

# Flexible manufacturing allows rapid adaptation to variants



# Global consortium to address pandemic - BNT162 global collaborations



- Co-development and co-commercialization worldwide (ex China) if approved
- Combined upfront payment and equity investment of \$185 million to BioNTech received in April
- Capital expenditures to be funded by each party independently
- Companies to share development expenses and gross profits on a 50:50 basis
- BioNTech eligible to receive further development & sales milestones up to \$563 million



- Co-development with Fosun Pharma to hold exclusive marketing rights in China if approved
- Combined upfront payment and equity investment of \$51 million to BioNTech received in April
- Fosun Pharma to fund development expenses in China
- BioNTech and Fosun to share gross profits on the sale of the vaccine in China
- BioNTech eligible to receive further China development & sales milestones up to \$84 million

# Agenda

## Overview and business outlook

Pipeline

## Deeper dive on our key programs

COVID-19 vaccine program (project “Lightspeed”)

mRNA vaccines – FixVac and iNeST

Antibodies

Small Molecule Immunomodulators

Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

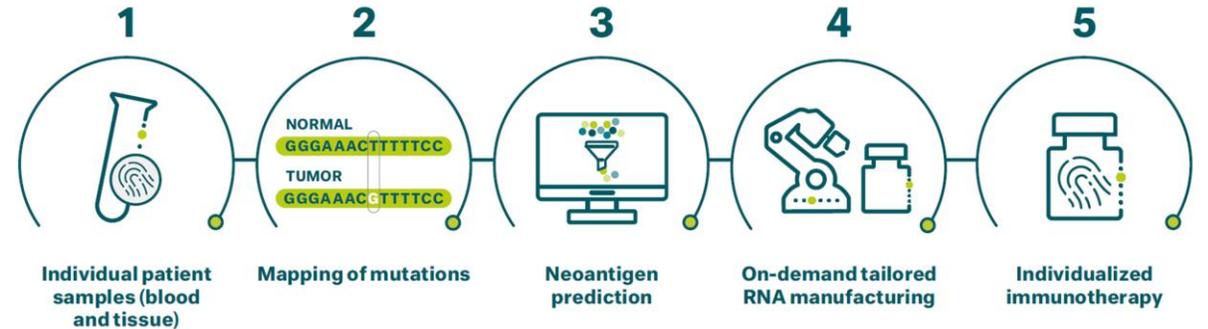
# Our mRNA vaccine platforms: FixVac and iNeST

## FixVac



- Off-the-shelf mRNA immunotherapy
- Targeting a fixed combination of shared antigens
  - Non-mutated shared antigens shared across patients
  - Applicable for almost all types of tumor antigens

## iNeST



- Fully individualized mRNA immunotherapy
- Targeting 20 neo-antigens unique to each patient
  - Vast majority of neo-antigens are unique to individual patients
  - Applicable across solid tumor types

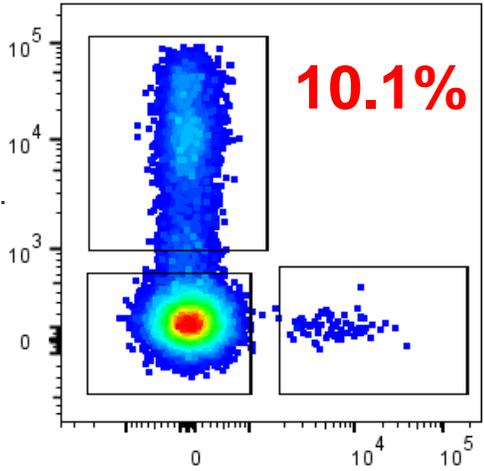
**Proprietary RNA-LPX formulation for systemic dendritic cell targeting**

**Strong immunogenicity observed *in vivo* via TLR7-driven adjuvant effect**

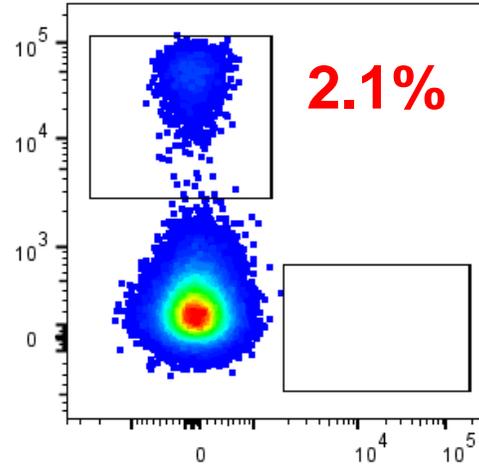
**Potent induction of strong *ex vivo* CD4+ and CD8+ T cell responses**

# Our RNA-LPX vaccine approach

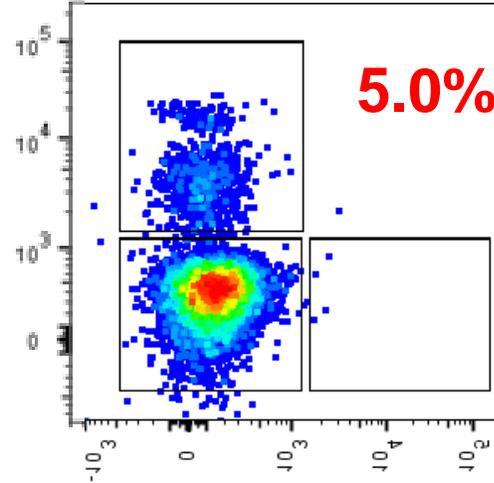
Strong vaccine-induced *ex vivo* CD8+ T cell responses<sup>1</sup> across different cancer types



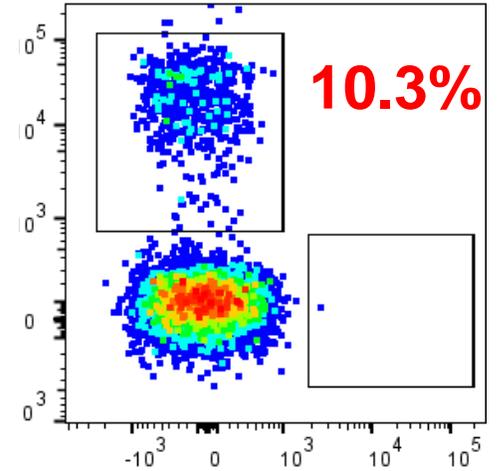
**NY-ESO-1**  
Melanoma  
BNT111, Lipo-MERIT trial



**MAGE-A3**  
Melanoma  
BNT111, Lipo-MERIT trial



**HPV16-E7**  
Head Neck Cancer  
BNT113, HARE40 trial



**Mutant Neoantigen**  
TNBC  
BNT114, TNBC MERIT trial

FixVac

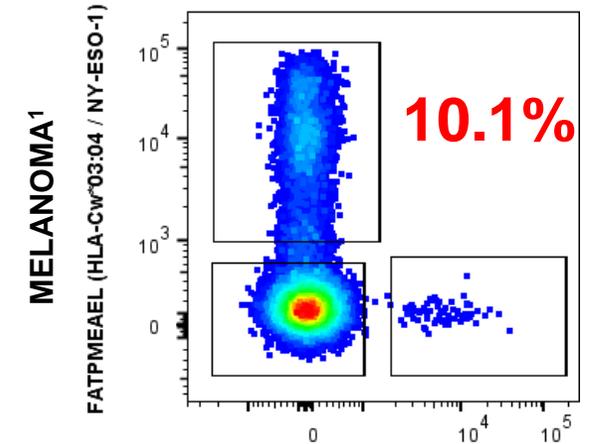
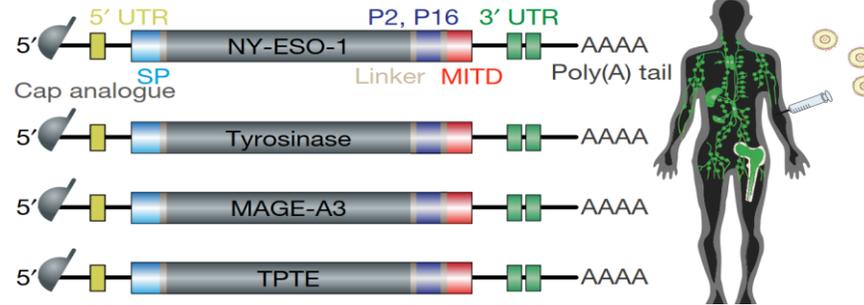
iNeST

# FixVac: Leveraging shared antigens to break immune tolerance

## Novel Structure

FixVac

- Multi-valency + Off-the-shelf
- Applicable for almost all types of tumor antigens



Product candidate<sup>2</sup>

BNT111

BNT113

BNT112

BNT116

Preclinical

**Advanced melanoma** *NY-ESO-1, MAGE-A3, Tyrosinase, TPTE*

**HPV+ head & neck cancer** *HPV E6 and E7 oncoproteins*

**Prostate cancer** *PSA, PAP, 3 addition undisclosed antigens*

NSCLC

Phase 1

Phase 2

# BNT111 FixVac Melanoma: Planning to initiate randomized phase 2 trial

**Ongoing Phase 1 trial in Advanced Melanoma published in Nature**

- Phase 1 trial data in CPI-experienced patients in monotherapy and in combination with anti-PD1 previously reported in July 2020 and published in Nature
- All patients showed tumor associated antigen (TAA) specific T cell responses with In vitro stimulation, and > 75% of patients showed immune responses against  $\geq 1$  TAA on an ex vivo basis
  - T cells responses ramped up over 4-8 weeks and increased or remained stable up to over one year with monthly maintenance therapy
- ***Reported durable clinical responses in monotherapy and in combination with anti-PD1 accompanied by high magnitude CD4+ and CD8+ response***

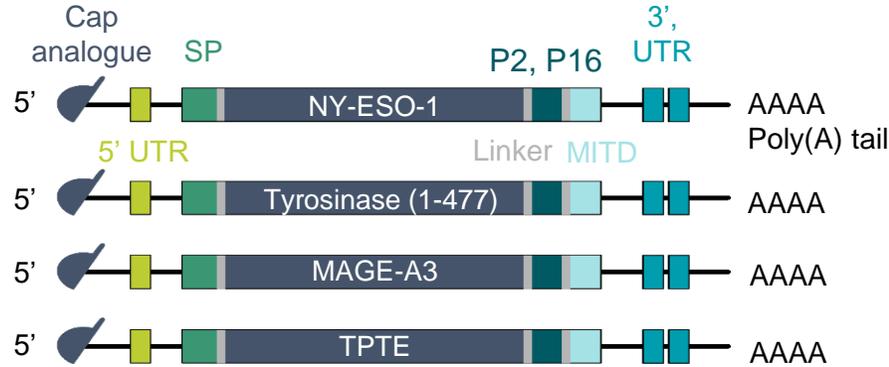
**Regeneron strategic collaboration and planned Phase 2 trial**

- Signed strategic collaboration to jointly conduct randomized Phase 2 trial with BNT111 and Libtayo® (cemiplimab anti-PD-1 therapy)
- Targeting patients with anti-PD1-refractory/relapsed, unresectable Stage III or IV cutaneous melanoma
- Companies to share development costs equally and keep full commercial rights to own programs
- ***Plan to initiate randomized Phase 2 trial in the first half of 2021***

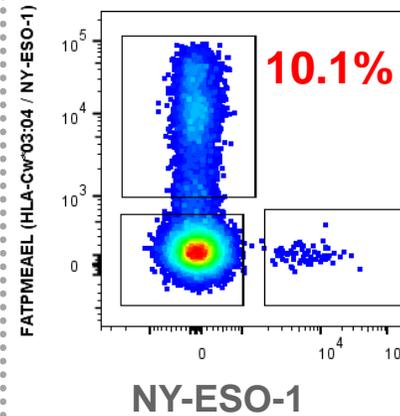
# BNT111: FixVac Melanoma Compelling Preliminary Data

## Off-the-shelf mRNA Immunotherapy

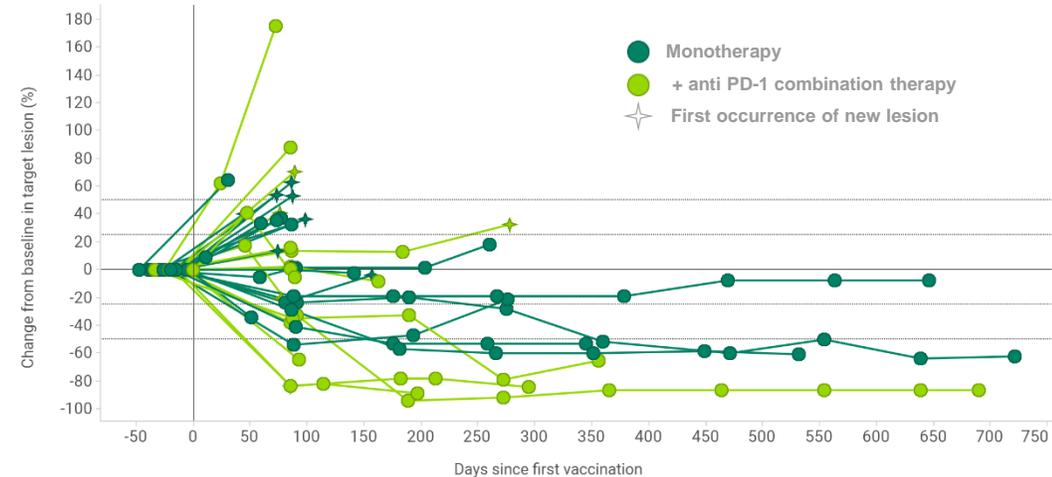
- Fixed combination of non-nucleoside modified mRNA
- Encodes 4 tumor-associated antigens (TAA) covering ~95% of melanoma patients
- Intravenous formulation targets antigen presenting cells bodywide to stimulate antigen-specific T cell responses



## Phase 1 trial in Advanced Melanoma published in Nature



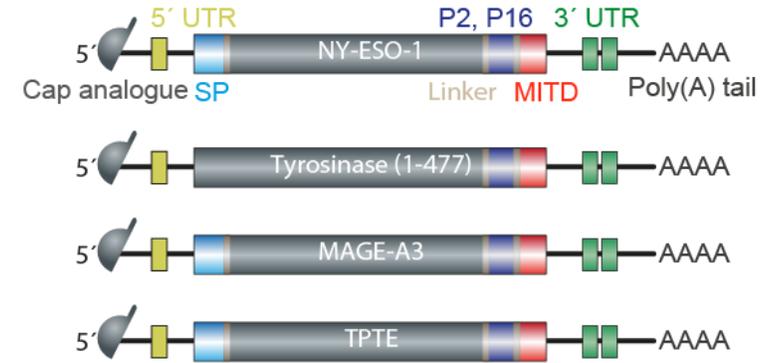
- Tolerable safety as monotherapy and in combination with CPI
- Durable Objective Responses in CPI-experienced patients with evaluable disease at baseline
  - ORR 35% for combination therapy (BNT111 + anti-PD1): 6/17 patients
- High-magnitude and persistent CD4+ and CD8+ T cell responses



# BNT111 interim clinical activity data in advanced melanoma

## Summary

- Advanced melanoma patients (stage III, IV); dose range: 14µg -100µg
- Out of **74 patients** with available follow-up radiological imaging **42 patients** were assessed for preliminary analysis as of July 29, 2019
- of 25 patients** with metastatic melanoma who received **BNT111 monotherapy** following progression on CPI\* and in some cases other therapies
  - 3 patients with partial response (PR)
  - 1 patient with metabolic complete response<sup>1</sup>
  - 7 patients with stable disease (SD)
  - 14 progressive disease (PD)
- of 17 patients** with metastatic melanoma who received **BNT111 in combination** with CPI after progression on CPI monotherapy
  - 6 patients with partial response (PR)
  - 2 patients with stable disease (SD)
  - 9 progressive disease (PD)
- Adjuvant cohort of 32 patients still in study

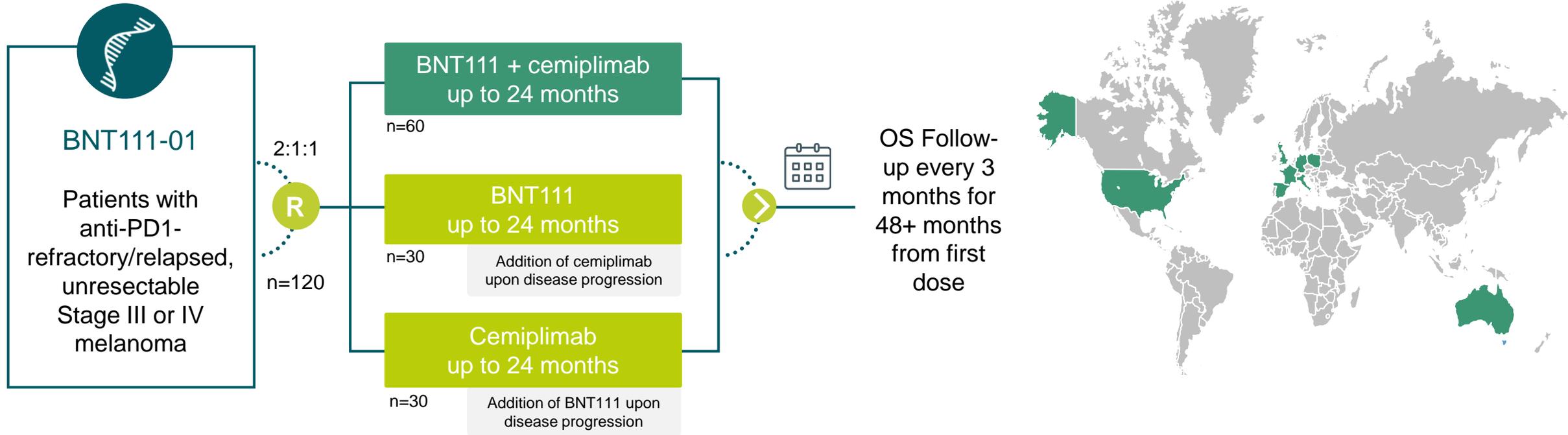


**Cumulative patient coverage of FixVac melanoma targets is over 90%**

**Report phase 1 data 1H 2020**

**Start randomized phase 2 trial in 1H 2021**

# BNT111: FixVac phase 2 clinical trial in anti-PD1 r/r melanoma patients



## Open-label, randomized Phase 2 trial with BNT111 and cemiplimab in combination or as single agents

- Collaboration with Regeneron

### Primary EP

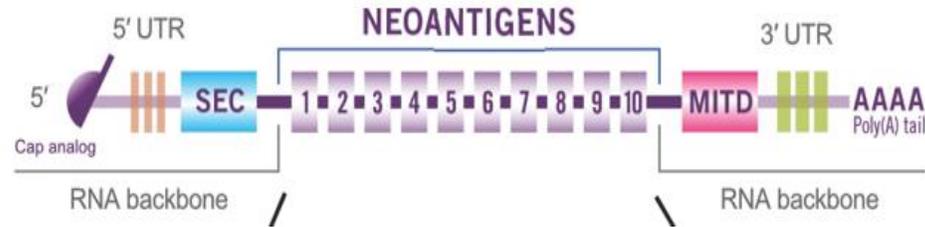
- Arm 1: ORR by RECIST 1.1

### Secondary EP

- ORR (key secondary endpoint arms 2, 3)  
DOR, DCR, TTR, PFS, by RECIST 1.1
- OS, safety, tolerability, PRO

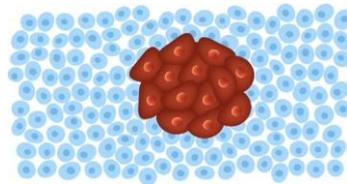
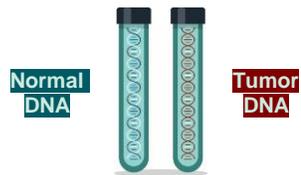
- main treatment arm
- calibrator arm

# iNeST<sup>1</sup>: Tailored treatment to exploit individual targets



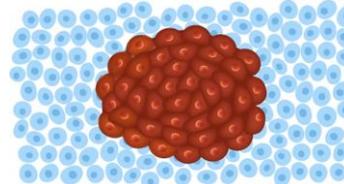
- Fully customized to the individual Patient
- Targeting 20 neo-antigens per patient

## ADJUVANT



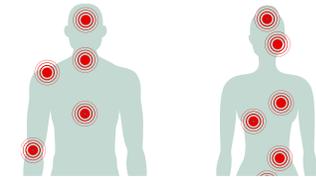
Residual cancer cells may remain – emphasis on recurrence free survival

## 1L METASTATIC



Rapidly growing but often still in early phase of metastases

## LATE-LINE METASTATIC



Bulky tumors with multiple organs involved

iNeST

- *Phase 2 trial planned*
- *8 of 8 stage III/IV melanoma patients with stable disease cancer free for up to 60 months (BNT121)<sup>1</sup>*

- *Ongoing Phase 2 trial in 1L melanoma*

- **Single agent activity** in melanoma<sup>2</sup> and gastric<sup>3</sup> cancer
- **Encouraging efficacy signal** validates iNeST potential in early settings

# iNeST: Recent update from BNT122 reported at AACR

## Phase 1a dose escalation: Monotherapy in locally advanced or metastatic solid tumors

- **31 patients** enrolled, cohorts with **doses ranging from 25-100ug**
  - Most common tumor types were HR+/HER2+ breast, prostate, and ovarian cancer
  - **Median of 5 lines of prior therapies (range 1-17)**
  - Most patients enrolled had low **level of PD-L1 expression** in tumor
- Neoantigen-specific **T cell responses** observed in peripheral blood in **86%** of patients, significant T cell expansion and **both naïve and memory activated phenotype**
- Of 26 patients with at least one tumor assessment,
  - **1 patient with gastric cancer and metastatic liver lesions** had **confirmed CR** (ongoing for 10 months)
  - **12 patients** had **SD**

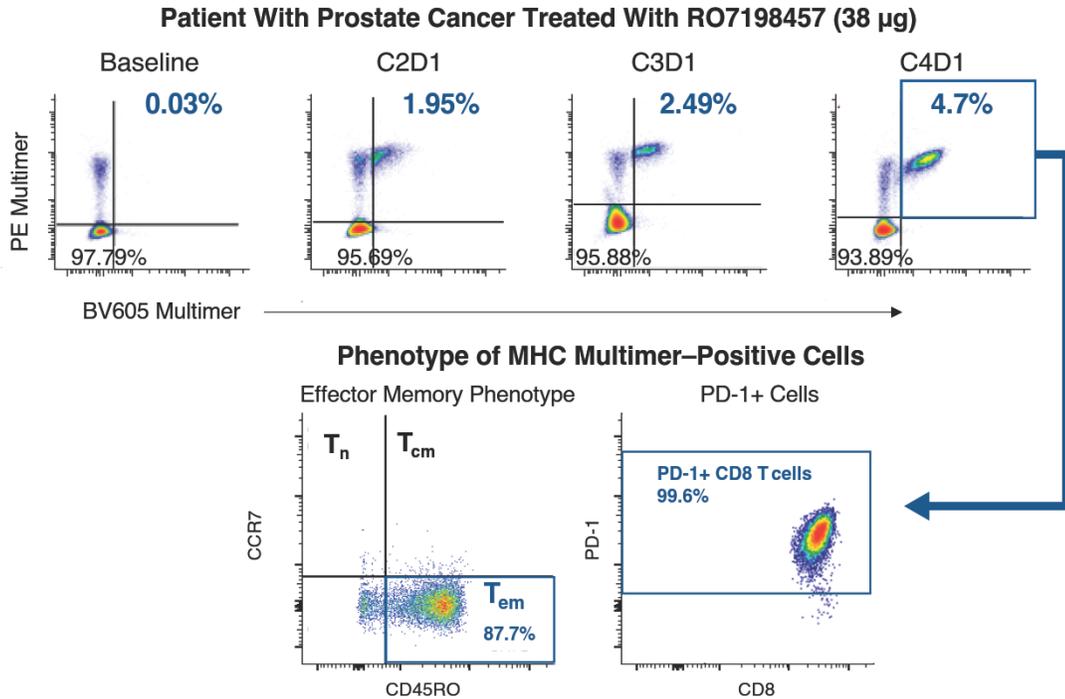
## Phase 1b combination with atezolizumab demonstrated clinical activity in heavily pre-treated patients

- **132 patients** enrolled, cohorts with **doses ranging from 15-50µg**
- Heavily pre-treated patient population
  - Both CPI experienced and inexperienced
  - **Most patients with low PD-1**
- Clinical responses associated with T cell response, correlating immune profiling of patients' T cells to cancer-specific response
- Of 108 patients with at least one tumor assessment
  - **1 patient had CR as best response** (0.9%),
  - **8 patients had PR** (7.4%), and
  - **53 patients had SD** (49.1%)

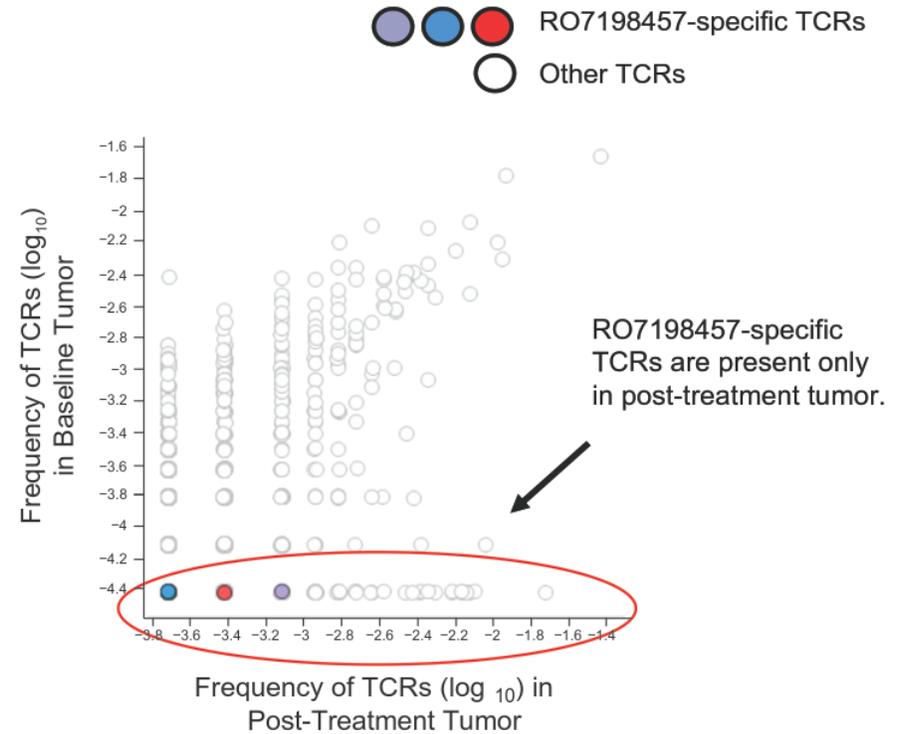
- **Demonstrates ability to elicit significant T cell responses of both effector and memory phenotype as monotherapy and in combination**
- **Treatment-related adverse events were primarily transient systemic reactions, manifesting as low grade CRS, IRR or flu-like symptoms**
- **Early evidence of clinical activity in highly refractory patient population**

# iNeST: Recent update from BNT122 reported at AACR (Cont'd)

## BNT122 induces CD8+ T cells in CPI-sensitive and CPI-insensitive tumor types



## BNT122 induces CD8+ T cell infiltrates in tumors



# BNT122 iNeST randomized Phase 2 trials ongoing and planned

	First-line advanced melanoma	Adjuvant colorectal cancer
Study design and patient population	A Phase 2, open-label, multicenter randomized trial of the efficacy and safety of BNT122 in combination with pembrolizumab vs. pembrolizumab in patients with previously untreated Advanced Melanoma	A Phase 2, open-label, multicenter randomized trial to compare the efficacy of BNT122 versus watchful waiting in patients with ctDNA positive, surgically resected Stage 2/3 rectal cancer, or Stage 2 high risk/stage 3 colon cancer
Rationale	<ul style="list-style-type: none"><li>▪ Evaluate added benefit of 1L BNT122 in an advanced CPI-sensitive tumor (PFS, ORR)</li><li>▪ Success un gates 1L use of iNeST in CPI-sensitive advanced cancers for combination therapy</li></ul>	<ul style="list-style-type: none"><li>▪ Evaluate added benefit of BNT122 in a micrometastatic CPI-insensitive tumor (RFS)</li><li>▪ Success un gates adjuvant use of iNeST for CPI-insensitive ctDNA+ cancer types</li></ul>
Status	<i>Currently enrolling</i>	<i>To start in 2H 2021</i>

# Digitalization and automation for neo-antigen vaccine manufacturing



**Paperless documentation**



**Semi-automatic manufacturing**

- 2 mRNA GMP production facilities: Idar-Oberstein (GMP since 2011) and Mainz (GMP since 2018)
- Construction and GMP licensure of new Mainz facility for iNeST expected in 2022/2023
- Partnered with Siemens to develop automated production processes

# Agenda

## Overview and business outlook

Pipeline

## Deeper dive on our key programs

COVID-19 vaccine program (project “Lightspeed”)

mRNA vaccines – FixVac and iNeST

**Antibodies**

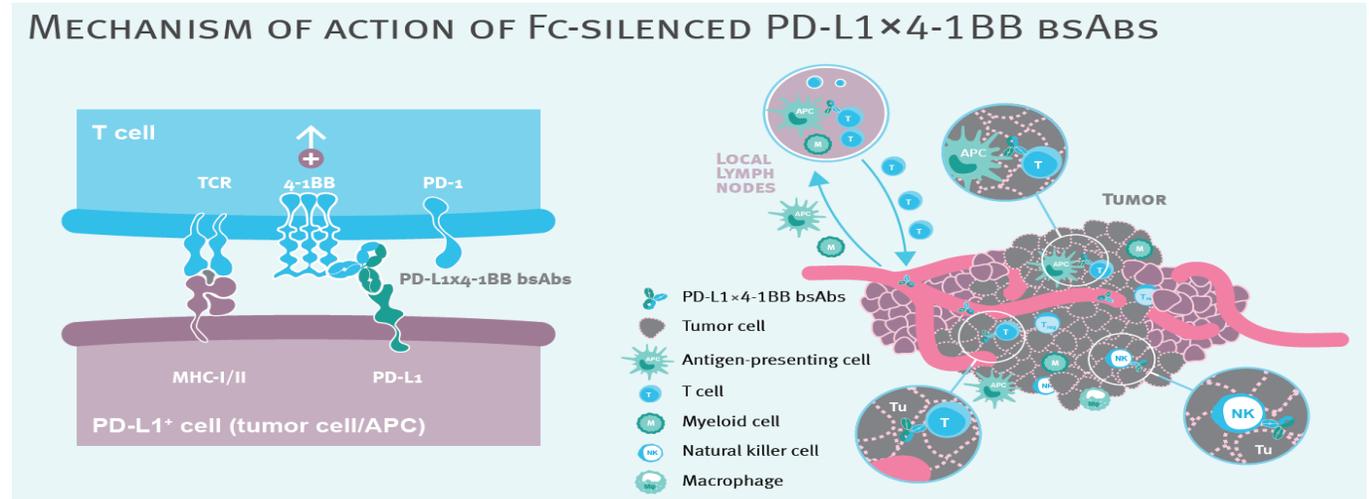
Small Molecule Immunomodulators

Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

# BNT311: Next-generation bispecific antibody PD-L1x4-1BB

- **Next-generation immunotherapy** designed to enhance T cell and NK cell function through conditional 4-1BB co-stimulation while simultaneously blocking PD-L1 axis
- Bispecific antibody is 50:50 profit/loss share partnered with Genmab

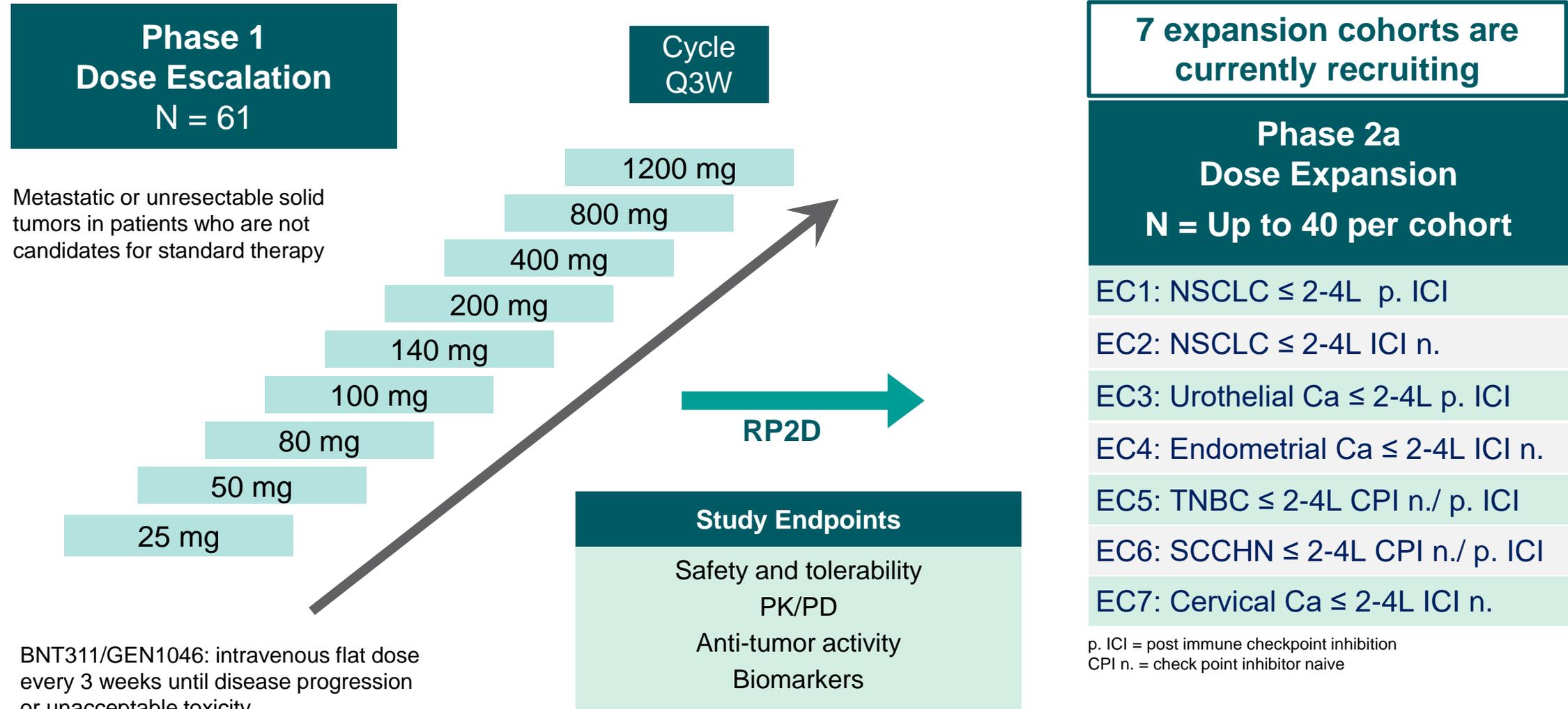


**Interim results  
of ongoing  
Phase 1/2a trial  
presented at  
SITC 2020**

Phase 1/2a dose escalation and expansion trial in heavily pretreated patients with advanced solid tumors to evaluate safety and initial anti-tumor activity

- Dose escalation (n=61) data demonstrated **manageable safety profile** and **preliminary clinical activity** across advanced solid tumors
- Expansion cohort (n=24) in NSCLC patients demonstrated **encouraging preliminary responses**

# BNT311: Safety trial in patients with malignant solid tumors (NCT03917381)



# BNT311: Interim results of ongoing Phase 1/2a trial

## Manageable safety profile and initial clinical activity in FIH trial

### Safety

- Most treatment-related AEs **mild to moderate**
- **No treatment-related bilirubin increases** or Grade-4 transaminase elevations
  - Grade-3 elevations resolved
  - 6 patients had DLTs
  - **MTD not reached**

### Dose escalation

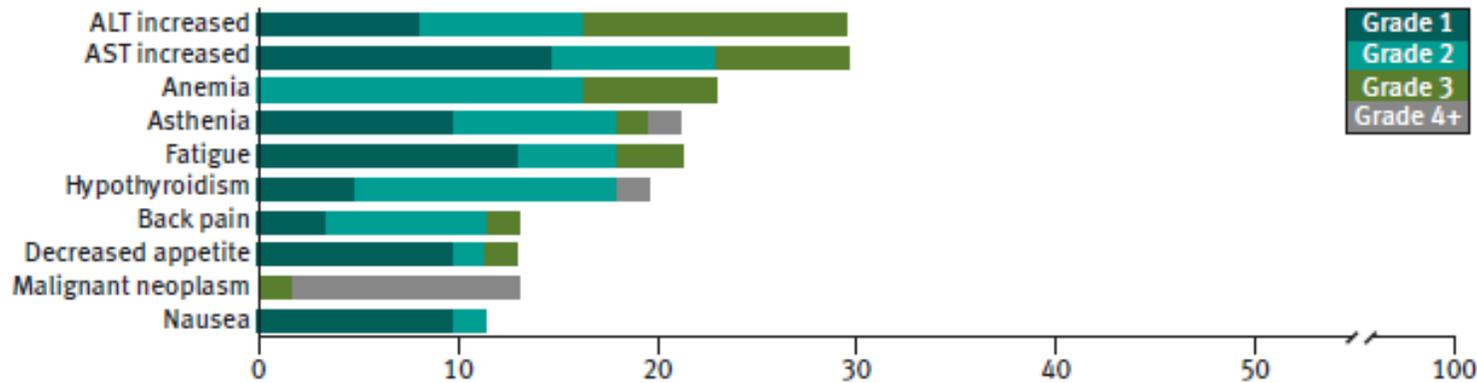
- Clinical benefit **across different dose levels and solid tumor types**
- Disease control in **65.6% of patients**
- **4 partial responses:**
  - TNBC (1), ovarian cancer (1), CPI\* pre-treated NSCLC (2)
- Modulation of **circulating CD8+ T cells** and serum levels of interferon gamma and IP10 observed
  - Maximal induction 8-15 days after treatment

### Dose expansion

- **Encouraging preliminary efficacy** in 12 **PD-L1 relapsed/refractory NSCLC** patients
  - **2 confirmed partial responses**
  - **1 unconfirmed partial response**
  - **4 patients demonstrated stable disease**
- Enrollment ongoing in 6 additional cohorts

# BNT311: Interim results of ongoing Phase 1/2a – safety profile

## TEAEs occurring in ≥10% of patients



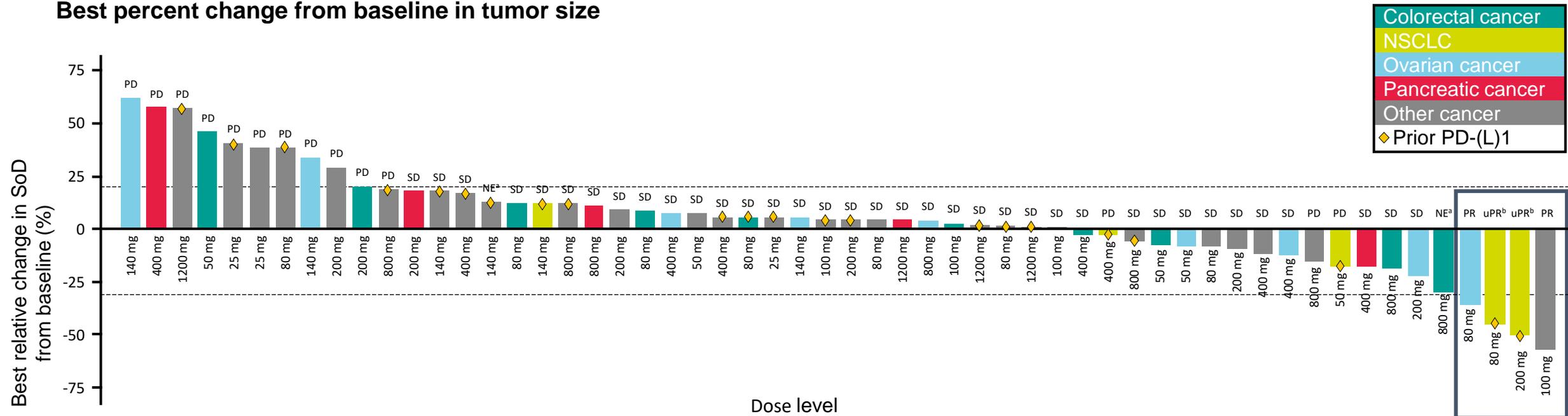
- The most common treatment-related adverse events were transaminase elevations, hypothyroidism and fatigue
- Treatment-related transaminase elevations occurred in 26.2% of patients (9.8% of patients had grade 3 transaminase elevations)
- There were no patients with Grade 4 transaminase, or treatment-related bilirubin increases
- MTD has not been reached

## TRAEs occurring in ≥10% of patients

Dose escalation cohort	All patients (N=61)		
	All grades, n (%)	Grade 3, n (%)	Grade 4, n (%)
Any TRAE	43 (70.5)	15 (24.6)	3 (4.9)
TRAEs in ≥10% of patients, by preferred term			
Transaminase elevation	16 (26.2)	6 (9.8)	0
Hypothyroidism	11 (18.0)	0	1 (1.6)
Fatigue	8 (13.1)	1 (1.6)	0

# BNT311: Interim results of ongoing phase 1/2a- anti-tumor activity dose escalation

## Best percent change from baseline in tumor size



**Disease control achieved in 65.6% of patients; four patients with PR**  
 Includes 4 early partial responses in TNBC (1), ovarian cancer (1), and ICI-pre treated NSCLC (2) patients

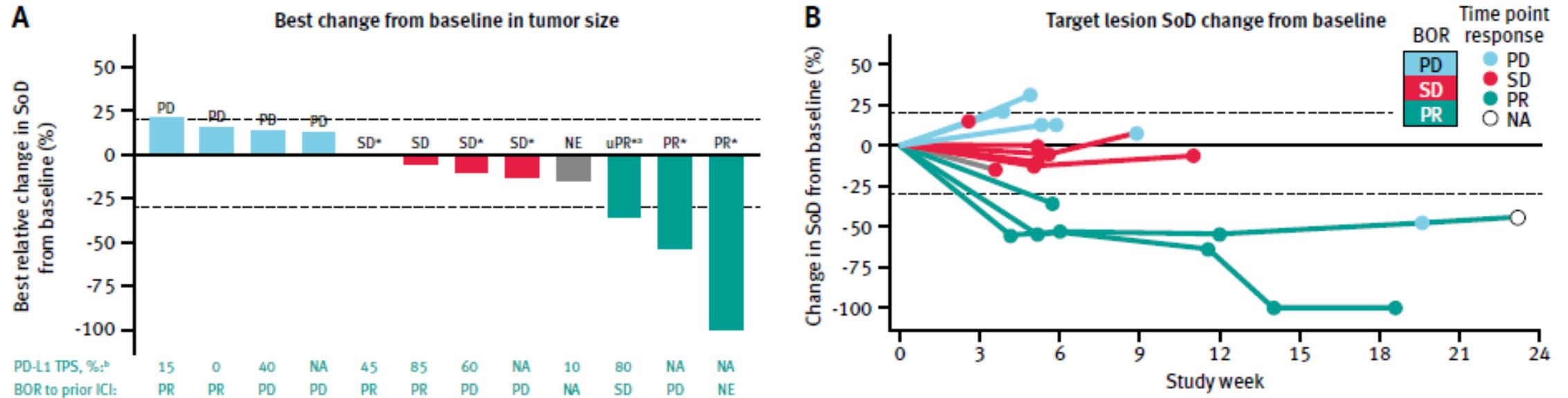
Data cut-off: September 29, 2020. Post-baseline scans were not conducted for five patients.

<sup>a</sup>Minimum duration of response (5 weeks) per RECIST v1.1 not reached.

<sup>b</sup>PR was not confirmed on a subsequent scan.

NE, non-evaluable; NSCLC, non-small cell lung cancer; PD, progressive disease; PD-(L)1, programmed death (ligand) 1; PR, partial response; SD, stable disease; SoD, sum of diameters; uPR, unconfirmed partial response.

# BNT311: Interim results of ongoing phase 1/2a – anti-tumor activity in CPI recurrent/refractory NSCLC expansion



As of October 12, 2020, 24 patients were enrolled in expansion cohort 1, which includes patients with NSCLC with progression on or after ICI therapy

- 12 patients had post-baseline scans; 6 patients were still on treatment with BNT311/GEN1046, 6 patients discontinued
- Preliminary efficacy in 12 patients who could be objectively assessed showed two patients who achieved confirmed PR, one with unconfirmed PR, and four patients with SD

Data cut-off: October 12, 2020.

<sup>a</sup>Denotes patients with ongoing treatment.

<sup>b</sup>aPR was not confirmed by a subsequent scan.

<sup>c</sup>Includes all patients who had at least one post-baseline tumor assessment (schedule is every 6 weeks), and thus could be assessed for clinical benefit; 6 of 12 patients are still on treatment.

BOR, best overall response; ICI, immune checkpoint inhibitor; NA, not available; NE, non-evaluable; NSCLC, non-small cell lung cancer; PD, progressive disease; PD-(L)1, programmed death (ligand) 1; PR, partial response; RECIST, Response Evaluation Criteria in Solid Tumors; SD, stable disease; SoD, sum of diameters; TPS, tumor proportion score; uPR, unconfirmed partial response.

# Agenda

Overview and business outlook

Deeper dive on our key programs



COVID-19 vaccine program (project “Lightspeed”)

mRNA vaccines – FixVac and iNeST

Antibodies

Small Molecule Immunomodulators

Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

## BNT411: initiated FIH Phase 1 trial for our TLR7 agonist in July 2020

- BNT411 is an intravenously administered small molecule TLR7 (toll-like receptor 7) agonist
- Engineered for high potency and high TLR7 receptor-selectivity at the therapeutically active dose range
- Activation of both adaptive and innate immune system has been observed, in particular in combination with cytotoxic therapies and CPIs
- Type 1 interferon-dominated release of cytokines and chemokines and potent stimulation of antigen-specific CD8+ T cells, B cells and innate immune cells such as NK cells and macrophages
- Expected to have therapeutic potential across various solid tumor indications
- Phase 1/2a clinical trial as a mono and combination therapy initiated in July 2020

### Study design:

- Phase 1/2a, first-in-human, open-label, dose-escalation trial
- Evaluation of safety, pharmacokinetics, pharmacodynamics, and preliminary efficacy of BNT411 as a monotherapy in patients with solid tumors and in combination with atezolizumab, carboplatin and etoposide in patients with chemotherapy-naïve extensive-stage small cell lung cancer (ES-SCLC)
- Enrollment: ~60 participants

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Small Molecule Immunomodulators

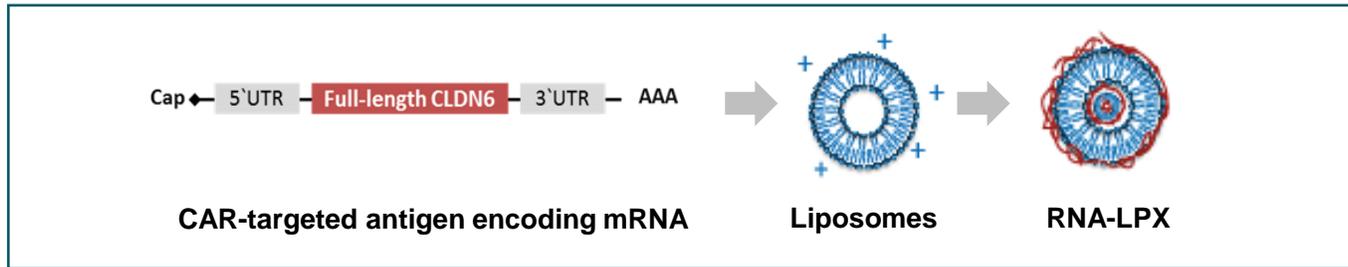
Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

# BNT211: Repeated CARVac dosing enables tunable expansion of CAR-T cells

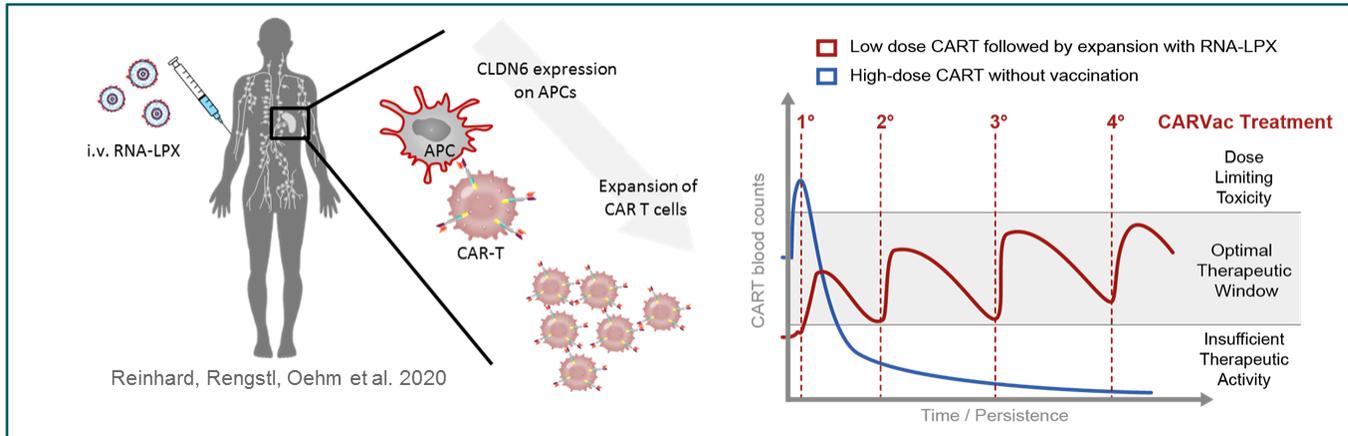
## CAR-T cell Amplifying RNA Vaccine (CARVac) drives in vivo expansion and efficacy of CAR-T against solid tumors

### CARVac production



- CARVac is based on RNA-LPX that selectively targets secondary lymphoid organs
- I.V. administration of CLDN6 RNA-LPX results in **expression of CAR antigen on APCs**

### CARVac based CAR-T expansion



- Repetitive administration of CARVac results in **increased frequency, persistence and activity of CAR-T cells** with a memory phenotype
- Combination of sub-therapeutic CAR-T dose and CARVac demonstrated **eradication of advanced tumors in mice**

# BNT211: CLDN6-CAR demonstrates potent and robust target recognition

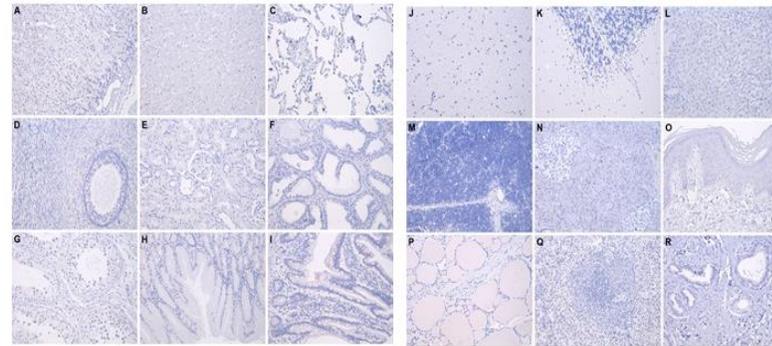
## CANCER IMMUNOTHERAPY

### An RNA vaccine drives expansion and efficacy of claudin-CAR-T cells against solid tumors

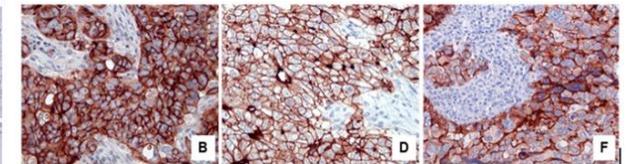
Katharina Reinhard<sup>1\*</sup>, Benjamin Rengstl<sup>1\*</sup>, Petra Oehm<sup>1\*</sup>, Kristina Michel<sup>1</sup>, Arne Billmeier<sup>1</sup>, Nina Hayduk<sup>1</sup>, Oliver Klein<sup>1</sup>, Kathrin Kuna<sup>2</sup>, Yasmina Ouchan<sup>1</sup>, Stefan Wöll<sup>1</sup>, Elmar Christ<sup>1</sup>, David Weber<sup>2</sup>, Martin Suchan<sup>2</sup>, Thomas Bukur<sup>2</sup>, Matthias Birtel<sup>1</sup>, Veronika Jahndel<sup>1</sup>, Karolina Mroz<sup>1</sup>, Kathleen Hobohm<sup>1</sup>, Lena Kranz<sup>1</sup>, Mustafa Diken<sup>2</sup>, Klaus Kühlcke<sup>1</sup>, Özlem Türeci<sup>1,†</sup>, Ugur Sahin<sup>1,2,3,†,‡</sup>

Science

## CLDN6 not present in healthy tissues



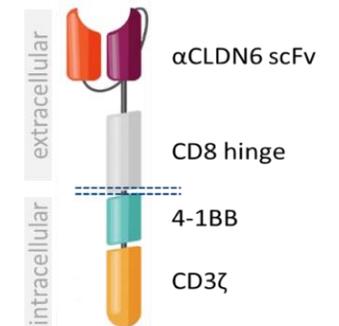
## CLDN6 expressed in multiple cancers



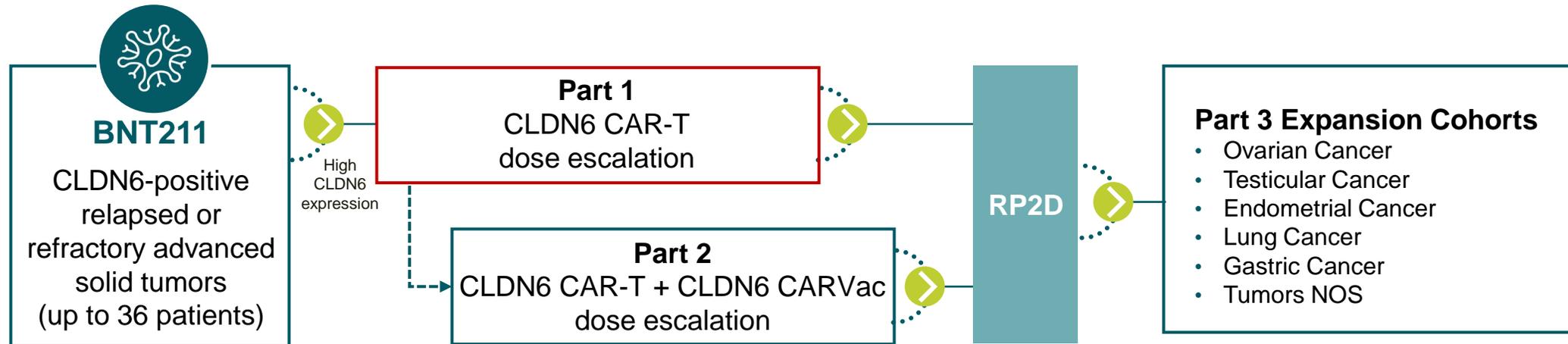
Ovarian Testicular Lung

- Directed against new carcino-embryonic antigen CLDN6
- 2<sup>nd</sup> generation CAR functionalized with antibody-derived CLDN6-binding domain ( $\alpha$ CLDN6-scFv)
- Binding domain mediates exclusive specificity and high sensitivity for CLDN6
- Costimulatory domain (4-1BB) mediates prolonged survival and repetitive killing ability
- CLDN6-CAR showed strong recognition and lysis of CLDN6-positive target cells in preclinical studies

## BNT211 CAR Structure



# BNT211: Next generation CAR-T therapy in solid tumors



## An open-label Phase 1/2a study of BNT211 in patients with advanced solid tumors

- Evaluation of safety and tolerability
- Ongoing Phase 1/2a study
- Monotherapy dose level 1 completed (3 patients)

# BNT211: CAR-T engraftment and stable disease in first 2 patients

Patient #	1	2	3
Age, gender	68 y, female	25 y, male	33 y, male
Tumor entity	Ovarian CA	Sarcoma	Testicular CA
CLDN6 II/III+	60%	80%	60%
Stage	FIGO IIIc	unknown	IIIc
Prior treatment lines	5	3	4
CAR-T infusion	FEB2021	MAR2021	MAR2021
DLTs	0	0	0
AEs ≥ grade 3*	0	0	0
CAR-T engraftment	9x (days 3-17)	>700x (days 3-24)	90x (days 3-10)

## First dose level was well tolerated

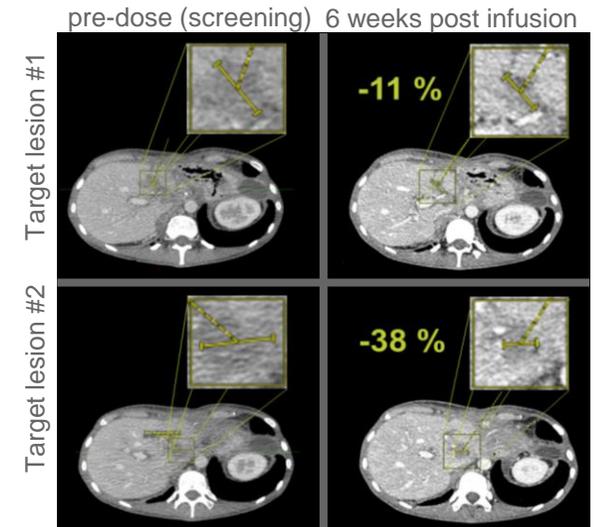
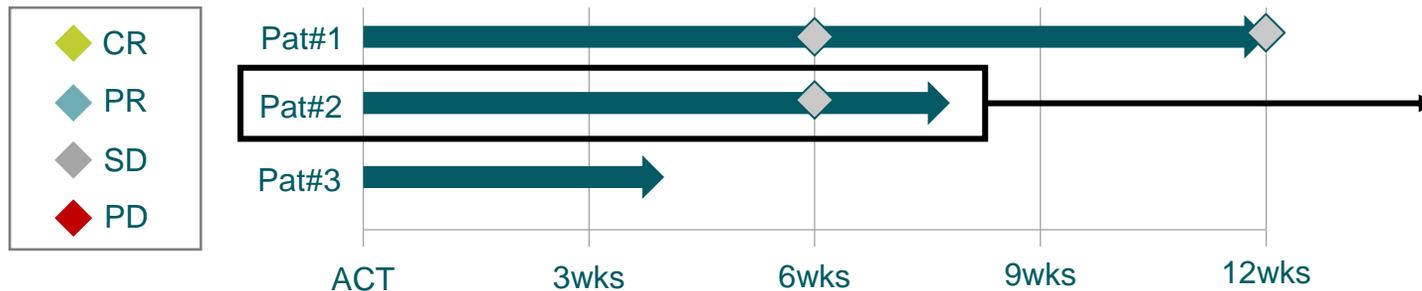
- AEs Mild to Moderate & Transient
  - No AEs ≥ grade 3 and no DLTs

## CAR-T detectable across different tumor types

- Robust engraftment in all patients,
  - Follow-up days 3-24 for patient #1 and #2, and days 3-10 for patient #3 post CAR-T cell transfer

## Tumor Reduction in Patient #2:

- 19.7% shrinkage of tumor (RECIST 1.1)



DLT, dose limiting toxicity; Pat, patient; CR, complete response; PR, partial response; SD, stable disease; PD, progressive disease;

57 LD, lymphodepletion; FIGO, International Federation of Gynecology and Obstetrics; CLDN6, Claudin-6; AE, adverse event; CAR-T, chimeric antigen receptor engineered T cells

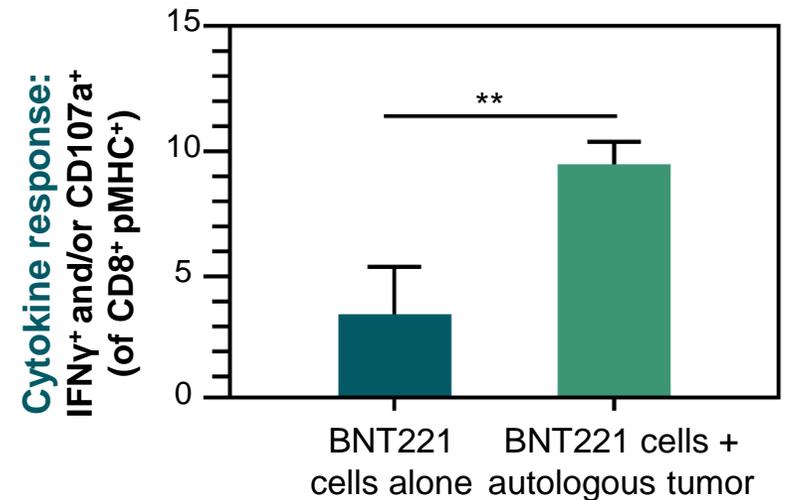
\* Suspected to be related to drug product

# BNT221: NEO-STIM<sup>®</sup> personalized neoantigen-targeted adoptive cell therapy

## Addresses limitations of TIL cell therapy approaches

- T cells induced from peripheral blood (NEO-STIM)
  - No gene engineering or viral vectors
- Targets each patient's personal tumor neoantigens
- Multiple specific CD8+ and CD4+ T cell populations that are functional and have a favorable phenotype
- First patient dosed in Phase 1 trial in anti-PD-1 experienced unresectable stage III or IV melanoma

## BNT221 cells specifically recognize autologous tumor



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COVID-19 vaccine program (project “Lightspeed”)

mRNA vaccines – FixVac and iNeST

Antibodies

Small Molecule Immunomodulators

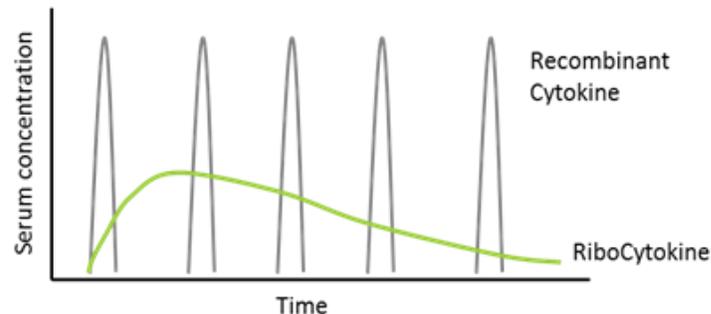
Cell Therapies – CARVac and NEO-STIM T cell therapy

RiboCytokines

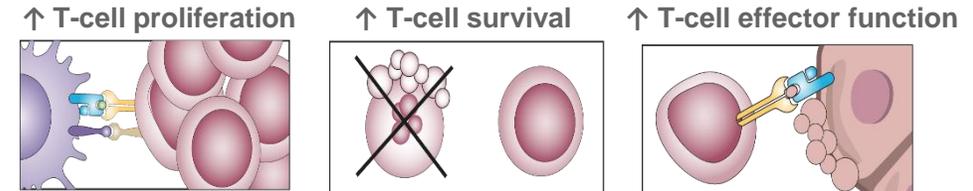
# BNT151: Designed to overcome limitations of recombinant cytokine therapy

## RiboCytokines: A novel therapeutic concept

- Cytokines encoded by mRNA and produced in patient
- Major improvements over recombinant cytokine therapies
  - Prolonged serum half-life
  - High bioavailability
  - Lower and less frequent dosing
  - Lower Toxicity
  - Sequence modifications easy to introduce

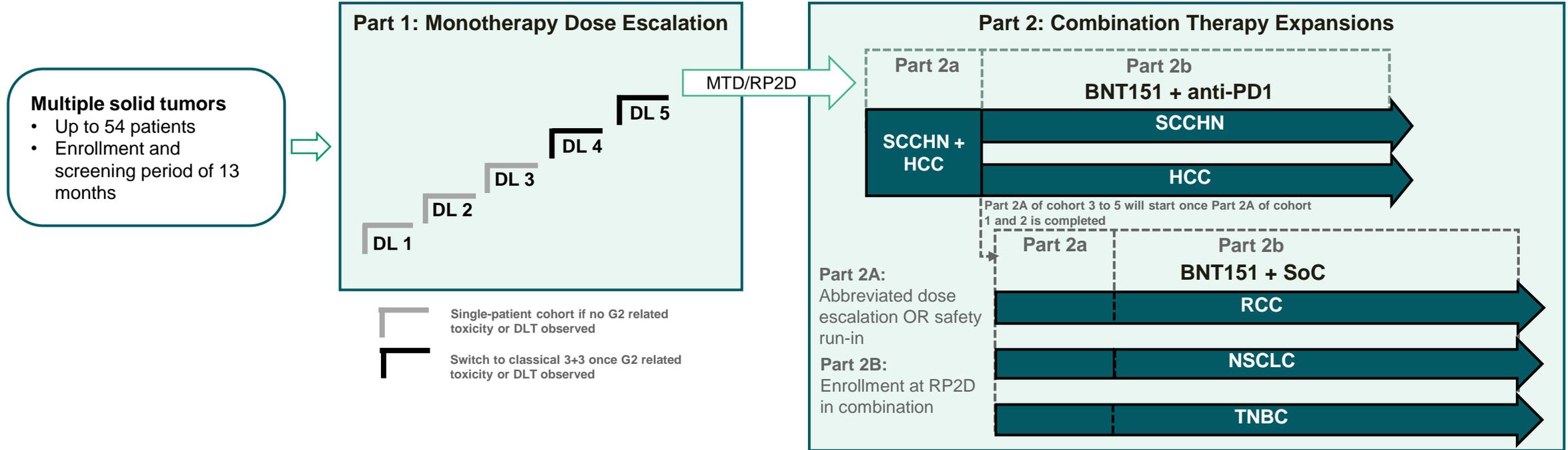


## BNT151: Optimized mRNA-encoded IL-2



- **BNT151** is nucleoside-modified mRNA encoding human **IL-2 variant fused to human albumin**
- **IL-2 is a key cytokine** in T cell immunity, supporting differentiation, proliferation, survival and effector functions of T cells
- **BNT151 stimulates anti-tumoral T cells without extensively triggering immunosuppressive T<sub>regs</sub>**
- **First patient dosed** in first-in-human Phase 1/2a Trial

# BNT151-01 Open-label, multicenter Phase 1/2a, first-in-human trial



Evaluation of dose escalation, safety, pharmacokinetics and pharmacodynamics of BNT151 with expansion cohorts in multiple solid tumor indications

The logo for Biontech, featuring the word "BIONTECH" in a bold, sans-serif font. The letters "B", "I", "O", "N", "T", "E", and "C" are in a light blue color, while the letters "H" and "H" are in a yellow color. The logo is positioned in the upper left quadrant of the page.

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