A PHASE 3, RANDOMIZED, OBSERVER-BLIND STUDY TO EVALUATE THE SAFETY, TOLERABILITY, AND IMMUNOGENICITY OF MULTIPLE PRODUCTION LOTS AND DOSE LEVELS OF THE VACCINE CANDIDATE BNT162b2 AGAINST COVID-19 IN HEALTHY PARTICIPANTS 12 THROUGH 50 YEARS OF AGE AND THE SAFETY, TOLERABILITY, AND IMMUNOGENICITY OF BNT162b2 RNA-BASED COVID-19 VACCINE CANDIDATES AS A BOOSTER DOSE IN HEALTHY PARTICIPANTS 18 THROUGH 50 YEARS OF AGE

Study Sponsor:	BioNTech
Study Conducted By:	Pfizer
Study Intervention Number:	PF-07302048
Study Intervention Name:	BNT162b2 RNA-Based COVID-19 Vaccines
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Short Title: A Phase 3 Study to Evaluate the Safety, Tolerability, and Immunogenicity of Multiple Production Lots and Dose Levels of BNT162b2 RNA-Based COVID-19 Vaccines Against COVID-19 in Healthy Participants

Protocol Amendment Summary of Changes Table

Document History		
Document	**Version Date**	**Summary and Rationale for Changes**
Protocol amendment 2	03 May 2021	• As more data about COVID-19 continue to accrue, the potential duration of protection afforded after a wild-type SARS-CoV-2 infection, and by vaccination, remains unknown. If a third dose of BNT162b2 becomes necessary, whether it be with the current vaccine or one encoding for a variant of concern (VOC), it will be important to understand the safety and immunogenicity when the third dose is administered in close proximity to the second dose. Therefore, in order to describe the safety and heterologous/homologous protection against emerging VOC(s), an additional dose of BNT162b2 or BNT162b2.B.1.351 will be given to 60 participants, 18 through 50 years of age, approximately 3 months after their second dose of BNT162b2. Safety and immunogenicity will be assessed up to 1 month after the additional dose. • Updates were made to Section 2.3.1 (Risk Assessment) for the risk of COVID-19 disease enhancement as a theoretical risk based on the results from studies in the program to date. • In the primary study, the endpoint for the lot-comparison analyses is now confirmed to be the full-length S-binding IgG levels. This is the assay selected for new studies in the program. • CCI [redacted] • Various updates and minor corrections were made throughout the document, including Sections 2 and 9.
Protocol amendment 1	26 January 2021	• With the demand to vaccinate the general population and the Phase 1 data showing robust immunogenicity at a 20-µg dose in the younger population, a noninferiority analysis of a 20-µg dose compared with the standard 30-µg dose has been added. The endpoint for this analysis is SARS-CoV-2 neutralizing titers. • In the event that the 20-µg dose is found to be suboptimal, the provision to administer a single 30-µg dose outside the study has been added. • The study intervention arm "control lot" has been removed. • The study population age range has changed from 18 through 55 years to 12 through 50 years. • Stratification by age group has been added to allow for balanced age representation across all arms.

		• Because of the addition of participants 12 through 17 years of age, multisystem inflammatory syndrome in children is added as an AE of special interest. • Added the possibility of assessing S1-binding instead of the full-length S-binding IgG levels. • Because of an increased incidence rate of SARS-CoV-2 in the US, it is expected that more participants will be diagnosed with COVID-19 during their time in the study; therefore, the nonevaluable rate was increased from 15% to 20%. • The criterion to discontinue the study intervention at Dose 2 in participants who were diagnosed with COVID-19 between Visit 1 and Visit 2 has been removed, as the ACIP recommends that vaccination should be offered to persons regardless of history of prior symptomatic or asymptomatic SARS-CoV-2 infection. • The exclusion criterion for immunocompromised individuals was inadvertently omitted and now appears as exclusion criterion 5. • The Benefit/Risk Assessment section has been updated to reflect the additional clinical data available for BNT162b2. The Overall Benefit/Risk Conclusions section has not changed. • A clarification was made in Section 8.1.1, Biological Samples, that no testing of the participant's DNA will be performed.
Original protocol	24 Nov 2020	N/A

This amendment incorporates all revisions to date, including amendments made at the request of country health authorities and IRBs/ECs.

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1. PROTOCOL SUMMARY

1.1. Synopsis

Short Title: A Phase 3 Study to Evaluate the Safety, Tolerability, and Immunogenicity of Multiple Production Lots and Dose Levels of BNT162b2 RNA-Based COVID-19 Vaccines Against COVID-19 in Healthy Participants

Rationale

A pneumonia of unknown cause detected in Wuhan, China, was first reported in December 2019. In January 2020, the pathogen causing this outbreak was identified as a novel coronavirus 2019. The outbreak was declared a Public Health Emergency of International Concern on 30 January 2020. On 12 February 2020, the virus was officially named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the WHO officially named the disease caused by SARS-CoV-2 as coronavirus disease 2019 (COVID-19). On 11 March 2020, the WHO upgraded the status of the COVID-19 outbreak from epidemic to pandemic, which is now spreading globally at high speed.

Based on Phase 2/3 safety, immunogenicity, and efficacy data, BNT162b2 was shown to be effective and has been authorized for temporary or emergency use in multiple countries.

BNT162b2 is administered intramuscularly as a 2-dose series spaced 21 days apart at a dose of 30 µg each. Study C4591001 (NCT04368728) is an ongoing Phase 1/2/3 trial designed to generate safety, tolerability, immunogenicity, and efficacy data from a novel RNA-based vaccine candidate. The trial is being conducted in a heterogeneous study population: eligible participants ≥12 years of age, healthy participants, including those participants with stable chronic medical conditions, as well as HIV-, HCV-, and HBV-positive participants. BNT162b2 was selected from the Phase 1 part of this study based on the overall safety, tolerability, and immunogenicity.

To support distribution of this vaccine on a wider scale, the study will evaluate the immune response across 4 different BNT162b2 lots manufactured at a commercial scale: 3 lots of drug substance manufactured in the United States and 1 lot of drug substance manufactured in Europe (Arms 1-4) and describe the safety and tolerability of these different vaccine lots in healthy participants.

While the 30-µg dose was selected based on favorable reactogenicity and immunogenicity in both younger and older participants, Phase 1 immunogenicity and safety data were also robust with the 20-µg dose in the younger population. Investigating the noninferiority of a 20-µg dose compared with the standard 30-µg dose may support the potential use of a lower vaccine dose in the defined population of this study. This will be of value with the demand to vaccinate the general population. Therefore, a noninferiority analysis will be performed in this study of a 20-µg dose against the standard 30-µg dose. The 20-µg dose arm (Arm 5) will contain the same US-manufactured drug substance as one of the US lots in the study and will be compared against that same lot in the noninferiority analysis.

Note: In this protocol, the US-manufactured drug substance lots are also referred to as the "US lots" and the EU-manufactured drug substance lot is also referred to as the "EU lot."

In light of the unknowns regarding duration of protection, as well as the emerging variants of concern (VOCs), it is important to understand the boostability of BNT162b2, and potential heterologous protection against emerging VOC(s). To this end, a booster study extension has been added in protocol amendment 2 in which a small subset of adult participants who received Doses 1 and 2 at 30 µg from a designated US lot(s) will receive a single dose of either 30 µg BNT162b2 or 30 µg BNT162b2.B.1.351 (BNT162b2s01 vaccine encoding for the full-length spike protein of South Africa variant B.1.351 [formerly known as $BNT162b2_{SA}$]). This third dose will be administered at approximately 3 months after Dose 2 of BNT162b2.

Primary Study

Objectives, Estimands, and Endpoints

Objectives	Estimands	Endpoints
Primary Immunogenicity – Lot Comparisons CCI [redacted]		
To demonstrate that the immune responses induced by BNT162b2 are similar across the 3 US lots (Arms 1, 2, and 3) in participants without evidence of SARS-CoV-2 infection during the study.	In participants complying with the key protocol criteria (evaluable participants): • GMR from one US lot to another lot (Arm 1/Arm 2, Arm 1/Arm 3, and Arm 2/Arm 3) 1 month after Dose 2	• Full-length S-binding IgG levels
To demonstrate that the immune response induced by the EU lot (Arm 4) of BNT162b2 is similar to the pooled US lots (Arms 1, 2, and 3) in participants without evidence of SARS-CoV-2 infection during the study.	In participants complying with the key protocol criteria (evaluable participants): • GMR from the EU lot (Arm 4) to the pooled US lots (Arm 4/pooled Arms 1, 2, and 3) 1 month after Dose 2	• Full-length S-binding IgG levels
Primary Immunogenicity – Dose Comparison		
To demonstrate the noninferiority of the immune response to prophylactic BNT162b2 in participants receiving 20 µg compared to participants receiving the standard 30-µg dose (prepared from the same manufacturing lot) without evidence of SARS-CoV-2 infection during the study.	In participants complying with the key protocol criteria (evaluable participants): • GMR, estimated by the ratio of the geometric mean of SARS-CoV-2 neutralizing titers in the 2 dose groups 1 month after Dose 2	• SARS-CoV-2 neutralizing titers
Primary Safety		
To evaluate the safety of BNT162b2 when administered on a 2-dose schedule in healthy participants 12 through 50 years of age.	In participants receiving at least 1 dose of study intervention from each vaccine group (individual and pooled US lots, EU lot, 20-µg dose), the percentage of participants reporting: • Local reactions for up to 7 days following each dose • Systemic events for up to 7 days following each dose • AEs and SAEs from Dose 1 to 1 month after Dose 2	• Local reactions (pain at the injection site, redness, and swelling) • Systemic events (fever, fatigue, headache, chills, vomiting, diarrhea, new or worsened muscle pain, and new or worsened joint pain) • AEs • SAEs

Secondary Immunogenicity		
To describe the immune responses induced by different 30-µg dose manufacturing lots of BNT162b2.	In evaluable participants from each vaccine group (individual and pooled US lots, EU lot): • GMCs at baseline (before Dose 1) and 1 month after Dose 2 • GMFR from baseline (before Dose 1) to 1 month after Dose 2	• Full-length S-binding IgG levels
To describe the immune responses induced by different doses of BNT162b2.	In evaluable participants from each vaccine group (20 µg and 30 µg from the same US lot): • GMCs at baseline (before Dose 1) and 1 month after Dose 2 • GMFR from baseline (before Dose 1) to 1 month after Dose 2	• SARS-CoV-2 neutralizing titers
Note: "US lots" refers to the lots of study vaccine containing drug substance manufactured in the United States. "EU lot" refers to the lot of study vaccine containing drug substance manufactured in Europe.		

Booster Study

Objectives	Estimands	Endpoints
Primary Safety		
To evaluate the safety and tolerability profile of a third dose of study intervention (either BNT162b2 30 µg or BNT162b2.B.1.351* 30 µg), administered to participants (18 through 50 years of age) who received two 30-µg doses of BNT162b2, approximately 3 months after Dose 2.	In participants receiving the third dose of study intervention, the percentage of participants reporting: • Local reactions for up to 7 days following the booster dose • Systemic events for up to 7 days following the booster dose • AEs and SAEs from the booster dose to 1 month after the booster dose	• Local reactions (pain at the injection site, redness, and swelling) • Systemic events (fever, fatigue, headache, chills, vomiting, diarrhea, new or worsened muscle pain, and new or worsened joint pain) • AEs • SAEs
Primary Immunogenicity		
To describe the immune response induced by a third dose of study intervention (either BNT162b2 30 µg or BNT162b2.B.1.351* 30 µg).	In evaluable participants from each vaccine group (either BNT162b2 30 µg or BNT162b2.B.1.351 30 µg): • Geometric mean neutralizing titers at baseline (before Dose 1), 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 • Geometric mean IgG concentrations at baseline (before Dose 1), 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 • GMFRs from 1 month after Dose 2 to 1 week after and 1 month after Dose 3 and from before Dose 3 to 1 week after and 1 month after Dose 3 • The percentages of participants with seroresponse§ (based on neutralizing titers) to the reference strain at 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 • The percentages of participants with seroresponse§ (based on neutralizing titers) to the B.1.351 variant strain at 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3	• SARS-CoV-2 reference-strain neutralizing titer† • SARS-CoV-2 B.1.351-strain neutralizing titer†† • Full-length S-binding IgG levels

* BNT162.B.1.351 = BNT162b2s01 vaccine encoding for the full-length spike protein of South African–origin variant B.1.351 (formerly BNT162b2$_{SA}$).
† SARS-CoV-2 reference-strain neutralizing titers = neutralizing titers against SARS-CoV-2 USA-WA1/2020 virus.
†† SARS-CoV-2 B.1.351-strain neutralizing titers = neutralizing titers against SARS-CoV-2 virus with B.1.351 spike.
§ Seroresponse is defined as ≥4-fold increase from baseline (before Dose 1) to the specified time point. If the baseline measurement is below LLOQ, a postvaccination measurement of ≥4 × LLOQ is considered a seroresponse.

Overall Design

This is a Phase 3, randomized, observer-blind study to evaluate the safety, tolerability, and immunogenicity of 4 manufacturing lots of BNT162b2 as a 30-µg dose and an additional 20-µg dose arm using one of the same manufactured 30-µg lots. BNT162b2 is an RNA-based COVID-19 vaccine, administered on a 2-dose schedule in healthy participants 12 through 50 years of age. Participants will be randomized to 1 of 5 arms in a 2:2:2:1:2 ratio (Arm 1: Arm 2: Arm 3: Arm 4: Arm 5), where Arms 1, 2, and 3 contain US-manufactured drug substance for 30-µg dosing; Arm 4 contains EU-manufactured drug substance for 30-µg dosing; and Arm 5 contains US-manufactured drug substance for 20-µg dosing. In order to allow for balanced age representation across all arms, the randomization will be stratified by age groups: 12 through 17, 18 through 30, and 31 through 50 years.

The duration of the study for each participant will be approximately 2 months. The study will be conducted in the United States.

Protocol amendment 2 has added a booster study in which a subset of the adult participants (18 through 50 years of age) who each received two 30-µg doses of the designated US lot(s) will be randomly assigned to 1 of 2 arms in a 1:1 ratio (Booster 1: Booster 2), where Booster 1 is BNT162b2 at 30 µg and Booster 2 is BNT162b2.B.1.351 at 30 µg. The third dose will be administered approximately 3 months after BNT162b2 Dose 2 of the primary study.

The duration of the booster study for each participant will be approximately 1 month. This study is observer-blinded, to minimize changes in study conduct compared with the primary study.

Number of Participants

Approximately 340 participants will be randomly assigned to each of the 3 US lots (Arms 1-3) and to the 20-µg arm (Arm 5) and approximately 170 participants will be randomly assigned to the EU lot (Arm 4), for a total of approximately 1530 randomized participants. It is expected that approximately 1224 evaluable participants will complete the study, based on a 20% nonevaluable rate.

In the booster study, approximately 30 participants will be assigned to each arm for a total of 60 participants to be enrolled. It is expected that approximately 48 evaluable participants will complete the study, based on a 20% nonevaluable rate.

Data Monitoring Committee or Other Independent Oversight Committee

This study will use a DMC. The DMC is independent of the study team and includes external members. The DMC charter describes the role of the DMC in more detail.

The DMC will be responsible for ongoing monitoring of the safety of participants in the study according to the charter. This may include, but is not limited to:

- Contemporaneous review of related AEs up to 1 month after completion of the vaccination schedule,

- Contemporaneous review of all SAEs up to 1 month after completion of the vaccination schedule.

The recommendations made by the DMC to alter the conduct of the study will be forwarded to the appropriate Pfizer personnel for final decision. Pfizer will forward such decisions, which may include summaries of aggregate analyses of safety data, to regulatory authorities, as appropriate.

Statistical Methods

There are 2 primary immunogenicity objectives on manufacturing lot comparisons. The first primary immunogenicity objective will be evaluated by formal hypothesis tests for consistency of the immune response induced by BNT162b2 30 µg across the 3 US lots. GMRs of the full-length S-binding IgG levels and their 2-sided 95% CIs will be provided for each pair of between-lot comparisons (Arm 1 to Arm 2, Arm 1 to Arm 3, and Arm 2 to Arm 3) using a 1.5-fold equivalence margin. Two lots will be considered similar if the 2-sided 95% CI for the GMR is contained in the interval (0.67, 1.5). Overall, the lots will be considered similar if the 1.5-fold equivalence criterion is met for all 3 between-lot comparisons (Arm 1 to Arm 2, Arm 1 to Arm 3, and Arm 2 to Arm 3).

The second primary immunogenicity objective of similarity between the EU lot and the 3 pooled US lots will be assessed sequentially after the first primary objective is met. Using a 1.5-fold equivalence margin, the EU lot and the pooled US lots will be considered similar if the 2-sided 95% CI for the GMR of the full-length S-binding IgG levels is contained in the interval (0.67, 1.5).

The primary immunogenicity objective of noninferiority of the BNT162b2 20-µg vs 30-µg dose levels, using a 1.5-fold noninferiority margin, will be achieved if the lower limit of the 2-sided 95% CI for the GMR of the SARS-CoV-2 neutralizing titers is >0.67.

With 270 evaluable participants per US lot, the study has a power of 91.7% for considering the 3 US lots to be similar. The study will also provide 92.8% power for considering the EU lot similar to the US lots, with 135 evaluable participants in the EU lot and 810 evaluable participants in the pooled US lots. With 270 evaluable participants for the 20-µg and 30-µg dose groups (Arm 5 and the corresponding US 30-µg lot [Arm 1, 2, or 3]), the study will have a power of 94.7% for declaring noninferiority. Assuming a nonevaluable rate of 20%, the study will randomize approximately 340 participants in each US lot, 170 participants in the EU lot, and 340 participants in the 20-µg dose group to achieve the required evaluable participants.

The secondary immunogenicity objectives will be evaluated descriptively by GMCs, GMFRs, and the associated 95% CIs for the full-length S-binding IgG levels for Arms 1

through 4 and GMTs, GMFRs, and the associated 95% CIs for the SARS-CoV-2 neutralizing titers for Arm 5 and the corresponding US 30-µg lot (Arm 1, 2, or 3).

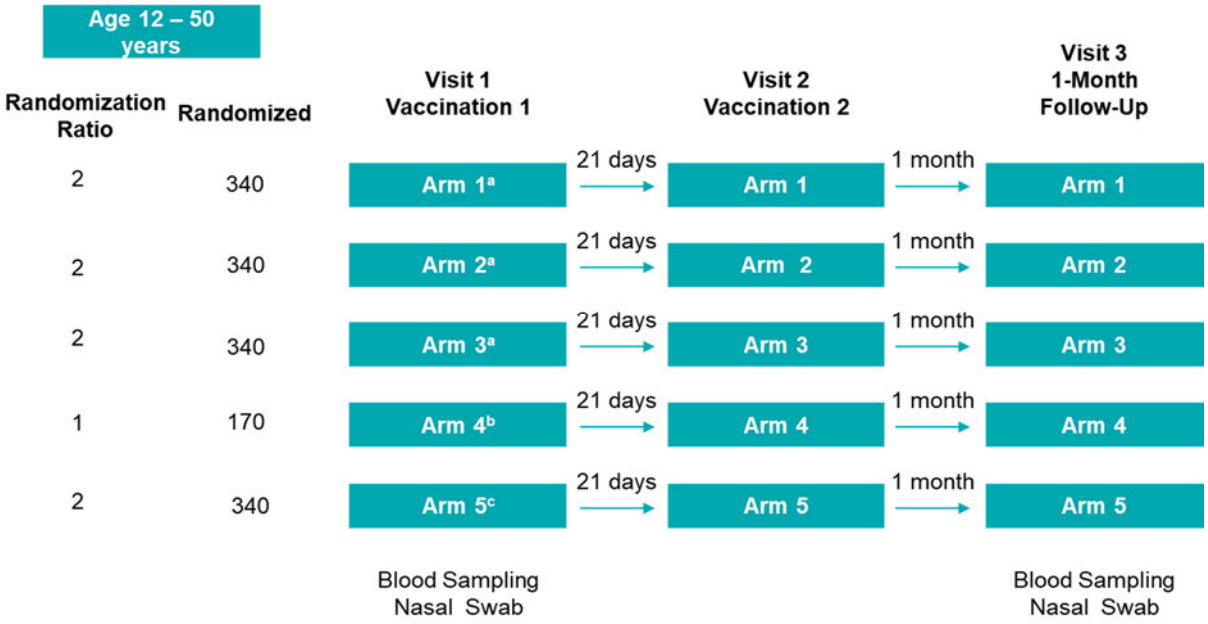
The primary safety objective will be evaluated by descriptive statistics including counts and percentages of participants and the associated Clopper-Pearson 95% CIs for local reactions, systemic events, and AEs/SAEs, for each vaccine group.

In the booster study, the primary immunogenicity objectives will be evaluated descriptively by GMCs, GMFRs, and the associated 95% CIs for the full-length S-binding IgG levels and by GMTs, GMFRs, and the associated 95% CIs for the SARS-CoV-2 neutralizing titers for both the reference strain and the B.1.351 strain for each vaccine group. Additionally, the percentage of participants with a seroresponse to the reference strain and B.1.351 strain using neutralizing titers will be summarized.

The primary safety objective will be evaluated by descriptive statistics including counts and percentages of participants and the associated Clopper-Pearson 95% CIs for local reactions, systemic events, and AEs/SAEs, for each vaccine group.

1.2. Schema

1.2.1. Primary Study

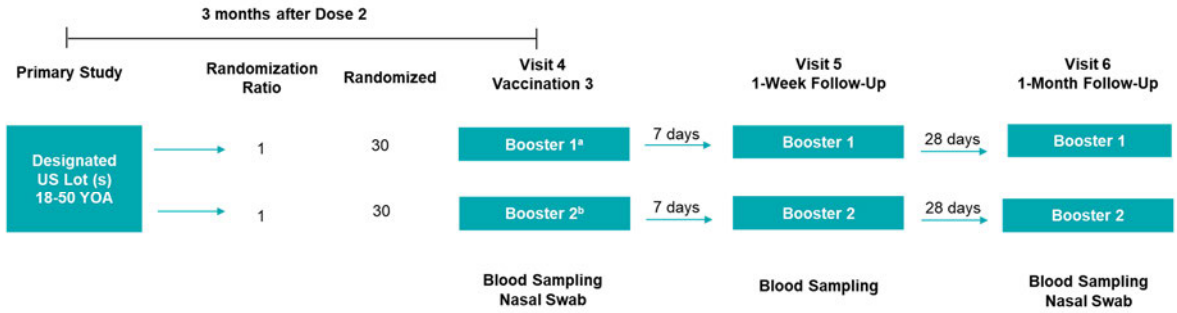


a. Arms 1 through 3 are administered a 30-µg dose level of manufacturing lots 1 through 3, respectively, containing US-manufactured drug substance.

b. Arm 4 is administered a 30-µg dose level of manufacturing lot 4, containing EU-manufactured drug substance.

c. Arm 5 is administered a 20-µg dose level from the corresponding US lot (Arm 1, 2, or 3).

1.2.2. Booster Study



[a] Booster 1 = BNT162b2 - 30 µg

[b] Booster 2 = BNT162b2.B.1.351 - 30 µg

1.3. Schedule of Activities

The SoA tables provide an overview of the protocol visits and procedures. Refer to the Study Assessments and Procedures section of the protocol for detailed information on each procedure and assessment required for compliance with the protocol.

The investigator may schedule visits (unplanned visits) in addition to those listed in the SoA tables, in order to conduct evaluations or assessments required to protect the well-being of the participant.

1.3.1. Primary Study

Visit Number	1	2	3
Visit Description	Vaccination 1	Vaccination 2	1-Month Follow-up Visit
Visit Window	Day 1[a]	19 to 23 Days After Visit 1	28 to 35 Days After Visit 2
Obtain informed consent[b]	X		
Assign participant number	X		
Obtain demography and medical history data	X		
Perform clinical assessment[c]	X		
Measure height and weight	X		
Measure temperature (body)	X	X	
Perform urine pregnancy test (if appropriate)	X	X	
Confirm use of contraceptives (if appropriate)	X	X	X
Collect nonstudy vaccine information	X	X	X
Collect prohibited medication use		X	X
Confirm eligibility	X	X	
Review temporary delay criteria	X	X	
Collect blood sample for immunogenicity assessment & for serological testing for prior COVID-19 infection.[d,e]	~20 mL/10 mL		~20 mL/10 mL
Obtain nasal (midturbinate) swab for determination of current SARS-CoV-2 status[d]	X		X
Obtain randomization number and study intervention allocation	X		

Visit Number	1	2	3
Visit Description	**Vaccination 1**	**Vaccination 2**	**1-Month Follow-up Visit**
Visit Window	**Day 1[a]**	**19 to 23 Days After Visit 1**	**28 to 35 Days After Visit 2**
Administer study intervention	X	X	
Assess acute reactions for at least 30 minutes after study intervention administration	X	X	
Explain/review participant communication methods (including for reactogenicity e-diary completion), assist the participant with downloading the app, or issue provisioned device, if required	X	X	
Provide/ensure participant has a thermometer and measuring device	X	X	
Review reactogenicity e-diary data (daily review is optimal during the active diary period of 7 days following each study intervention administration)	X →	X →	
Review ongoing reactogenicity e-diary symptoms with participant and obtain stop dates		X	X
Collect AEs and SAEs	X	X	X[f]
Collect e-diary or assist the participant to delete the application			X

Abbreviations: → = continuous/ongoing event; e-diary = electronic diary.

a. The visit may be conducted across 2 consecutive days; if so, all steps from assessing the inclusion and exclusion criteria onwards must be conducted on the same day.
b. For participants <18 years of age (at the time of consent), the parent(s)/legal guardian will provide signed informed consent. Depending on the age of the participant and according to local requirements, participants will also be asked to provide assent as appropriate (verbal or written).
c. Including, if indicated, a physical examination.
d. Administration of study intervention is not dependent on test result.
e. 20 mL is to be collected from participants ≥16 years of age; 10 mL is to be collected from participants 12 through 15 years of age.
f. Any AEs occurring up to 48 hours after blood draw and nasal swab collection must be recorded.

1.3.2. Booster Study

A subset of participants at selected sites who received 2 doses of BNT162b2 (30 µg each) from the designated US lot(s) will be administered a third dose of BNT162b2 or BNT162b2.B.1.351.

Visit Number	4	5	6
Visit Description	Booster Vaccination (Vax 3)	1-Week Follow-up Visit (After Vax 3)	1-Month Follow-up Visit (After Vax 3)
Visit Window	83 to 97 Days After Visit 2	6 to 8 Days After Visit 4	28 to 35 Days After Visit 4
Obtain informed consent	X		
Perform urine pregnancy test (if appropriate)	X		
Confirm use of contraceptives (if appropriate)	X	X	X
Collect nonstudy vaccine information	X	X	X
Collect prohibited medication use	X	X	X
Measure temperature (body)	X		
Confirm eligibility[a]	X		
Collect blood sample for immunogenicity assessment and for serological testing for prior COVID-19 infection[b]	~50 mL		~50 mL
Collect blood sample for immunogenicity assessment		~50 mL	
Obtain nasal (midturbinate) swab for determination of current SARS-CoV-2 status[a]	X		X
Obtain new SSID and randomization number, then study intervention allocation	X		
Administer study intervention	X		
Assess acute reactions for at least 30 minutes after study intervention administration	X		
Explain/review participant communication methods (including for reactogenicity e-diary completion), assist the participant with downloading the app, or issue provisioned device, if required	X		
Provide/ensure participant has a thermometer and measuring device	X		

Visit Number	4	5	6
Visit Description	**Booster Vaccination (Vax 3)**	**1-Week Follow-up Visit (After Vax 3)**	**1-Month Follow-up Visit (After Vax 3)**
Visit Window	**83 to 97 Days After Visit 2**	**6 to 8 Days After Visit 4**	**28 to 35 Days After Visit 4**
Review reactogenicity e-diary data (daily review is optimal during the active diary period of 7 days following each study intervention administration)	X →	X	
Review ongoing reactogenicity e-diary symptoms with participant and obtain stop dates			X
Collect AEs and SAEs	X	X	X[c]
Collect e-diary or assist the participant to delete the application		X[d]	X

Abbreviations: → = continuous/ongoing event; e-diary = electronic diary; SSID = single subject ID.

a. Any disorders or adverse events that occurred between Visits 3 and 4 that exclude participant from the booster study are to be recorded in the source documents.
b. Administration of study intervention is not dependent on test result.
c. Any AEs occurring up to 48 hours after blood draw and nasal swab collection must be recorded.
d. If the participant has completed e-diary reporting by Visit 5, the device may be collected or the app deleted at this visit.

2. INTRODUCTION

BNT162b2 is an RNA-based COVID-19 vaccine that is currently being investigated for the prevention of COVID-19 in individuals ≥12 years of age.

2.1. Study Rationale

One aim of the study is to demonstrate that a similar immune response is induced by 4 lots of BNT162b2 (3 containing drug substance manufactured in the United States, referred to as the "US lots," and 1 containing drug substance manufactured in Europe, referred to as the "EU lot"), and describe the safety and tolerability of these different vaccine lots in healthy participants, thereby supporting both US and EU manufacturing processes at commercial scale. One of the US lots will also be administered at a 20-µg dose and compared with the standard 30-µg dose from the same US production lot in a noninferiority analysis. This objective will support the potential use of a lower vaccine dose in the defined study population, which will be of value, given the demand to vaccinate the general population.

As more data about COVID-19 continue to accrue, the potential duration of protection afforded after a wild-type SARS-CoV-2 infection, and by vaccination, remains unknown. If a third dose of BNT162b2 becomes necessary, whether it be with the current vaccine or one encoding for a VOC, it will be important to understand the safety and immunogenicity when the third dose is administered in close proximity to the second dose.

2.2. Background

In December 2019, a pneumonia outbreak of unknown cause occurred in Wuhan, China. In January 2020, it became clear that a novel coronavirus (2019-nCoV) was the underlying cause. Later in January, the genetic sequence of the 2019-nCoV became available to the WHO and the public (MN908947.3), and the virus was categorized in the *Betacoronavirus* subfamily. By sequence analysis, the phylogenetic tree revealed a closer relationship to SARS virus isolates than to another coronavirus infecting humans, the MERS virus.[1,2]

The outbreak was declared a Public Health Emergency of International Concern on 30 January 2020.[3] On 12 February 2020, the virus was officially named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the WHO officially named the disease caused by SARS-CoV-2 as coronavirus disease 2019 (COVID-19).[3] SARS-CoV-2 infections and the resulting disease, COVID-19, have spread globally and on 11 March 2020, the WHO characterized the COVID-19 outbreak as a pandemic.[4] On 08 January 2021, the Center for Systems Science and Engineering at Johns Hopkins University reported more than 88 million cases globally, with over 1.9 million deaths from 191 countries. The United States has reported 21.6 million cases and over 366,000 deaths.[5] Since fall of 2020, the incidence of COVID-19 illnesses is increasing dramatically in many northern hemisphere countries, including the United States, France, Germany, Italy, and the United Kingdom, raising the specter that as temperatures fall and the "respiratory virus season" starts, cases may dramatically increase, potentially overwhelming healthcare infrastructures. This possibility highlights the importance of developing a COVID-19 vaccine as quickly as possible while ensuring that all safety measures are met.

Based on Phase 2/3 safety, immunogenicity, and efficacy data, BNT162b2 was shown to be effective and has been authorized for temporary or emergency use in multiple countries.

As more data about COVID-19 continue to accrue, the potential duration of protection afforded after a wild-type SARS-CoV-2 infection, and by vaccination, remains unknown. In addition, mutated SARS-CoV-2 VOCs have started to emerge, for example, B.1.1.7 (also known as 20I/501Y.V1, VOC 202012/01 [UK origin]), B.1.351 (also known as 20H/501Y.V2 [South Africa origin]), and P.1 (also known as 20J/501Y.V3 [Brazil origin]).[6]

A prophylactic, RNA-based SARS-CoV-2 vaccine provides one of the most flexible and fastest approaches available to immunize against the emerging virus.[7,8]

The development of an RNA-based vaccine encoding a viral antigen, which is then expressed by the vaccine recipient as a protein capable of eliciting protective immune responses, provides significant advantages over more traditional vaccine approaches. Unlike live attenuated vaccines, RNA vaccines do not carry the risks associated with infection and may be given to people who cannot be administered live virus (eg, pregnant women and immunocompromised persons). RNA-based vaccines are manufactured via a cell-free in vitro transcription process, which allows an easy and rapid production and the prospect of producing high numbers of vaccination doses within a shorter time period than achieved with traditional vaccine approaches. This capability is pivotal to enable the most effective response in outbreak scenarios.[7,8]

In an attempt to prevent the spread of disease and to control the pandemic, numerous COVID-19 vaccine candidates are in development. Two SARS-CoV-2–RNA lipid nanoparticle (RNA-LNP) vaccines based on a platform of nucleoside-modified messenger RNA (modRNA, BNT162b2) will be evaluated in this study. Each vaccine candidate expresses 1 of 2 antigens:

- **Primary and booster studies: BNT162b2** (variant RBP020.2): modRNA encoding the Wuhan-Hu-1 reference[1] SARS-CoV-2 full-length, P2 mutant, prefusion spike glycoprotein (P2 S) (version 9);

- **Booster study: BNT162b2s01** (variant RBP020.11): modRNA as above, but encoding the P2 S containing B.1.351 variant–specific mutations (South Africa origin), as a representative VOC formerly referred to as BNT162b2$_{SA}$, hereafter referred to as **BNT162b2.B.1.351**.

In light of the unknowns regarding duration of protection, as well as the emerging VOCs, it is important to understand the boostability of BNT162, and potential heterologous protection against emerging VOC(s). To this end, a booster study extension has been added in protocol amendment 2 in which a small subset of adult participants who received Doses 1 and 2 at 30 µg from a designated US lot(s) will receive a single dose of either 30 µg BNT162b2 or 30 µg BNT162b2.B.1.351.

2.2.1. Clinical Overview

Given clinical data from other similarly formulated unmodified messenger RNA liposomal vaccines from BioNTech in oncology trials[9] and recent published results from clinical trials using modRNA influenza vaccines by Moderna,[10] the BNT162 vaccines were expected to have a favorable safety profile with mild, localized, and transient effects. BNT162 vaccines based on modRNA have now been administered to humans for the first time in Study C4591001 (NCT04368728) and the BNT162-01 study conducted in Germany by BioNTech, at doses between 1 µg and 100 µg. The currently available safety and immunogenicity data are presented in the BNT162 IB.[11]

2.3. Benefit/Risk Assessment

There is an ongoing global pandemic of COVID-19 and, based on the data available from the C4591001 study, multiple temporary or emergency use authorizations and conditional marketing authorizations have been granted for BNT162b2. The available safety and immunogenicity data from the ongoing Pfizer/BioNTech clinical trial combined with available nonclinical data with BNT162 vaccines, and data from nonclinical studies and clinical trials with the same or related RNA components, or antigens, support a favorable benefit/risk profile and support continued clinical development of BNT162b2.

In the C4591001 study, BNT162b2 has been shown to elicit increased local and systemic adverse reactions as compared to those in the placebo arm, usually lasting a few days. The most common solicited adverse reactions were injection site pain (84.1%), fatigue (62.9%), headache (55.1%), muscle pain (38.3%), chills (31.9%), joint pain (23.6%), fever (14.2%), and injection site swelling (10.5%).[11] Adverse reactions characterized as reactogenicity were generally mild to moderate. The number of participants reporting hypersensitivity-related AEs was numerically higher in the vaccine group compared with the placebo group (137 [0.63%] vs 111 [0.51%]). Severe adverse reactions occurred in 0.0% to 4.6% of participants, were more frequent after Dose 2 than after Dose 1, and were generally less frequent in older adults (>55 years of age) (<2.8%) as compared to younger participants (≤4.6%). Among reported unsolicited AEs, lymphadenopathy occurred much more frequently in the vaccine group than the placebo group and is plausibly related to vaccination. SAEs, while uncommon (<1.0%), represented medical events that occur in the general population at similar frequency as observed in the study.[11]

No specific safety concerns were identified in subgroup analyses by age, race, ethnicity, medical comorbidities, or prior SARS-CoV-2 infection. Although participants 16 through 17 years of age were enrolled in the Phase 3 trial, safety data for this age group are limited. However, available data are consistent with the safety profile in the adult population, and it is biologically reasonable to extrapolate the greater safety experience in adults, in particular younger adults, to the oldest pediatric age group of 12 through 17 years. The potential risks are based on the observed safety profile to date, which shows mostly mild reactogenicity, low incidence of severe or serious events, and no clinically concerning safety observations. The preponderance of severe cases of COVID-19 in the placebo group relative to the BNT162b2

group (9 of 10) suggests no evidence of VAED.[11] Continued clinical investigation is justified given:

- the urgent need for the development of a more stable prophylactic vaccine for COVID-19,
- the threat posed by the increasing number of globally distributed outbreaks of SARS-CoV-2 infection and emerging VOCs,
- the potential of the BioNTech platform of RNA-based vaccines to rapidly deliver high numbers of vaccine doses in a single production campaign.

More detailed information about the known and expected benefits and risks and reasonably expected AEs of BNT162b2 may be found in the IB,[11] which is the SRSD for this study.

2.3.1. Risk Assessment

Identified/Potential Risk of Clinical Significance	Summary of Data/Rationale for Risk	Mitigation Strategy
Study Intervention: BNT162b2 RNA-Based COVID-19 Vaccine		
Local and systemic reactions to the vaccine may occur (injection site redness, injection site swelling, and injection site pain; fever, fatigue, headache, chills, muscle pain, and joint pain) following vaccination.	These are common adverse reactions seen with other vaccines[12] as well as the COVID-19 vaccine. The most common events reported in the C4591001 study were mild to moderate pain at the injection site, fatigue, and headache.	• The study employs the use of a reactogenicity e-diary to monitor local reactions and systemic events in real time. • All study participants will be observed for at least 30 minutes after vaccination.
Safety profile of a novel vaccine not yet fully characterized. Adverse reactions (risks) identified from the postauthorization safety data include: Anaphylaxis, other hypersensitivity reactions (eg, rash, pruritus, urticaria, angioedema), pain in extremity (injected arm), vomiting, diarrhea.	Data available from the C4591001 study showed low incidence of severe or serious events, and no clinically concerning safety observations across the safety population and within demographic subgroups based on age, sex, race/ethnicity, country, and baseline SARS-CoV-2 status. Postauthorization safety data surveillance has confirmed the safety profile observed in C4591001 and has resulted in identification of some additional adverse reactions (risks) as noted in this table.	• Collection of AE and SAE reports from signing of the ICD to 1 month after the second dose of vaccine. • DMC throughout the study to review all safety data. • All participants will be observed for at least 30 minutes after vaccination.
Theoretical risk for COVID-19 enhancement.	Disease enhancement has been seen following vaccination with RSV, feline coronavirus, and Dengue virus vaccines. It is a modified and/or severe presentation of an infectious disease affecting individuals exposed to the wild-type pathogen after having received vaccine designed to prevent infection. No evidence of disease enhancement has been seen in large-scale clinical study of BNT162b2 in humans or in postauthorization surveillance.	Monitoring for cases of COVID-19 developing during the study, which will be reported as AESIs. Assessments of individual cases for disease enhancement is challenging based on current understanding of mechanism of pathogenesis, thus evaluations of any adverse or unexpected imbalances in severe COVID-19 cases may provide insight to a potential signal for this theoretical risk.

Identified/Potential Risk of Clinical Significance	Summary of Data/Rationale for Risk	Mitigation Strategy
Primary study: Multisystem inflammatory syndrome in children (MIS-C)	Febrile hyperinflammatory condition with multisystem (≥2 organs) involvement as defined in Section 8.3.8.	MIS-C will be collected as an AESI for the duration of study participation.
Study Procedures		
Participants will be required to attend healthcare facilities during the global SARS-CoV-2 pandemic.	Without appropriate social distancing and PPE, there is a potential for increased exposure to SARS-CoV-2.	• Pfizer will work with sites to ensure appropriate COVID-19 prevention strategies. • Monitoring for cases of COVID-19 developing during the study, which will be reported as AESIs.
Venipuncture will be performed during the study.	There is the risk of bleeding, bruising, hematoma formation, and infection at the venipuncture site.	Only appropriately qualified personnel will obtain the blood draw.

2.3.2. Benefit Assessment

Benefits to individual participants may include:

- Receipt of an efficacious or potentially efficacious COVID-19 vaccine during a global pandemic
- Access to COVID-19 diagnostic testing
- Contributing to research to help others in a time of global pandemic

2.3.3. Overall Benefit/Risk Conclusion

Taking into account the measures taken to minimize risk to participants participating in this study, the potential risks identified in association with BNT162b2 are justified by the anticipated benefits that may be afforded to healthy participants.

3. OBJECTIVES, ESTIMANDS, AND ENDPOINTS

3.1. Primary Study

Objectives	Estimands	Endpoints
Primary Immunogenicity – Lot Comparisons [redacted]		
To demonstrate that the immune responses induced by BNT162b2 are similar across the 3 US lots (Arms 1, 2, and 3) in participants without evidence of SARS-CoV-2 infection during the study.	In participants complying with the key protocol criteria (evaluable participants): • GMR from one US lot to another lot (Arm 1/Arm 2, Arm 1/Arm 3, and Arm 2/Arm 3) 1 month after Dose 2	• Full-length S-binding IgG levels
To demonstrate that the immune response induced by the EU lot (Arm 4) of BNT162b2 is similar to the pooled US lots (Arms 1, 2, and 3) in participants without evidence of SARS-CoV-2 infection during the study.	In participants complying with the key protocol criteria (evaluable participants): • GMR from the EU lot (Arm 4) to the pooled US lots (Arm 4/pooled Arms 1, 2, and 3) 1 month after Dose 2	• Full-length S-binding IgG levels
Primary Immunogenicity – Dose Comparison		
To demonstrate the noninferiority of the immune response to prophylactic BNT162b2 in participants receiving 20 µg compared to participants receiving the standard 30-µg dose (prepared from the same manufacturing lot) without evidence of SARS-CoV-2 infection during the study.	In participants complying with the key protocol criteria (evaluable participants): • GMR, estimated by the ratio of the geometric mean of SARS-CoV-2 neutralizing titers in the 2 dose groups 1 month after Dose 2	• SARS-CoV-2 neutralizing titers

Objectives	Estimands	Endpoints
Primary Safety		
To evaluate the safety of BNT162b2 when administered on a 2-dose schedule in healthy participants 12 through 50 years of age.	In participants receiving at least 1 dose of study intervention from each vaccine group (individual and pooled US lots, EU lot, 20-µg dose), the percentage of participants reporting: • Local reactions for up to 7 days following each dose • Systemic events for up to 7 days following each dose • AEs and SAEs from Dose 1 to 1 month after Dose 2	• Local reactions (pain at the injection site, redness, and swelling) • Systemic events (fever, fatigue, headache, chills, vomiting, diarrhea, new or worsened muscle pain, and new or worsened joint pain) • AEs • SAEs
Secondary Immunogenicity		
To describe the immune responses induced by different 30-µg dose manufacturing lots of BNT162b2.	In evaluable participants from each vaccine group (individual and pooled US lots, EU lot): • GMCs at baseline (before Dose 1) and 1 month after Dose 2 • GMFR from baseline (before Dose 1) to 1 month after Dose 2	• Full-length S-binding IgG levels
To describe the immune responses induced by different doses of BNT162b2.	In evaluable participants from each vaccine group (20 µg and 30 µg from the same US lot): • GMCs at baseline (before Dose 1) and 1 month after Dose 2 • GMFR from baseline (before Dose 1) to 1 month after Dose 2	• SARS-CoV-2 neutralizing titers
Note: "US lots" refers to lots of study vaccine containing drug substance manufactured in the United States. "EU lot" refers to the lot of study vaccine containing drug substance manufactured in Europe.		

3.2. Booster Study

Objectives	Estimands	Endpoints
Primary Safety		
To evaluate the safety and tolerability profile of a third dose of study intervention (either BNT162b2 30 µg or BNT162b2.B.1.351* 30 µg) administered to participants (18 through 50 years of age) who received two 30-µg doses of BNT162b2, approximately 3 months after Dose 2.	In participants receiving the third dose of study intervention, the percentage of participants reporting: • Local reactions for up to 7 days following the booster dose • Systemic events for up to 7 days following the booster dose • AEs and SAEs from the booster dose to 1 month after the booster dose	• Local reactions (pain at the injection site, redness, and swelling) • Systemic events (fever, fatigue, headache, chills, vomiting, diarrhea, new or worsened muscle pain, and new or worsened joint pain) • AEs • SAEs
Primary Immunogenicity		
To describe the immune response induced by a third dose of study intervention (either BNT162b2 30 µg or BNT162b2.B.1.351* 30 µg).	In evaluable participants from each vaccine group (either BNT162b2 30 µg or BNT162b2.B.1.351 30 µg): • Geometric mean neutralizing titers at baseline (before Dose 1), 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 • Geometric mean IgG concentrations at baseline (before Dose 1), 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 • GMFRs from 1 month after Dose 2 to 1 week after and 1 month after Dose 3 and from before Dose 3 to 1 week after and 1 month after Dose 3 • The percentages of participants with seroresponse§ (based on neutralizing titers) to the reference strain at 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 • The percentages of participants with seroresponse§ (based on neutralizing titers) to the B.1.351 variant strain at 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3	• SARS-CoV-2 reference-strain neutralizing titer† • SARS-CoV-2 B.1.351-strain neutralizing titer†† • Full-length S-binding IgG levels

* BNT162.B.1.351 = BNT162b2s01 vaccine encoding for the full-length spike protein of South African–origin variant B.1.351 (formerly BNT162b2$_{SA}$).
† SARS-CoV-2 reference-strain neutralizing titers = neutralizing titers against SARS-CoV-2 USA-WA1/2020 virus.
†† SARS-CoV-2 B.1.351-strain neutralizing titers = neutralizing titers against SARS-CoV-2 virus with B.1.351 spike.
§ Seroresponse is defined as ≥4-fold increase from baseline (before Dose 1) to the specified time point. If the baseline measurement is below LLOQ, a postvaccination measurement of ≥4 × LLOQ is considered a seroresponse.

4. STUDY DESIGN

4.1. Overall Design

Primary Study

This is a Phase 3, randomized, observer-blind study to evaluate the safety, tolerability, and immunogenicity of 4 manufacturing lots of BNT162b2 as a 30-µg dose and an additional 20-µg dose arm using one of the same manufactured 30-µg lots. BNT162b2 is an RNA-based COVID-19 vaccine, administered on a 2-dose schedule in healthy participants 12 through 50 years of age. The study will be conducted in the United States.

Participants will be randomized to 1 of 5 arms in a 2:2:2:1:2 ratio (Arm 1: Arm 2: Arm 3: Arm 4: Arm 5), where Arms 1, 2, and 3 contain US-manufactured drug substance for 30-µg dosing; Arm 4 contains EU-manufactured drug substance for 30-µg dosing; and Arm 5 contains US-manufactured drug substance for 20-µg dosing. In order to allow for balanced age representation across all arms, the randomization will be stratified by age groups: 12 through 17, 18 through 30, and 31 through 50 years.

The duration of the study for each participant will be approximately 2 months. This study is observer-blinded, as the volumes of the 20-µg and the 30-µg doses of investigational vaccine are different.

Approximately 340 participants will be randomly assigned to each of the 3 US lots (Arms 1-3) and to the 20-µg arm (Arm 5) and approximately 170 participants will be randomly assigned to the EU lot (Arm 4), for a total of approximately 1530 randomized participants. It is expected that approximately 1224 evaluable participants will complete the study, based on a 20% nonevaluable rate.

Booster Study

Protocol amendment 2 has added a booster study in which a subset of the adult participants (18 through 50 years of age) who each received two 30-µg doses of the designated US lot(s) will be randomly assigned to 1 of 2 arms in a 1:1 ratio (Booster 1: Booster 2), where Booster 1 is BNT162b2 at 30 µg and Booster 2 is BNT162b2.B.1.351 at 30 µg. The third dose will be administered approximately 3 months after BNT162b2 Dose 2 of the primary study.

Approximately 30 participants will be assigned to each arm for a total of 60 participants enrolled. It is expected that approximately 48 evaluable participants will complete the study, based on a 20% nonevaluable rate.

The duration of the study for each participant will be approximately 1 month. This study is observer-blinded, to minimize changes in study conduct compared with the primary study. This facilitates the start of a booster study with the third dose to be given 3 months after the receipt of Dose 2.

4.2. Scientific Rationale for Study Design

This study contains assessments that could be considered standard for a vaccine study. Blood samples taken for immunogenicity will establish the level of immune response elicited by each arm to provide the necessary data to meet the primary endpoints of the study. Immunogenicity will be assessed by the full-length S-binding IgG assay and 2 SARS-CoV-2 neutralization assays, one with the reference strain and the second with the B.1.351 strain.

To establish if a participant has asymptomatic SARS-CoV-2 infection, nasal swabs for SARS-CoV-2 nucleic acid amplification testing (ie, NAAT) and blood samples to measure N-binding antibody levels will be taken. A positive result on either test will result in the immunogenicity data from that participant being excluded from the evaluable portion of the study population. All reactogenicity and safety assessments are standard for a study of this nature.

This study will not include a placebo, as the aim and design of this study is not to demonstrate efficacy.

Human reproductive safety data are not available for BNT162b2, but there is no suspicion of human teratogenicity based on the intended mechanism of action of the compound. Therefore, the use of a highly effective method of contraception is required (see Appendix 4).

4.3. Justification for Dose

Based on data from the Phase 1 component of clinical trial C4591001, after administration of Dose 1 and prior to administration of Dose 2, BNT162b2 showed modest increases in SARS-CoV-2 neutralizing GMTs over baseline across dose levels (10 µg, 20 µg, and 30 µg) in both younger and older groups. Overall, BNT162b2 elicited higher antigen-binding and neutralizing responses in younger participants than in older participants. The boost effect after receiving Dose 2 was most pronounced at the 30-µg dose level for older participants, hence its selection as the dose for Phase 2/3 evaluation.[11] These data also support investigating the lower dose of 20 µg in this younger study population, as the measured immune responses in both the 20-µg and 30-µg cohorts were similar with regard to the younger age group.

As this 30-µg dose was approved in multiple countries for EUA, the additional booster dose will be administered at the same dose.

4.4. End of Study Definition

A participant is considered to have completed the study if he/she has completed all phases (as applicable) of the respective study (primary, booster) into which he/she is enrolled, including the last visit.

The end of the study is defined as the date of the last visit of the last participant in the booster study.

5. STUDY POPULATION

This study can fulfill its objectives only if appropriate participants are enrolled. The following eligibility criteria are designed to select participants for whom participation in the study is considered appropriate. All relevant medical and nonmedical conditions should be taken into consideration when deciding whether a particular participant is suitable for this protocol.

Prospective approval of protocol deviations to recruitment and enrollment criteria, also known as protocol waivers or exemptions, is not permitted.

5.1. Inclusion Criteria

Participants are eligible to be included in the study only if all of the following criteria apply:

Age and Sex:

1. Primary study: Male or female participants between the ages of 12 and 50 years, inclusive, at Visit 1 (Day 1).

   Booster study: Male or female participants between the ages of 18 and 50 years, inclusive, at rerandomization.

   - Refer to Appendix 4 for reproductive criteria for male (Section 10.4.1) and female (Section 10.4.2) participants.

Type of Participant and Disease Characteristics:

2. Participants who are willing and able to comply with all scheduled visits, treatment plan, laboratory tests, lifestyle considerations, and other study procedures.

3. Healthy participants who are determined by medical history, physical examination (if required), and clinical judgment of the investigator to be eligible for inclusion in the study.

   Note: Healthy participants with preexisting stable disease, defined as disease not requiring significant change in therapy or hospitalization for worsening disease during the 6 weeks before enrollment, can be included.

Informed Consent:

4. Capable of giving personal signed informed consent/have parent(s)/legal guardian capable of giving signed informed consent as described in Appendix 1, which includes compliance with the requirements and restrictions listed in the ICD and in this protocol.

5.2. Exclusion Criteria

Participants are excluded from the study if any of the following criteria apply:

Medical Conditions:

1. Other medical or psychiatric condition including recent (within the past year) or active suicidal ideation/behavior or laboratory abnormality that may increase the risk of study participation or, in the investigator's judgment, make the participant inappropriate for the study.

2. Known infection with HIV, HCV, or HBV.

3. History of severe adverse reaction associated with a vaccine and/or severe allergic reaction (eg, anaphylaxis) to any component of the study intervention(s).

4. Previous clinical (based on COVID-19 symptoms/signs alone, if a SARS-CoV-2 NAAT result was not available) or microbiological (based on COVID-19 symptoms/signs and a positive SARS-CoV-2 NAAT result) diagnosis of COVID-19.

5. Immunocompromised individuals with known or suspected immunodeficiency, as determined by history and/or laboratory/physical examination.

6. Bleeding diathesis or condition associated with prolonged bleeding that would, in the opinion of the investigator, contraindicate intramuscular injection.

7. Women who are pregnant or breastfeeding.

Prior/Concomitant Therapy:

8. Primary study: Previous vaccination with any coronavirus vaccine.

   Booster study: Previous vaccination with any coronavirus vaccine outside of this study.

9. Receipt of medications intended to prevent COVID-19.

10. Individuals who receive treatment with radiotherapy or immunosuppressive therapy, including cytotoxic agents or systemic corticosteroids (if systemic corticosteroids are administered for ≥14 days at a dose of ≥20 mg/day of prednisone or equivalent), eg, for cancer or an autoimmune disease, or planned receipt throughout the study. Inhaled/nebulized, intra-articular, intrabursal, or topical (skin or eyes) corticosteroids are permitted.

11. Receipt of blood/plasma products or immunoglobulin, from 60 days before study intervention administration or planned receipt throughout the study.

Prior/Concurrent Clinical Study Experience:

12. Participation in other studies involving study intervention within 28 days prior to study entry and/or during study participation.

13. Previous participation in other studies involving study intervention containing LNPs.

Other Exclusions:

14. Investigator site staff or Pfizer/BioNTech employees directly involved in the conduct of the study, site staff otherwise supervised by the investigator, and their respective family members.

Additional Exclusion Criteria Specific to the Booster Study:

1. Current febrile illness (body temperature ≥100.4°F [≥38.0°C]) or other acute illness within 48 hours before study intervention administration.

2. Receipt of any seasonal or pandemic influenza vaccine within 14 days, or any other nonstudy vaccine within 28 days, before study intervention administration.

3. Anticipated receipt of any seasonal or pandemic influenza vaccine within 14 days, or any other nonstudy vaccine within 28 days, after study intervention administration.

4. Receipt of short-term (<14 days) systemic corticosteroids. Inhaled/nebulized, intra-articular, intrabursal, or topical (skin or eyes) corticosteroids are permitted.

5.3. Lifestyle Considerations

5.3.1. Contraception

The investigator or his or her designee, in consultation with the participant, will confirm that the participant has selected an appropriate method of contraception for the individual participant and his or her partner(s) from the permitted list of contraception methods (see Appendix 4, Section 10.4.4) and will confirm that the participant has been instructed in its consistent and correct use.

At time points indicated in the SoA, the investigator or designee will inform the participant of the need to use highly effective contraception consistently and correctly and document the conversation and the participant's affirmation in the participant's chart (participants need to affirm their consistent and correct use of at least 1 of the selected methods of contraception). In addition, the investigator or designee will instruct the participant to call immediately if the selected contraception method is discontinued or if pregnancy is known or suspected in the participant or partner.

5.4. Screen Failures

Screen failures are defined as participants who consent to participate in the clinical study but are not subsequently randomly assigned to study intervention. A minimal set of screen failure information is required to ensure transparent reporting of screen failure participants to meet the CONSORT publishing requirements and to respond to queries from regulatory authorities. Minimal information includes demography, screen failure details, eligibility criteria, and any SAEs.

Primary study only: Individuals who do not meet the criteria for participation in this study (screen failure) may be rescreened under a different participant number.

5.5. Criteria for Temporarily Delaying Enrollment/Randomization/Study Intervention Administration (Primary Study)

The following conditions are temporary or self-limiting and a participant may be vaccinated once the condition(s) has/have resolved and no other exclusion criteria are met. The booster study does not include temporary delay criteria.

1. Current febrile illness (body temperature ≥100.4°F [≥38.0°C]) or other acute illness within 48 hours before study intervention administration. This includes current symptoms that could represent a potential COVID-19 illness (refer to Section 7.1 for further guidance):
    - New or increased cough;
    - New or increased shortness of breath;
    - Chills;
    - New or increased muscle pain;
    - New loss of taste/smell;
    - Sore throat;
    - Diarrhea;
    - Vomiting.
2. Receipt of any seasonal or pandemic influenza vaccine within 14 days, or any other nonstudy vaccine within 28 days, before study intervention administration.
3. Anticipated receipt of any seasonal or pandemic influenza vaccine within 14 days, or any other nonstudy vaccine within 28 days, after study intervention administration.

4. Receipt of short-term (<14 days) systemic corticosteroids. Study intervention administration should be delayed until systemic corticosteroid use has been discontinued for at least 28 days. Inhaled/nebulized, intra-articular, intrabursal, or topical (skin or eyes) corticosteroids are permitted.

6. STUDY INTERVENTION

Study intervention is defined as any investigational intervention(s), marketed product(s), placebo, medical device(s), or study procedure(s) intended to be administered to a study participant according to the study protocol.

For the purposes of this protocol, in the primary study, study intervention refers to BNT162b2, an RNA-based vaccine for immunization against COVID-19. All 4 production lots will be administered at a 30-µg dose and 1 of the lots will also be administered at a 20-µg dose, with the group names Arms 1, 2, 3, 4, and 5, respectively. The study will evaluate a 2-dose (separated by 21 days) schedule in healthy participants 12 through 50 years of age.

In the booster study, study intervention refers to BNT162b2 and BNT162b2.B.1.351, RNA-based vaccines for immunization against COVID-19. The study will evaluate a single 30-µg dose administered 3 months after Dose 2 in the primary study to healthy participants 18 through 50 years of age.

6.1. Study Intervention(s) Administered

6.1.1. Primary Study

Intervention Name	BNT162b2 (BNT162 RNA-LNP vaccine utilizing modRNA)
Arm Name[a] **(group of participants receiving a specific vaccine or no vaccine)**	Arm 1 Arm 2 Arm 3 Arm 4 Arm 5
Type	Vaccine
Dose Formulation	modRNA
Unit Dose Strength	250 µg/0.5 mL
Dosage Level	30 µg (Arms 1-4); 20 µg (Arm 5)
Route of Administration	Intramuscular injection
Use	Experimental
IMP or NIMP	IMP
Sourcing	Provided centrally by the sponsor
Packaging and Labeling	Study intervention will be provided in a single-dose glass vial. Each vial will be labeled as required per country requirement.

a. Arms 1, 2, and 3 contain US-manufactured drug substance; Arm 4 contains EU-manufactured drug substance; Arm 5 contains US-manufactured drug substance from one of the US lots in the study.

6.1.2. Booster Study

Intervention Names	BNT162b2[a] BNT162.B.1.351 (BNT162b2s01)[b] (BNT162 RNA-LNP vaccine utilizing modRNA)
Arm Name[a] **(group of participants receiving a specific vaccine or no vaccine)**	Booster 1: BNT162b2 Booster 2: BNT162.B.1.351
Type	Vaccine
Dose Formulation	modRNA
Unit Dose Strength	250 µg/0.5 mL
Dosage Level	30 µg
Route of Administration	Intramuscular injection
Use	Experimental
IMP or NIMP	IMP
Sourcing	Provided centrally by the sponsor
Packaging and Labeling	Study intervention will be provided in a single-dose glass vial. Each vial will be labeled as required per country requirement.

a. Reference vaccine.
b. Vaccine with B.1.351 variant–specific mutations. Study intervention label is BNT162b2s01.

6.1.3. Administration

Primary study: Participants will receive 1 dose of study intervention as randomized at each vaccination visit (Visits 1 and 2) separated by 21 days in accordance with the study's SoA. Full details are described in the IP manual.

Booster study: Participants will receive 1 dose of study intervention based on rerandomization at the vaccination visit (Visit 4). Participants will be assigned 1 vial of either BNT162b2 (Booster 1) or BNT162b2.B.1.351 (Booster 2). All participants will receive a total dose of 30 µg.

Full details are described in the IP manual.

Study intervention should be administered intramuscularly into the deltoid muscle, preferably of the nondominant arm, by an **unblinded** administrator.

Standard vaccination practices must be observed and vaccine must not be injected into blood vessels. Appropriate medication and other supportive measures for management of an acute hypersensitivity reaction should be available in accordance with local guidelines for standard immunization practices.

Administration of study interventions should be performed by an appropriately qualified, GCP-trained, and vaccine-experienced member of the study staff (eg, physician, nurse,

physician's assistant, nurse practitioner, pharmacist, or medical assistant) as allowed by local, state, and institutional guidance.

Study intervention administration details will be recorded on the CRF.

6.2. Preparation/Handling/Storage/Accountability

1. The investigator or designee must confirm appropriate temperature conditions have been maintained during transit for all study interventions received and any discrepancies are reported and resolved before use of the study intervention.

2. Only participants enrolled in the study may receive study intervention and only authorized site staff may supply or administer study intervention. All study interventions must be stored in a secure, environmentally controlled, and monitored (manual or automated recording) area in accordance with the labeled storage conditions with access limited to the investigator and authorized site staff. At a minimum, daily minimum and maximum temperatures for all site storage locations must be documented and available upon request. Data for nonworking days must indicate the minimum and maximum temperatures since previously documented for all site storage locations upon return to business.

3. Any excursions from the study intervention label storage conditions should be reported to Pfizer upon discovery along with any actions taken. The site should actively pursue options for returning the study intervention to the storage conditions described in the labeling, as soon as possible. Once an excursion is identified, the study intervention must be quarantined and not used until Pfizer provides permission to use the study intervention. Specific details regarding the definition of an excursion and information the site should report for each excursion will be provided to the site in the IP manual.

4. Any storage conditions stated in the SRSD will be superseded by the storage conditions stated on the label.

5. Study interventions should be stored in their original containers.

6. See the IP manual for storage conditions of the study intervention.

7. The investigator, institution, or the head of the medical institution (where applicable) is responsible for study intervention accountability, reconciliation, and record maintenance (ie, receipt, reconciliation, and final disposition records), such as the IPAL or sponsor-approved equivalent. All study interventions will be accounted for using a study intervention accountability form/record.

8. Further guidance and information for the final disposition of unused study interventions are provided in the IP manual. All destruction must be adequately documented. If destruction is authorized to take place at the investigator site, the investigator must ensure that the materials are destroyed in compliance with applicable environmental regulations, institutional policy, and any special instructions provided by Pfizer.

Upon identification of a product complaint, notify the sponsor within 1 business day of discovery as described in the IP manual.

6.2.1. Preparation and Dispensing

See the IP manual for detailed instructions on how to prepare the study intervention for administration. Study intervention should be prepared and dispensed by an appropriately qualified and experienced member of the study staff (eg, physician, nurse, physician's assistant, nurse practitioner, pharmacy assistant/technician, or pharmacist) as allowed by local, state, and institutional guidance. A second staff member will verify the preparation and dispensing.

Study intervention will be prepared by qualified unblinded site personnel according to the IP manual. The study intervention will be administered in such a way to ensure the participants remain blinded.

6.3. Measures to Minimize Bias: Randomization and Blinding

6.3.1. Allocation to Study Intervention

Allocation (randomization) of participants to vaccine groups will proceed through the use of an IRT system (IWR). The site personnel (study coordinator or specified designee) will be required to enter or select information including but not limited to the user's ID and password, the protocol number, and the participant number. The site personnel will then be provided with a vaccine assignment and randomization number. The IRT system will provide a confirmation report containing the participant number, randomization number, and study intervention allocation assigned. The confirmation report must be stored in the site's files.

The study-specific IRT reference manual and IP manual will provide the contact information and further details on the use of the IRT system.

6.3.2. Blinding of Site Personnel

Primary study: Because the volumes of the 20-µg and the 30-µg doses of the investigational vaccine are different, this study is observer-blinded, which requires the study staff receiving, storing, dispensing, preparing, and administering the study interventions to be unblinded.

Booster study: To align with the primary study, this study is observer-blinded, which requires the study staff receiving, storing, dispensing, preparing, and administering the study interventions to be unblinded.

All other study and site personnel, including the investigator, investigator staff, and participants, will be blinded to study intervention assignments. In particular, the individuals who evaluate participant safety will be blinded.

The responsibility of the unblinded dispenser and administrator must be assigned to an individual or individuals who will not participate in the evaluation of any study participants.

Contact between the unblinded dispenser and study participants and unblinded administrator and study participants should be kept to a minimum. The remaining site personnel must not know study intervention assignments.

In the event of a Quality Assurance audit, the auditor(s) will be allowed access to unblinded study intervention records at the site(s) to verify that randomization/dispensing has been done accurately.

6.3.3. Blinding of the Sponsor

The majority of sponsor staff will be blinded to study intervention allocation. The blinded study team will become unblinded to the primary study randomization information at the time of the database release of the primary study. These same study team members will remain blinded to the randomization information for the booster study until completion of that phase.

All laboratory testing personnel performing serology assays will remain blinded to study intervention assigned/received throughout the testing for the primary study and for the booster study, respectively. The following sponsor staff, who will have no part in the blinded conduct of the study, will be unblinded (further details will be provided in a data blinding plan):

- Those study team members who are involved in ensuring that protocol requirements for study intervention preparation, handling, allocation, and administration are fulfilled at the site will be unblinded for the duration of the study (eg, unblinded study manager, unblinded clinical research associate).

- Unblinded clinician(s) who are not direct members of the study team and will not participate in any other study-related activities will review unblinded protocol deviations.

6.3.4. Breaking the Blind

All study participants will receive BNT162b2; blinding refers only to which vaccine lot or vaccine dose (primary study) or to which vaccine (booster study) the participant will receive. The IRT will be programmed with blind-breaking instructions. In case of an emergency, the investigator has the sole responsibility for determining if unblinding of a participant's study intervention assignment is warranted. Participant safety must always be the first consideration in making such a determination. If the investigator decides that unblinding is warranted, the investigator should make every effort to contact the sponsor prior to unblinding a participant's vaccine assignment unless this could delay further management of the participant. If a participant's vaccine assignment is unblinded, the sponsor must be notified within 24 hours after breaking the blind. The date and reason that the blind was broken must be recorded in the source documentation and CRF.

The study-specific IRT reference manual and IP manual will provide the contact information and further details on the use of the IRT system.

6.4. Study Intervention Compliance

When participants are dosed at the site, they will receive study intervention directly from the investigator or designee, under medical supervision. The date and time of each dose administered in the clinic will be recorded in the source documents and recorded in the CRF. The dose of study intervention and study participant identification will be confirmed at the time of dosing by a member of the study site staff other than the person administering the study intervention.

6.5. Concomitant Therapy

The following concomitant medications and vaccinations will be recorded in the CRF:

- All vaccinations received from 28 days prior to study enrollment until the 1-month follow-up visit (Visit 3, primary study/Visit 6, booster study).

- Prohibited vaccines and medications listed in Section 6.5.1 will be recorded, to include start and stop dates, name of the medication, dose, unit, route, and frequency.

6.5.1. Prohibited During the Study

Receipt of the following vaccines and medications during the time periods listed below may exclude a participant from the per-protocol analysis from that point onwards and, in the primary study, may require vaccinations to be discontinued in that participant; however, it is anticipated that the participant would not be withdrawn from the study (see Section 7). Medications should not be withheld if required for a participant's medical care.

- Unless considered medically necessary, no vaccines other than study intervention should be administered within 28 days before and 28 days after each study vaccination. One exception to this is that seasonal and pandemic influenza vaccine can be given at least 14 days after, or at least 14 days prior to, the administration of study intervention.

- Receipt of chronic systemic treatment with known immunosuppressant medications, or radiotherapy, within 60 days before enrollment through conclusion of the study.

- Receipt of systemic corticosteroids (≥20 mg/day of prednisone or equivalent) for ≥14 days is prohibited from 28 days prior to enrollment to Visit 3, primary study/Visit 6, booster study.

- Receipt of blood/plasma products or immunoglobulins within 60 days before enrollment through conclusion of the study.

- Receipt of any other (nonstudy) coronavirus vaccine at any time prior to or during study participation is prohibited.

- Receipt of prophylactic medications intended to prevent symptoms associated with COVID-19. However, if a participant is taking a medication for another condition, even if it may have such properties, it should not be withheld prior to study vaccination.

- Prophylactic antipyretics and other pain medication to prevent symptoms associated with study intervention administration are not permitted. However, if a participant is taking a medication for another condition, even if it may have antipyretic or pain-relieving properties, it should not be withheld prior to study vaccination.

6.5.2. Permitted During the Study

The use of antipyretics and other pain medication to treat symptoms associated with study intervention administration or ongoing conditions is permitted.

Medication other than that described as prohibited in Section 6.5.1 required for treatment of preexisting stable conditions is permitted.

Inhaled, topical, or localized injections of corticosteroids (eg, intra-articular or intrabursal administration) are permitted.

6.6. Dose Modification

Not applicable for this study.

6.7. Intervention After the End of the Study (Primary Study)

If the 20-µg dose group (Arm 5) is found to have a suboptimal immune response, as determined by the sponsor, this group will be offered a single 30-µg dose outside of the study.

7. DISCONTINUATION OF STUDY INTERVENTION AND PARTICIPANT DISCONTINUATION/WITHDRAWAL

7.1. Discontinuation of Study Intervention (Primary Study)

In rare instances, it may be necessary for a participant to permanently discontinue study intervention (definitive discontinuation). Reasons for definitive discontinuation of study intervention include the following: AEs; participant request; investigator request; pregnancy; protocol deviation (including no longer meeting all the inclusion criteria, or meeting 1 or more exclusion criteria*). In general, unless the investigator considers it unsafe to administer the second dose, or the participant does not wish to receive it, it is preferred that the second dose be administered.

* A positive SARS-CoV-2 NAAT result without symptoms or a COVID-19 diagnosis (signs/symptoms only or signs/symptoms and a positive SARS-CoV-2 NAAT result) should not result in discontinuation of study intervention. If study intervention (Dose 2) has been delayed per Section 5.5, because of febrile or other acute illness (Item 1 in the list in Section 5.5), and the investigator later diagnoses the signs and symptoms as COVID-19 (with

or without a positive SARS-CoV-2 NAAT result), the participant should not be discontinued from any further doses of study intervention.

Note that discontinuation of study intervention does not represent withdrawal from the study. Per the study estimands, if study intervention is definitively discontinued, the participant will remain in the study to be evaluated for safety and immunogenicity. See the SoA for data to be collected at the time of discontinuation of study intervention and follow-up for any further evaluations that need to be completed.

In the event of discontinuation of study intervention, it must be documented on the appropriate CRF/in the medical records whether the participant is discontinuing further receipt of study intervention or also from study procedures, postvaccination study follow-up, and/or future collection of additional information.

7.2. Participant Discontinuation/Withdrawal From the Study

A participant may withdraw from the study at any time at his/her own request. Reasons for discontinuation from the study include the following:

- Refused further follow-up;
- Lost to follow-up;
- Death;
- Study terminated by sponsor;
- AEs;
- Participant request;
- Investigator request;
- Protocol deviation.

If a participant does not return for a scheduled visit, every effort should be made to contact the participant. All attempts to contact the participant and information received during contact attempts must be documented in the participant's source document. In any circumstance, every effort should be made to document participant outcome, if possible.

The investigator or his or her designee should capture the reason for withdrawal in the CRF for all participants.

If a participant withdraws from the study, he/she may request destruction of any remaining samples taken and not tested, and the investigator must document any such requests in the site study records and notify the sponsor accordingly.

If the participant withdraws from the study and also withdraws consent (see Section 7.2.1) for disclosure of future information, no further evaluations should be performed and no additional data should be collected. The sponsor may retain and continue to use any data collected before such withdrawal of consent.

Lack of completion of all or any of the withdrawal/early termination procedures will not be viewed as protocol deviations so long as the participant's safety was preserved.

7.2.1. Withdrawal of Consent

Participants who request to discontinue receipt of study intervention will remain in the study and must continue to be followed for protocol-specified follow-up procedures. The only exception to this is when a participant specifically withdraws consent for any further contact with him or her or persons previously authorized by the participant to provide this information. Participants should notify the investigator in writing of the decision to withdraw consent from future follow-up, whenever possible. The withdrawal of consent should be explained in detail in the medical records by the investigator, as to whether the withdrawal is only from further receipt of study intervention or also from study procedures and/or postvaccination study follow-up, and entered on the appropriate CRF page. In the event that vital status (whether the participant is alive or dead) is being measured, publicly available information should be used to determine vital status only as appropriately directed in accordance with local law.

7.3. Lost to Follow-up

A participant will be considered lost to follow-up if he or she repeatedly fails to return for scheduled visits and is unable to be contacted by the study site.

The following actions must be taken if a participant fails to attend a required study visit:

- The site must attempt to contact the participant and reschedule the missed visit as soon as possible and counsel the participant on the importance of maintaining the assigned visit schedule and ascertain whether or not the participant wishes to and/or should continue in the study;

- Before a participant is deemed lost to follow-up, the investigator or designee must make every effort to regain contact with the participant (where possible, 3 telephone calls and, if necessary, a certified letter to the participant's last known mailing address or local equivalent methods). These contact attempts should be documented in the participant's medical record;

- Should the participant continue to be unreachable, he/she will be considered to have withdrawn from the study.

8. STUDY ASSESSMENTS AND PROCEDURES

The investigator (or an appropriate delegate at the investigator site) must obtain a signed and dated ICD before performing any study-specific procedures.

The full date of birth will be collected to critically evaluate the immune response and safety profile by age.

Study procedures and their timing are summarized in the SoA. Protocol waivers or exemptions are not allowed.

Safety issues should be discussed with the sponsor immediately upon occurrence or awareness to determine whether the participant should continue or discontinue study intervention.

Adherence to the study design requirements, including those specified in the SoA, is essential and required for study conduct.

All screening evaluations must be completed and reviewed to confirm that potential participants meet all eligibility criteria. The investigator will maintain a screening log to record details of all participants screened and to confirm eligibility or record reasons for screening failure, as applicable.

Every effort should be made to ensure that protocol-required tests and procedures are completed as described. However, it is anticipated that from time to time there may be circumstances outside the control of the investigator that may make it unfeasible to perform the test. In these cases, the investigator must take all steps necessary to ensure the safety and well-being of the participant. When a protocol-required test cannot be performed, the investigator will document the reason for the missed test and any corrective and preventive actions that he or she has taken to ensure that required processes are adhered to as soon as possible. The study team must be informed of these incidents in a timely manner.

For samples being collected and shipped, detailed collection, processing, storage, and shipment instructions and contact information will be provided to the investigator site prior to initiation of the study.

The total blood sampling volume for individual participants in the primary study is approximately 20 mL for participants 12 through 15 years and 40 mL for participants ≥16 years of age. The total blood sampling volume for individual participants in the booster study is approximately 150 mL for each participant. Additional blood samples may be taken for safety assessments at times specified by Pfizer, provided the total volume taken during the study does not exceed 550 mL during any period of 60 consecutive days.

8.1. Immunogenicity Assessments

Serum samples will be obtained for immunogenicity testing at the visits specified in the SoA. The tests to be performed will be the full-length S-binding IgG-concentration assay and

measurement of SARS-CoV-2 neutralizing titers. For the primary study, full-length S-binding IgG concentrations will be measured for the lot-comparison analyses on all eligible samples. Testing for SARS-CoV-2 reference-strain neutralizing titers will be performed on all eligible samples for the dose-comparison analysis. For the booster study, testing for both SARS-CoV-2 reference-strain and B.1.351-strain neutralizing titers and full-length S-binding IgG concentrations will be performed on all eligible samples. Note that all immunogenicity analyses will be based upon samples analyzed at the central laboratory.

Nasal (midturbinate) swabs at the visits specified in the SoA will be obtained as one of the determinations for participants to be included in the evaluable immunogenicity analysis. These samples will be tested at the central laboratory using an RT-PCR test (Cepheid, an NAAT; FDA approved under EUA) to detect SARS-CoV-2. Another determination for participants to be included in the evaluable immunogenicity analysis is the N-binding antibody assay. Blood samples will be taken at visits specified in the SoA and analyzed at the central laboratory. A positive result on either test will result in the immunogenicity data from that participant being excluded from the evaluable portion of the study population. However, administration of study intervention is not dependent on these test results, which will only be available after the study has ended.

8.1.1. Biological Samples

Blood and nasal swab samples will be used only for scientific research. Each sample will be labeled with a code so that the laboratory personnel testing the samples will not know the participant's identity. Samples that remain after performing assays outlined in the protocol may be stored by Pfizer. Unless a time limitation is required by local regulations or ethical requirements, the samples will be stored for up to 15 years after the end of the study and then destroyed. If allowed by the ICD, stored samples may be used for additional testing to better understand the immune responses to the vaccine(s) under study in this protocol, to inform the development of other products, and/or for vaccine-related assay work supporting vaccine programs. No testing of the participant's DNA will be performed.

The participant may request that his or her samples, if still identifiable, be destroyed at any time; however, any data already collected from those samples will still be used for this research. The biological samples may be shared with other researchers as long as confidentiality is maintained and no testing of the participant's DNA is performed.

8.2. Safety Assessments

Planned time points for all safety assessments are provided in the SoA. Unscheduled clinical laboratory measurements may be obtained at any time during the study to assess any perceived safety issues.

A clinical assessment, including medical history, will be performed on all participants at their first visit to establish a baseline. Significant medical history and observations from any physical examination, if performed, will be documented in the CRF.

AEs and SAEs are collected, recorded, and reported as defined in Section 8.3.

Acute reactions within the first 30 minutes will be assessed and documented in the AE CRF.

The safety parameters also include reactogenicity e-diary reports of local reactions, systemic events (including fever), and use of antipyretic medication that occur in the 7 days after administration of the study intervention. These prospectively self-collected occurrences of local reactions and systemic events are graded as described in Section 8.2.2.

8.2.1. Clinical Safety Laboratory Assessments

Clinical safety laboratory assessments will not be collected in this study.

See Section 10.5, Appendix 5, for suggested actions and follow-up assessments in the event of potential DILI.

8.2.2. Electronic Diary

Participants will be required to complete a reactogenicity e-diary through an application installed on a provisioned device or on the participant's own personal device. All participants will be asked to monitor and record local reactions, systemic events, and antipyretic medication usage for 7 days from the day of administration of the study intervention. The reactogenicity e-diary allows recording of these assessments only within a fixed time window, thus providing the accurate representation of the participant's experience at that time. Data on local reactions and systemic events reported in the reactogenicity e-diary will be transferred electronically to a third-party vendor, where they will be available for review by investigators and the Pfizer clinicians at all times via an internet-based portal.

At intervals agreed to by the vendor and Pfizer, these data will be transferred electronically into Pfizer's database for analysis and reporting. Generally, these data do not need to be reported by the investigator in the CRF as AEs.

Investigators (or designee) will be required to review the reactogenicity e-diary data online at frequent intervals as part of the ongoing safety review.

The investigator or designee must obtain stop dates from the participant for any ongoing local reactions, systemic events, or use of antipyretic medication on the last day that the reactogenicity e-diary was completed. The stop dates should be documented in the source documents and the information entered in the CRF.

8.2.2.1. Grading Scales

The grading scales used in this study to assess local reactions and systemic events as described below are derived from the FDA CBER guidelines on toxicity grading scales for healthy adult volunteers enrolled in preventive vaccine clinical trials.[12]

8.2.2.2. Local Reactions

During the reactogenicity e-diary reporting period, participants will be asked to assess redness, swelling, and pain at the injection site and to record the symptoms in the

reactogenicity e-diary. If a local reaction persists beyond the end of the reactogenicity e-diary period following vaccination, the participant will be requested to report that information. The investigator will enter this additional information in the CRF.

Redness and swelling will be measured and recorded in measuring device units (range: 1 to 21) and then categorized during analysis as absent, mild, moderate, or severe based on the grading scale in Table 1. Measuring device units can be converted to centimeters according to the following formula: 1 measuring device unit = 0.5 cm. Pain at the injection site will be assessed by the participant as absent, mild, moderate, or severe according the grading scale in Table 1.

If a Grade 3 local reaction is reported in the reactogenicity e-diary, a telephone contact should occur to ascertain further details and determine whether a site visit is clinically indicated. Only an investigator or medically qualified person is able to classify a participant's local reaction as Grade 4. If a participant experiences a confirmed Grade 4 local reaction, the investigator must immediately notify the sponsor and, if it is determined to be related to the administration of the study intervention, further vaccinations will be discontinued in that participant.

Table 1. Local Reaction Grading Scale

	Mild (Grade 1)	Moderate (Grade 2)	Severe (Grade 3)	Potentially Life Threatening (Grade 4)
Pain at the injection site	Does not interfere with activity	Interferes with activity	Prevents daily activity	Emergency room visit or hospitalization for severe pain
Redness	>2.0 cm to 5.0 cm (5 to 10 measuring device units)	>5.0 cm to 10.0 cm (11 to 20 measuring device units)	>10 cm (≥21 measuring device units)	Necrosis or exfoliative dermatitis
Swelling	>2.0 cm to 5.0 cm (5 to 10 measuring device units)	>5.0 cm to 10.0 cm (11 to 20 measuring device units)	>10 cm (≥21 measuring device units)	Necrosis

8.2.2.3. Systemic Events

During the reactogenicity e-diary reporting period, participants will be asked to assess vomiting, diarrhea, headache, fatigue, chills, new or worsened muscle pain, and new or worsened joint pain and to record the symptoms in the reactogenicity e-diary. The symptoms will be assessed by the participant as absent, mild, moderate, or severe according to the grading scale in Table 2.

If a Grade 3 systemic event is reported in the reactogenicity e-diary, a telephone contact should occur to ascertain further details and determine whether a site visit is clinically indicated. Only an investigator or medically qualified person is able to classify a participant's systemic event as Grade 4. If a participant experiences a confirmed Grade 4 systemic event, the investigator must immediately notify the sponsor and, if it is determined

to be related to the administration of the study intervention, further vaccinations will be discontinued in that participant.

Table 2. Systemic Event Grading Scale

	Mild (Grade 1)	Moderate (Grade 2)	Severe (Grade 3)	Potentially Life Threatening (Grade 4)
Vomiting	1-2 times in 24 hours	>2 times in 24 hours	Requires IV hydration	Emergency room visit or hospitalization for hypotensive shock
Diarrhea	2 to 3 loose stools in 24 hours	4 to 5 loose stools in 24 hours	6 or more loose stools in 24 hours	Emergency room visit or hospitalization for severe diarrhea
Headache	Does not interfere with activity	Some interference with activity	Prevents daily routine activity	Emergency room visit or hospitalization for severe headache
Fatigue/tiredness	Does not interfere with activity	Some interference with activity	Prevents daily routine activity	Emergency room visit or hospitalization for severe fatigue
Chills	Does not interfere with activity	Some interference with activity	Prevents daily routine activity	Emergency room visit or hospitalization for severe chills
New or worsened muscle pain	Does not interfere with activity	Some interference with activity	Prevents daily routine activity	Emergency room visit or hospitalization for severe new or worsened muscle pain
New or worsened joint pain	Does not interfere with activity	Some interference with activity	Prevents daily routine activity	Emergency room visit or hospitalization for severe new or worsened joint pain

Abbreviation: IV = intravenous.

During the 7 days following each vaccination, potential COVID-19 symptoms that overlap with solicited systemic events (ie, fever, chills, new or increased muscle pain, diarrhea, vomiting) should be assessed by the investigator.

If, in the investigator's opinion, the symptoms are considered more likely to be vaccine reactogenicity, but a participant is required to demonstrate that they are SARS-CoV-2–negative, a local SARS-CoV-2 test may be performed: if positive, the symptoms should be recorded as an AE rather than as systemic events in the reactogenicity e-diary.

8.2.2.4. Fever

In order to record information on fever, a thermometer will be given to participants with instructions on how to measure oral temperature at home. Temperature will be collected in the reactogenicity e-diary in the evening daily during the reactogenicity e-diary reporting period. It will also be collected at any time during the reactogenicity e-diary data collection

periods when fever is suspected. Fever is defined as an oral temperature of ≥38.0°C (100.4°F). The highest temperature for each day will be recorded in the reactogenicity e-diary. Temperature will be measured and recorded to 1 decimal place. Temperatures recorded in degrees Fahrenheit will be programmatically converted to degrees Celsius and then categorized according to the scale shown in Table 3 during analysis.

If a fever of ≥39.0°C (102.1°F) is reported in the reactogenicity e-diary, a telephone contact should occur to ascertain further details and determine whether a site visit is clinically indicated. Only an investigator or medically qualified person is able to confirm a participant's fever as >40.0°C (>104.0°F). If a participant experiences a confirmed fever >40.0°C (>104.0°F), the investigator must immediately notify the sponsor and, if it is determined to be related to the administration of the study intervention, further vaccinations will be discontinued in that participant.

Table 3. Scale for Fever

≥38.0-38.4°C (100.4-101.1°F)
>38.4-38.9°C (101.2-102.0°F)
>38.9-40.0°C (102.1-104.0°F)
>40.0°C (>104.0°F)

8.2.2.5. Antipyretic/Analgesic Medication

The use of antipyretic/analgesic medication to treat symptoms associated with study intervention administration will be recorded in the reactogenicity e-diary daily during the reporting period (Day 1 through Day 7).

8.2.3. Pregnancy Testing

Pregnancy tests may be urine or serum tests, but must have a sensitivity of at least 25 mIU/mL. Pregnancy tests will be performed in WOCBP at the times listed in the SoA, immediately before the administration of each vaccine dose. A negative pregnancy test result will be required prior to the participant's receiving the study intervention. Pregnancy tests may also be repeated if requested by IRBs/ECs or if required by local regulations. In the case of a positive confirmed pregnancy, the participant will be withdrawn from administration of study intervention but may remain in the study.

8.3. Adverse Events and Serious Adverse Events

The definitions of an AE and an SAE can be found in Appendix 3.

AEs will be reported by the participant (or, when appropriate, by a caregiver, surrogate, or the participant's parent(s)/legal guardian).

The investigator and any qualified designees are responsible for detecting, documenting, and recording events that meet the definition of an AE or SAE and remain responsible to pursue and obtain adequate information both to determine the outcome and to assess whether the event meets the criteria for classification as an SAE or caused the participant to discontinue the study intervention (see Section 7.1).

Each participant/parent(s)/legal guardian will be questioned about the occurrence of AEs in a nonleading manner.

In addition, the investigator may be requested by Pfizer Safety to obtain specific follow-up information in an expedited fashion.

8.3.1. Time Period and Frequency for Collecting AE and SAE Information

During the primary study, the time period for actively eliciting and collecting AEs and SAEs ("active collection period") for each participant begins from the time the participant/parent(s)/legal guardian provides informed consent, which is obtained before the participant's participation in the study (ie, before undergoing any study-related procedure and/or receiving study intervention), through and including Visit 3 (1-month follow-up). In addition, any AEs occurring up to 48 hours after the blood draw and nasal swab collection at Visit 3 must be recorded in the CRF.

During the booster study, the time period for actively eliciting and collecting AEs and SAEs ("active collection period") for each participant begins from the time the participant provides informed consent, which is obtained before the participant's enrollment into the booster study at Visit 4 (ie, before undergoing any study-related procedure and/or receiving study intervention), through and including Visit 6 (1-month follow-up). In addition, any AEs occurring up to 48 hours after the blood draw and nasal swab collection at Visit 6 must be recorded in the CRF.

Follow-up by the investigator continues throughout and after the active collection period and until the AE or SAE or its sequelae resolve or stabilize at a level acceptable to the investigator and Pfizer concurs with that assessment.

For participants who are screen failures, the active collection period ends when screen failure status is determined.

If the participant withdraws from the study and also withdraws consent for the collection of future information, the active collection period ends when consent is withdrawn.

If a participant definitively discontinues or temporarily discontinues study intervention because of an AE or SAE, the AE or SAE must be recorded on the CRF and the SAE reported using the Vaccine SAE Reporting Form.

Investigators are not obligated to actively seek AEs or SAEs after the participant has concluded study participation. However, if the investigator learns of any SAE, including a death, at any time after a participant has completed the study, and he/she considers the event

to be reasonably related to the study intervention, the investigator must promptly report the SAE to Pfizer using the Vaccine SAE Reporting Form.

8.3.1.1. Reporting SAEs to Pfizer Safety

All SAEs occurring in a participant during the active collection period as described in Section 8.3.1 are reported to Pfizer Safety on the Vaccine SAE Reporting Form immediately upon awareness and under no circumstance should this exceed 24 hours, as indicated in Appendix 3. The investigator will submit any updated SAE data to the sponsor within 24 hours of it being available.

8.3.1.2. Recording Nonserious AEs and SAEs on the CRF

All nonserious AEs and SAEs occurring in a participant during the active collection period, which begins after obtaining informed consent as described in Section 8.3.1, will be recorded on the AE section of the CRF.

The investigator is to record on the CRF all directly observed and all spontaneously reported AEs and SAEs reported by the participant.

8.3.2. Method of Detecting AEs and SAEs

The method of recording, evaluating, and assessing causality of AEs and SAEs and the procedures for completing and transmitting SAE reports are provided in Appendix 3.

Care will be taken not to introduce bias when detecting AEs and/or SAEs. Open-ended and nonleading verbal questioning of the participant is the preferred method to inquire about AE occurrences.

8.3.3. Follow-up of AEs and SAEs

After the initial AE/SAE report, the investigator is required to proactively follow each participant at subsequent visits/contacts. For each event, the investigator must pursue and obtain adequate information until resolution, stabilization, the event is otherwise explained, or the participant is lost to follow-up (as defined in Section 7.3).

In general, follow-up information will include a description of the event in sufficient detail to allow for a complete medical assessment of the case and independent determination of possible causality. Any information relevant to the event, such as concomitant medications and illnesses, must be provided. In the case of a participant death, a summary of available autopsy findings must be submitted as soon as possible to Pfizer Safety.

Further information on follow-up procedures is given in Appendix 3.

8.3.4. Regulatory Reporting Requirements for SAEs

Prompt notification by the investigator to the sponsor of an SAE is essential so that legal obligations and ethical responsibilities towards the safety of participants and the safety of a study intervention under clinical investigation are met.

The sponsor has a legal responsibility to notify both the local regulatory authority and other regulatory agencies about the safety of a study intervention under clinical investigation. The sponsor will comply with country-specific regulatory requirements relating to safety reporting to the regulatory authority, IRBs/ECs, and investigators.

Investigator safety reports must be prepared for SUSARs according to local regulatory requirements and sponsor policy and forwarded to investigators as necessary.

An investigator who receives SUSARs or other specific safety information (eg, summary or listing of SAEs) from the sponsor will review and then file it along with the SRSD(s) for the study and will notify the IRB/EC, if appropriate according to local requirements.

8.3.5. Exposure During Pregnancy or Breastfeeding, and Occupational Exposure

Exposure to the study intervention under study during pregnancy or breastfeeding and occupational exposure are reportable to Pfizer Safety within 24 hours of investigator awareness.

8.3.5.1. Exposure During Pregnancy

An EDP occurs if:

- A female participant is found to be pregnant while receiving or after discontinuing study intervention.
- A male participant who is receiving or has discontinued study intervention exposes a female partner prior to or around the time of conception.
- A female is found to be pregnant while being exposed or having been exposed to study intervention due to environmental exposure. Below are examples of environmental exposure during pregnancy:
    - A female family member or healthcare provider reports that she is pregnant after having been exposed to the study intervention by inhalation or skin contact.
    - A male family member or healthcare provider who has been exposed to the study intervention by inhalation, or skin contact then exposes his female partner prior to or around the time of conception.

The investigator must report EDP to Pfizer Safety within 24 hours of the investigator's awareness, irrespective of whether an SAE has occurred. The initial information submitted should include the anticipated date of delivery (see below for information related to termination of pregnancy).

- If EDP occurs in a participant or a participant's partner, the investigator must report this information to Pfizer Safety on the Vaccine SAE Reporting Form and an EDP Supplemental Form, regardless of whether an SAE has occurred. Details of the

pregnancy will be collected after the start of study intervention and until 1 month after the last dose of study intervention.

- If EDP occurs in the setting of environmental exposure, the investigator must report information to Pfizer Safety using the Vaccine SAE Reporting Form and EDP Supplemental Form. Since the exposure information does not pertain to the participant enrolled in the study, the information is not recorded on a CRF; however, a copy of the completed Vaccine SAE Reporting Form is maintained in the ISF.

Follow-up is conducted to obtain general information on the pregnancy and its outcome for all EDP reports with an unknown outcome. The investigator will follow the pregnancy until completion (or until pregnancy termination) and notify Pfizer Safety of the outcome as a follow-up to the initial EDP Supplemental Form. In the case of a live birth, the structural integrity of the neonate can be assessed at the time of birth. In the event of a termination, the reason(s) for termination should be specified and, if clinically possible, the structural integrity of the terminated fetus should be assessed by gross visual inspection (unless preprocedure test findings are conclusive for a congenital anomaly and the findings are reported).

Abnormal pregnancy outcomes are considered SAEs. If the outcome of the pregnancy meets the criteria for an SAE (ie, ectopic pregnancy, spontaneous abortion, intrauterine fetal demise, neonatal death, or congenital anomaly), the investigator should follow the procedures for reporting SAEs. Additional information about pregnancy outcomes that are reported to Pfizer Safety as SAEs follows:

- Spontaneous abortion including miscarriage and missed abortion;

- Neonatal deaths that occur within 1 month of birth should be reported, without regard to causality, as SAEs. In addition, infant deaths after 1 month should be reported as SAEs when the investigator assesses the infant death as related or possibly related to exposure to the study intervention.

Additional information regarding the EDP may be requested by the sponsor. Further follow-up of birth outcomes will be handled on a case-by-case basis (eg, follow-up on preterm infants to identify developmental delays). In the case of paternal exposure, the investigator will provide the participant with the Pregnant Partner Release of Information Form to deliver to his partner. The investigator must document in the source documents that the participant was given the Pregnant Partner Release of Information Form to provide to his partner.

8.3.5.2. Exposure During Breastfeeding

An exposure during breastfeeding occurs if:

- A female participant is found to be breastfeeding while receiving or after discontinuing study intervention.

- A female is found to be breastfeeding while being exposed or having been exposed to study intervention (ie, environmental exposure). An example of environmental exposure during breastfeeding is a female family member or healthcare provider who reports that she is breastfeeding after having been exposed to the study intervention by inhalation or skin contact.

The investigator must report exposure during breastfeeding to Pfizer Safety within 24 hours of the investigator's awareness, irrespective of whether an SAE has occurred. The information must be reported using the Vaccine SAE Reporting Form. When exposure during breastfeeding occurs in the setting of environmental exposure, the exposure information does not pertain to the participant enrolled in the study**,** so the information is not recorded on a CRF. However, a copy of the completed Vaccine SAE Reporting Form is maintained in the ISF.

An exposure during breastfeeding report is not created when a Pfizer drug specifically approved for use in breastfeeding women (eg, vitamins) is administered in accord with authorized use. However, if the infant experiences an SAE associated with such a drug, the SAE is reported together with the exposure during breastfeeding.

8.3.5.3. Occupational Exposure

An occupational exposure occurs when a person receives unplanned direct contact with the study intervention, which may or may not lead to the occurrence of an AE. Such persons may include healthcare providers, family members, and other roles that are involved in the trial participant's care.

The investigator must report occupational exposure to Pfizer Safety within 24 hours of the investigator's awareness, regardless of whether there is an associated SAE. The information must be reported using the Vaccine SAE Reporting Form. Since the information does not pertain to a participant enrolled in the study, the information is not recorded on a CRF; however, a copy of the completed Vaccine SAE Reporting Form is maintained in the ISF.

8.3.6. Cardiovascular and Death Events

Not applicable.

8.3.7. Disease-Related Events and/or Disease-Related Outcomes Not Qualifying as AEs or SAEs

Not applicable.

8.3.8. Adverse Events of Special Interest

This section provides information on AESIs that may be detected during the study:

- Confirmed COVID-19 diagnosis (clinical signs/symptoms and positive SARS-CoV-2 NAAT test)

- Clinically confirmed cases of MIS-C[13] defined as follows:
  - An individual <21 years of age presenting with fever (≥38.0°C for ≥24 hours or report of subjective fever lasting ≥24 hours), AND
  - Laboratory evidence of inflammation (based on local laboratory ranges) including, but not limited to, one or more of the following: an elevated CRP, ESR, fibrinogen, procalcitonin, D-dimer, ferritin, LDH, or IL-6, elevated neutrophils, reduced lymphocytes, and low albumin; AND
  - Evidence of clinically severe illness requiring hospitalization, with multisystem (>2) organ involvement (cardiac, renal, respiratory, hematologic, gastrointestinal, dermatologic, or neurological); AND
  - No alternative plausible diagnoses; AND
  - Positive for current or recent SARS-CoV-2 infection by NAAT (RT-PCR), serology, or antigen test; or COVID-19 exposure within the 4 weeks prior to the onset of symptoms

All AESIs must be reported as an AE or SAE following the procedures described in Section 8.3.1 through Section 8.3.4. An AESI is to be recorded as an AE or SAE on the CRF. In addition, an AESI that is also an SAE must be reported using the Vaccine SAE Reporting Form.

8.3.8.1. Lack of Efficacy

Lack of efficacy is reportable to Pfizer Safety only if associated with an SAE.

8.3.9. Medical Device Deficiencies

Not applicable.

8.3.10. Medication Errors

Medication errors may result from the administration or consumption of the study intervention by the wrong participant, or at the wrong time, or at the wrong dosage strength.

Exposures to the study intervention under study may occur in clinical trial settings, such as medication errors.

Safety Event	Recorded on the CRF	Reported on the Vaccine SAE Reporting Form to Pfizer Safety Within 24 Hours of Awareness
Medication errors	All (regardless of whether associated with an AE)	Only if associated with an SAE

Medication errors include:

- Medication errors involving participant exposure to the study intervention;
- Potential medication errors or uses outside of what is foreseen in the protocol that do or do not involve the study participant;
- The administration of expired study intervention;
- The administration of an incorrect study intervention;
- The administration of an incorrect dosage;
- The administration of study intervention that has undergone temperature excursion from the specified storage range, unless it is determined by the sponsor that the study intervention under question is acceptable for use.

Such medication errors occurring to a study participant are to be captured on the medication error page of the CRF, which is a specific version of the AE page.

In the event of a medication dosing error, the sponsor should be notified within 24 hours.

Whether or not the medication error is accompanied by an AE, as determined by the investigator, the medication error is recorded on the medication error page of the CRF and, if applicable, any associated AE(s), serious and nonserious, are recorded on the AE page of the CRF.

Medication errors should be reported to Pfizer Safety within 24 hours on a Vaccine SAE Reporting Form **only when associated with an SAE.**

8.4. Treatment of Overdose

For this study, any dose of study intervention greater than 1 dose of study intervention within a 24-hour time period will be considered an overdose.

Pfizer does not recommend specific treatment for an overdose.

In the event of an overdose, the investigator should:

1. Contact the medical monitor within 24 hours.
2. Closely monitor the participant for any AEs/SAEs.
3. Document the quantity of the excess dose as well as the duration of the overdose in the CRF.
4. Overdose is reportable to Safety **only when associated with an SAE**.

Decisions regarding dose interruptions or modifications will be made by the investigator in consultation with the medical monitor based on the clinical evaluation of the participant.

8.5. Pharmacokinetics

Pharmacokinetic parameters are not evaluated in this study.

8.6. Pharmacodynamics

Pharmacodynamic parameters are not evaluated in this study.

8.7. Genetics

Genetics (specified analyses) are not evaluated in this study.

8.8. Biomarkers

Biomarkers are not evaluated in this study.

8.9. Immunogenicity Assessments

Immunogenicity assessments are described in Section 8.1.

8.10. Health Economics

Health economics/medical resource utilization and health economics parameters are not evaluated in this study.

8.11. Study Procedures

8.11.1. Visit 1 – Vaccination 1 (Day 1)

Before enrollment and before any study-related procedures are performed, voluntary, written, study-specific informed consent will be obtained from the participant or his/her parent(s)/legal guardian, as appropriate. Each signature on the ICD must be personally dated by the signatory. The investigator or his or her designee will also sign the ICD. A copy of the signed and dated ICD must be given to the participant/parent(s)/legal guardian. The source data must reflect that the informed consent was obtained before participation in the study.

It is anticipated that the procedures below will be conducted in a stepwise manner. The visit may be conducted across 2 consecutive days; if so, all steps from assessing the inclusion and exclusion criteria onwards must be conducted on the same day.

- Assign a single participant number using the IRT system.
- Obtain the participant's demography (including date of birth, sex, race, and ethnicity). The full date of birth will be collected to critically evaluate the immune response and safety profile by age.
- Obtain any medical history of clinical significance.

- Perform a clinical assessment. If the clinical assessment indicates that a physical examination is necessary to comprehensively evaluate the participant, perform a physical examination and record any findings in the source documents and, if clinically significant, record on the medical history CRF.
- Measure the participant's height and weight.
- Measure the participant's body temperature.
- Perform urine pregnancy test on WOCBP as described in Section 8.2.3.
- Discuss contraceptive use as described in Section 10.4.
- Record nonstudy vaccinations as described in Section 6.5.
- Ensure and document that all of the inclusion criteria and none of the exclusion criteria are met.
- Ensure that the participant meets none of the temporary delay criteria as described in Section 5.5.
- Collect a blood sample (approximately 20 mL for participants ≥16 years of age and approximately 10 mL for participants 12 through 15 years of age) for immunogenicity testing and to test for prior COVID-19. Please refer to the ISF for further instructions.
- Obtain a nasal (midturbinate) swab (collected by site staff) for determination of current SARS-CoV-2 status. Please refer to the ISF for further instructions.
- A blinded site staff member selects the age stratum and obtains the randomization number using the IRT system. An unblinded site staff member then enters the participant number (SSID) and randomization number to assign the study intervention allocation number.
- Unblinded site staff member(s) will dispense/administer 1 dose of study intervention into the deltoid muscle of the preferably nondominant arm. Please refer to the IP manual for further instruction on this process.
- Blinded site staff must observe the participant for at least 30 minutes after study intervention administration for any acute reactions. Record any acute reactions (including time of onset) in the participant's source documents and on the AE page of the CRF, and on an SAE form as applicable.
- Explain the e-diary technologies available for this study (Section 8.2.2), and assist the participant in downloading the study application onto the participant's own device or issue a provisioned device if required.

- Provide instructions on reactogenicity e-diary completion and ask the participant to complete the reactogenicity e-diary from Day 1 through Day 7, with Day 1 being the day of vaccination.

- Ask the participant to contact the site staff or investigator immediately if the participant experiences any of the following from Day 1 through Day 7 after vaccination (where Day 1 is the day of vaccination) to determine if an unscheduled reactogenicity visit is required:

  - Fever ≥39.0°C (≥102.1°F).

  - Redness or swelling at the injection site measuring greater than 10 cm (>20 measuring device units).

  - Severe pain at the injection site.

  - Any severe systemic event.

- Issue a measuring device to measure local reactions at the injection site and a thermometer for recording daily temperatures and provide instructions on their use.

- Record AEs/SAEs as described in Section 8.3.

- Ask the participant to contact the site staff or investigator if a medically attended event (eg, doctor's visit, emergency room visit) or hospitalization occurs.

- Ask the participant to contact the site staff or investigator if he/she develops symptoms of a COVID-19 infection, as defined by the CDC,[14] including:

  - New or increased cough;

  - New or increased shortness of breath;

  - Chills;

  - New or increased muscle pain;

  - New loss of taste/smell;

  - Sore throat;

  - Diarrhea;

  - Vomiting.

- Schedule an appointment for the participant to return for the next study visit.

- Remind the participant to bring the reactogenicity e-diary to the next visit.
- Complete the source documents.
- The investigator or an authorized designee completes the CRFs and an unblinded dispenser/administrator updates the study intervention accountability records.

The investigator or appropriately qualified designee reviews the reactogenicity e-diary data online following vaccination to evaluate participant compliance and as part of the ongoing safety review. Daily review is optimal during the active diary period.

8.11.2. Visit 2 – Vaccination 2 (19 to 23 Days After Visit 1)

- Record AEs/SAEs as described in Section 8.3.
- Review the participant's reactogenicity e-diary data. Collect stop dates of any reactogenicity e-diary events ongoing on the last day that the reactogenicity e-diary was completed and record stop dates in the CRF if required.
- Perform urine pregnancy test on WOCBP as described in Section 8.2.3.
- Discuss contraceptive use as described in Section 10.4.
- Record nonstudy vaccinations as described in Section 6.5.
- Record details of any of the prohibited medications specified in Section 6.5.1 received by the participant if required for his or her clinical care.
- Ensure and document that all of the inclusion criteria and none of the exclusion criteria are met. If not, the participant may not receive further study intervention but will remain in the study to be evaluated for safety, immunogenicity, and efficacy (see Section 7.1).
- Measure the participant's body temperature.
- Ensure that the participant meets none of the temporary delay criteria as described in Section 5.5.
- Unblinded site staff member(s) will dispense/administer 1 dose of study intervention into the deltoid muscle of the preferably nondominant arm. Please refer to the IP manual for further instruction on this process.
- Blinded site staff must observe the participant for at least 30 minutes after study intervention administration for any acute reactions. Record any acute reactions (including time of onset) in the participant's source documents and on the AE page of the CRF, and on an SAE form as applicable.

- Ensure the participant has a measuring device to measure local reactions at the injection site and a thermometer for recording daily temperatures.

- Ensure the participant remains comfortable with the chosen e-diary platform, confirm instructions on e-diary completion, and ask the participant to complete the reactogenicity e-diary from Day 1 through Day 7, with Day 1 being the day of vaccination.

- Ask the participant to contact the site staff or investigator immediately if the participant experiences any of the following from Day 1 through Day 7 after vaccination (where Day 1 is the day of vaccination) to determine if an unscheduled reactogenicity visit is required:

    - Fever ≥39.0°C (≥102.1°F).

    - Redness or swelling at the injection site measuring greater than 10 cm (>20 measuring device units).

    - Severe pain at the injection site.

    - Any severe systemic event.

- Ask the participant to contact the site staff or investigator if a medically attended event (eg, doctor's visit, emergency room visit) or hospitalization occurs.

- Ask the participant to contact the site staff or investigator if he/she develops symptoms of a COVID-19 infection, as defined by the CDC,[14] including:

    - New or increased cough;

    - New or increased shortness of breath;

    - Chills;

    - New or increased muscle pain;

    - New loss of taste/smell;

    - Sore throat;

    - Diarrhea;

    - Vomiting.

- Schedule an appointment for the participant to return for the next study visit.

- Remind the participant to bring the reactogenicity e-diary to the next visit.

- Complete the source documents.
- The investigator or an authorized designee completes the CRFs and an unblinded dispenser/administrator updates the study intervention accountability records.
- The investigator or appropriately qualified designee reviews the reactogenicity e-diary data online following vaccination to evaluate participant compliance and as part of the ongoing safety review. Daily review is optimal during the active diary period.

8.11.3. Visit 3 – 1-Month Follow-up (28 to 35 Days After Visit 2)

- Record AEs/SAEs as described in Section 8.3.
- Review the participant's reactogenicity e-diary data. Collect stop dates of any reactogenicity e-diary events ongoing on the last day that the reactogenicity e-diary was completed and record stop dates in the CRF if required.
- Record nonstudy vaccinations as described in Section 6.5.
- Record details of any of the prohibited medications specified in Section 6.5.1 received by the participant if required for his or her clinical care.
- Discuss contraceptive use as described in in Section 10.4.
- Collect a blood sample (approximately 20 mL for participants ≥16 years of age and approximately 10 mL for participants 12 through 15 years of age) for immunogenicity testing and to test for prior COVID-19.
- Obtain a nasal (midturbinate) swab (collected by site staff) for determination of current SARS-CoV-2 status.
- Collect the participant's reactogenicity e-diary or assist the participant to remove the study application from his or her own personal device.
- Complete the source documents.
- The investigator or an authorized designee completes the CRFs.

Booster Study Procedures

8.11.4. Visit 4 – Vaccination 3 (83 to 97 Days After Visit 2)

Before vaccination and before any study-related procedures are performed, voluntary, written, study-specific informed consent (via an ICD addendum) will be obtained from the participant. Each signature on the ICD addendum must be personally dated by the signatory. The investigator or his or her designee will also sign the ICD addendum. A copy of the

signed and dated ICD addendum must be given to the participant. The source data must reflect that the informed consent was obtained before participation in the booster study.

It is anticipated that the procedures below will be conducted in a stepwise manner.

- Perform urine pregnancy test on WOCBP as described in Section 8.2.3.
- Discuss contraceptive use as described in Section 10.4.
- Record nonstudy vaccinations as described in Section 6.5.
- Record details of any of the prohibited medications specified in Section 6.5.1 received by the participant if required for his or her clinical care.
- Measure body temperature.
- Ensure and document that all of the inclusion criteria and none of the exclusion criteria are met.
- Collect a blood sample (approximately 50 mL) for immunogenicity testing and to test for prior COVID-19. Please refer to the ISF for further instructions.
- Obtain a nasal (midturbinate) swab (collected by site staff) for determination of current SARS-CoV-2 status. Please refer to the ISF for further instructions.
- A blinded site staff member obtains the single subject ID (SSID) number and the participant's randomization number from the IRT system. The SSID number will not be used as the primary identifier for the participant (outside of Impala), but must be included in the participant's source documents and transcribed into the CRF. An unblinded site staff member then enters the SSID and randomization number to assign the study intervention allocation number.
- Unblinded site staff member(s) will dispense/administer 1 dose of study intervention into the deltoid muscle of the preferably nondominant arm. Please refer to the IP manual for further instruction on this process.
- Blinded site staff must observe the participant for at least 30 minutes after study intervention administration for any acute reactions. Record any acute reactions (including time of onset) in the participant's source documents and on the AE page of the CRF, and on an SAE form as applicable.
- Ensure the participant remains comfortable with the chosen e-diary platform and assist the participant in downloading the study application onto the participant's own device or issue a provisioned device if required.

- Review instructions on e-diary completion, and ask the participant to complete the reactogenicity e-diary from Day 1 through Day 7, with Day 1 being the day of vaccination.

- Ask the participant to contact the site staff or investigator immediately if the participant experiences any of the following from Day 1 through Day 7 after vaccination (where Day 1 is the day of vaccination) to determine if an unscheduled reactogenicity visit is required:

  - Fever ≥39.0°C (≥102.1°F).

  - Redness or swelling at the injection site measuring greater than 10 cm (>20 measuring device units).

  - Severe pain at the injection site.

  - Any severe systemic event.

- Issue a measuring device to measure local reactions at the injection site and a thermometer for recording daily temperatures and provide instructions on their use.

- Record AEs/SAEs as described in Section 8.3.

- Ask the participant to contact the site staff or investigator if a medically attended event (eg, doctor's visit, emergency room visit) or hospitalization occurs.

- Ask the participant to contact the site staff or investigator if he/she develops symptoms of a COVID-19 infection, as defined by the CDC,[14] including:

  - New or increased cough;

  - New or increased shortness of breath;

  - Chills;

  - New or increased muscle pain;

  - New loss of taste/smell;

  - Sore throat;

  - Diarrhea;

  - Vomiting.

- Schedule an appointment for the participant to return for the next study visit.

- Remind the participant to bring the reactogenicity e-diary to the next visit.
- Complete the source documents.
- The investigator or an authorized designee completes the CRFs and an unblinded dispenser/administrator updates the study intervention accountability records.

The investigator or appropriately qualified designee reviews the reactogenicity e-diary data online following vaccination to evaluate participant compliance and as part of the ongoing safety review. Daily review is optimal during the active diary period.

8.11.5. Visit 5 – 1-Week Follow-up (6 to 8 Days After Visit 4)

- Discuss contraceptive use as described in Section 10.4.
- Record nonstudy vaccinations as described in Section 6.5.
- Record details of any of the prohibited medications specified in Section 6.5.1 received by the participant if required for his or her clinical care.
- Collect a blood sample of approximately 50 mL for immunogenicity testing.
- Record AEs as described in Section 8.3.
- Ask the participant to contact the site staff or investigator if a medically attended event (eg, doctor's visit, emergency room visit) or hospitalization occurs.
- If the participant has completed e-diary reporting by Visit 5, the e-diary may be collected or app deleted.
- Schedule an appointment for the participant to return for the next study visit.
- Complete the source documents.
- The investigator or an authorized designee completes the CRFs.

8.11.6. Visit 6 – 1-Month Follow-up (28 to 35 Days After Visit 4)

- Discuss contraceptive use as described in in Section 10.4.
- Record nonstudy vaccinations as described in Section 6.5.
- Record details of any of the prohibited medications specified in Section 6.5.1 received by the participant if required for his or her clinical care.
- Collect a blood sample (approximately 50 mL) for immunogenicity testing and to test for prior COVID-19.

- Obtain a nasal (midturbinate) swab (collected by site staff) for determination of current SARS-CoV-2 status.

- Review the participant's reactogenicity e-diary data. Collect stop dates of any reactogenicity e-diary events ongoing on the last day that the reactogenicity e-diary was completed and record stop dates in the CRF if required.

- Record AEs/SAEs as described in Section 8.3.

- Collect the participant's reactogenicity e-diary or assist the participant to remove the study application from his or her own personal device.

- Complete the source documents.

- The investigator or an authorized designee completes the CRFs.

8.12. Unscheduled Visits for a Grade 3 or Suspected Grade 4 Reaction

If a Grade 3 local reaction (Section 8.2.2.2), systemic event (Section 8.2.2.3), or fever (Section 8.2.2.4) is reported in the reactogenicity e-diary, a telephone contact should occur to ascertain further details and determine whether a site visit is clinically indicated. If a suspected Grade 4 local reaction (Section 8.2.2.2), systemic event (Section 8.2.2.3), or fever (Section 8.2.2.4) is reported in the reactogenicity e-diary, a telephone contact or site visit should occur to confirm whether the event meets the criteria for Grade 4.

- A site visit must be scheduled as soon as possible to assess the participant unless any of the following is true:

- The participant is unable to attend the unscheduled visit.

- The local reaction/systemic event is no longer present at the time of the telephone contact.

- The participant recorded an incorrect value in the reactogenicity e-diary (confirmation of a reactogenicity e-diary data entry error).

- The PI or authorized designee determined it was not needed.

- This telephone contact will be recorded in the participant's source documentation and the CRF.

- If the participant is unable to attend the unscheduled visit, or the PI or authorized designee determined it was not needed, any ongoing local reactions/systemic events must be assessed at the next study visit.

- During the unscheduled visit, the reactions should be assessed by the investigator or a medically qualified member of the study staff such as a study physician or a study nurse, as applicable to the investigator's local practice, who will:
  - Measure body temperature (°F/°C).
  - Measure minimum and maximum diameters of redness (if present).
  - Measure minimum and maximum diameters of swelling (if present).
- Assess injection site pain (if present) in accordance with the grades provided in Section 8.2.2.2.
- Assess systemic events (if present) in accordance with the grades provided in Section 8.2.2.3.
- Assess for other findings associated with the reaction and record on the AE page of the CRF, if appropriate.

The investigator or an authorized designee will complete the unscheduled visit assessment page of the CRF.

9. STATISTICAL CONSIDERATIONS

Methodology for summary and statistical analyses of the data collected in this study is described here and further detailed in a SAP, which will be maintained by the sponsor. The SAP may modify what is outlined in the protocol where appropriate; however, any major modifications of the primary endpoint definitions or their analyses will also be reflected in a protocol amendment.

9.1. Estimands and Statistical Hypotheses

9.1.1. Estimands

The estimands corresponding to each primary and secondary objective are described in the tables in Section 3.

The estimands to evaluate the immunogenicity objectives are based on the evaluable immunogenicity population (Section 9.3). These estimands estimate the vaccine effect in the hypothetical settings where participants follow the study schedules and protocol requirements as directed. The estimands address the objective of estimating the maximum potential difference between 2 groups, since the impact of noncompliance is likely to diminish the observed difference between the 2 groups. Missing antibody results will not be imputed. Immunogenicity results that are below the LLOQ will be set to 0.5 × LLOQ in the analysis; this may be adjusted once additional data on the assay characteristics become available.

In the primary safety objective evaluations, missing reactogenicity e-diary data will not be imputed. Missing AE start dates will be imputed according to Pfizer safety rules. No other missing information will be imputed in the safety analysis.

9.1.2. Statistical Hypothesis

Primary Study

There are 2 primary immunogenicity objectives on manufacturing lot comparisons. The first primary immunogenicity objective is to assess the similarity of the immune response induced by BNT162b2 30 μg across the 3 US lots. The null hypothesis (H_{01}) is

$$H_{01}: |\ln(\mu_1)-\ln(\mu_2)| \geq \ln(1.5) \textit{ or } |\ln(\mu_1)-\ln(\mu_3)| \geq \ln(1.5) \textit{ or } |\ln(\mu_2)-\ln(\mu_3)| \geq \ln(1.5)$$

where ln (1.5) corresponds to a 1.5-fold equivalence margin, and $\ln(\mu_1)$, $\ln(\mu_2)$, and $\ln(\mu_3)$ are the natural log of the geometric mean of full-length S-binding IgG levels measured 1 month after Dose 2 from participants receiving BNT162b2 30 μg from the US lots in Arm 1, Arm 2, and Arm 3, respectively.

Two lots will be considered similar if the 2-sided 95% CI for the GMR is contained in the interval (0.67, 1.5). The 3 lots will be considered similar if the 1.5-fold equivalence criterion is met for all 3 between-lot comparisons (Arm 1 to Arm 2, Arm 1 to Arm 3, and Arm 2 to Arm 3).

The second primary immunogenicity objective is to assess the similarity of the immune response induced by BNT162b2 30 μg in the EU lot to the US lots. The null hypothesis (H_{02}) is

$$H_{02}: |\ln(\mu_4)-\ln(\mu_p)| \geq \ln(1.5)$$

where ln (1.5) corresponds to a 1.5-fold equivalence margin, and $\ln(\mu_4)$ and $\ln(\mu_p)$ are the natural log of the geometric mean of full-length S-binding IgG levels measured 1 month after Dose 2 from participants receiving the BNT162b2 30 μg from the EU lot and the 3 pooled US lots, respectively.

The EU lot and the US lots will be considered similar if the 2-sided 95% CI for the GMR is contained in the interval (0.67, 1.5).

The primary immunogenicity objective on dose comparison is to assess the noninferiority of immune response of 20 μg to the standard 30-μg dose (prepared from the same lot). The null hypothesis is

$$H_{03}: \ln(\mu_{20})-\ln(\mu_{30}) \leq \ln(0.67)$$

where ln (0.67) corresponds to a 1.5-fold noninferiority margin and $\ln(\mu_{20})$ and $\ln(\mu_{30})$ are the natural log of the geometric mean of the SARS-CoV-2 neutralizing titers measured 1 month

after Dose 2 from participants receiving the BNT162b2 20-µg dose and 30-µg dose (from the same US lot), respectively.

Noninferiority of the 20-µg dose to the corresponding 30-µg dose will be declared if the lower limit of the 2-sided 95% CI for the GMR is >0.67.

Booster Study

Not applicable.

CCI

[redacted]

9.2. Sample Size Determination

Primary Study

The study sample size is based on the lot-to-lot similarity evaluation for the first and second primary immunogenicity endpoints, full-length S-binding IgG levels 1 month after Dose 2, using a 1.5-fold equivalence margin for each between-lot comparison across 3 US lots (Arms 1-3) and the comparison of the EU lot (Arm 4) to the US lots.

CCI [redacted]

With 270 evaluable participants per US lot (Arms 1-3), and the stated assumptions on the maximum between-lot difference and the standard deviation, the study has a power of 91.7% for considering the 3 US lots to be similar. The study will also provide 92.8% power for considering the EU lot (Arm 4) similar to the US lots, with 135 evaluable participants in the EU lot (Arm 4) and 810 evaluable participants in the pooled US lots (Arms 1-3) CCI [redacted]

With 270 evaluable participants each in the 20-µg dose group and corresponding 30-µg dose group, and assumptions on the standard deviation CCI [redacted] in SARS-CoV-2 neutralizing titers (on the natural log scale) between the 2 dose groups, the study has 94.7% power to declare noninferiority of 20 µg to 30 µg CCI [redacted]

Assuming a nonevaluable rate of 20%, the study will randomize approximately 340 participants in each US lot (Arms 1-3), 170 participants in the EU lot (Arm 4), and 340 participants in the 20-µg dose group (Arm 5) to achieve the required evaluable participants.

CCI [redacted]

Booster Study

The study size in each vaccine group is not based on any formal hypothesis test for any endpoint. All statistical analyses will be descriptive.

The primary safety objectives include the endpoints for AEs reported within 1 month after vaccination. With 30 participants in each vaccine group, if the true AE rate is 1%, the probability of observing at least 1 AE is 26% (Table 5).

Table 5. Probability of Observing an Event Given a Specified Incidence Rate With 30 Participants per Group

True Rate of an AE	Probability of Observing at Least 1 AE
0.5%	14.0%
1%	26.0%
2%	45.5%
4%	70.6%
5%	78.5%
10%	95.8%

9.3. Analysis Sets

Primary Study

For purposes of analysis, the following analysis sets are defined:

Participant Analysis Set	Description
Enrolled	All participants who have a signed ICD.
Randomized	All participants who are assigned a randomization number in the IRT system.
Evaluable immunogenicity	All eligible randomized participants who receive 2 doses of the vaccine to which they are randomized with Dose 2 received within the predefined window, have at least 1 valid and determinate immunogenicity result from the blood sample collected within an appropriate window at 1 month after the Dose 2 visit, are negative for SARS-CoV-2 infection during the study, and have no other important protocol deviations as determined by the clinician.
All-available immunogenicity	All participants who receive at least 1 dose of the study intervention with at least 1 valid and determinate immunogenicity result after vaccination.
Safety	All randomized participants who receive at least 1 dose of the study intervention.

Booster Study

For purposes of analysis, the following analysis sets are defined:

Participant Analysis Set	Description
Enrolled	All participants who have a signed ICD at Visit 4.
Randomized	All participants who are assigned a randomization number at Visit 4 in the IRT system.
Booster evaluable immunogenicity	All eligible randomized participants who receive 2 doses of the vaccine to which they are randomized in the primary study with Dose 2 received within the predefined window, receive Dose 3 to which they are randomized in the booster study with Dose 3 received within the predefined window, have at least 1 valid and determinate immunogenicity result from the blood sample collected within an appropriate window at 1 month after the Dose 3 visit, are negative for SARS-CoV-2 infection during the primary and booster studies, and have no other important protocol deviations as determined by the clinician.
Booster all-available immunogenicity	All participants who receive Dose 3 with at least 1 valid and determinate immunogenicity result after Dose 3.
Safety	All randomized participants who receive Dose 3.

9.4. Statistical Analyses

The SAP will be developed and finalized before any analyses are performed and will describe the analyses and procedures for accounting for missing, unused, and spurious data. This section is a summary of the planned statistical analyses of the primary and secondary endpoints.

9.4.1. General Considerations

Unless stated otherwise, "vaccine group" in this section refers to participants receiving any 1 of the three 30-µg US lots, the (30-µg) EU lot, or the 20-µg dose group for the primary study and to participants receiving BNT162b2 at 30 µg or BNT162b2.B.1.351 at 30 µg (refer to Section 4.1). CIs for all endpoints in the statistical analysis will be presented as 2-sided at the 95% level unless specified otherwise.

For all the immunogenicity endpoints, the analysis will be based on the evaluable immunogenicity population. An additional analysis will be performed based on the all-available immunogenicity population if there is a large enough difference in sample size between the all-available immunogenicity population and the evaluable immunogenicity

population. Participants will be summarized according to the vaccine group to which they were randomized.

The safety analyses will be based on the safety population. Participants will be summarized by vaccine group according to the investigational products they actually received.

9.4.1.1. Analyses for Binary Data

Descriptive statistics for categorical variables (eg, proportions) are the percentage (%), the numerator (n) and the denominator (N) used in the percentage calculation, and the 95% CIs where applicable.

The exact 95% CI for binary endpoints for each group will be computed using the F distribution (Clopper-Pearson).

9.4.1.2. Analyses for Continuous Data

Unless otherwise stated, descriptive statistics for continuous variables are n, mean, median, standard deviation, minimum, and maximum.

9.4.1.2.1. Geometric Mean Ratios

Model-Based

As the primary approach, the GMR and associated 95% CI will be calculated by exponentiating the difference in LS means and the corresponding CIs based on analysis of logarithmically transformed assay results using a linear regression model.

Unadjusted

The GMRs will be calculated as the mean of the difference of logarithmically transformed assay results between 2 vaccine groups and exponentiating the mean. Two-sided CIs will be obtained by calculating CIs using Student's t-distribution for the mean difference of the logarithmically transformed assay results and exponentiating the confidence limits.

9.4.1.2.2. Geometric Means

The geometric means will be calculated as the mean of the assay results after making the logarithm transformation and then exponentiating the mean to express results on the original scale. Two-sided 95% CIs will be obtained by taking log transforms of assay results, calculating the 95% CI with reference to Student's t-distribution, and then exponentiating the confidence limits.

9.4.1.2.3. Geometric Mean Fold Rises

GMFRs are defined as ratios of the results at a later time point to the results at an earlier time point. GMFRs are limited to participants with nonmissing values at both time points.

GMFRs will be calculated as the mean of the difference of logarithmically transformed assay results (later time point minus earlier time point) and exponentiating the mean. The associated 2-sided 95% CIs will be obtained by constructing CIs using Student's t-distribution for the mean difference on the logarithm scale and exponentiating the confidence limits.

9.4.1.2.4. Reverse Cumulative Distribution Curves

Empirical RCDCs will plot proportions of participants with values equal to or exceeding a specified assay value versus the indicated assay value, for all observed assay values. Data points will be joined by a step function with data points on the left side of the step.

9.4.2. Primary Endpoint(s)

Primary Study

Endpoint	Statistical Analysis Methods
Immunogenicity	**GMRs of full-length S-binding IgG levels between the US lots** For full-length S-binding levels, the GMRs for each between-lot comparison (Arm 1/Arm 2, Arm 1/Arm 3, and Arm 2/Arm 3) at 1 month after Dose 2 will be provided along with associated 2-sided 95% CIs (see Section 9.4.1.2.1). Using a 1.5-fold equivalence margin, 2 lots will be considered similar if the 2-sided 95% CI for each GMR is contained in the interval (0.67, 1.5). **GMR of full-length S-binding IgG levels between the EU lot and the 3 US lots** The GMR of the EU lot (Arm 4) to the pooled US lots (Arm 4/pooled Arms 1, 2, and 3) at 1 month after Dose 2 will be provided along with associated 2-sided 95% CIs (see Section 9.4.1.2.1). Using a 1.5-fold equivalence margin, the EU lot Arm 4) and the pooled US lots (Arms 1-3) will be considered similar if the 2-sided 95% CI for the GMR is contained in the interval (0.67, 1.5).

Endpoint	Statistical Analysis Methods
	GMR of SARS-CoV-2 neutralizing titers between the 20-µg dose and the corresponding 30-µg dose The GMR of the 20-µg dose (Arm 5) to the corresponding 30-µg dose (Arm 1, 2, or 3) (20 µg/30 µg) at 1 month after Dose 2 will be provided along with associated 2-sided 95% CIs (see Section 9.4.1.2.1). Using a 1.5-fold noninferiority margin, noninferiority of the 20-µg dose (Arm 5) to the corresponding 30-µg dose (Arm 1, 2, or 3) will be declared if the lower limit of the 2-sided 95% CI for the GMR is >0.67. As the primary approach for these similarity and noninferiority assessments, a linear regression model that includes a term for age and vaccine group will be used to calculate the adjusted GMR and 2-sided 95% CI. The unadjusted GMR and CI will also be calculated.
Safety	Descriptive statistics will be provided for each reactogenicity endpoint for each dose and vaccine group. Local reactions and systemic events from Day 1 through Day 7 after each vaccination will be presented by severity and cumulatively across severity levels. Descriptive summary statistics will include counts and percentages of participants with the indicated endpoint and the associated Clopper-Pearson 95% CIs (see Section 9.4.1.1). AEs and SAEs will be categorized according to MedDRA terms. Counts, percentages, and the associated Clopper-Pearson 95% CIs of AEs and SAEs from Dose 1 to 1 month after Dose 2 will be provided for each vaccine group.

Booster Study

Endpoint	Statistical Analysis Methods
Immunogenicity	**GMCs of full-length S-binding IgG levels** For full-length S-binding IgG levels, GMCs and 2-sided 95% CIs will be provided for each vaccine group at baseline (before Dose 1), 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3. Statistical methods are described in Section 9.4.1.2.2.

Endpoint	Statistical Analysis Methods
	GMFRs of full-length S-binding IgG levels For full-length S-binding IgG levels, the GMFRs and 2-sided 95% CIs will be provided for each vaccine group from 1 month after Dose 2 to 1 week after and 1 month after Dose 3 and from before Dose 3 to 1 week after and 1 month after Dose 3. GMFRs will be limited to participants with nonmissing values at both time points being considered. The statistical methods are described in Section 9.4.1.2.3. **GMTs of SARS-CoV-2 reference-strain neutralizing titers and SARS-CoV-2 B.1.351-strain neutralizing titers** For SARS-CoV-2 neutralizing titers, GMTs and 2-sided 95% CIs will be provided for each vaccine group at baseline (before Dose 1), 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3. Statistical methods are described in Section 9.4.1.2.2. **GMFRs of SARS-CoV-2 reference-strain neutralizing titers and SARS-CoV-2 B.1.351-strain neutralizing titers** For SARS-CoV-2 neutralizing titers, the GMFRs and 2-sided 95% CIs will be provided for each vaccine group from 1 month after Dose 2 to 1 week after and 1 month after Dose 3 and from before Dose 3 to 1 week after and 1 month after Dose 3. GMFRs will be limited to participants with nonmissing values at both time points being considered. The statistical methods are described in Section 9.4.1.2.3. **Percentage of participants with seroresponse* to the SARS-CoV-2 reference strain and SARS-CoV-2 B.1.351 strain in neutralizing titers** The percentage of participants with a seroresponse to the reference strain and to the B.1.351 strain (and corresponding 2-sided Clopper-Pearson 95% CI) will be provided by vaccine group at 1 month after Dose 2, before Dose 3, and 1 week after and 1 month after Dose 3 (see Section 9.4.1.1).
* Seroresponse is defined as ≥4-fold increase from baseline (before Dose 1) to the specified time point. If the baseline measurement is below LLOQ, a postvaccination measurement of ≥4 × LLOQ is considered a seroresponse.	

9.4.3. Secondary Endpoints

Primary Study

Endpoint	Statistical Analysis Methods
Immunogenicity	**GMCs of full-length S-binding IgG levels** For full-length S-binding IgG levels, GMCs and 2-sided 95% CIs will be provided for each vaccine group (individual and pooled US lots, EU lot) at baseline (before Dose 1) and at 1 month after Dose 2. Statistical methods are described in Section 9.4.1.2.2. **GMFRs of full-length S-binding IgG levels** For full-length S-binding IgG levels, the GMFRs and 2-sided 95% CIs will be provided for each vaccine group (individual and pooled US lots, EU lot) from baseline (before Dose 1) to 1 month after Dose 2. GMFRs will be limited to participants with nonmissing values prior to the first dose and at the postvaccination time point. The statistical methods are described in Section 9.4.1.2.3. **GMTs of SARS-CoV-2 neutralizing titers** For SARS-CoV-2 neutralizing titers, GMTs and 2-sided 95% CIs will be provided for the 20-µg dose (Arm 5) and the corresponding 30-µg dose (Arm 1, 2, or 3) at 1 month after Dose 2. Statistical methods are described in Section 9.4.1.2.2. **GMFRs of SARS-CoV-2 neutralizing titers** For SARS-CoV-2 neutralizing titers, the GMFRs and 2-sided 95% CIs will be provided for the 20-µg dose (Arm 5) and the corresponding 30-µg dose (Arm 1, 2, or 3) from baseline (before Dose 1) to 1 month after Dose 2. GMFRs will be limited to participants with nonmissing values prior to the first dose and at the postvaccination time point. The statistical methods are described in Section 9.4.1.2.3.

9.5. Interim Analyses

No formal interim analysis will be conducted for this study. CCI [redacted]

9.6. Data Monitoring Committee or Other Independent Oversight Committee

This study will use a DMC. The DMC is independent of the study team and includes external members. The DMC charter describes the role of the DMC in more detail.

The DMC will be responsible for ongoing monitoring of the safety of participants in the study according to the charter. This may include, but is not limited to:

- Contemporaneous review of related AEs up to 1 month after completion of the vaccination schedule,
- Contemporaneous review of all SAEs up to 1 month after completion of the vaccination schedule.

The recommendations made by the DMC to alter the conduct of the study will be forwarded to the appropriate Pfizer personnel for final decision. Pfizer will forward such decisions, which may include summaries of aggregate analyses of safety data, to regulatory authorities, as appropriate.

10. SUPPORTING DOCUMENTATION AND OPERATIONAL CONSIDERATIONS

10.1. Appendix 1: Regulatory, Ethical, and Study Oversight Considerations

10.1.1. Regulatory and Ethical Considerations

This study will be conducted in accordance with the protocol and with the following:

- Consensus ethical principles derived from international guidelines including the Declaration of Helsinki and CIOMS International Ethical Guidelines;
- Applicable ICH GCP guidelines;
- Applicable laws and regulations, including applicable privacy laws.

The protocol, protocol amendments, ICD, SRSD(s), and other relevant documents (eg, advertisements) must be reviewed and approved by the sponsor and submitted to an IRB/EC by the investigator and reviewed and approved by the IRB/EC before the study is initiated.

Any amendments to the protocol will require IRB/EC approval before implementation of changes made to the study design, except for changes necessary to eliminate an immediate hazard to study participants.

The investigator will be responsible for the following:

- Providing written summaries of the status of the study to the IRB/EC annually or more frequently in accordance with the requirements, policies, and procedures established by the IRB/EC;
- Notifying the IRB/EC of SAEs or other significant safety findings as required by IRB/EC procedures;
- Providing oversight of the conduct of the study at the site and adherence to requirements of 21 CFR, ICH guidelines, the IRB/EC, European regulation 536/2014 for clinical studies (if applicable), and all other applicable local regulations.

10.1.1.1. Reporting of Safety Issues and Serious Breaches of the Protocol or ICH GCP

In the event of any prohibition or restriction imposed (ie, clinical hold) by an applicable regulatory authority in any area of the world, or if the investigator is aware of any new information that might influence the evaluation of the benefits and risks of the study intervention, Pfizer should be informed immediately.

In addition, the investigator will inform Pfizer immediately of any urgent safety measures taken by the investigator to protect the study participants against any immediate hazard, and of any serious breaches of this protocol or of ICH GCP that the investigator becomes aware of.

10.1.2. Informed Consent Process

The investigator or his/her representative will explain the nature of the study to the participant or his or her parent(s)/legal guardian and answer all questions regarding the study. The participant or his or her parent(s)/legal guardian should be given sufficient time and opportunity to ask questions and to decide whether or not to participate in the trial. When consent is obtained from a participant's parent(s)/legal guardian, the participant's assent (affirmative agreement) must be subsequently obtained when the participant has the capacity to provide assent, as determined by the IRB/EC. If study participants are minors who reach the age of majority during the study, as recognized under local law, they must be reconsented as adults to remain in the study.

Participants must be informed that their participation is voluntary. Participants or their parent(s)/legal guardian will be required to sign a statement of informed consent that meets the requirements of 21 CFR 50, local regulations, ICH guidelines, HIPAA requirements, where applicable, and the IRB/EC or study center.

The investigator must ensure that each study participant or his or her parent(s)/legal guardian is fully informed about the nature and objectives of the study, the sharing of data related to the study, and possible risks associated with participation, including the risks associated with the processing of the participant's personal data.

The participant must be informed that his/her personal study-related data will be used by the sponsor in accordance with local data protection law. The level of disclosure must also be explained to the participant or his or her parent(s)/legal guardian.

The participant must be informed that his/her medical records may be examined by Clinical Quality Assurance auditors or other authorized personnel appointed by the sponsor, by appropriate IRB/EC members, and by inspectors from regulatory authorities.

The investigator further must ensure that each study participant or his or her parent(s)/legal guardian is fully informed about his or her right to access and correct his or her personal data and to withdraw consent for the processing of his or her personal data.

The medical record must include a statement that written informed consent was obtained before the participant was enrolled in the study and the date the written consent was obtained. The authorized person obtaining the informed consent must also sign the ICD.

Participants must be reconsented to the most current version of the ICD(s) during their participation in the study.

A copy of the ICD(s) must be provided to the participant or his or her parent(s)/legal guardian. Participants who are rescreened are required to sign a new ICD.

Unless prohibited by local requirements or IRB/EC decision, the ICD will contain a separate section that addresses the use of samples for optional additional research. The optional additional research does not require the collection of any further samples. The investigator

or authorized designee will explain to each participant the objectives of the additional research. Participants will be told that they are free to refuse to participate and may withdraw their consent at any time and for any reason during the storage period.

10.1.3. Data Protection

All parties will comply with all applicable laws, including laws regarding the implementation of organizational and technical measures to ensure protection of participant data.

Participants' personal data will be stored at the study site in encrypted electronic and/or paper form and will be password protected or secured in a locked room to ensure that only authorized study staff have access. The study site will implement appropriate technical and organizational measures to ensure that the personal data can be recovered in the event of disaster. In the event of a potential personal data breach, the study site will be responsible for determining whether a personal data breach has in fact occurred and, if so, providing breach notifications as required by law.

To protect the rights and freedoms of participants with regard to the processing of personal data, participants will be assigned a single, participant-specific numerical code. Any participant records or data sets that are transferred to the sponsor will contain the numerical code; participant names will not be transferred. All other identifiable data transferred to the sponsor will be identified by this single, participant-specific code. The study site will maintain a confidential list of participants who participated in the study, linking each participant's numerical code to his or her actual identity and medical record identification. In case of data transfer, the sponsor will protect the confidentiality of participants' personal data consistent with the clinical study agreement and applicable privacy laws.

10.1.4. Dissemination of Clinical Study Data

Pfizer fulfills its commitment to publicly disclose clinical study results through posting the results of studies on www.clinicaltrials.gov (ClinicalTrials.gov), the EudraCT, and/or www.pfizer.com, and other public registries in accordance with applicable local laws/regulations. In addition, Pfizer reports study results outside of the requirements of local laws/regulations pursuant to its SOPs.

In all cases, study results are reported by Pfizer in an objective, accurate, balanced, and complete manner and are reported regardless of the outcome of the study or the country in which the study was conducted.

www.clinicaltrials.gov

Pfizer posts clinical trial results on www.clinicaltrials.gov for Pfizer-sponsored interventional studies (conducted in patients) that evaluate the safety and/or efficacy of a product, regardless of the geographical location in which the study is conducted. These results are submitted for posting in accordance with the format and timelines set forth by US law.

EudraCT

Pfizer posts clinical trial results on EudraCT for Pfizer-sponsored interventional studies in accordance with the format and timelines set forth by EU requirements.

www.pfizer.com

Pfizer posts public disclosure synopses (CSR synopses in which any data that could be used to identify individual participants have been removed) on www.pfizer.com for Pfizer-sponsored interventional studies at the same time the corresponding study results are posted to www.clinicaltrials.gov.

Documents within marketing authorization packages/submissions

Pfizer complies with the European Union Policy 0070, the proactive publication of clinical data to the EMA website. Clinical data, under Phase 1 of this policy, includes clinical overviews, clinical summaries, CSRs, and appendices containing the protocol and protocol amendments, sample CRFs, and statistical methods. Clinical data, under Phase 2 of this policy, includes the publishing of individual participant data. Policy 0070 applies to new marketing authorization applications submitted via the centralized procedure since 01 January 2015 and applications for line extensions and for new indications submitted via the centralized procedure since 01 July 2015.

Data Sharing

Pfizer provides researchers secure access to patient-level data or full CSRs for the purposes of "bona-fide scientific research" that contributes to the scientific understanding of the disease, target, or compound class. Pfizer will make available data from these trials 24 months after study completion. Patient-level data will be anonymized in accordance with applicable privacy laws and regulations. CSRs will have personally identifiable information redacted.

Data requests are considered from qualified researchers with the appropriate competencies to perform the proposed analyses. Research teams must include a biostatistician. Data will not be provided to applicants with significant conflicts of interest, including individuals requesting access for commercial/competitive or legal purposes.

10.1.5. Data Quality Assurance

All participant data relating to the study will be recorded on printed or electronic CRF unless transmitted to the sponsor or designee electronically (eg, laboratory data). The investigator is responsible for verifying that data entries are accurate and correct by physically or electronically signing the CRF.

The investigator must maintain accurate documentation (source data) that supports the information entered in the CRF.

The investigator must ensure that the CRFs are securely stored at the study site in encrypted electronic and/or paper form and are password protected or secured in a locked room to prevent access by unauthorized third parties.

The investigator must permit study-related monitoring, audits, IRB/EC review, and regulatory agency inspections and provide direct access to source data documents. This verification may also occur after study completion. It is important that the investigator(s) and their relevant personnel are available during the monitoring visits and possible audits or inspections and that sufficient time is devoted to the process.

Monitoring details describing strategy (eg, risk-based initiatives in operations and quality such as risk management and mitigation strategies and analytical risk-based monitoring), methods, responsibilities, and requirements, including handling of noncompliance issues and monitoring techniques (central, remote, or on-site monitoring), are provided in the monitoring plan.

The sponsor or designee is responsible for the data management of this study, including quality checking of the data.

Study monitors will perform ongoing source data verification to confirm that data entered into the CRF by authorized site personnel are accurate, complete, and verifiable from source documents; that the safety and rights of participants are being protected; and that the study is being conducted in accordance with the currently approved protocol and any other study agreements, ICH GCP, and all applicable regulatory requirements.

Records and documents, including signed ICDs, pertaining to the conduct of this study must be retained by the investigator for 15 years after study completion unless local regulations or institutional policies require a longer retention period. No records may be destroyed during the retention period without the written approval of the sponsor. No records may be transferred to another location or party without written notification to the sponsor. The investigator must ensure that the records continue to be stored securely for as long as they are maintained.

When participant data are to be deleted, the investigator will ensure that all copies of such data are promptly and irrevocably deleted from all systems.

The investigator(s) will notify the sponsor or its agents immediately of any regulatory inspection notification in relation to the study. Furthermore, the investigator will cooperate with the sponsor or its agents to prepare the investigator site for the inspection and will allow the sponsor or its agent, whenever feasible, to be present during the inspection. The investigator site and investigator will promptly resolve any discrepancies that are identified between the study data and the participant's medical records. The investigator will promptly provide copies of the inspection findings to the sponsor or its agent. Before response submission to the regulatory authorities, the investigator will provide the sponsor or its agents with an opportunity to review and comment on responses to any such findings.

10.1.6. Source Documents

Source documents provide evidence for the existence of the participant and substantiate the integrity of the data collected. Source documents are filed at the investigator site.

Data reported on the CRF or entered in the eCRF that are from source documents must be consistent with the source documents or the discrepancies must be explained. The investigator may need to request previous medical records or transfer records, depending on the study. Also, current medical records must be available.

Definition of what constitutes source data can be found in the study monitoring plan.

Description of the use of computerized system is documented in the Data Management Plan.

10.1.7. Study and Site Start and Closure

The study start date is the date on which the clinical study will be open for recruitment of participants.

The first act of recruitment is the date of the first participant's first visit and will be the study start date.

The sponsor designee reserves the right to close the study site or terminate the study at any time for any reason at the sole discretion of the sponsor. Study sites will be closed upon study completion. A study site is considered closed when all required documents and study supplies have been collected and a study-site closure visit has been performed.

The investigator may initiate study-site closure at any time upon notification to the sponsor or designee if requested to do so by the responsible IRB/EC or if such termination is required to protect the health of study participants.

Reasons for the early closure of a study site by the sponsor may include but are not limited to:

- Failure of the investigator to comply with the protocol, the requirements of the IRB/EC or local health authorities, the sponsor's procedures, or GCP guidelines;
- Inadequate recruitment of participants by the investigator;
- Discontinuation of further study intervention development.

If the study is prematurely terminated or suspended, the sponsor shall promptly inform the investigators, the ECs/IRBs, the regulatory authorities, and any CRO(s) used in the study of the reason for termination or suspension, as specified by the applicable regulatory requirements. The investigator shall promptly inform the participant and should assure appropriate participant therapy and/or follow-up.

Study termination is also provided for in the clinical study agreement. If there is any conflict between the contract and this protocol, the contract will control as to termination rights.

10.1.8. Sponsor's Qualified Medical Personnel

The contact information for the sponsor's appropriately qualified medical personnel for the study is documented in the study contact list located in the supporting study documentation electronic system.

To facilitate access to appropriately qualified medical personnel on study-related medical questions or problems, participants are provided with a contact card at the time of informed consent. The contact card contains, at a minimum, protocol and study intervention identifiers, participant numbers, contact information for the investigator site, and contact details for a contact center in the event that the investigator site staff cannot be reached to provide advice on a medical question or problem originating from another healthcare professional not involved in the participant's participation in the study. The contact number can also be used by investigator staff if they are seeking advice on medical questions or problems; however, it should be used only in the event that the established communication pathways between the investigator site and the study team are not available. It is therefore intended to augment, but not replace, the established communication pathways between the investigator site and the study team for advice on medical questions or problems that may arise during the study. The contact number is not intended for use by the participant directly, and if a participant calls that number, he or she will be directed back to the investigator site.

10.2. Appendix 2: Clinical Laboratory Tests

A pregnancy test will be performed at times defined in the SoA section of this protocol: Visit 1 (Vaccination 1/Day 1) and Visit 2 (Vaccination 2/19-23 days after Visit 1).

- Pregnancy test (β-hCG): Local urine testing will be standard for the protocol unless serum testing is required by local regulation or IRB/EC for female participants of childbearing potential.

Unscheduled clinical laboratory measurements may be obtained at any time during the study to assess any perceived safety issues. Investigators must document their review of each laboratory safety report.

10.3. Appendix 3: Adverse Events: Definitions and Procedures for Recording, Evaluating, Follow-up, and Reporting

10.3.1. Definition of AE

AE Definition
• An AE is any untoward medical occurrence in a patient or clinical study participant, temporally associated with the use of study intervention, whether or not considered related to the study intervention. • NOTE: An AE can therefore be any unfavorable and unintended sign (including an abnormal laboratory finding), symptom, or disease (new or exacerbated) temporally associated with the use of study intervention.

Events <u>Meeting</u> the AE Definition

• Any abnormal laboratory test results (hematology, clinical chemistry, or urinalysis) or other safety assessments (eg, ECG, radiological scans, vital sign measurements), including those that worsen from baseline, considered clinically significant in the medical and scientific judgment of the investigator. Any abnormal laboratory test results that meet any of the conditions below must be recorded as an AE:
 	
  • Is associated with accompanying symptoms.
 	
  • Requires additional diagnostic testing or medical/surgical intervention.
 	
  • Leads to a change in study dosing (outside of any protocol-specified dose adjustments) or discontinuation from the study, significant additional concomitant drug treatment, or other therapy.
 	
• Exacerbation of a chronic or intermittent preexisting condition including either an increase in frequency and/or intensity of the condition.
 	
• New conditions detected or diagnosed after study intervention administration even though it may have been present before the start of the study.
 	
• Signs, symptoms, or the clinical sequelae of a suspected drug-drug interaction.
 	
• Signs, symptoms, or the clinical sequelae of a suspected overdose of either study intervention or a concomitant medication. Overdose per se will not be reported as an AE/SAE unless it is an intentional overdose taken with possible suicidal/self-harming intent. Such overdoses should be reported regardless of sequelae.

Events NOT Meeting the AE Definition
• Any clinically significant abnormal laboratory findings or other abnormal safety assessments which are associated with the underlying disease, unless judged by the investigator to be more severe than expected for the participant's condition. • The disease/disorder being studied or expected progression, signs, or symptoms of the disease/disorder being studied, unless more severe than expected for the participant's condition. • Medical or surgical procedure (eg, endoscopy, appendectomy): the condition that leads to the procedure is the AE. • Situations in which an untoward medical occurrence did not occur (social and/or convenience admission to a hospital). • Anticipated day-to-day fluctuations of preexisting disease(s) or condition(s) present or detected at the start of the study that do not worsen.

10.3.2. Definition of SAE

If an event is not an AE per definition above, then it cannot be an SAE even if serious conditions are met (eg, hospitalization for signs/symptoms of the disease under study, death due to progression of disease).

An SAE is defined as any untoward medical occurrence that, at any dose:
a. Results in death
b. Is life-threatening The term "life-threatening" in the definition of "serious" refers to an event in which the participant was at risk of death at the time of the event. It does not refer to an event that hypothetically might have caused death if it were more severe.
c. Requires inpatient hospitalization or prolongation of existing hospitalization In general, hospitalization signifies that the participant has been detained (usually involving at least an overnight stay) at the hospital or emergency ward for observation and/or treatment that would not have been appropriate in the physician's office or outpatient setting. Complications that occur during hospitalization are AEs. If a complication prolongs hospitalization or fulfills any other serious criteria, the event is serious. When in doubt as to whether "hospitalization" occurred or was necessary, the AE should be considered serious.

Hospitalization for elective treatment of a preexisting condition that did not worsen from baseline is not considered an AE.

d. Results in persistent disability/incapacity

- The term disability means a substantial disruption of a person's ability to conduct normal life functions.
- This definition is not intended to include experiences of relatively minor medical significance such as uncomplicated headache, nausea, vomiting, diarrhea, influenza, and accidental trauma (eg, sprained ankle) which may interfere with or prevent everyday life functions but do not constitute a substantial disruption.

e. Is a congenital anomaly/birth defect

f. Other situations:

- Medical or scientific judgment should be exercised in deciding whether SAE reporting is appropriate in other situations such as important medical events that may not be immediately life-threatening or result in death or hospitalization but may jeopardize the participant or may require medical or surgical intervention to prevent one of the other outcomes listed in the above definition. These events should usually be considered serious.
- Examples of such events include invasive or malignant cancers, intensive treatment in an emergency room or at home for allergic bronchospasm, blood dyscrasias or convulsions that do not result in hospitalization, or development of drug dependency or drug abuse.
- Suspected transmission via a Pfizer product of an infectious agent, pathogenic or non-pathogenic, is considered serious. The event may be suspected from clinical symptoms or laboratory findings indicating an infection in a patient exposed to a Pfizer product. The terms "suspected transmission" and "transmission" are considered synonymous. These cases are considered unexpected and handled as serious expedited cases by pharmacovigilance personnel. Such cases are also considered for reporting as product defects, if appropriate.

10.3.3. Recording/Reporting and Follow-up of AEs and/or SAEs

AE and SAE Recording/Reporting

The table below summarizes the requirements for recording adverse events on the CRF and for reporting serious adverse events on the Vaccine SAE Reporting Form to Pfizer Safety. These requirements are delineated for 3 types of events: (1) SAEs; (2) nonserious adverse events (AEs); and (3) exposure to the study intervention under study during pregnancy or breastfeeding, and occupational exposure.

It should be noted that the Vaccine SAE Reporting Form for reporting of SAE information is not the same as the AE page of the CRF. When the same data are collected, the forms must be completed in a consistent manner. AEs should be recorded using concise medical terminology and the same AE term should be used on both the CRF and the Vaccine SAE Reporting Form for reporting of SAE information.

Safety Event	**Recorded on the CRF**	**Reported on the Vaccine SAE Reporting Form to Pfizer Safety Within 24 Hours of Awareness**
SAE	All	All
Nonserious AE	All	None
Exposure to the study intervention under study during pregnancy or breastfeeding, and occupational exposure	All AEs/SAEs associated with exposure during pregnancy or breastfeeding Occupational exposure is not recorded.	All (and EDP supplemental form for EDP) Note: Include all SAEs associated with exposure during pregnancy or breastfeeding. Include all AEs/SAEs associated with occupational exposure.

- When an AE/SAE occurs, it is the responsibility of the investigator to review all documentation (eg, hospital progress notes, laboratory reports, and diagnostic reports) related to the event.
- The investigator will then record all relevant AE/SAE information in the CRF.
- It is **not** acceptable for the investigator to send photocopies of the participant's medical records to Pfizer Safety in lieu of completion of the Vaccine SAE Reporting Form/AE/SAE CRF page.

- There may be instances when copies of medical records for certain cases are requested by Pfizer Safety. In this case, all participant identifiers, with the exception of the participant number, will be redacted on the copies of the medical records before submission to Pfizer Safety.

- The investigator will attempt to establish a diagnosis of the event based on signs, symptoms, and/or other clinical information. Whenever possible, the diagnosis (not the individual signs/symptoms) will be documented as the AE/SAE.

Assessment of Intensity

The investigator will make an assessment of intensity for each AE and SAE reported during the study and assign it to 1 of the following categories:

GRADE	If required on the AE page of the CRF, the investigator will use the adjectives MILD, MODERATE, SEVERE, or LIFE-THREATENING to describe the maximum intensity of the AE. For purposes of consistency, these intensity grades are defined as follows:	
1	MILD	Does not interfere with participant's usual function.
2	MODERATE	Interferes to some extent with participant's usual function.
3	SEVERE	Interferes significantly with participant's usual function.
4	LIFE-THREATENING	Life-threatening consequences; urgent intervention indicated.

Assessment of Causality

- The investigator is obligated to assess the relationship between study intervention and each occurrence of each AE/SAE.

- A "reasonable possibility" of a relationship conveys that there are facts, evidence, and/or arguments to suggest a causal relationship, rather than a relationship cannot be ruled out.

- The investigator will use clinical judgment to determine the relationship.

- Alternative causes, such as underlying disease(s), concomitant therapy, and other risk factors, as well as the temporal relationship of the event to study intervention administration, will be considered and investigated.
- The investigator will also consult the IB and/or product information, for marketed products, in his/her assessment.
- For each AE/SAE, the investigator **must** document in the medical notes that he/she has reviewed the AE/SAE and has provided an assessment of causality.
- There may be situations in which an SAE has occurred and the investigator has minimal information to include in the initial report to the sponsor. However, **it is very important that the investigator always make an assessment of causality for every event before the initial transmission of the SAE data to the sponsor.**
- The investigator may change his/her opinion of causality in light of follow-up information and send an SAE follow-up report with the updated causality assessment.
- The causality assessment is one of the criteria used when determining regulatory reporting requirements.
- If the investigator does not know whether or not the study intervention caused the event, then the event will be handled as "related to study intervention" for reporting purposes, as defined by the sponsor. In addition, if the investigator determines that an SAE is associated with study procedures, the investigator must record this causal relationship in the source documents and CRF, and report such an assessment in the dedicated section of the Vaccine SAE Reporting Form and in accordance with the SAE reporting requirements.

Follow-up of AEs and SAEs

- The investigator is obligated to perform or arrange for the conduct of supplemental measurements and/or evaluations as medically indicated or as requested by the sponsor to elucidate the nature and/or causality of the AE or SAE as fully as possible. This may include additional laboratory tests or investigations, histopathological examinations, or consultation with other healthcare providers.
- If a participant dies during participation in the study or during a recognized follow-up period, the investigator will provide Pfizer Safety with a copy of any postmortem findings including histopathology.
- New or updated information will be recorded in the originally completed CRF.

- The investigator will submit any updated SAE data to the sponsor within 24 hours of receipt of the information.

10.3.4. Reporting of SAEs

SAE Reporting to Pfizer Safety via Vaccine SAE Reporting Form
• Facsimile transmission of the Vaccine SAE Reporting Form is the preferred method to transmit this information to Pfizer Safety. • In circumstances when the facsimile is not working, notification by telephone is acceptable with a copy of the Vaccine SAE Reporting Form sent by overnight mail or courier service. • Initial notification via telephone does not replace the need for the investigator to complete and sign the Vaccine SAE Reporting Form pages within the designated reporting time frames.

10.4. Appendix 4: Contraceptive Guidance

10.4.1. Male Participant Reproductive Inclusion Criteria

Male participants are eligible to participate if they agree to the following requirements during the intervention period and for at least 28 days after the last dose of study intervention, which corresponds to the time needed to eliminate reproductive safety risk of the study intervention(s):

- Refrain from donating sperm.

  PLUS either**:**

- Be abstinent from heterosexual intercourse with a female of childbearing potential as their preferred and usual lifestyle (abstinent on a long-term and persistent basis) and agree to remain abstinent.

  OR

- Must agree to use a male condom when engaging in any activity that allows for passage of ejaculate to another person.

- In addition to male condom use, a highly effective method of contraception may be considered in WOCBP partners of male participants (refer to the list of highly effective methods below in Section 10.4.4).

10.4.2. Female Participant Reproductive Inclusion Criteria

A female participant is eligible to participate if she is not pregnant or breastfeeding, and at least 1 of the following conditions applies:

- Is not a WOCBP (see definitions below in Section 10.4.3).

  OR

- Is a WOCBP and using an acceptable contraceptive method as described below during the intervention period (for a minimum of 28 days after the last dose of study intervention). The investigator should evaluate the effectiveness of the contraceptive method in relationship to the first dose of study intervention.

The investigator is responsible for review of medical history, menstrual history, and recent sexual activity to decrease the risk for inclusion of a woman with an early undetected pregnancy.

10.4.3. Woman of Childbearing Potential

A woman is considered fertile following menarche and until becoming postmenopausal unless permanently sterile (see below).

If fertility is unclear (eg, amenorrhea in adolescents or athletes) and a menstrual cycle cannot be confirmed before the first dose of study intervention, additional evaluation should be considered.

Women in the following categories are not considered WOCBP:

1. Premenopausal female with 1 of the following:

    - Documented hysterectomy;
    - Documented bilateral salpingectomy;
    - Documented bilateral oophorectomy.

For individuals with permanent infertility due to an alternate medical cause other than the above, (eg, mullerian agenesis, androgen insensitivity), investigator discretion should be applied to determining study entry.

Note: Documentation for any of the above categories can come from the site personnel's review of the participant's medical records, medical examination, or medical history interview. The method of documentation should be recorded in the participant's medical record for the study.

2. Postmenopausal female:

    - A postmenopausal state is defined as no menses for 12 months without an alternative medical cause. In addition, a
        - high FSH level in the postmenopausal range must be used to confirm a postmenopausal state in women under 60 years of age and not using hormonal contraception or HRT.
        - Female on HRT and whose menopausal status is in doubt will be required to use one of the nonestrogen hormonal highly effective contraception methods if they wish to continue their HRT during the study. Otherwise, they must discontinue HRT to allow confirmation of postmenopausal status before study enrollment.

10.4.4. Contraception Methods

Contraceptive use by men or women should be consistent with local availability/regulations regarding the use of contraceptive methods for those participating in clinical trials.

1. Implantable progestogen-only hormone contraception associated with inhibition of ovulation.

2. Intrauterine device.

3. Intrauterine hormone-releasing system.

4. Bilateral tubal occlusion.

5. Vasectomized partner:

    - Vasectomized partner is a highly effective contraceptive method provided that the partner is the sole sexual partner of the WOCBP and the absence of sperm has been confirmed. If not, an additional highly effective method of contraception should be used. The spermatogenesis cycle is approximately 90 days.

6. Combined (estrogen- and progestogen-containing) hormonal contraception associated with inhibition of ovulation:

    - Oral;

    - Intravaginal;

    - Transdermal;

    - Injectable.

7. Progestogen-only hormone contraception associated with inhibition of ovulation:

    - Oral;

    - Injectable.

8. Sexual abstinence:

    - Sexual abstinence is considered a highly effective method only if defined as refraining from heterosexual intercourse during the entire period of risk associated with the study intervention. The reliability of sexual abstinence needs to be evaluated in relation to the duration of the study and the preferred and usual lifestyle of the participant.

9. Progestogen-only oral hormonal contraception where inhibition of ovulation is not the primary mode of action.

10. Male or female condom with or without spermicide.

11. Cervical cap, diaphragm, or sponge with spermicide.

12. A combination of male condom with either cervical cap, diaphragm, or sponge with spermicide (double-barrier methods).

10.5. Appendix 5: Liver Safety: Suggested Actions and Follow-up Assessments

Potential Cases of Drug-Induced Liver Injury

Humans exposed to a drug who show no sign of liver injury (as determined by elevations in transaminases) are termed “tolerators,” while those who show transient liver injury, but adapt are termed “adaptors.” In some participants, transaminase elevations are a harbinger of a more serious potential outcome. These participants fail to adapt and therefore are "susceptible" to progressive and serious liver injury, commonly referred to as DILI. Participants who experience a transaminase elevation above 3 × ULN should be monitored more frequently to determine if they are an “adaptor” or are “susceptible.”

LFTs are not required as a routine safety monitoring procedure in this study. However, should an investigator deem it necessary to assess LFTs because a participant presents with clinical signs/symptoms, such LFT results should be managed and followed as described below.

In the majority of DILI cases, elevations in AST and/or ALT precede TBili elevations (>2 × ULN) by several days or weeks. The increase in TBili typically occurs while AST/ALT is/are still elevated above 3 × ULN (ie, AST/ALT and TBili values will be elevated within the same laboratory sample). In rare instances, by the time TBili elevations are detected, AST/ALT values might have decreased. This occurrence is still regarded as a potential DILI. Therefore, abnormal elevations in either AST OR ALT in addition to TBili that meet the criteria outlined below are considered potential DILI (assessed per Hy’s law criteria) cases and should always be considered important medical events, even before all other possible causes of liver injury have been excluded.

The threshold of laboratory abnormalities for a potential DILI case depends on the participant’s individual baseline values and underlying conditions. Participants who present with the following laboratory abnormalities should be evaluated further as potential DILI (Hy’s law) cases to definitively determine the etiology of the abnormal laboratory values:

- Participants with AST/ALT and TBili baseline values within the normal range who subsequently present with AST OR ALT values >3 × ULN AND a TBili value >2 × ULN with no evidence of hemolysis and an alkaline phosphatase value <2 × ULN or not available.

- For participants with baseline AST **OR** ALT **OR** TBili values above the ULN, the following threshold values are used in the definition mentioned above, as needed, depending on which values are above the ULN at baseline:

    - Preexisting AST or ALT baseline values above the normal range: AST or ALT values >2 times the baseline values AND >3 × ULN; or >8 × ULN (whichever is smaller).

- Preexisting values of TBili above the normal range: TBili level increased from baseline value by an amount of at least 1 × ULN **or** if the value reaches >3 × ULN (whichever is smaller).

Rises in AST/ALT and TBili separated by more than a few weeks should be assessed individually based on clinical judgment; any case where uncertainty remains as to whether it represents a potential Hy's law case should be reviewed with the sponsor.

The participant should return to the investigator site and be evaluated as soon as possible, preferably within 48 hours from awareness of the abnormal results. This evaluation should include laboratory tests, detailed history, and physical assessment.

In addition to repeating measurements of AST and ALT and TBili for suspected cases of Hy's law, additional laboratory tests should include albumin, CK, direct and indirect bilirubin, GGT, PT/INR, total bile acids, and alkaline phosphatase. Consideration should also be given to drawing a separate tube of clotted blood and an anticoagulated tube of blood for further testing, as needed, for further contemporaneous analyses at the time of the recognized initial abnormalities to determine etiology. A detailed history, including relevant information, such as review of ethanol, acetaminophen/paracetamol (either by itself or as a coformulated product in prescription or over-the-counter medications), recreational drug, supplement (herbal) use and consumption, family history, sexual history, travel history, history of contact with a jaundiced person, surgery, blood transfusion, history of liver or allergic disease, and potential occupational exposure to chemicals, should be collected. Further testing for acute hepatitis A, B, C, D, and E infection and liver imaging (eg, biliary tract) and collection of serum samples for acetaminophen/paracetamol drug and/or protein adduct levels may be warranted.

All cases demonstrated on repeat testing as meeting the laboratory criteria of AST/ALT and TBili elevation defined above should be considered potential DILI (Hy's law) cases if no other reason for the LFT abnormalities has yet been found. **Such potential DILI (Hy's law) cases are to be reported as SAEs, irrespective of availability of all the results of the investigations performed to determine etiology of the LFT abnormalities.**

A potential DILI (Hy's law) case becomes a confirmed case only after all results of reasonable investigations have been received and have excluded an alternative etiology.

10.6. Appendix 6: Abbreviations

The following is a list of abbreviations that may be used in the protocol.

Abbreviation	Term
2019-nCoV	novel coronavirus 2019
ACIP	Advisory Committee on Immunization Practices
AE	adverse event
AESI	adverse event of special interest
ALT	alanine aminotransferase
AST	aspartate aminotransferase
β-hCG	beta-human chorionic gonadotropin
CBER	Center for Biologics Evaluation and Research
CDC	Centers for Disease Control and Prevention (United States)
CFR	Code of Federal Regulations
CI	confidence interval
CIOMS	Council for International Organizations of Medical Sciences
CK	creatine kinase
CONSORT	Consolidated Standards of Reporting Trials
COVID-19	coronavirus disease 2019
CRF	case report form
CRO	contract research organization
CRP	C-reactive protein
CSR	clinical study report
DILI	drug-induced liver injury
DMC	data monitoring committee
DNA	deoxyribonucleic acid
EC	ethics committee
ECG	electrocardiogram
eCRF	electronic case report form
e-diary	electronic diary
EDP	exposure during pregnancy
EMA	European Medicines Agency
ESR	erythrocyte sedimentation rate
EU	European Union
EUA	emergency use authorization
EudraCT	European Clinical Trials Database
FDA	Food and Drug Administration
FSH	follicle-stimulating hormone
GCP	Good Clinical Practice
GGT	gamma-glutamyl transferase
GMC	geometric mean concentration

Abbreviation	Term
GMFR	geometric mean fold rise
GMR	geometric mean ratio
HBV	hepatitis B virus
HCV	hepatitis C virus
HIPAA	Health Insurance Portability and Accountability Act
HIV	human immunodeficiency virus
HRT	hormone replacement therapy
IB	investigator's brochure
ICD	informed consent document
ICH	International Council for Harmonisation
ID	identification
IgG	immunoglobulin G
IL-6	interleukin-6
IMP	investigational medicinal product
IND	investigational new drug
INR	international normalized ratio
IP manual	investigational product manual
IPAL	Investigational Product Accountability Log
IRB	institutional review board
IRT	interactive response technology
ISF	investigator site file
IV	intravenous(ly)
IWR	interactive Web-based response
LDH	lactate dehydrogenase
LFT	liver function test
LLOQ	lower limit of quantitation
LNP	lipid nanoparticle
LS	least squares
MedDRA	Medical Dictionary for Regulatory Activities
MERS	Middle East respiratory syndrome
MIS-C	multisystem inflammatory syndrome in children
modRNA	nucleoside-modified messenger ribonucleic acid
N	SARS-CoV-2 nucleoprotein
N/A	not applicable
NAAT	nucleic acid amplification test
NIMP	noninvestigational medicinal product
P2 S	SARS-CoV-2 full-length, P2 mutant, prefusion spike glycoprotein
PCR	polymerase chain reaction
PI	principal investigator
PPE	personal protective equipment
PT	prothrombin time

Abbreviation	Term
RCDC	reverse cumulative distribution curve
RNA	ribonucleic acid
RSV	respiratory syncytial virus
RT-PCR	reverse transcription–polymerase chain reaction
S	spike protein
S1	spike protein S1 subunit
SAE	serious adverse event
SAP	statistical analysis plan
SARS	severe acute respiratory syndrome
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
SoA	schedule of activities
SOP	standard operating procedure
SRSD	single reference safety document
SSID	single subject identification
SUSAR	suspected unexpected serious adverse reaction
TBili	total bilirubin
Th 1	T-helper type 1
UK	United Kingdom
ULN	upper limit of normal
US	United States
VOC	variant of concern
WHO	World Health Organization
WOCBP	woman/women of childbearing potential

11. REFERENCES

1 Virus Pathogen Resource (ViPR). Strain details for severe acute respiratory syndrome-related coronavirus strain Wuhan-Hu-1. Available from: https://www.viprbrc.org/brc/viprStrainDetails.spg?ncbiAccession=MN908947&decorator=corona. Accessed: 11 Aug 2020.

2 Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med. 2020;382(8):727-33.

3 World Health Organization. Timeline: WHO's COVID-19 response. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline#!. Accessed: 08 Jan 2021.

4 World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020. Published: 11 Mar 2020. Accessed: 01 Apr 2020.

5 COVID-19 dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. Available from: https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6. Accessed: 08 Jan 2021.

6 Centers for Disease Control and Prevention. Emerging SARS-CoV-2 variants. Available from: https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/scientific-brief-emerging-variants.html. Updated: 28 Jan 2021. Accessed: 10 Feb 2021.

7 Rauch S, Jasny E, Schmidt KE, et al. New vaccine technologies to combat outbreak situations. Front Immunol. 2018;9:1963.

8 Sahin U, Karikó K, Türeci Ö. mRNA-based therapeutics—developing a new class of drugs. Nat Rev Drug Discov. 2014;13(10):759-80.

9 BioNTech RNA Pharmaceuticals GmbH. CorVAC/BNT162 Investigator's Brochure. Mainz, Germany: BioNTech RNA Pharmaceuticals GmbH; 25 Mar 2020.

10 Feldman RA, Fuhr R, Smolenov I, et al. mRNA vaccines against H10N8 and H7N9 influenza viruses of pandemic potential are immunogenic and well tolerated in healthy adults in phase 1 randomized clinical trials. Vaccine. 2019;37(25):3326-34.

11 BioNTech RNA Pharmaceuticals GmbH. BNT162/PF-07302048 Investigator's Brochure. Mainz, Germany: BioNTech RNA Pharmaceuticals GmbH; 29 Jan 2021.

[12] US Food and Drug Administration. Guidance for industry: toxicity grading scale for healthy adult and adolescent volunteers enrolled in preventive vaccine clinical trials. Rockville, MD: Center for Biologics Evaluation and Research; September 2007.

[13] Centers for Disease Control and Prevention. Multisystem inflammatory syndrome in children (MIS-C) associated with coronavirus disease 2019 (COVID-19). Available from: https://emergency.cdc.gov/han/2020/han00432.asp. Updated: 14 May 2020. Accessed: 15 Jan 2021.

[14] Centers for Disease Control and Prevention. Symptoms of COVID-19. Available from: https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html. Updated: 22 Feb 2021. Accessed: 29 Apr 2021.

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