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Description

The pandemic coronavirus disease 2019 (COVID-19) is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). As the first step of the viral replication, the virus attaches to the host cell surface before entering the cell. The viral Spike protein recognizes and attaches to the Angiotensin-Converting Enzyme 2 (ACE2) receptor found on the surface of type I and II pneumocytes, endothelial cells, and ciliated bronchial epithelial cells. Drugs targeting the interaction between the Spike protein of SARS-CoV-2 and human ACE2 may offer protection against the viral infection. Numerous SARS-CoV-2 variants have been identified so far. These variants contain a number of mutations that may increase morbidity and mortality and allow the virus to spread more easily and quickly than the original strain.

BPS Bioscience has launched a series of Spike Variants (SARS-CoV-2) Pseudotyped Lentivirus (Luc reporter). The Spike (SARS-CoV-2) Pseudotyped Lentiviruses were produced with SARS-CoV-2 Spike Variant (see below for mutation details) as the envelope glycoproteins instead of the commonly used VSV-G. These pseudovirions contain the firefly luciferase gene driven by a CMV promoter (Figure 1), therefore, the spike-mediated cell entry can be measured via luciferase activity. The Spike Variants (SARS-CoV-2) Pseudotyped Lentivirus Pack (Luciferase Reporter) contains a collection of 12 Spike variants (SARS-CoV-2) Pseudotyped lentivirus (Luc reporter). It is a great tool to screen for variant-specific antibodies or to test the binding or efficacy of drug candidates against the different Spike variants. The Spike (SARS-CoV-2) pseudotyped lentiviruses can be used to measure the activity of neutralizing antibody against SARS-CoV-2 infection in a Biosafety Level 2 facility.

The pack provides one vial of each of the following:

SARS-CoV-2 Variant	BPS CAT#	Sequence details
WT Spike Wuhan-Hu-1	79942-1	Genbank Accession #QHD43416.1
D614G	78028-1	D614G
B.1.1.7 (Alpha variant, UK)	78112-1	Deletions of H69, V70, and Y144; N501Y, A570D, D614G, P681H, T716I, S982A, D1118H
B.1.351 (Beta variant, SA)	78142-1	L18F, D80A, D215G, R246I, K417N, E484K, N501Y, D614G, A701V
P.1 (Gamma variant, Brazil)	78144-1	L18F, T20N, P26S, D138Y, R190S, K417T, E484K, N501Y, D614G, H655Y, T1027I
B.1.429 (Epsilon variant)	78172-1	S13I, W152C, L452R, D614G
B.1.617	78204-1	L452R, E484Q, D614G, P681R
B.1.617.1 (Kappa variant)	78205-1	G142D, E154K, L452R, E484Q, D614G, P681R, Q1071H
B.1.618	78206-1	Y145del, H146del, E484K, D614G
B.1.617.2 (Delta variant)	78215-1	T19R, G142D, 156/157del, R158G, L452R, T478K, D614G, P681R, D950N
B.1.617.2.1 (Delta plus)	78218-1	T19R, G142D, 156/157del, R158G, K417N, L452R, T478K, D614G, P681R, D950N
B.1.621 (Mu variant)	78618-1	T95I, Y144S, Y145N, R346K, E484K, N501Y, D614G, P681H, D950N

Applications

1. Study the mechanism of viral transduction
2. Screening for neutralizing antibodies that inhibit the interaction between ACE2 and the Spike protein of SARS-CoV-2 variants.
3. Identify variant-specific antibodies recognizing the different Spike mutations.

Formulation

The lentiviruses were produced from HEK293T cells. Supplied in medium containing 90% DMEM + 10% FBS.

Titer

The titer will vary with each lot; the exact value is provided with each shipment.

Storage

Lentiviruses are shipped with dry ice. For long term storage, it is recommended to store the virus at -80°C. Avoid repeated freeze-thaw cycles. Titers can drop significantly with each freeze-thaw cycle.

Biosafety

None of the HIV genes (gag, pol, rev) will be expressed in the transduced cells, as they are expressed from packaging plasmids lacking the packing signal. Although the pseudotyped lentiviruses are replication-incompetent, they require the use of a Biosafety Level 2 facility. BPS recommends following all local federal, state, and institutional regulations and using all appropriate safety precautions.

Materials Required but Not Supplied

These materials are not supplied with this lentivirus but are necessary to follow the designed protocol. BPS Bioscience media and reagents are all validated and optimized for use with this lentivirus and are highly recommended for best results.

Name	Ordering Information
Thaw Medium 1 or HEK293 Growth Medium	BPS Bioscience, #60187
ACE2-HEK293 Recombinant Cell Line	BPS Bioscience, #79951
Spike S1 Neutralizing Antibody (Clone C-A11) (SARS-CoV-2)	BPS Bioscience, #101024
96-well tissue culture treated, white clear-bottom assay plate	Corning, #3610
ONE-Step™ Luciferase assay system	BPS Bioscience, #60690

Media Formulation

Thaw Medium 1 (BPS Bioscience, #60187):

MEM medium (Hyclone, #SH30024.01) supplemented with 10% FBS (Thermo Fisher, #26140079), 1% non-essential amino acids (Hyclone, #SH30238.01), 1 mM Na pyruvate (Hyclone #SH30239.01), 1% Penicillin/Streptomycin (Hyclone, #SV30010.01).

Assay Protocol

The following protocol is a general guideline for transducing ACE2-HEK293 cells using SARS-CoV-2 Spike pseudotyped lentivirus (Luciferase reporter). The optimal transduction conditions (e.g. MOI, concentration of polybrene, time of assay development) should be optimized according to the cell type and the assay requirements. In most cell types, the expression of the reporter gene can be measured approximately 48-72 hours after transduction.

1. Day 1:

Harvest ACE2-HEK293 cells from culture and seed cells at a density of 5,000-10,000 cells per well into white, clear-bottom, 96-well microplate in 90 µl of Thaw Medium 1 (BPS Bioscience, #60187) (This step can be done during incubation of antibody and Spike pseudotyped lentivirus).

Prepare serial dilutions of anti-Spike or anti-ACE2 antibody in Thaw Medium 1.

To test anti-Spike antibody, preincubate 5 μ l of the SARS-CoV-2 Spike pseudotyped lentivirus with 5 μ l of diluted anti-Spike antibody for 30 minutes. After incubation, add 10 μ l of virus/antibody mix into each well of the ACE2-HEK293 cells.

To test anti-ACE2 antibody, add 5 μ l of diluted anti-ACE2 antibody into each well of ACE2-HEK293 cells and incubate for 30 minutes. At the end of the incubation, add 5 μ l of SARS-CoV-2 Spike pseudotyped lentivirus into each well.

For control wells, the same number of ACE2-HEK293 cells are seeded, but no virus or antibody is added.

Optional: Add polybrene to each well at a final concentration of 5 μ g/ml.

Incubate the plates at 37°C with 5% CO₂.

2. Day 3:

Approximately 48-72 hours after transduction, prepare the ONE-Step™ Luciferase reagent per recommended protocol. Add 100 μ l of ONE-Step™ Luciferase Assay reagent per well. Incubate at room temperature for ~15 to 30 minutes and measure luminescence using a luminometer. The transduction efficacy is determined by measuring the luciferase activity.

Figures and Validation Data

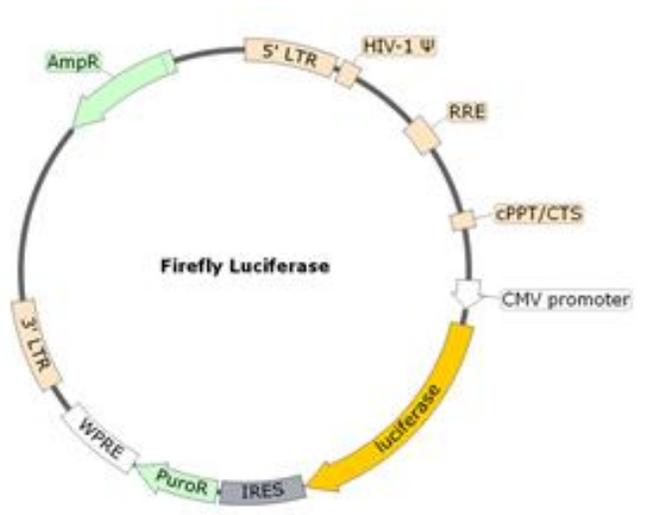


Figure 1. Schematic of the Luciferase Reporter in Spike (SARS-CoV-2) Pseudotyped Lentiviruses

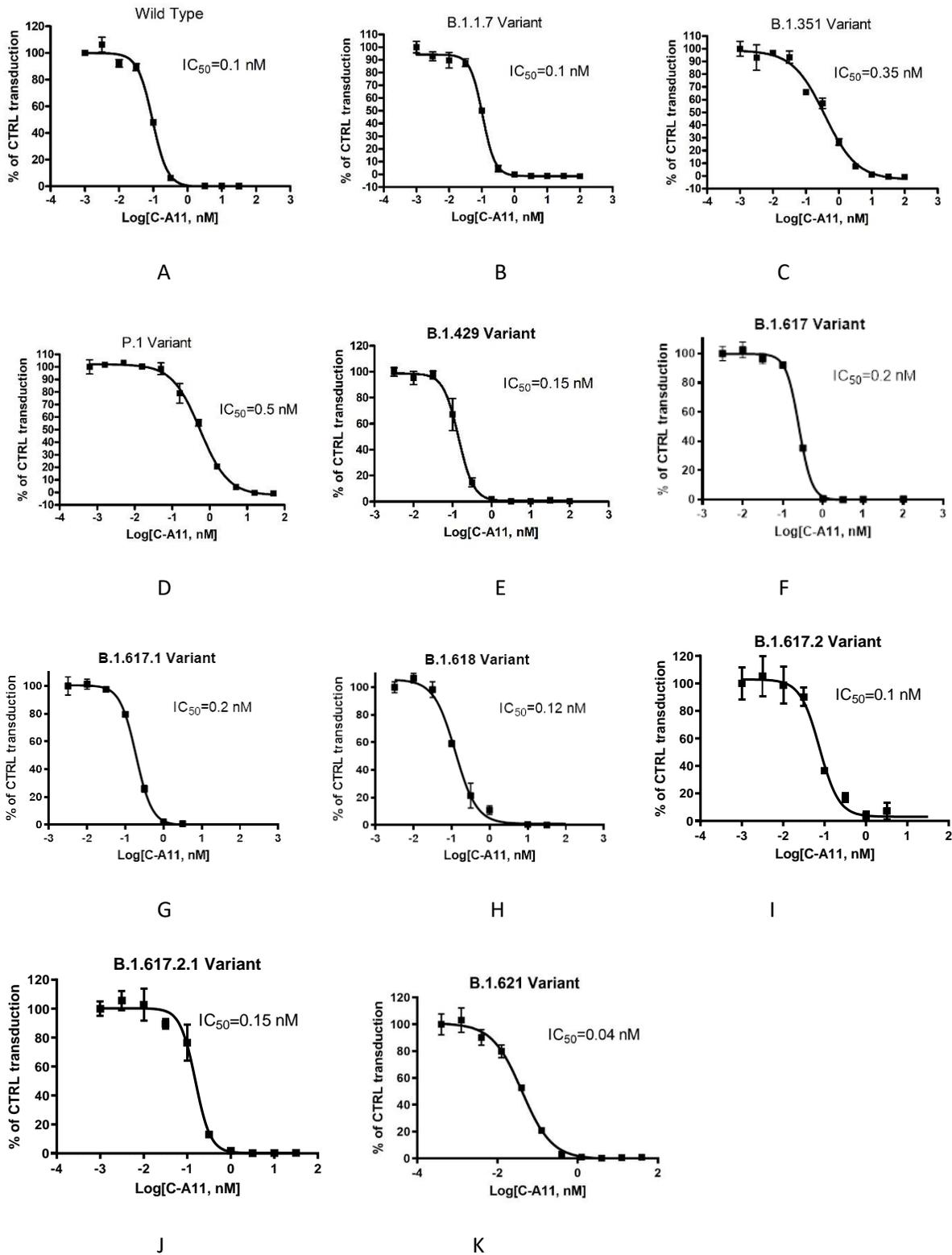


Figure 2: Representative titration plots of Spike (SARS-CoV-2) Pseudotyped Lentivirus (Luc reporter) by anti-SARS-CoV-2 Spike antibody (clone# C-A11)

Approximately 8,000 ACE2-HEK293 cells/well were transduced with 10 μ l/well of Spike (SARS-CoV-2) Pseudotyped Lentivirus (Luc reporter)/anti-Spike antibody mix. After 48 hours of transduction, ONE-Step Luciferase reagent (BPS Bioscience #60690) was added to cells to measure the luciferase activity. The transduction efficiency was determined by measuring the luciferase activity. The transduction efficiency of the wells with virus only (no antibody treatment) was set as 100%, while the transduction efficiency of the wells without virus was set as 0%. The titration curve for Spike S1 Neutralizing Antibody (SARS-CoV-2) (Clone: C-A11) (BPS Bioscience, #101024) is shown.

License Disclosure

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Troubleshooting Guide

Visit bpsbioscience.com/lentivirus-faq for detailed troubleshooting instructions. For all further questions, please email support@bpsbioscience.com.

Related Products

<i>Products</i>	<i>Catalog #</i>	<i>Size</i>
Bald Lentiviral Pseudovirion (Luciferase Reporter)	79943	500 μ l x 2
ACE2 - HEK293 Recombinant Cell Line	79951	2 vials
Spike (B.1.617.2; Delta Variant) (SARS-CoV-2) Pseudotyped	78215	500 μ l x 2
Spike (B.1.617 Variant) Pseudotyped Lentivirus (Luc Reporter)	78204	500 μ l x 2
Spike (B.1.617.1 Variant; Kappa) Pseudotyped Lentivirus (Luc Reporter)	78205	500 μ l x 2
Spike (B.1.618 Variant) Pseudotyped Lentivirus (Luc Reporter)	78206	500 μ l x 2
Spike (B.1.1.7 Variant; Alpha) (SARS-CoV-2) Pseudotyped lentivirus (Luc reporter)	78112	500 μ l x 2
Spike (P.1 Variant; Gamma) (SARS-CoV-2) Pseudotyped Lentivirus (Luc Reporter)	78144	500 μ l x 2
Spike (B.1.429 Variant) Pseudotyped Lentivirus (Luc Reporter)	78172	500 μ l x 2
Spike (B.1.351 variant; Beta) (SARS-CoV-2) Pseudotyped lentivirus (Luc reporter)	78142	500 μ l x 2
Spike (B.1.617.2.1; Delta Plus Variant) Pseudotyped Lentivirus (Luc Reporter)	78218	500 μ l x 2
Spike (D614G) (SARS-CoV-2) Pseudotyped Lentivirus (Luc Reporter)	78028	500 μ l x 2
Spike (B.1.617.2; Delta Variant) (SARS-CoV-2) Pseudotyped Lentivirus (eGFP Reporter)	78216	500 μ l x 2
Spike (B.1.351 Variant) (SARS-CoV-2) Pseudotyped Lentivirus	78160	500 μ l x 2
Spike (B.1.1.7 Variant) (SARS-CoV-2) Pseudotyped Lentivirus	78158	500 μ l x 2