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Data Sheet

Spike (SARS-CoV-2) Pseudotyped Lentivirus (Luc Reporter) **Catalog#: 79942**

Product 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 ACE2 may offer protection against the viral infection.

The SARS-CoV-2 Spike Pseudotyped Lentivirus were produced with SARS-CoV-2 Spike (Genbank Accession #QHD43416.1) as the envelope glycoproteins instead of the commonly used VSV-G. These pseudovirions also contain the firefly luciferase gene driven by a CMV promoter (Figure 1), therefore, the spike-mediated cell entry can be conveniently measured via luciferase reporter activity. The SARS-CoV-2 Spike pseudotyped lentivirus can be used to measure the activity of neutralizing antibody against SARS-CoV-2 in a Biosafety Level 2 facility.

Application

1. Study the mechanism of viral transduction.
2. Screening for neutralizing antibodies for SARS-CoV-2 Spike and ACE2.

Formulation

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

Titer

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

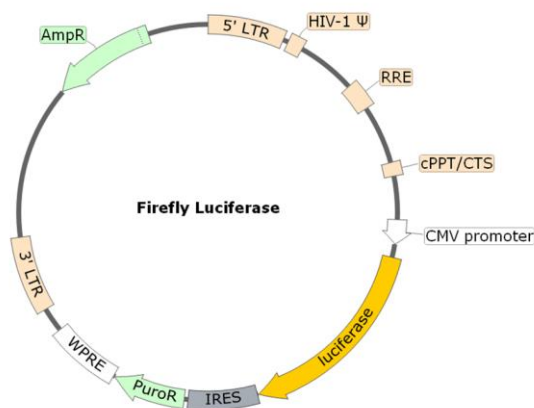


Figure 1. Schematic of the Luciferase Reporter in SARS-CoV-2 Spike Pseudovirion

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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

- HEK293 growth medium or use Thaw Medium 9 (BPS Bioscience #79665): MEM with 10% FBS, 0.1 mM nonessential amino acids, 1 mM sodium pyruvate
- ACE2-HEK293 Recombinant Cell Line (BPS Bioscience, #79951)
- Bald lentiviral pseudovirion (Luciferase reporter) (BPS Bioscience, #79943)
- Anti-SARS-CoV-2 Spike antibody (clone AM001414, Active motif, #91361)
- Anti-SARS-CoV-2 Spike antibody (clone AM002414, Active motif, #91349)
- Anti-ACE2 antibody (R&D systems, #AF933)
- Recombinant ACE2 protein (BPS Bioscience, #11003)
- 96-well tissue culture treated, white clear-bottom assay plate (Corning, #3610)
- ONE-Step™ luciferase assay system (BPS Bioscience, #60690)

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 opaque 96-well microplate in 50 µl of Thaw Medium 9 (BPS Bioscience, #79665). Incubate cells at 37°C with 5% CO₂ overnight.
2. Day 2: prepare serial dilutions of anti-Spike or anti-ACE2 antibody in Thaw Medium 9.

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

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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 were seeded, but no virus or antibody was added.

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

3. Day 3: Remove the medium containing the lentivirus from the wells. Add 50 μ l of fresh Thaw Medium 9 to each well.

If the tested antibody does not adversely affect the target cells, it is not necessary to change the medium on Day 3.

4. Day 4, approximately 48-60 hours after transduction, prepare the ONE-Step™ Luciferase reagent per recommended protocol. Add 50 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 was determined by measuring the luciferase activity.

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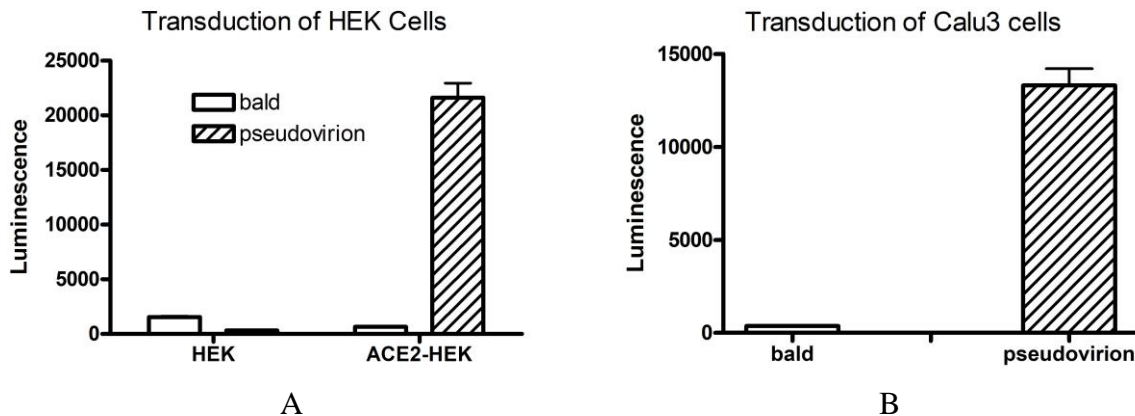


Figure 2. Transduction of ACE2-HEK293 cells and Calu3 cells using SARS-CoV-2 Spike pseudotyped lentivirus.

A. Approximately 10,000 cells/well of ACE2-HEK293 cells or HEK293 parental cells were transduced with 5 μ l/well of SARS-CoV-2-Spike pseudotyped lentivirus (Luc reporter). After 18 hours of transduction, the medium was changed to fresh HEK growth medium (Thaw Medium 9). After 48 hours of transduction, ONE-Step Luciferase reagent (BPS Bioscience, #60690) was added to cells to measure the luciferase activity. The SARS-CoV-2 Spike pseudotyped lentivirus transduced ACE2-HEK293 with much greater efficiency compared with HEK293 parental cells, indicating the transduction is dependent upon ACE2 expression. The bald lentiviral pseudovirion (BPS Bioscience #79943), where no envelope glycoprotein is expressed, was used as a negative control.

B. Approximately 25,000 Calu3 cells/well were transduced with 5 μ l/well of SARS-CoV-2 Spike pseudotyped lentivirus (Luc reporter) in the presence of 5 μ g/ml of polybrene. After 18 hours of transduction, the medium was changed to fresh Calu3 growth medium. After 48 hours of transduction, ONE-Step Luciferase reagent (BPS Bioscience, #60690) was added to cells to measure the luciferase activity. The bald lentiviral pseudovirion (BPS Bioscience #79943), where no envelope glycoprotein is expressed, was used as a negative control.

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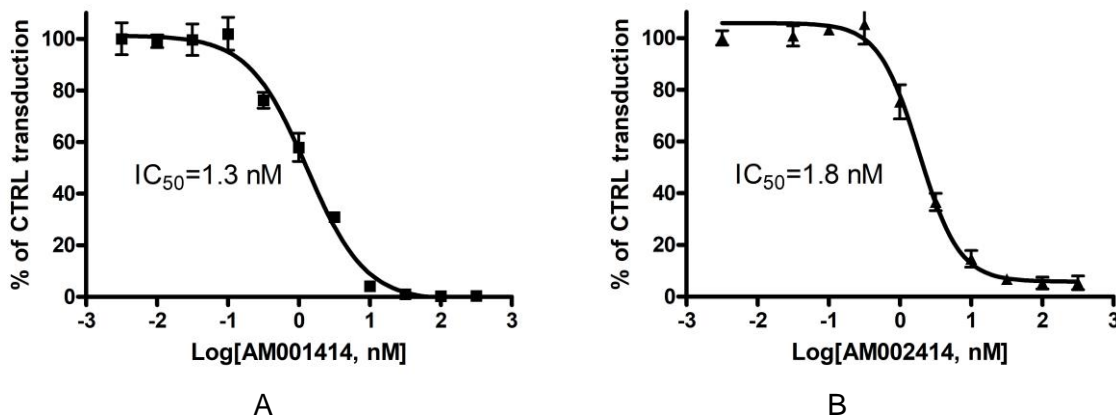


Figure 3. Neutralization assay by anti-SARS-CoV-2 Spike antibody. Approximately 10,000 ACE2-HEK293 cells/well were transduced with 10 μ l/well of SARS-CoV-2 Spike pseudotyped lentivirus (Luc reporter)/anti-Spike antibody mix. After 18 hours of transduction, the medium was changed to fresh HEK growth medium (Thaw Medium 9). 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 curves for anti-Spike antibody clone #AM001414 (Active Motif #91361) and clone #AM002414 (Active Motif #91349) are shown in A and B respectively.

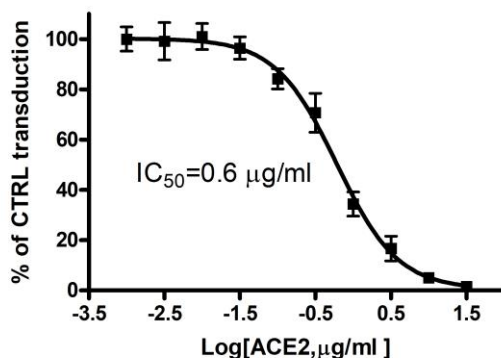


Figure 4. Neutralization assay by recombinant ACE2. Approximately 10,000 ACE2-HEK293 cells/well were transduced with 10 μ l/well mixture of SARS-CoV-2 Spike pseudotyped lentivirus (Luc reporter)/ACE2 (BPS Bioscience, #11003). After 18 hours of transduction, the medium was changed to fresh HEK growth medium (Thaw Medium 9). After 48 hours of transduction, ONE-Step Luciferase reagent (BPS Bioscience #60690) was added to cells to measure the luciferase activity.

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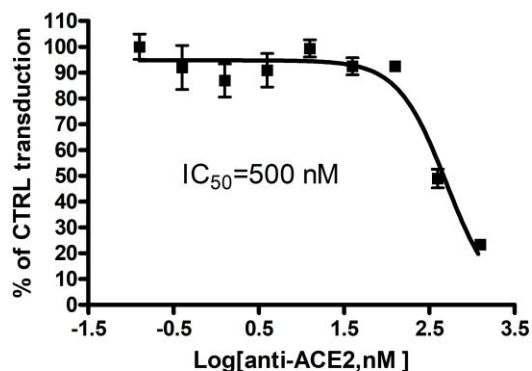


Figure 5. Neutralization assay by anti-ACE2 antibody. Approximately 10,000 ACE2-HEK293 cells/well were preincubated with anti-ACE2 antibody (R&D Systems #AF933) for 30 minutes, and then transduced with 5 μ l/well SARS-CoV-2 Spike pseudotyped lentivirus (Luc reporter). After 18 hours of transduction, the medium was changed to fresh HEK growth medium (Thaw Medium 9). After 48 hours of transduction, ONE-Step Luciferase reagent (BPS Bioscience #60690) was added to cells to measure the luciferase activity.

Related Products

| <u>Product</u> | <u>Cat. #</u> | <u>Size</u> |
|--|---------------|----------------|
| Bald Lentiviral Pseudovirion (Luciferase Reporter) | 79943 | 500 μ l x2 |
| NFkB Luciferase Reporter Lentivirus | 79564 | 500 μ l x2 |
| CRE Luciferase Reporter Lentivirus | 79580 | 500 μ l x2 |
| NFAT Luciferase Reporter Lentivirus | 79579 | 500 μ l x2 |
| STAT3 Luciferase Reporter Lentivirus | 79744 | 500 μ l x2 |
| STAT5 Luciferase Reporter Lentivirus | 79745 | 500 μ l x2 |
| TCF/LEF Luciferase Reporter Lentivirus | 79787 | 500 μ l x2 |
| ISRE Luciferase Reporter Lentivirus | 79824 | 500 μ l x2 |
| IL-2 Promoter Luciferase Reporter Lentivirus | 79825 | 500 μ l x2 |
| IL-8 Promoter Luciferase Reporter Lentivirus | 79827 | 500 μ l x2 |
| AP-1 Luciferase Reporter Lentivirus | 79823 | 500 μ l x2 |
| SBE Luciferase Reporter Lentivirus | 79806 | 500 μ l x2 |
| TEAD Luciferase Reporter Lentivirus | 79833 | 500 μ l x2 |
| ARE Luciferase Reporter Lentivirus | 79869 | 500 μ l x2 |
| Negative Control Lentivirus | 79578 | 500 μ l x2 |
| Renilla Luciferase (Rluc) Lentivirus | 79565 | 500 μ l x2 |
| Firefly Luciferase (Fluc) Lentivirus (G418) | 79692-G | 500 μ l x2 |
| Firefly Luciferase (Fluc) Lentivirus (Hygromycin) | 79692-H | 500 μ l x2 |
| Firefly Luciferase (Fluc) Lentivirus (Puromycin) | 79692-P | 500 μ l x2 |

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