



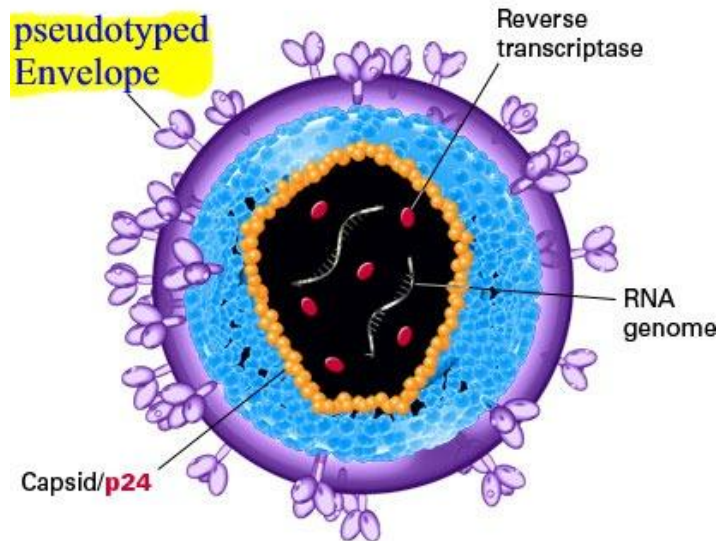
## Virus Like Particle of COVID-19 Spike protein (S)

| Catalog#               | Product Name  | Amounts                                   |
|------------------------|---|---|
| <a href="#">VLP001</a> | COVID-19 S Protein / ( <b>GFP</b> )-<br>(6His) VLP          | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP002</a> | COVID-19 S Protein / ( <b>Luciferase</b> )-<br>(6His) VLP   | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP003</a> | COVID-19 S Protein<br>-(6His) VLP                           | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP012</a> | COVID-19 S Protein Mutant (L452R)-<br>6His VLP              | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP013</a> | COVID-19 S Protein Mutant (K417T,<br>E484K, N501Y)-6His VLP | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP014</a> | COVID-19 S Protein Mutant (W152C,<br>L452R, D614G)-6His VLP | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP015</a> | COVID-19 S Protein Mutant (S477N)-<br>6His VLP              | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP016</a> | COVID-19 S Protein Mutant (L452R,<br>D614G)-6His VLP        | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP017</a> | COVID-19 S Protein Mutant (K417N,<br>E484K, N501Y)-6His VLP | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |
| <a href="#">VLP018</a> | COVID-19 S Protein Delta variant<br>(L452R, T478K)-6His VLP | <b>200ul</b><br>(1x10 <sup>8</sup> VP/ml) |

**Storage:** < -70 °C, avoid repeat freeze/thaw cycles. Stable for > 6 months.

### What is Virus-Like Particles (VLP)?

A viral envelope is the outermost layer of the virus, consist of the glycoproteins. It serves to bind the receptor on the host's cell membrane. When desired, the virus can be enveloped with a desired protein (so called pseudo-typing). A glycoproteins that maintains the viral particle structure, can be used as that virus's envelope proteins.



### **GenTarget's Lentivirus-Like Particles (VLP):**

GenTarget developed the virus-like particle product line with different pseudo-typed envelope protein. They are pseudo-typed with a desired envelope protein at its surface. It is packaged with a report (GFP or Luciferase), or simply a Null-control sequence as virion core. Such VLP are non-replicative, non-pathogenic and non-infectious to mammalian cells, or only infect the specific cell types that containing the corresponding receptor to the pseudo-typed envelope protein.

### **COVID-19 Spike (S) Protein:**

A novel coronavirus is responsible for the global healthcare crisis, start in late 2019, from Wuhan, China. On Feb 11, 2020, WHO named this virus as COVID-19 and the international Committee of Virus Taxonomy named it as SARS-Cov-2.

COVID-19 coronavirus binds human ACE2 receptors with high affinity through its Spike (S) protein. S protein is a glycoprotein presented on the virus surface. COVID-19 virus constantly evolutes variants through creating mutations in S protein. The S protein mutants may reduce the neutralization by antibodies generated against the wild-type virus. Mutant protein can be used to validate the vaccination efficacy, or raise mutant (variant) specific antibodies.

### **Virus Like Lentiviral Particles (VLP) of S Protein and its mutants:**

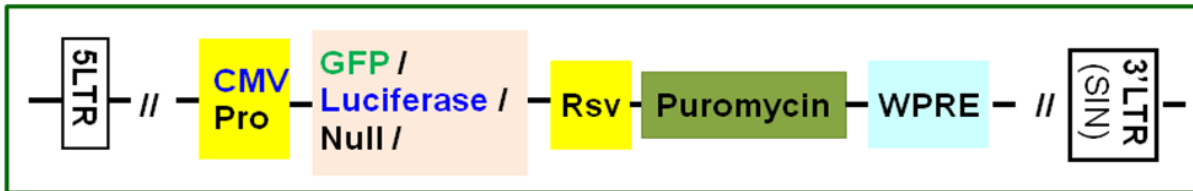
COVID-19 Spike protein (S) Virus Like Particle was packaged in HEK293T cells using our proprietary technology. It is the replication-incompetent particles in



which the native, full-length COVID-19 S protein (with **6His-tag** at its C-terminal) was pseudo-typed as the lentiviral particles' surface envelope protein.

[**Note:** This VLP has the Spike protein (or mutant) already expressed / presented at surface of lentiviral particle to mimic coronavirus. It is not used as lentivirus for over-expression of the Spike protein. For over-expressing COVID-19 S protein or mutants, please use over-expression lentivirus product, such as CAT#: [LVP1329](#)]

This VLPs packaged with either the Green Fluorescent Protein (**GFP**) (CAT#: **VL001**) or the **firefly luciferase** (CAT#: **VLP002**), or a Non-sense sequence (**Null**) as the particle's virion genomic material. The VLPs carry the Puromycin resistance. The following scheme showed COVID-S1-VLP's genomic core cassette.



The S Protein VLP can bind to its receptor (such as ACE2) presented in cell surface. IF so, its viral genomic material can enter the cell's cytoplasm.

The VLP of COVID-19 S Protein has been tested in response to the binding of anti-S antibody in ELISA plate. This VLP can be detected by anti-C-terminal 6His-tag antibody because the S protein was tagged by C-term 6His-tag

The VLP was concentrated using Gentarget's lentivirus concentration kit (CAT#: [LV-CONC](#).) and resuspended into PBS solution to obtain the desired titer. VLP's titer was measured via ELISA P24 assay. Each single particle assembled many copies of the S protein or its mutant molecular at its surface.

## Application for VLP of S protein:

- 1) Effective presentation of COVID-19 S protein antigen, or Mimic COVID-19 Structure:

The S2 protein VLPs are mimic COVID-19's spike protein exposure. The Spike protein is presented as the VLP's surface envelope in high density, and easier access to immune response. They are highly immunogenic and more



effectively activate the immune response. Therefore, the most effective antibodies can be raised from the VLP. Those VLPs can be used to study the structural properties of the SARS-CoV-2 virions, and can be used for antibody development and validation, or can be used in platform for high through-put research in vaccine research and development.

- 2) Those VLPs are premade with high density of COVID-19 Spike protein on the surface of particle, provided as 200ul aliquots, ready to use, no need any purification. You simply coat the VLP as antigen, onto wells in ELISA plate, for its antibody / vaccine detection or validation. They can be detected by anti-Spike antibody and anti-6His antibody. Or add it into your specific cell culture expressing ACE2 receptors.

### Safety Precaution:

Gentarget lentiviral particles adapts must advanced lentiviral safety features (using the third-generation vectors with self-inactivation SIN-3UTR), and the premade lentivirus is replication incompetent. However, please use extra caution when using lentiviral particles. Use the lentiviral particles in Bio-safety II cabinet. Wear glove all the time when handling Lentiviral particles! Please refer CDC and NIH's guidelines for more details regarding to safety issues.

### References:

Front Bioeng. Biotechnol. 30 July 2020; Ruodan Xu et al. Construction of SARS-CoV-2 Virus-Like Particles.

### Warranty:

**This product is for research use only.** It is warranted to meet its quality as described when used in accordance with its instructions. GenTarget disclaims any implied warranty of this product for application. In no event shall GenTarget be liable for any incidental or consequential damages in connection with the products. GenTarget's sole remedy for breach of this warranty should be, at GenTarget's option, to replace the products.

### Related Products: GenTarget's Pre-made lentivirus Products:

| <b>Lentivirus Category</b><br>(click to see) | <b>Product Description</b>  |
|--|---|
| <a href="#">Target Expression</a>            | Premade lentivirus express a <b>human, mouse or rat</b> gene with Fluorescent-Antibiotic fusion dual selection. |
| <a href="#">Luciferase expression</a>        | Premade lentivirus express all kinds of luciferase: <b>firefly; Renilla; Cypridina; Red-Luc; Nano-Luc,</b> with |



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|---|---|
|   | different fluorescent and antibiotic selection.   |
| <a href="#">Fluorescent markers</a>       | Preamde lentivirus express human codon optimized fluorescent protein, <b>GFP / RFP / CFP / BFP / YFP/niRFP /unstable GFP, etc.</b>  |
| <a href="#">Cytoskeleton Imaging</a>      | Fluorescent ( <b>GFP / RFP/ CFP</b> ) labelled cell skeleton protein (Actin; Tubulin; Paxillin; Vimentin)   |
| <a href="#">Cell Organelle imaging</a>    | Premade lentivirus for cell organelle imaging. The fluorescent labelled cell organelle lentivirus for living cell imaging.  |
| <a href="#">CRISPR /hu CAS9</a>           | Preamde lentivirus express humanized wild-type <b>Cas9</b> endonuclease for genomic editing by <b>CRISPR</b>  |
| <a href="#">Fluorescent Fusion target</a> | Lentivirus express the " <b>Fluorescent-Target</b> " fusion proteins. A desired target is fused to <b>Green, Blue, Red,</b> or <b>Cyan</b> Fluorescent Protein, demonstrating the target's functionality and localization |
| <a href="#">CRE recombinase</a>           | Premade lentivirus for expressing <b>nuclear permeant CRE</b> recombinase with different fluorescent and antibiotic markers.  |
| <a href="#">LoxP ColorSwitch</a>          | Premade lentivirus expressing "LoxP- <b>GFP</b> -Stop-LoxP- <b>RFP</b> " cassette, used to monitor the CRE recombination event in vivo.   |
| <a href="#">SEAP Reporter</a>             | <b>SEAP</b> (Secreted Embryonic Alkaline Phosphatase) secreted expression lentivirus under different promoter.  |
| <a href="#">TetR repressor expression</a> | Premade lentivirus expressin <b>TetR</b> (tetracycline regulator) protein, the repressor protein for the inducible expression system.   |
| <a href="#">rtTA Expression</a>           | Lentivirus express the reverse tetracycline transcription activator gene, rtTA-M2 with different selection.   |
| <a href="#">Pathway Reporter</a>          | Different Report lentivirus ( <b>Luc, RFP, GFP, SEAP</b> ) under a pathway specific response promoter.  |
| <a href="#">Cell Immortalization</a>      | Comprehensive lentivirus for cell immortalization, for different cell types.  |
| <a href="#">Cell Specific reporter</a>    | Different Report lentivirus driven by cell specific promoter.   |
| <a href="#">Infectious Antigens</a>       | Lentivirus express all kinds of infectious antigens.  |
| <a href="#">Viral Like Particle (VLP)</a> | Lentiviral particles pseudo-typed with high density of surface envelope protein.  |



|   |  |
|---|--|
| <a href="#">Immuno Therapy</a>                        | Lentivirus products for Immuno Therapy application.  |
| <a href="#">iPS factors</a>                           | Premade lentivirus for human and mouse iPS ( <b>Myc, NANOG, OCT4, SOX2, FGF4</b> ) factors with different fluorescent and antibiotic markers   |
| <a href="#">LacZ expression</a>                       | Express different full length <b><math>\beta</math>-galactosidase (lacZ)</b> with different selection markers  |
| <a href="#">Anti-miRNA lentivirus</a>                 | Pre-made lentivirus expression a specific <b>anti-miRNA</b> cassette.  |
| <a href="#">Pre-made shRNA lentivirus</a>             | Premade shRNA lentivirus for knockdown a specific genes ( <b>P53, LacZ, Luciferase</b> and more).  |
| <a href="#">microRNA and anti-microRNA lentivirus</a> | Premade lentivirus expression human or mouse <b>precursor miRNA</b> . And <b>anti-miRNA</b> lentivector and virus for human and mouse miRNA.   |
| <a href="#">Negative control lentiviruses</a>         | Premade <b>negative control lentivirus with different markers</b> : serves as the negative control of lentivirus treatment, for validation of the specificity of any lentivirus target expression effects. |
| <a href="#">Other Enzyme</a>                          | Ready-to-use lentivirus, expressing <b>specific enzymes</b> with different selection markers.  |