



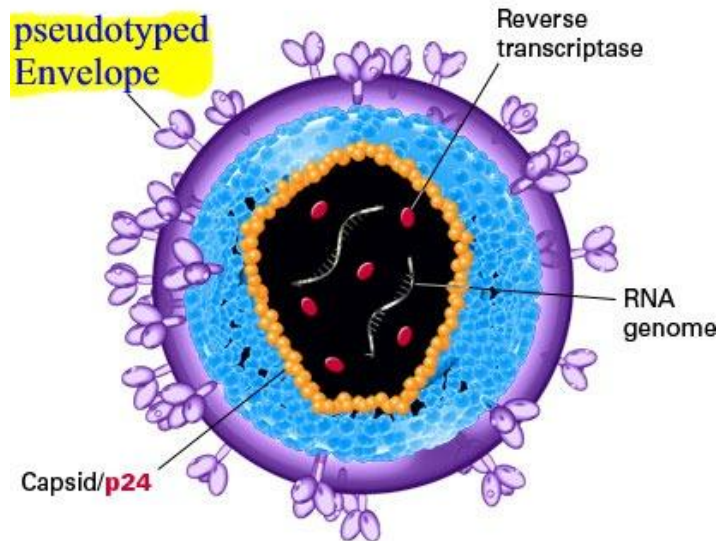
Virus Like Particle of COVID-19 Spike protein (S)

Catalog#	Product Name	Amounts
VLP001	COVID-19 S Protein / (GFP)- (6His) VLP	200ul (1x10 ⁸ VP/ml)
VLP002	COVID-19 S Protein / (Luciferase)- (6His) VLP	200ul (1x10 ⁸ VP/ml)
VLP003	COVID-19 S Protein -(6His) VLP	200ul (1x10 ⁸ VP/ml)
VLP012	COVID-19 S Protein Mutant (L452R)- 6His VLP	200ul (1x10 ⁸ VP/ml)
VLP013	COVID-19 S Protein Mutant (K417T, E484K, N501Y)-6His VLP	200ul (1x10 ⁸ VP/ml)
VLP014	COVID-19 S Protein Mutant (W152C, L452R, D614G)-6His VLP	200ul (1x10 ⁸ VP/ml)
VLP015	COVID-19 S Protein Mutant (S477N)- 6His VLP	200ul (1x10 ⁸ VP/ml)
VLP016	COVID-19 S Protein Mutant (L452R, D614G)-6His VLP	200ul (1x10 ⁸ VP/ml)
VLP017	COVID-19 S Protein Mutant (K417N, E484K, N501Y)-6His VLP	200ul (1x10 ⁸ VP/ml)
VLP018	COVID-19 S Protein Delta variant (L452R, T478K)-6His VLP	200ul (1x10 ⁸ 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 Lentivial Particles (VLP) of S Protein and its mutants:

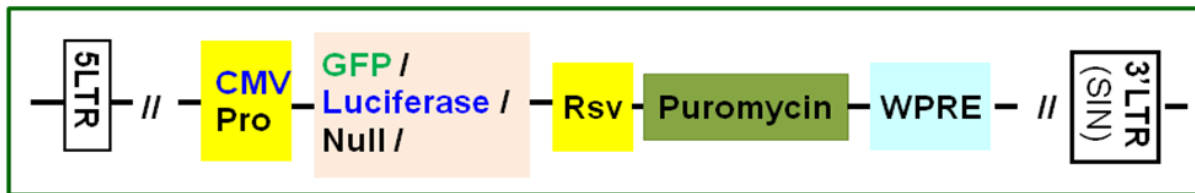
COVID-19 Spike protein (S) Virus Like Particle was packaged in HEK293T cells using our proprietary technology. It is the replication-incompetent particles in



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.

Attachment: GenTarget's pre-made lentivirus product categories.

Product Category	Product Description (please click into each category's page)
Pathway Reporter	Repoter Lentivirus for all kinds of pathway screening assays
Cell Immortalization	Lentivirus for cell immortalization: Large T-antigen, hTERT, EBNA1/EBNA2, HpV16-E6/E7, Adenovial E1A, Kras_G12V, HOXA9, et al.



Product Category	Product Description (please click into each category's page)
ImmunoOncology Research	Lentivirus products for immuno therapy research: CAR and TCR; Assay Cell Lines for T-cell targeted killing assay and other cell-based assays; over-expression lentivirus products for the immune response targets; Cell surface antigens (CDs); immune checkpoint / Receptors; CRISPR gene Repair and knock-IN lentivirus; CRISPR knockout lentivirus;
CAR-T, TCR Lentivirus	CARs Lentivirus: Anti-CD19 /CD20 /CD22 /BCMA /hHER2 /HLA-A2 /TGFβ; TCRs : MART-1/ NY-ESO1/ CD1d-α-GalCer/ TRαV3-F2A-TRβV5-6;
CRISPR Gene Editing	Preamde lentivirus express humanized wild-type Cas9 endonuclease, the dCas9 , gRNAs, CRISPR gene editing research
Epigenomic: CRISPRi and CRISPRa	"dCas9-Protein" fusion Lentivirus for epigenomic modification, resulted in CRISPR interference (CRISPRi) or activation (CRISPRa).
Cell-Specific Reporter	a set of reporter lentiviruses to express a luminescence or fluorescent reporter (firefly Luciferase, Renilla luciferase, RFP or GFP fluorescent marker) under a tissue specific promoter
Infectious Antigens	Lentivirus that express all kinds of infectious antigens with C-term 6His-tag.
Virus Like Particles (VLP)	Lentiviral Like Particles, pseudo-typed with a different envelope proteins.
Non-integrating LV	Integration Defective Lentivirus, express different targets for transient expression without the unwanted insertional mutagenesis.
shRNA Knockdown	Knockdown verified and customized shRNA lentivirus for target knockdown,
microRNA lentivirus	Premade lentivirus expression human or mouse precursor miRNA . And anti-miRNA lentivector and virus for human and mouse miRNA.
Anti-miRNA lentivirus	Pre-made lentivirus expression a specific anti-miRNA cassette.
Human and mouse ORFs	Premade lentivirus expressin a human, mouse or rat gene with RFP-Blastididin fusion dual markers.



Product Category	Product Description (please click into each category's page)
Luciferase expression	Premade lentivirus for all kinds of luciferase protein expression: firefly and Renilla, Red-Luc and more , with different antibiotic selection markers.
Fluorescent Markers	Lentivirus express all commonly used fluorescent proteins: GFP, RFP, CFP, BFP YFP, niRFP, unstable GFP and others.
Luminescent Imaging	Lentivirus express Nano-Latern as Bio-probes for in vivo imaging of sub-cellular structural organization and dynamic processes in living cells and organisms
Sub-cellular Imaging	Lentivirus contain a well-defined organelle targeting signal fused to a fluorescent protein, great tools for live-cell imaging and for dynamic investigation of sub-cellular signal pathways.
Cytoskeleton Imaging	A fluorescent marker (GFP, RFP or CFP) fusion with a cellular structure protein, provides a convenient tool for visualization of cytoskeletal structure
Unstable GFP	Lentivirus express the the destabilized GFP (uGFP) which provides fast turnover responses in signal pathway assay and in knockdown / knockout detection
near-infrared RFP	The near-infrared Red fluorescent (niRFP) expression Lentiviurs provides the whole-body images with better contrast and brighter images
Fluorescent-ORF fusion	Pre-made lentivirus expression a " GFP/RFP/CFP-ORF " fusion target.
CRE recombinase	Premade lentivirus for expressing nuclear permeant CRE recombinase with different flurescent and antibiotic markers.
CRE, Flp ColorSwitch	Lentivirus expressing "LoxP-GFP-Stop-LoxP-RFP" or "FRT-GFP-Stop-FRT-RFP" cassette, used to monitor the CRE or Flp recombination event in vivo.
SEAP Reporter	lentivirus expressing SEAP under different promoters (TetCMV, EF1a, CAG, Ubc, mPGK, Actin-beta or a signal pathway responsive promoter),
TetR Repressor	Premade lentivirus expressin TetR (tetracycline regulator) protein, the repressor protein for the inducible expression system.
rtTA Expression	rtTA binds to the tetracycline operator element (TetO) in the presence of doxycycline (Dox). Used for Tet-On /OFF



Product Category	Product Description (please click into each category's page)
	inducible system.
iPS factors	Premade lentivirus for human and mouse iPS (Myc, NANOG, OCT4, SOX2, FGF4) factors with different fluorescent and antibiotic markers
LacZ expression	Express different full length β-galactosidase (lacZ) with different selection markers
Negative control lentiviruses	Premade negative control lentivirus with different markers : serves as the negative control of lentivirus treatment, for validation of the specificity of any lentivirus target expression effects.
Other Enzyme expression	Ready-to-use lentivirus, expressing a specific enzymes with different selection markers.
Ultra titer lentivirus	Ultra-titer lentivirus used for the hard-to-transduced cells and for in vivo manipulation of sperm cells, or stem cells.