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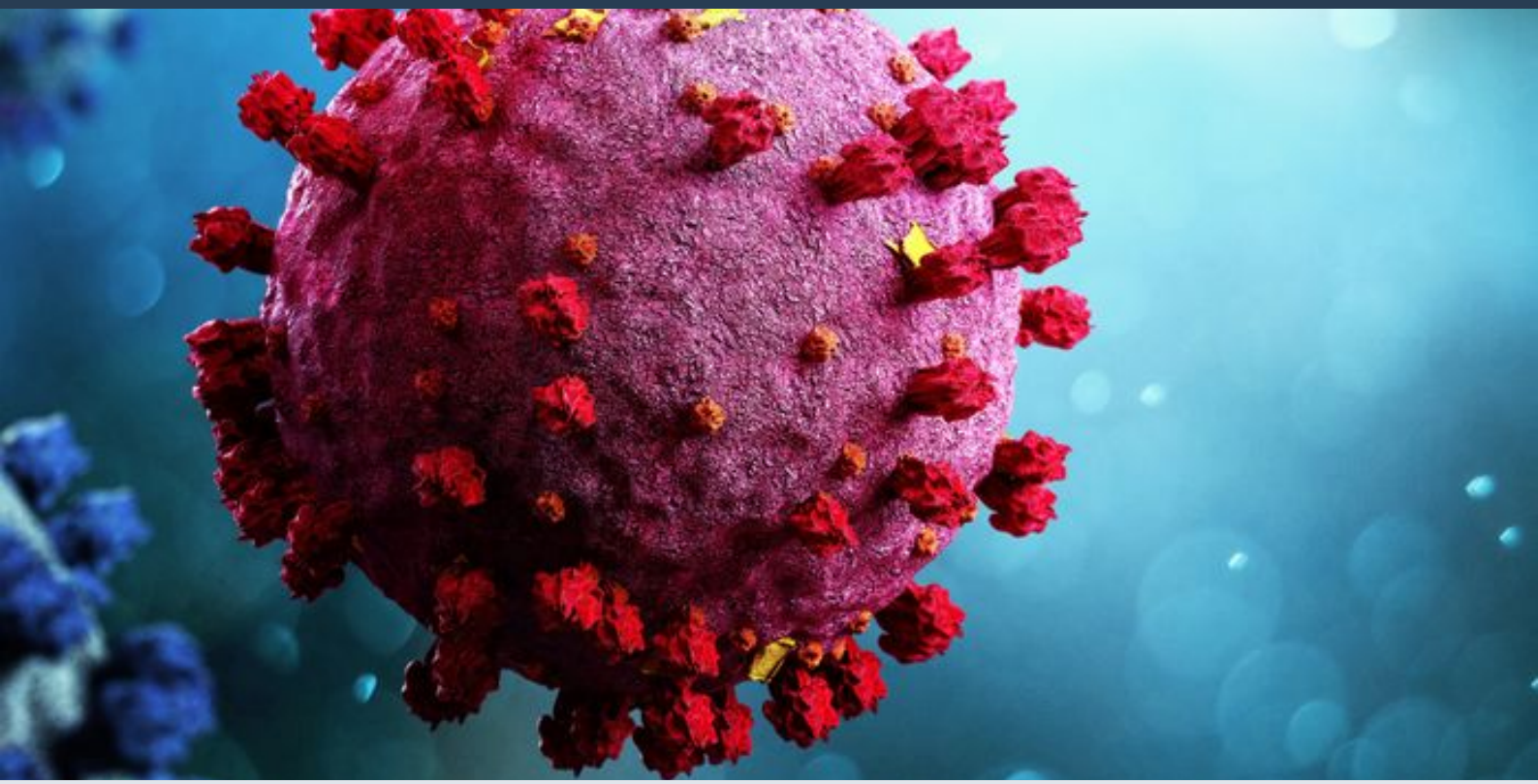
Engineered Virus-like Particles for Vaccination Against SARS-CoV-2

Virus-like particles comprising immunogenic sequences of SARS-CoV-2 for the prevention of COVID-19

Reference: VLPs Against COVID-19



Source: https://stock.adobe.com/uk/333039083

IP Status

Patent application submitted

Seeking

Commercial partner, Development partner, Licensing

About **LMU Munich**

Ludwig-Maximilians-Universität München is the University in the heart of Munich. LMU is recognized as one of Europe's premier academic and research institutions. The LMU Munich community is engaged in generating new knowledge for the benefit of society at large.

Background

The Covid-19 pandemic has a huge impact on public health, society, and the economy. Effective vaccines are urgently needed to mitigate these negative effects. More than 180 vaccine candidates are currently in preclinical development and approx. 50 are already in clinical development. In addition to conventional vaccination technologies, several novel technologies are currently employed to generate vaccines against SARS-CoV-2. While vaccine development is moving forward at an accelerated speed, it is clear that a single vaccine will not be sufficient to cover all needs.

Given the unconventionally expedited development time, bottlenecks in large-scale production of individual vaccines, and the uncertainty about the long-term efficacy of SARS-CoV-2 vaccines there is a clear need for multiple vaccines with distinct properties. In particular, natural SARS-CoV-2 is known to induce both mucosal (secretory IgA) and systemic (IgG) antibody responses. Therefore, the route of administration of a vaccine also needs to be taken into account.

In this project, LMU Munich researchers develop novel engineered virus-like particle (VLP)-based SARS-CoV-2 vaccine candidates, which are easy to produce and can be administered systemically or locally (e.g. nasal application). The SARS-CoV-2-mimicking VLPs have been engineered to display multiple copies of large SARS-CoV-2 protein sequences on their surface. Preclinical *in vitro* and *in vivo* characterization and testing is ongoing.

Tech Overview

Virus-like particles (VLPs) have been engineered, which display multiple copies of large (e.g. 200 amino acids) portions of surface exposed immunogenic protein sequence(s) derived from SARS-CoV-2. Thus, the engineered VLPs mimic SARS-CoV-2, but without being infectious and without causing COVID-19 pathology. Of note, the parental VLPs (lacking SARS-CoV-2 sequences) do not induce much immune response themselves.

The SARS-CoV-2-mimicking VLPs can be easily produced in a scalable production process. Purification of the VLPs can be achieved using standard chromatographic methods. Engineered VLPs possess virus-like properties. In particular, when loaded with a DNA-genome containing a fluorescent protein gene expression cassette, cells can be infected and transduced to express the fluorescent protein. VLP variants which display SARS-CoV-2 sequences known to mediate ACE2 binding show enhanced transduction of cell cultures that overexpress human ACE2. Information on antibody binding can be provided under a confidentiality agreement. *In vivo* immunization experiments are ongoing. For immunization, empty SARS-CoV-2-mimicking VLPs can be used. Alternatively, VLPs could be loaded with gene expression cassettes for additional gene-based immunization. While the current focus is on developing a SARS-CoV-2 vaccine, the technology platform can be adapted for immunization against other pathogens and is thus broadly applicable.

Stage of Development

In vitro proof of concept for the generation of the VLPs has been achieved. Parental VLP and endowed SARS-CoV-2 properties could be confirmed *in vitro*. *In vivo* proof of concept studies are ongoing.

Benefits

- Easy to produce
- Engineered to contain large SARS-CoV-2 sequences at the surface
- Exposed SARS-CoV-2-derived sequences retain native properties (e.g. ACE2 binding)
- Multiple routes of administration, e.g. s.c., i.v., nasal.

Applications

- Candidate vaccine for the prevention of COVID-19
- Platform technology could be adapted to other pathogens
- Candidate immunization agent for the generation of anti-SARS-CoV-2 antibodies

Opportunity

The team is looking for a competent and experienced partner with proven vaccine development (and commercialization) capabilities. The partner should optimally also support preclinical development.

Patents

- Patent application submitted. Contact TTO for further information.

For further information, please contact us.

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