Corona: Vaccination Without Needle?

Scientists are developing a procedure whereby vaccines can be absorbed through the skin

Potsdam and Dortmund, Germany, May 13, 2020 -- The Max Planck Institute of Colloids and Interfaces in Potsdam and the Technology Transfer Fund KHAN-I are developing a vaccine procedure for SARS-CoV2 together with the Lead Discovery Center in Dortmund. The researchers hope that within the next few years, they will be able to establish immunity to and protection from the virus using targeted vaccine transport via the skin.

SARS-CoV2 has already infected more than 3.6 million people worldwide, and is responsible for over 250.000 deaths. The number of unreported cases is estimated to be significantly higher. The pandemic is affecting the everyday life of billions of people, with long-term severe consequences for the global economy and health systems. Industry and academia are currently applying many different approaches to the rapid development of effective, sustained immunization in order to avoid the drastic measures required to prevent the spread of such diseases.

Vaccines are the only possibility for defeating an infectious agent in the long term. In the case of SARS-CoV2, novel vaccine technologies that can quickly be adapted to new viruses are being pushed, particularly those based on the application of nucleic acids or the use of adenovirus vectors. Nearly all these technologies involve the injection of the vaccine into the patient's muscle.

Targeted activation of Langerhans cells
The concentration of immune cells is, however, higher in the skin than in muscle. So-called Langerhans cells are also present in the skin, and these activate and coordinate the body's antiviral response [1].

Christoph Rademacher's research group at the Max Planck Institute of Colloids and Interfaces has developed a new platform technology that specifically addresses Langerhans cells: the Langerhans Cell Targeted Delivery System (LC-TDS) [2, 3]. This system enables vaccines to be applied directly onto the skin or injected with microneedles, thereby using the immune system's natural mechanisms. "We expect our system to be able to release all vaccines that use proteins, peptides or mRNA," says Christoph Rademacher, Group Leader at the Max Planck Institute of Colloids and Interfaces and main inventor of the new technology.

New platform technology allows efficient vaccine release
The central role in the LC-TDS is played by a highly specific chemical component that enables exclusive binding to Langerhans cells, where the efficient release of vaccine can then take place. By adapting existing LC-TDS technology to SARS-CoV2, researchers at the Max Planck Institute of Colloids and Interfaces – with the help of the swiftly mobilized KHAN-I financing – now aim to develop a rapidly available vaccination procedure in cooperation with the LDC in Dortmund. "The KHAN-I financing marks the first step for LC-TDS technology on the road to future entrepreneurial independence as Cutanos GmbH, which we look forward to with high hopes for wide-ranging applications," says Bert Klebl, CEO of KHAN-I, adding: "Further investors are welcome."

"With the KHAN-I-funded collaboration between the LDC and the Max Planck Institute, extraordinarily competent partners have been brought together, and an excellent way has been found to quickly make this promising LC-TDS technology available for the development of a SARS-CoV2 vaccine," adds Mareike Göritz, Patent & License Manager at the licensor and contractual partner Max Planck Innovation.

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About the Max Planck Institute of Colloids and Interfaces
The institute focuses on the exploration and control of very small and very thin structures in in the nanometer and micrometer ranges. These minute structures determine the properties of materials and biosystems. A deeper understanding is the key to numerous inventions, e.g. new vaccines, smart drug carriers and adaptive biomaterials. Future energy production and avoidance of CO2 emissions are further areas of research.

About KHAN-I
KHAN-I is a technology transfer fund founded at the end of 2019 and financed, among others, by the European Investment Fund, the Max Planck Foundation and the Austria Wirtschaftsservice GmbH. It invests in projects and start-ups developing innovative therapies.

About the Lead Discovery Center
The Lead Discovery Center was established in 2008 by the technology transfer organization Max Planck Innovation, as a novel approach to capitalize on the potential of excellent basic research for the discovery of new therapies for diseases with high medical need. The Lead Discovery Center takes on promising early-stage projects from academia and transforms them into innovative pharmaceutical leads and antibodies that reach initial proof-of-concept in animals. In close collaboration with high-profile partners from academia and industry, the Lead Discovery Center is building a strong and growing portfolio of small molecule leads with exceptional medical and commercial potential. Further information: www.lead-discovery.de

About Max Planck Innovation
Max Planck Innovation (MI) is responsible for the technology transfer of the Max Planck Society and, as such, the link between industry and basic research. With an interdisciplinary, team MI advises and supports scientists at Max Planck Institutes in evaluating their inventions, filing patents and founding companies. MI offers industry unique access to the innovations of the Max Planck Institutes. Thus, MI performs an important task: the transfer of basic research results into products that contribute to economic and social progress.

1. *Wong, E., et al., Langerhans Cells Orchestrate the Protective Antiviral Innate Immune Response in the Lymph Node. Cell Rep, 2019. 29(10): p.3047-3059 e3.*
2. *Wamhoff, E.C., et al., A Specific, Glycomimetic Langerin Ligand for Human Langerhans Cell Targeting. ACS Cent Sci, 2019. 5(5): p. 808-820.*
3. *Schulze, J., et al., A Liposomal Platform for Delivery of a Protein Antigen to Langerin-Expressing Cells. Biochemistry, 2019. 58(21): p. 2576-2580.*