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CoronaSys

CoronaSys Innovation sheet 14

Computer-designed Mini-proteins

Background

The surface of SARS-CoV-2 is covered with spike proteins. These proteins connect to human cells, allowing the virus to enter and infect them. Once inside the cell, the virus can copy itself and reproduce[1]. But the spike proteins are also a weakness of the virus due to their exposed position[2]. Researchers have been testing monoclonal antibody treatments to neutralize the virus by binding the spike protein. But these antibodies are often quite difficult to produce, relatively unstable, and require refrigeration in most cases. Researchers have now generated computer-designed proteins to do the job.

State of information: 10/01/2020

Publication: September 2020

Country: USA

Focus area: possibly treatment

Developers: University of Washington

Beneficiaries: Covid-19 patients

Features

SARS- COV-2 binds to the ACE2 receptor on the surface of human cells[3]. Two approaches were used to create the computer- based proteins. First, a segment of the ACE2 receptor was integrated into a series of little protein scaffolds. In the second method, fully artificial proteins that did not pre-exist in nature were created from scratch. The latter method produced the most potent antiviral proteins, including the most promising LCB1, that outperformed monoclonal antibodies in lab tests[4]. It was then determined how exactly the mini- proteins bound to the receptor and by further testing and correcting the binding mechanisms were improved[5]. The researchers originated more than two million new spike- binding proteins since January 2020 of which more than 100,000 were then tested in the lab[6].

Potentials

The computer-designed proteins are quite easy to produce and can be produced relatively fast in large quantities. They do not necessarily need refrigeration and can be applied locally (e.g. nasal via nebulizer)[78]. With further development researchers might be able to produce the proteins for future viruses within weeks after their genome has been obtained[9].

Points to consider

Although the results seem to be promising so far, clinical testing has to be extended and further research is needed.

Conclusion

The computer-designed antiviral proteins might be a promising innovative method in the fight against future viruses, although much more clinical research is needed to prove their efficacy and effectiveness in human beings under everyday conditions.

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[9] Bryant, Erin. "Computer-Designed Proteins May Protect against Coronavirus." National Institutes of Health (NIH), September 28, 2020. https://www.nih.gov/news-events/nih-research-matters/computer-designed-proteins-may-protect-against-coronavirus.

Background on Innovation Sheet Series

As part of a real-time evaluation of the SARS CoV 2 pandemic (with focus on epidemiological, medical, economical, societal, technical, and cultural developments in Germany and Armenia) the CoronaSys research team, under the leadership of Prof. Dr. Martin Voss, is conducting a continuous monitoring of developments and medical, technical, and social innovations concerning Covid-19.

Multiple national and international media outlets, research platforms, and scientific and organizational guidelines, briefs, and updates are screened to feed into this outlet. The rationale behind this is to support the projects' network partners in Armenia and Germany with short summaries of key developments and promising innovations that are shaping the global, German, and Armenian outbreak response and recovery.

The aim of these short briefs is to give condensed and structured information on selected innovations emerging out of the conducted horizon scanning. This could be mainstream big-ticket items or fringe subjects that are easily overlooked in the global flood of information. Some innovations will be followed through their evolution in time while others may only appear once. While subjectively selected, the briefs are descriptive in nature and leave analysis and critical interpretation to the reader. Network partners in both countries are invited to provide feedback on their interest areas and suggest particularly relevant topics for the CoronaSys Workshop series.

The CoronaSys Innovation Sheet Series is published by the Academy of the Disaster Research Unit, which is, as a non-profit limited liability company, a spin-off of the Disaster Research Unit at the Free University of Berlin. The series is part of the research project "CoronaSys: Addressing the corona pandemic in Armenia through systemic risk management", sponsored by the German Federal Ministry of Education and Research.

If you have any questions, suggestions, or if you wish to be taken on (or off) the project mailing list for CoronaSys updates, innovation sheets, and workshop invitations, please send a message to Janina Schäfer (schaefer@a-kfs.de). For general project inquiries, you may contact the team lead Sara Merkes (merkes@a-kfs.de) or the project lead Martin Voss (voss@a-kfs.de).

Previous CoronaSys Innovation Sheets

1 “New” Antiviral Face Masks
2 ”Dyphox” Surface Coating
3 MOVES SLC Portable ICU
4 Portable TRI- KLEEN 500UV
5 Convalescent Plasma Therapy
6 ASIC- App
7 BinaxNOW Antigen Test
8 Corona Traffic Light
9 Aproof at Home Antibody Test
10 IVAT Hygiene Tower
11 LY-CoV555 Antibody Treatment
12 4C Mortality Score
13 Regional Corona Prediction Model

All previous CoronaSys Innovation Sheets are available online:
http://coronasys.a-kfs.de/category/innovation-stream/

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