Gur Yaari, PhD
Bioengineering
Faculty of engineering
Bar Ilan University
Phone: +972-3-7384625
http://yaarilab.com/

Designing passive vaccination to Covid-19 by generalizing antibody repertoires of recovered individuals.

In this project we will utilize recent developments in the field of antibody repertoire sequencing and their analysis. We will use machine learning approaches to characterize antibody repertoire sequencing data and find common features that can differentiate between individuals that recovered from the virus compared to unaffected individuals. These features will be used to design a list of antibodies that will be constructed and expressed, and their affinities and neutralization properties will be tested first in-vitro and then in-vivo.

What we have:

1. Working protocols to sequence antibody repertoires (BIU-Yaari).

2. A strong computational group that can do the bioinformatics analysis (BIU-Yaari).

3. A virology group that will construct COVID-19- based pseudoparticle system for the screening of neutralizing antibodies (BIU-Gal Tanamy) .

4. A working protocol to produce neutralizing antibodies and evaluate their efficacy in inhibiting COVID-19- infection (BIU-Gal Tanamy).

What we are still missing:

1. A clinical collaborator that can take blood from patients and sort the blood cells (European or Israeli).

2. A molecular dynamics computational group that can assess in-silico the affinities of many antibody candidates (European or Israeli).

Development time - about three months

Hadar Ben-Yoav, Ph.D.
Senior Lecturer,

Head, Nanobioelectronics Laboratory (NBEL)
Department of Biomedical Engineering,
Ilse Katz Institute for Nanoscale Science and Technology,
Ben-Gurion University of the Negev
Beer Sheva, 8410501, Israel
Building 64, Room 204.
(O) +972-8-6479717 | (F) +972-8-6479628 | (M) +972-53-2225342

Lab-on-a-Chip for Rapid Detection of COVID-19

The goal of the project is to develop an immunosensor-based electrochemical lab-on-a-chip (LOC) for rapid detection of the COVID-19 at the point-of-test. We will functionalize the surface of an electrochemical micro-sensor with antibodies that are specific to the whole COVID-19 and/or its structural proteins and we will detect the virus by using electrochemical impedance spectroscopy (EIS) method (a method that we have recently demonstrated in our lab[1]). By using EIS, small changes of charge at the sensor's surface due to antibody-antigen binding events will generate quantifiable electrical signals. The miniaturized LOC will be integrated into a portable supporting electronic platform to enable testing at the physician office or at home

1. Zorea, J., Shukla, R.P., Elkabets, M., Ben-Yoav, H., *Probing antibody surface density and analyte antigen incubation time as dominant parameters influencing the antibody-antigen recognition events of a non-faradaic and diffusion-restricted electrochemical immunosensor.* Analytical and Bioanalytical Chemistry, 2020. **412**(7): p. 1709-1717.

Development time - about three months

Dr. Amos Danielli
Faculty of Engineering
Bar-Ilan University

Relevant article
https://www.hayadan.org.il/corona-virus-detection-in-15-minutes-1802201

Rapid detection of the Covid-19 at point of care settings

Objectives

- Development of a highly sensitive point of care diagnostic test with high throughput, ensuring rapid evaluation of multiple suspected patients, faster diagnosis, and better surveillance. Using a novel magnetic modulation biosensing technology, we have shown rapid detection of biomarkers, such as proteins, antibodies, and specific DNA sequences. In particular, we showed that we can detect viruses with much less amplification cycles than qPCR (4-9 times faster).

- Rapid discovery of monoclonal antibody therapeutics against 2019-nCoV using state-of-the-art single-cell sequencing technologies already established in academic laboratories (FHNW), innovative artificial intelligence solutions from industrial partners (aiNET), and a most reputable institute globally for R&D for the control of infectious diseases (Swiss Tropical and Public Health Institute, Swiss TPH).

Avi Schroeder, PhD
Associate Professor of Chemical Engineering, Technion
Adjunct Associate Professor of Biomedical Engineering, Technion
Laboratory for Targeted Drug Delivery and Personalized Medicine Technologies,
Head Technion - Israel Institute of Technology, Haifa 32000, Israel
Member, The Israel Young Academy
President, Israel Institute of Chemical Engineers

Email: avids@technion.ac.il
Cell: 055-667-8868 (+972-55-667-8868)
Office: 077-887-1953 (+972-77-887-1953)
Website: https://www.schroederlab.com/
Publications: https://scholar.google.com/citations?user=iJJSKasAAAAJ&hl=en

Rapid Development of Treatment for Coronavirus

To address the pandemic, we assembled an EU-based team with both clinical, experimental, and scientific expertise. Our approach is aimed at: 1) reducing the ability of healthy people to be infected by COVID-19 virus, and, 2) improve care to infected patients by reducing the viral load and disease symptoms. To be practical and rapid in the clinical dissemination, we will use FDA and EMA-approved platforms as possible. To protect healthy individuals from being infected we propose to employ an siRNA-based approach .siRNA is a Nobel-winning mechanism that downregulates (knocks-down) protein expression in all cells through the delivery of short double-stranded RNA molecules. siRNA technologies are highly specific targeted technologies for down-regulating a disease protein in the body. In the context of a viral disease, we have tested in field trials the ability to target proteins the virus needs for multiplying and invading other cells. We will use an siRNA technology to – reduce the viral load in patients with the virus, and to prevent the ability to be infected in healthy individuals that are exposed to the virus. We expect the protection to last for 6-12 weeks, during this time a healthy individual will not be threatened even if exposed to the virus, afterwards, a new siRNA injection will be administered to continue protection until the pandemic ends.

Furthermore, to reduce sepsis in the patients affected by the virus, we propose to employ a drug delivery platform already FDA-approved for lung therapy with antibiotics, here we will use this platform for administering steroids to the lung. Work our team has done has shown that lung inflammation can be reduced using this approach.

Timeline – we believe that a EU-based effort will be able to provide a clinical candidate within 6 moths, with interim POC after 2 months. The team will work closely with the local Ministries of Health and Science, for constant discussions and updates.

Budget – the project budget, for each team, is 350,000 Euro (i.e. 350,000 Euro per country), to provide research evidence in 6 months to initiate government aided clinical trials.