Ben-Gurion University of the Negev

Coronavirus Taskforce

Project Descriptions and Updates

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COVID-19 from a Life Sciences Perspective

Efficient High Throughput SARS-CoV-2 Testing to Detect Asymptomatic Carriers

Researchers: Noam Shental, Dept. of Computer Science, Tomer Hertz, NIBN, Yonat Shemmer-Avni, Shraga Segal Department of Microbiology, Immunology and Genetics, and Angel Porgador, Shraga Segal Department of Microbiology, Immunology and Genetics

Goal: Conducting testing to detect carriers who present no symptoms of disease.

Path: This method has been implemented and experimentally validated. An ongoing clinical study at Soroka University Medical Center is now being conducted to screen 2000 health care workers. Proposals were submitted for grants and a patent was submitted. Ongoing discussions are now being held with Ministry of Health and IDF officials.

Progress and Outlook: This testing, after being implemented at Soroka, will be deployed to other labs, using a new advanced liquid dispensing robot to accelerate the process. An improved PCR process (polymerase chain reaction technique to produce millions of copies of a particular DNA section) and sample collection protocols will be activated. New pooling schemes will be used to test symptomatic cases.
Geospatial Distribution of Corona Virome and Including COVID-19 in Urban Sewage System and Treated Water Cycle

**Researcher:** Ariel Kushmaro, Dept. of Biotechnology Engineering

**Goal:** The future of public health surveillance depends on developing innovative approaches for following the spread of this virus. One way that this virus may spread is through water and sewage leakage and this should be investigated.

**Path:** This project provides a unique screening method to better understand transmission dynamics and risk factors of the coronavirus in the human population, via previously uncharted means such as sewage systems. Implementing sewage level screening in cities and smaller communities will provide better understanding of the dynamics of spread and the level of infection in the population; this will allow researchers and officials to determine the mutation and evolution rates of the coronavirus, and implement preventive measures for the containment of spread, functioning as an early warning system.

**Progress and Outlook:** This method was validated using samples from sewage from the Dan Panorama Hotel in Tel Aviv, which currently functions as a COVID-19 isolation facility. The preliminary study provides a proof-of-concept for the detection of SARS-CoV-2 RNA in sewage, and a linear “dose-dependent” curve pivotal for surveillance from different localities in Israel, including from the Tel-Aviv metropolis.

Understanding SARS-CoV-2 ecology in human waste could lead to subsequent environmental applications including efficient monitoring and surveillance for SARS-CoV-2. In the future, this study may also provide tools for sewage monitoring as part of an early warning system for SARS-CoV-2 outbreaks in the population.
Identification of Human Neutralizing Antibodies Against the Coronavirus (SARS-CoV-2)

**Researcher:** Ran Taube, Shraga Segal Dept. of Microbiology, Immunology and Genetics

**Goal:** To identify human neutralizing antibodies against the coronavirus.

**Path:** In this project, a high throughput screening platform is used to identify human neutralizing antibodies against COVID-19. These antibodies should prevent SARS-CoV2 from entering the host cell.

**Progress and Outlook:** SARS-CoV-2 soluble antibodies are being purified from human cells. A large antibody library was generated to screen against the S protein of SARS-CoV-2 and neutralization assays were optimized, using pseudo typed viruses.
Non-Pharmaceutical Treatment for COVID-19, Using Microalgae and Plant-Derived Viral Protease Inhibitors

Researchers: Rivka Ofir, NIBN, Vered Tzin, French Associates Institute for Agriculture and Biotechnology of Drylands, Inna Khozin-Goldberg, French Associates Institute for Agriculture and Biotechnology of Drylands, Barak Akabayov, Dept. of Chemistry, Gabriel Frank, Dept. of Life Sciences

Goal: Algae have long been identified as potential sources of pharmacological compounds, including compounds with antiviral properties. To help mitigate the COVID-19 pandemic, researchers will explore single-cell algae to produce potent antiviral agents.

Path: These materials could potentially slow down virus reproduction and would enable patients in early phases of the virus to take alga medication in tablet form or apply plant-based ethereal oil.

Progress and Outlook: "GenScript Biotech", a leading biotech company focusing on early drug discovery, produced the main protease cloned and is now producing and cleaning the protease. Edible algae/plants containing inhibitors for the two proteases will then be formulated into a pill or spray and they could be consumed by patients early as a prophylactic agent.
Saliva-Based Point-of-Care Immunoassay for COVID-19 Detection

Researcher: Robert Marks, Dept. of Biotechnology Engineering

Goal: The current COVID-19 epidemic forces systems to handle an exponentially growing number of patients. Although RT-PCR is the key diagnostic tool in hand to confirm the presence of the virus in sick and seemingly healthy individuals, there has been a dangerous backlog in processing the tests. This project will introduce a quick triage test, serving as an initial screening of SARS-CoV-2 positive individuals, a process which will enable more people to be screened.

Path: There is now evidence of virions in saliva, making it a convenient non-evasive means of diagnostic testing. The lower accuracy of the test will be compensated for by the increase in the number of patients tested. Therefore, even if some positive cases are missed, many more people will be tested. To create a saliva-based test to check for the presence of SARS-CoV-2 virions, this project will produce synthetic peptides to be used to later produce monoclonal antibodies. The results can later be used to produce a putative COVID-19 synthetic vaccine.

Progress and Outlook: Step one of the project – identifying epitope candidates in order to raise capture monoclonal antibodies – was achieved. Step two will be to synthesize the first batch of synthetic peptides. These will then be screened with a cohort of survivor saliva from patients who have survived after contracting the virus, with Helsinki committee approval.
Yeast Display of SARS-CoV2 Antigens

**Researcher:** Roi Gazit, Center for Evolutionary Genomics and Medicine

**Goal:** Individuals infected by SARS-CoV2 develop effective natural immunization hallmarked by robust antibodies response. This project offers fast and efficient diagnosis of individuals who have natural-immunization, while providing an option for developing mass-immunization of the population.

**Path:** Utilizing yeast-display, a method by which specific proteins are expressed on the surface of yeast-cells, will enable scientists to develop a platform for the expression of SARS-CoV2 antigens. Patients who have recovered from SARS-CoV-2 will be screened and diagnostic protocols will be developed, applicable for Israeli settings.

**Progress and Outlook:** The team now includes five members: three researchers, two students and a lab manager. They expect to obtain yeast-lines soon. Since several research teams are desperate to obtain serological tests and blood samples of recovered patients, these may soon become a limited resource. However, the BGU team has easy access to Corona patients in the Corona ward at the Soroka University Medical Center, who could provide materials for clinical research.
Zinc as a Co-Treatment for COVID-19

Researchers: Michal Hershfinkel, School of Pharmacy, Israel Sekler, Dept. of Physiology and Cell Biology, Lior Nesher, Joyce and Irving Goldman Medical School, Jacob Moran-Gilad, Dept. of Health Systems Management

Goal: To investigate a role for zinc as a co-treatment for COVID-19, based on the known roles of zinc in inhibiting viral replication and quinone-based drugs in serving as a carrier that can facilitate zinc permeation into the cells.

Path: The researchers had planned to run an intervention study, using a specific treatment regime to enhance the interaction between hydroxychloroquine and zinc, to enhance cellular zinc levels. At the time, hydroxychloroquine was used in the treatment protocol at Soroka University Medical Center. Due to the emergency situation at this medical center, this study was replaced by a non-interventional cohort prospective study, in which tissue samples will be collected from COVID-19 patients. Tissue samples will be tested for zinc levels and inflammation (ACE2 activity), and proteomics analysis of respiratory samples will be performed.

Progress and Outlook: In vitro analysis was launched to determine the efficacy of hydroxychloroquine as a zinc ionophore in several cell lines that are most susceptible to the virus, focusing on cells that are targets for SARS-CoV-2. To verify the safety of hydroxychloroquine in relation to cardiac function, the researchers will identify if lower doses of the drug will still allow sufficient zinc permeation and expand analysis to other compounds that are potential zinc carriers.
COVID-19 from a Social Science Perspective

Anxiety Levels of Israeli Public during Coronavirus

**Researcher:** Golan Shahar, Dept. of Psychology and Stress, Self and Health Lab

**Goal:** To investigate the behavior of the Israeli public prior to and throughout the COVID-19 crisis, using an interdisciplinary approach and team.

**Path:** Prof. Golan and his team polled a representative sample of 1,000 Jewish Israelis, when the coronavirus took hold in other countries, but before it reached Israel. Respondents answered questions on their general anxiety, their anxiety specifically regarding the virus, and their attitudes toward the Israel Ministry of Health. The most significant increase in anxiety was evident in people who were already prone to worry, whereas for the typical person, the effect of the virus on anxiety levels was much weaker. Citizens who were already anxious, and citizens with negative views of the ministry, were found to be more apprehensive amid the COVID-19 pandemic. People who perceived the Health Ministry as caring and confident had lower anxiety levels. Tracking the changing levels of anxiety in the Israeli public during the spread of COVID-19 is extremely important, because anxiety is a major force affecting the public's reaction to mass medical crises. Too high anxiety ("panic") may obstruct the social order and instill hostilities between government agencies and civilians. In contrast, too little anxiety ("complacency") could affect compliance.

The researchers recommend that the Ministry of Health take steps toward cultivating a more positive image of their office, in order to reduce anxiety levels and reassure citizens prone to anxiety.

**Progress and Outlook:** Weekly assessments of the public’s anxiety have been conducted. A paper and grant requests were submitted. Findings were published, generating widespread, national/international media attention. Data collection continues, to analyze the role of attitudes towards the Ministry of Health and community resilience in anxiety and compliance with the guidelines. The findings will inform national/international public health policies targeting the population’s behavior in the face of COVID-19.
Assessment of Voice Markers of Depression and Other Clinical States Among Medical Staff Treating Corona Patients and Among Corona Patients During the Corona Crisis

Researchers: Julie Cwikel, Charlotte B. and Jack J. Spitzer Dept. of Social Work, Alison Stern Perez, Charlotte B. and Jack J. Spitzer Dept. of Social Work, Dan Vilenchik, Dept. of Computer Sciences and Electrical Engineering, Iris Raz, senior nurse and midwife at Soroka University Medical Center:

Goal: Exposure to stress and trauma, and our emotional and behavioral responses, affect our wellbeing and health, which can seriously affect our functioning at work, triggering various mental disorders, which may co-exist with posttraumatic stress disorder (PTSD). The stress of medical staff under conditions of high media focus and crisis, such as those now occurring during the COVID-19 pandemic, may compromise the quality of healthcare delivery, since chronic stress increases the risk of poor medical decisions. Thus, the timely identification of chronic mental and physical distress of medical staff required to work long hours during a shift while concurrently making myriad decisions under pressure is vital to ensuring both their own health and effective healthcare delivery. By identifying indicators of verbal manifestations of mental distress among various populations who have experienced stressful life events, or are experiencing chronic fatigue and stress from the corona crisis, this project aims to obtain better understanding of the manner in which speech is used, investigate relations between the verbal and non-verbal expressions in speech, develop methods of unobtrusive differential diagnosis, and create innovative technologies for recognizing mental states.

Path: This project will conduct an efficient, real-time assessment of depression, fatigue, and chronic emotional and physical stress, by rapidly assessing individuals’ level of acute distress through speech patterns.

Progress and Outlook: The team has secured the cooperation of Dr. Leonid Barski, Dr. Eli Rosenberg and Dr. Nadav Amitai, all physicians on the corona ward at Soroka University Medical Center, for this project. After consulting with them, the project will focus on the detection of chronic stress among the medical staff, in addition to evaluating the emotional state and stress levels of ambulatory patients. All forms have been completed to submit a proposal to Soroka’s Helsinki committee. The team has visited the corona ward to meet the three collaborating physicians. Prof. Eyal Sheiner, Director of Soroka’s Obstetrics and Gynecology Dept., has agreed to have his department participate in the project.
Giving and Volunteering During the Coronavirus Crisis

**Researcher:** Hagai Katz, Dept. of Business Administration, in collaboration with Tel-Aviv University’s Institute for Law and Philanthropy.

**Goal:** The corona epidemic has resulted in a dramatic decrease in pro-social behavior, such as donations of time and money, thus weakening the capacity of nonprofit services that rely on such support. Exploring this issue could deepen our understanding of some of the less visible social impacts of global pandemics and could serve as the basis of managerial and policy recommendations aimed at mitigating such impact.

**Path:** National weekly surveys of giving and volunteering in the Israeli public were held, indicating a dramatic reduction of 50-75% in both, corresponding with the severity of social distancing measures required by authorities.

**Progress and Outlook:** The philanthropic dynamics of individuals in Israel were compared to those of the previous year. Once social distancing was required (beginning March 12, 2020) there was an 18% drop in donations to organizations in comparison to the four weeks prior to this date, resulting in a decrease of hundreds of millions of shekels in third sector organizations’ income. Volunteering decreased by 35% during this time - resulting in 166,000 less volunteers. Results show that the effect of coronavirus is stronger than that of other factors such as the March Knesset elections and the Passover holiday. A grant from the Ministry of Science was obtained, enabling the project to be extended until October 2020 in order to examine the ongoing effects of quarantine and the period after that.
Increasing Cultural Competence of Health Professionals
Coping with the COVID-19 Crises: A Randomized Controlled Trial

Researchers: Odeya Cohen, Medical School for International Health, Ortal Slobodin, Dept. of Education

Goal: Developing a culturally informed online education program to make health professionals more sensitive to individuals from different ethnic, cultural and racial backgrounds, and cultivate immediate trust, making them more competent in dealing with corona challenges. This training could improve the treatment provided for language/cultural minority groups.

Path: Interviewing key informants, including academic scholars, military personnel, and medical professionals, and members of ethnic minority groups in Israel (Bedouin Arabs, Druze, Ethiopian immigrants, immigrants from the former Soviet Union, Muslim Arabs and ultra-orthodox Jews).

Progress and Outlook: Interviews with professionals were held, and the team contacted academic and health organizations that agreed to incorporate an intervention program in their work practice. This program will be formalized as an online unit within the next few weeks, at which time a randomized trial will be conducted to measure the efficacy of the intervention in boosting the cultural competence of healthcare professionals and students in coping with the COVID-19 outbreak. Participants will be recruited from academic institutes, governmental emergency organizations and community emergency response teams.
Making Health-Focused Messages More Effective in Minority Societies by Developing Culturally-Adapted Health Promotion Models

Researchers: Orna Braun-Lewensohn, Dept. of Conflict Management and Resolution, Sara Abu-Kaf, Dept. of Conflict Management and Resolution, Tehila Kalaji, Dept. of Administration and Public Policy

Goal: Providing diverse tools, such as value and culture based instruction, to enable Bedouin and Jewish ultra-orthodox minority groups to better respond to media health guidelines

Path: A multi-cultural research team, which includes Bedouin and ultra-orthodox Jewish researchers, will explore the potential of culturally adapted instruction that implements family and community values regarding personal and public health during severe health crises.

Pilot surveys were conducted in ultra-orthodox Jewish and Arab communities. Participants were asked to indicate the extent to which they adhere to various authority figures (family physician, Minister of Health, religious leaders, etc.), the importance of the health message (personal health, risk of virus spreading) in relation to adherence to instructions and the effectiveness of media options in transmitting guidelines (radio, television, WhatsApp groups, neighborhood megaphone).

Progress and Outlook: Several steps are recommended in light of findings: In the ultra-orthodox Jewish community, a combined religious leader/physician authority model should be created to deliver guidelines, megaphones should be used to broadcast instructions in Yiddish, the risk of endangering the elderly population should be heavily emphasized and women should be recruited to disseminate health messages. In the Arab community, infectious disease experts and family physicians should deliver health guidelines, via radio, and television broadcasts should be dubbed in Arabic. The risk of endangering elders should be emphasized, and guidelines should be disseminated through women, who can be effective information agents.
Monitoring Public Adherence to Social Distancing in the COVID-19 Era Through Data Mining from Social Networks

**Researchers:** Jacob Moran-Gilad, Dept. of Health Systems Management, Rami Puzis, Dept. of Software and Information Systems Engineering, Michael Fire, Dept. of Software and Information Systems Engineering

**Goal:** This project utilizes the social network infrastructure to collect relevant data related to COVID-19.

**Path:** The team has begun collecting tweets on COVID-19, including those utilizing other names for the virus and related keywords (SARS, MERS, CORONA, nCoV2) and Instagram posts with COVID-19 related hashtags, including image data, text, and comments. As the research progresses, Instagram data collection will be expanded throughout Israel and other countries.

**Progress and Outlook:** Initial findings based on studying face and object detection in images to infer social distancing behavior showed that there was a decrease in the overall number of posts on social networks, from the second/third week of March 2020, when social distancing guidelines were introduced. There seemed to be no such decrease during the same period last year (aligned with the Jewish holidays). There was no significant difference in the number of faces, as well as in the gender and age distributions on Instagram between the pre-COVID-19 period and after the rollback of the social distancing guidelines. However, there was an increase in the proportion of images containing indoor objects. The next steps will be to analyze the content from Twitter posts regarding COVID-19, continue collecting data from social networks as government restrictions are being lifted and apply for additional funding to continue the project.
New Media and Healthcare Professionals' Experience during Coronavirus Crisis

Researchers: Odeya Cohen, Medical School for International Health, Rami Puzis, Dept. of Software and Information Systems Engineering

Goal: Investigating experiences of healthcare workers during the COVID-19 outbreak as reflected in professional social media networks. Their accounts of these experiences reflect how they cope with the new challenges posed by this epidemic.

Path: Analyzing formal and informal health-related communication in social media during the COVID-19 outbreak and forming insights based on textual analysis.

Progress and Outlook: Two research students were recruited and have traced 167 Twitter accounts of U.S. hospitals and 358 accounts of workers organizations. 300,000 Twitter accounts following hospitals were sampled, keywords were targeted and posts were identified to serve as a primary information pool for topic sentiment analysis. The team now plans to contact content experts in health areas, to validate research results and to continue building and analyze the database.
Relieving Emotional Distress and Loneliness Among Community-Dwelling Older Adults Through Online Support Group Meetings as a Way of Improving Quality of Life


Goal: Improving quality of life for older adults during the coronavirus epidemic, by improving their online communication skills to enable social interaction.

Path: Creating an intervention program to boost technological skills among the elderly in the community, while creating a space for people to share their hardships in coping with the pandemic and improve their coping abilities. Two pilot groups have been formed, each consisting of seven participants from Beer-Sheva and the surrounding area, most of whom live alone. BGU students will serve as instructors and provide online sessions, instructing the participants on how to use WhatsApp and Zoom and how to make conference phone calls. The participants will complete questionnaires pre-and post-participation, to assess emotional distress, social exclusion, loneliness, compliance with regular medication regime, adherence to social distancing practices, etc.

Progress and Outlook: Participants who complete the program will become instructors for others with low digital literacy. Once proven effective, the program can become sustainable and benefit broader populations, including older people living in sheltered housing, people living in remote rural communities or people with suppressed immune systems, in periods of crisis and in routine times as well.
Searching Coronavirus: Quality of Google Search Results Around the World

**Researchers:** Nir Grinberg, Dept. of Software and Information Systems Engineering, BGU, Ayelet Baram-Tsabari, Technion

**Goal:** In times of global epidemic, Internet search is the primary source of information about current affairs. High-quality information can guide individuals' behavior and have major health implications. This project maps the quality of Google's online COVID-19 related search results as seen by a global audience and tries to improve it.

**Path:** Surveys were done to evaluate the quality of Google search results in 39 different languages. Results show that the quality is good but not excellent, and high-quality assessments tend to be linked to official information (health and government sources) and are less linked to the news media.

**Progress and Outlook:** In order to more effectively build search engines that support people’s decision-making during this time of crisis and its aftermath, the team hopes to implement the survey in more countries and update the survey to reflect changes in Google (the results page is now more curated and less algorithmically ranked).

Participants recruited for the project will be requested to use crowdsourcing platforms to execute a Google search query in a country, language, and location they choose. They will be asked to use a query term, in the language of their choice, that a non-expert in that country would use and report on various aspects of the results page, such as the number of links to various sources (governmental, health, news, Wikipedia, etc.), the order of page elements (news on top, search results, etc.), and whether the results appear in the language chosen for search. In addition, participants will be asked to evaluate the overall quality of the results, flag any issues, and suggest ways to improve the results.
COVID-19 from an Engineering Perspective

Closed System for the Efficient Removal of Mucus Secretions from the Respiratory System (as Part of Ventilator/Respiratory System), While Reducing Risk to the Medical Team

**Researchers:** David Katoshevsky, Dept. of Environmental Engineering, Yuval Kavari, Soroka University Medical Center, Shimon Lerman (emeritus)

**Goal:** Developing a system to automatically help patients clear mucus secretions from the airways of patients with various respiratory diseases.

**Path:** Blockages, formed due to the virus and containing the virus, will be cleared during the respiratory process. The technology works by introducing air pressure and acoustic pulses into the airway and lungs over a low-pressure airstream. The mucus is disintegrated into pieces and then removed.

**Progress and Outlook:** The use of this technology was found to be effective in a series of airway and lung laboratory experiments that were conducted. The pilot lab system disintegrates and removes the exhaled mucus and then safely stores it. Part of the lab system already exists based on a project with Cincinnati Children's Hospital. Implementation at Soroka University Medical Center is anticipated as well as at other hospitals.
Drones for Public Health Emergency Management

Researchers: Jessica Cauchard, Dept. of Industrial Engineering and Management, Stav Shapira, Dept. of Emergency Medicine

Goal: Using drones to maintain care continuity, especially crucial for at-risk populations, during the COVID-19 crisis. During social distancing or a power shortage, drones can deliver relief supplies while carrying cameras to support remote medical care, and can be used to monitor and inform populations.

Path: Although drones are increasingly being used in the management of the COVID-19 crisis, they are often perceived as threatening and people may refuse to interact with them. This project will conduct a socially sensitive exploration of perceptions related to human-drone interactions during large-scale public health emergencies among vulnerable populations in Israeli society, and acquire insights on how to best design medical emergency drones to maximize their contribution to emergency relief. The project will investigate these perceptions among frail elderly people, Bedouin and ultra-orthodox Jews, all considered highly vulnerable in the current epidemic.

Progress and Outlook: A initial survey will be sent to the general population and two vulnerable population groups – ultra-orthodox Jews and Bedouin. The research team is now submitting proposals to the EU and AXA Research Fund.
Electrically Active Antibacterial and Antiviral Air Filters

**Researcher:** Christopher Arnusch, Dept. of Desalination and Water Treatment, Blaustein Institutes for Desert Research (BIDR)

**Goal:** Developing an air filter with enhanced anti-viral properties that could be incorporated into individual facemasks, building ventilation systems and private and public vehicles such as cars and buses.

**Path:** Air filtration equipment was set up to test laser-induced graphene air filters. Simulations for breathing through the filter and coughing/sneezing were prepared. Preliminary results show that the LIG filter blocks up to 95% of bacteria when a small voltage of 2.5 V is applied, thus enhancing the air filter's antimicrobial function.

**Progress and Outlook:** Preliminary results show that electrical effects significantly enhance the antimicrobial function of the air filter. The team plans to validate the preliminary results and expand testing. A Ministry of Science and Technology (MOST) grant of NIS175,000 was obtained to continue the project for one year.
Increasing Efficiency of Virus Capturing/Filtration

**Researchers:** David Katoshevsky, Dept. of Environmental Engineering, Shimshon Lerman (emeritus), Rafael Tadmor, Dept. of Mechanical Engineering

**Goal:** To build an air purifier to be installed in air conditioning systems or as independent units.

**Path:** Developing a lab system.

**Progress and Outlook:** A preliminary lab system has been developed and collaboration with Israel Aircraft Industries was initiated. Preliminary results are promising. This project, supported by Israel’s Ministry of Science and Technology, will then be implemented in work places, airplane cabins (in collaboration with Israel Aircraft Industries), and medical centers.
Rapid Detection of COVID-19 Asymptomatic Carriers Based on an Nano-Gap Antenna Array in a Breathalyzer Configuration

**Researcher:** Gabby Sarusi, School of Electrical Engineering, Dept. of Photonics and Electro-Optics

**Goal:** Rapid and effective detection of COVID-19 (to replace the existing swab system).

**Path:** This project offers a fast and easy to use testing technique: the patient breathes into a breathalyzer containing a capsule with chip. The capsule with the chip is then taken out and checked with a spectrometer to detect the coronavirus. The entire process takes only one minute, as opposed to swab-PCR-based tests that require sending swabs to the lab and a two-three day waiting period before results are obtained.

This method was implemented and experimentally validated, in an ongoing clinical study at Sheba Medical Center checking 100 combat soldiers staying in a shutdown hotel facility, after testing positive for COVID-19. This test functions similar to a soft drink vending machine: the patient inserts a capsule into the breathalyzer, breathes on it and receives a result within 30 seconds.

**Progress and Outlook:** In 93.3% of the individual tests performed, the results matched those obtained via PCR-swab tests. External grants and patents were submitted, a paper is being drafted, and commercialization options are now under discussion. Prof. Sarusi plans to implement machine learning to achieve near 100% accuracy and hopes to validate the method by testing an additional 400 people. Atomization of the entire system will provide very accurate 30-second tests.