



### **TECHNION INNOVATIONS** COVID-19

**SCIENCE SAVES LIVES** 



## HOME-TEST KIT FOR COVID-19

#### The Need

One of the major obstacles experienced during the global COVID-19 pandemic has been the accessibility to testing. The inability to test the greater population has kept decision makers relying on statistical probability in the absence of hard numbers.Testing is considered key to an effective exit strategy for countries to return to normal economic activity.

#### Product

An inexpensive kit that will enable a simple home test for COVID-19 with results available in under an hour. The test only requires a saliva sample, reactive material and a thermal cup. Once the protocol is approved by the Health Ministry, it can be made widely available to the population at large. The home-test kit does not require any special lab equipment.

#### Technology

Lead researcher, at the Rappaport Medical Faculty, Prof. Naama Geva-Zatorsky, has developed a kit using existing materials capable of identifying the genetic material of COVID-19. The team proved that in medium and high concentrations of coronavirus, the test identifies 99% of the cases. The technology is low-cost, rapid, and does not require specialist equipment or lab expertise. In future the test could be adapted to other viruses and pathogens.

The test was developed with the collaboration of colleagues at the Rambam Health Care Center and Meir Medical Center.





Prof. Naama Geva-Zatorsky and her team in the Rappaport Medical Faculty



## **AIR SHIELD** PROTECTS DOCTORS AND NURSES ON THE FRONT LINE

#### The Need

N95 masks provide up to 95% protection, which is insufficient to ensure the safety of medical staff caring for COVID-19 patients, and in particular when intubating severe cases. Furthermore, medical staff worldwide report that problems of overheating and foggy glasses make it difficult when caring for COVID-19 patients.

#### Product

A breakthrough device known as the "Air Shield," dramatically improves the efficacy of protective masks and is already in use by medical staff caring for COVID-19 patients in hospitals throughout Israel. The device continuously blows air into the mask, improving protection against infection while eliminating fogging and overheating.

#### Technology

The invention generates airflow downwards from the forehead area and creates an air shield inside the protective mask that isolates the doctor from the surrounding atmosphere, which may carry COVID-19 droplets. A small pump attached to the waist blows air through a tube up to the forehead, which is expelled via small holes in a manifold attached to the mask.

Head of the DesignTech Lab at Technion, Prof. Ezri Tarazi based the idea on the pump used in protective masks against nuclear, biological and chemical (NBC) warfare, and adapted it to the needs of the medical professionals. The Air Shield integrates a thin flexible tube, a lightweight manifold, a thin shield and a rechargeable battery. All the components are standard except for the manifold, which is being manufactured at Technion using industrial 3D printers.

The Air Shield was developed in collaboration with medical staff at Rambam Health Care Campus.



PEELEN

Air Shield device powered by a waiststrapped air pump ensures viral droplets are kept clear of the face and permits clear vision in the visor during medical intervention.

# LIQUID FOAM THERAPY FOR ARDS

#### The Need

Acute Respiratory Distress Syndrome (ARDS) is recognized as the leading cause of death in COVID-19 patients. To date, there is no existing therapy to treat ARDS patients. These patients undergo assisted ventilation and oxygenation, oftentimes under intubation, in intensive care units.

#### Product

Liquid Foam Therapy (LIFT) is a radical new method for pulmonary drug delivery with the potential of delivering therapeutics homogeneously into the lungs, and in large doses. The new technology could help save the lives of severe COVID-19 patients suffering from ARDS. Due to the global crisis, the development is being fast-tracked.

#### Technology

One of the hallmark symptoms of ARDS is pulmonary surfactant damage. The patentpending technology LIFT, invented by Prof. Josué Sznitman and Dr. Yan Ostrovski, of the Faculty of Biomedical Engineering, is designed to dramatically improve the distribution of surfactant across the lungs. The device incorporates loading proprietary capsules containing chemically inert foaming material, capable of drug delivery. Alternatively, the drug itself is foamed.

The LIFT technology is licensed to the new startup, Neshima Medical, headed by Dr. Ostrovski.





Lung models in Prof. Josué Sznitman's lab in the Faculty of Biomedical Engineering.





## **MAYA:** ANTI-VIRAL PROTECTIVE STICKER

#### The Need

Every healthcare worker in the hospital is potentially exposed to COVID-19 virus droplets, and standard surgical masks do not provide adequate protection. The COVID-19 droplets are nanosized and therefore require a nanotech solution.

#### Product

"Maya" is an anti-viral protective sticker, marketed in individual sterile packages, which can be easily affixed to any surgical mask. The simple sticker is based on sophisticated nanotechnology and is 3D printed at Technion. It immediately improves protection while significantly reducing the possibility of infection. The sticker is already in initial use in major Israeli hospitals. There is a worldwide demand which cannot be met at current production rates.

#### Technology

The sticker, made of nano fibers coated with antiseptics, traps the nano-sized virus droplets inside the fiber texture. The antiseptic is released on contact with the virus and efficiently neutralizes the droplets. Prof. Eyal Zussman and team applied sophisticated nanotechnology developed in the Nano-Engineering Lab in the Faculty of Mechanical Engineering to create and manufacture this unique sticker.

The Maya sticker has been granted a Health Ministry initial approval. Maya was developed in collaboration with the Defense Ministry's COVID-19 R&D Emergency Team and Galilee Medical Center.





#### **TECHNION COVID-19 RESPONSE:**

PARTIAL PROJECT LIST

#### DIAGNOSTICS

Home-testing for COVID-19 diagnosisI Prof. Naama Geva-ZatorskyDiagnostic test for pre-symptomatic COVID-19 carriersI Prof. Hossam HaickPooling method for accelerated testing of COVID-19I Prof. Roy KishonyIdentifying and quantifying viral RNA using nanoporesI Prof. Amit MellerInnovative and rapid diagnostic test using blood and salivaI Prof. Moran BercoviciThermal imaging camera for remote measurement of vital signsI Prof. Yonatan SavirAI powered smart stethoscopeI Prof. Yehoshua Zeevi and Prof. Rafael BeyarSensor for rapid COVID-19 diagnosis using CRISPR technologyI Prof. Daniel RamezAdvanced microscopy techniques to detect COVID-19 antibodies in the bloodI Prof. Yoav ShechtmanDiagnostic testing based on throat cultures and blood and urine samplesI Prof. Tomer ShlomiRapid and precise diagnostic techniquesI Prof. Gilad Yossifon and Prof. Yehezkel Kashi

#### VACCINE DEVELOPMENT

<u>Vaccine for COVID-19 based on a vaccine for shrimps</u> | Prof. Avi Schroeder Developing antibodies for ACE-2 receptors | Prof. Zaid Abassi and Prof. Oded Lewinson

#### THERAPEUTICS

Drug delivery to the lungs for ARDS | Prof. Josué Sznitman Ointment to treat COVID-19 infections | Prof. Roee Amit <u>Trapping COVID-19 using existing nano-ghost technology</u> | Prof. Marcelle Machluf <u>Direct drug delivery to the lungs</u> | Prof. Dror Seliktar Respirators using microturbines | Prof. Beni Cukurel

#### AIDS FOR MEDICAL TEAMS

Developing filters and coatings using nanometric fibers | Prof. Eyal Zussman Identifying infected individuals based on immune response | Prof. Shai Shen-Orr Developing anti-viral disinfectants | Prof. Shady Farah Al research to evaluate the patients' condition | Profs. Shie Mannor, Uri Shalit, Joachim Behar Ultrasound for lung imaging | Prof. Alex Bronstein, Prof. Ron Kimmel and Doron Shaked <u>Novel protective equipment for medical personnel using 3D printing</u> | Prof. Ezri Tarazi 2D and 3D biocidal surfaces | Prof. Yoav Eichen Active coating for face masks | Prof. Yair Ein-Eli Analysis of antiviral sterilizers | Prof. Debbie Lindell and Prof. Oded Beja





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