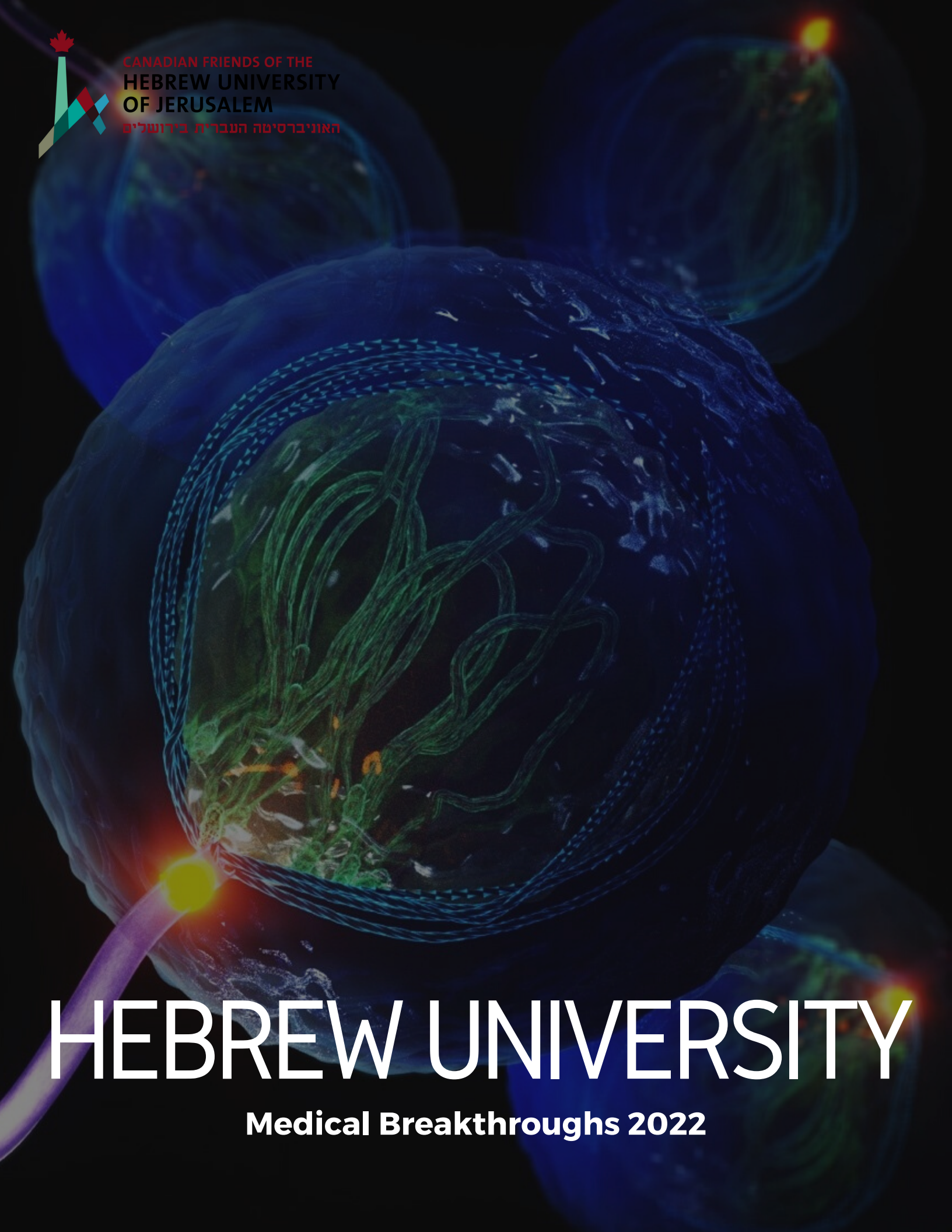
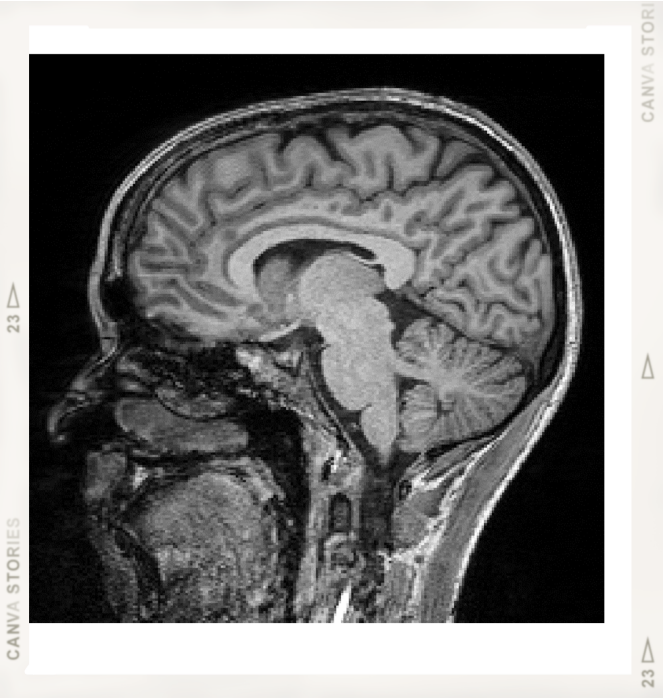
CANADIAN FRIENDS OF THE
HEBREW UNIVERSITY
OF JERUSALEM
האוניברסיטה העברית בירושלים



HEBREW UNIVERSITY

Medical Breakthroughs 2022

DIAGNOSIS OF EARLY-STAGE PARKINSON'S DISEASE NOW POSSIBLE WITH NEW METHOD DEVELOPED AT HEBREW UNIVERSITY



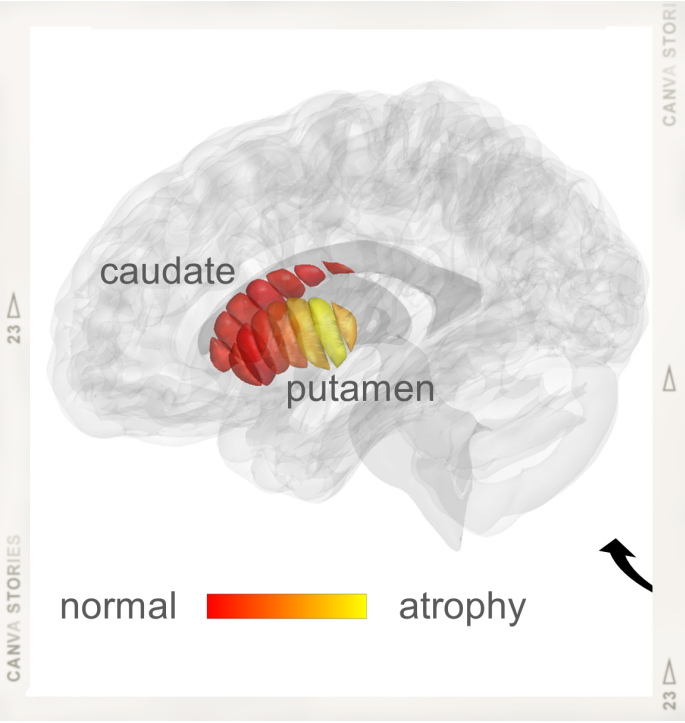
Parkinson's is a progressive and debilitating disease of the brain that eventually compromises patients' ability to walk and even to talk. Its diagnosis is complex, and in the early stages – impossible.

The usual method of visualizing brain structure utilizes a technique most of us are familiar with, called MRI. However, it is not sensitive enough to reveal the biological changes that take place in the brain of Parkinson patients, and at present is primarily only used to eliminate other possible diagnoses.

The Hebrew University of Jerusalem (HU) researchers, led by Professor Aviv Mezer, realized that the cellular changes in Parkinson's could possibly be revealed by adapting a related technique, known as quantitative MRI (qMRI). Their method has enabled them to look at microstructures within the part of the deep brain known as the striatum – an organ which is known to deteriorate during the progress of Parkinson's disease. Using a novel method of analysis, developed by Mezer's doctoral student, Elior Drori, biological changes in the cellar tissue of the striatum were clearly revealed. Moreover, they were able to demonstrate that these changes were associated with the early stages of Parkinson's and patients' movement dysfunction. Their findings were published in the prestigious journal Science Advances.

qMRI achieves its sensitivity by taking several MRI images using different excitation energies – rather like taking the same photograph in different colors of lighting. The HU researchers were able to use their qMRI analysis to reveal changes in the tissue structure within distinct regions of the striatum. The structural sensitivity of these measurements could only have been previously achieved in laboratories examining the brain cells of patients post mortem.Not an ideal situation for detecting early disease or monitoring the efficacy of a drug!

"When you don't have measurements, you don't know what is normal and what is abnormal brain structure, and what is changing during the progress of the disease," explained Mezer. The new information will facilitate early diagnosis of the disease and provide "markers" for monitoring the efficacy of future drug therapies. "What we have discovered," he continued "is the tip of the iceberg." It is a technique that they will now extend to investigate microstructural changes in other regions of the brain. Furthermore, the team are now developing qMRI into a tool that can be used in a clinical setting. Mezer anticipates that is about 3-5 years down the line.



MRI images used for automatic detection of microstructural changes in early-stage Parkinson's Disease (PD) patients.Marked in yellow are areas in the putamen where PD patients show tissue damage, compared to healthy controls.

PROMISING NEW MOLECULE DEVELOPED AT HEBREW UNIVERSITY MAY PREVENT AGE-RELATED DISEASES AND INCREASE LIFE EXPECTANCY AND WELLNESS

With a constant renewal of cell vitality in diseased tissues, this new drug will hopefully lead to the treatment or prevention of diseases, such as Alzheimer's and Parkinson's

While breakthroughs in the world of medicine and technology account for the global increase in life expectancy, improvements in quality of life for the elderly population lag far behind. Longevity without a decline in health is one of the major challenges that faces the world of medicine. A new study led by Professors Einav Gross and Shmuel Ben-Sasson of the Faculty of Medicine at the Hebrew University of Jerusalem (HU) has identified a group of molecules that enable cells to repair damaged components, making it possible for those tissues to retain proper function. Their findings were published in Autophagy.

Currently, a major factor in aging tissues is the reduced effectiveness of the cell's quality-control mechanism, which leads to the accumulation of defective mitochondria.

Although these 'batteries' wear out constantly, our cells have a sophisticated mechanism that removes defective mitochondria and replaces them with new ones." However, this mechanism declines with age, leading to cell dysfunction and deterioration in tissue activity.

This degenerative process lies at the heart of many age-related diseases, such as Alzheimer's disease, Parkinson's disease, heart failure and sarcopenia, which are on the rise. Gross and Ben-Sasson's study may have far-reaching practical applications since their new technology, developed at Hebrew U., helped create innovative compounds to treat diseases that are currently incurable. The study also showed that these molecules can be used preventively. "In the future, we hope we will be able to significantly delay the development of many age-related diseases and improve people' quality of life," shared Ben-Sasson. Further, these compounds are user-friendly and can be taken orally.

To advance their important research and translate it into medical treatment for a variety of patients, the research team, together with Yissum, Hebrew University's tech transfer company, established Vitalunga, a startup that is currently developing this drug. "Ben-Sasson's and Gross's findings have significant value for the global aging population," noted Itzik Goldwaser, CEO of Yissum. "As Vitalunga advances towards pre-clinical studies, they're closer than ever to minimizing the unbearable burden that aging-related diseases, such as Alzheimer's and Parkinson's, has on individuals, their families and the our health care systems."

Dr. Moran Yassour

HEBREW UNIVERSITY DRS. MORAN YASSOUR AND HAITHAM AMAL AWARDED 2022 KRILL PRIZE FOR EXCELLENCE IN SCIENTIFIC RESEARCH

Dr. Moran Yassour at Hebrew University of Jerusalem (HU)'s Department of Microbiology and Molecular Genetics, and Dr. Haitham Amal, at HU's Institute for Drug Research and the School of Pharmacy, have been awarded the prestigious Krill Prize for Excellence in Scientific Research, which is administered by the Wolf Foundation. The Krill Prize is awarded each year to 10 outstanding young researchers who have not yet been granted tenure. Winners are chosen based on standards of excellence and on the subject of their research.

Dr. Moran Yassour is considered one of the world's leading researchers of the microbiome, an innovative field based on the premise that the human body contains a huge number of bacteria that play important roles in metabolic processes. She has published a number of articles on this subject, focusing on the Bedouin population of the Negev as well as infant microbiomes, and has developed significant computational tools that are in use around the world. In addition to her research, Yassour is one of the leaders of the computational medicine track at Hebrew University-Hadassah's Medical School and has done much to help prepare Israel's next generation of doctors.

Dr. Haitham Amal's research focuses on the molecular mechanisms and biological indicators of conditions such as autism and Alzheimer's.Recently, he led a research project that discovered that both these conditions share a common molecular mechanism that can lead to neurological disruption, a finding that may help the development of effective treatments for both conditions. Amal is a particularly prolific researcher, having already published a large number of articles in prestigious journals and is involved in the development of drugs and diagnostic methods, alongside his extensive research activities.

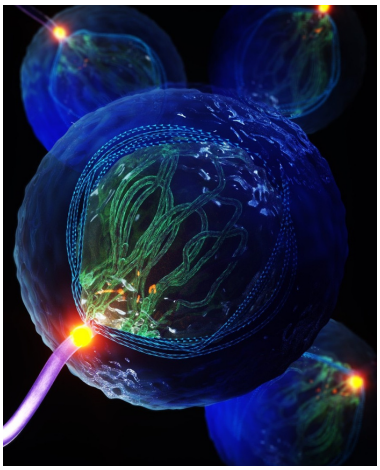
Dr. Haitham Amal

CURRENT STUDIES

HEBREW UNIVERSITY SCIENTISTS FIND THE MOST PRIMITIVE BLUEPRINT FOR EMBRYO CELL CREATION

A groundbreaking study, led by Professors Yossi Buganim at the Hebrew University of Jerusalem (HU) Faculty of Medicine's Institute for Medical Research and Tommy Kaplan at HU's School of Computer Science and Engineering and Department of Computational Biology, has uncovered unique 14,000 sites in the DNA that together form the most elementary blueprint for embryogenesis- the creation of embryos. Their findings were published in Nature Communications.

Going forward, this significant discovery may help explain the embryonic defense system, which prevents early placental cells from developing into embryonic cells. "Since placental cells are susceptible to damage and infection, the body's natural defense mechanism prevents placental cells that migrating to the developing embryo and attaching to it to become part of the embryo," Buganim explained. Overall, this study illuminates key features that characterize our ability to reprogram cells and provides a powerful tool to study cellular plasticity and cell-fate decisions.

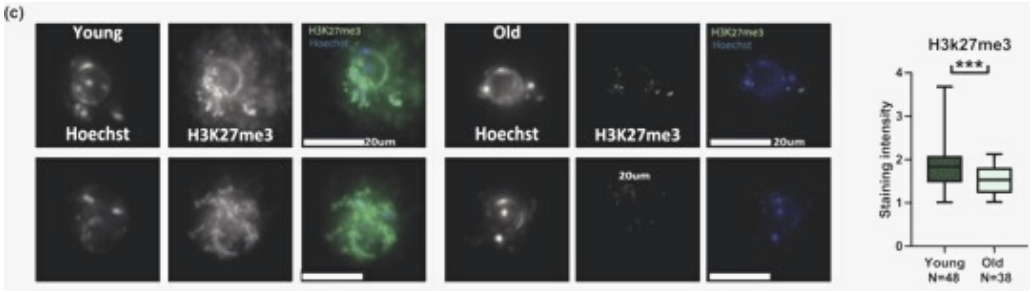


GROUNDBREAKING RESEARCH

Hebrew U. Study of Zebrafish Ovaries Discovers New Structure Vital for Normal Egg Development. Groundbreaking research could lead to better understanding of human infertility

Using unique research tools developed in In the lab of Dr. Yaniv Elkouby's Faculty of Medicine lab, researchers were able to watch in real-time as a cluster of oocytes progressed towards maturity. This has implications for their role within human reproduction. Failure of chromosomal organization within human egg and sperm cells result in miscarriages and infertility.

However, the mechanisms controlling these processes are not understood. The discovery of a cilium that plays an essential role in controlling chromosomal organization could provide new insights. "Identifying mechanisms moves medical research one step closer to finding solutions," Elkouby shared.



EXTENDING WOMEN'S FERTILITY & REVERSING AGING IN HUMAN EGG CELLS

Throughout much of the world, increasing numbers of women are delaying having their first child until they are in their late thirties, and even into their forties. At this age, their eggs are rapidly deteriorating and, even with IVF, their prospects of conception are far from guaranteed.

Reversing that deterioration is the ultimate goal of molecular biologist Dr. Michael Klutstein, head of the Chromatin and Aging Research Lab in the Faculty of Dental Medicine at the Hebrew University of Jerusalem (HU). This possibility has now come one step closer with recent research from his lab, carried out by PhD student Peera Wasserzug-Pash. in collaboration with clinicians from Hadassah Medical Center and Shaare Zedek hospitals.

Their findings were published in Aging Cell. In their paper, the researchers showed that anti-viral drugs did indeed reverse the process in mouse egg cells and returned to their former youthful selves! There has also been similar success using genetic manipulation to insert two genes into the mouse egg cell DNA – the implanted genes produce enzymes which prevent the chain of events that leads to the activation of the damaging parts of the DNA. "Within a decade, I hope we will be able to increase fertility among older women using anti-viral drugs," shared Klutstein.

VIROBLOCK, A HEBREW UNIVERSITY STARTUP, ANNOUNCES PRELIMINARY SUCCESS OF ANTI-VIRAL DRUG PLATFORM

New Drug Targets Common Viruses and Could Treat Current and Future COVID-19 Variants, Influenza, Zika, West Nile, Hepatitis and Future Threats

ViroBlock, a startup company founded by Hebrew University of Jerusalem (HU) researchers, has developed a new drug platform for rapidly generating anti-viral drugs that target proteins common to all viruses.

"Currently, there are no efficient, validated platforms for rapidly generating anti-viral drugs," says ViroBlock CEO and Founder Isaiah (Shy) Arkin, who is also an HU professor of biological chemistry in the Alexander Silberman Institute of Life Sciences. "Scientists must develop new agents and a customized approach to target every new virus, without the ability to predict how that virus will develop resistance. ViroBlock is working on a promising drug candidate for COVID-19 using an approach that can be duplicated with most other important viruses."

According to a new study conducted by pharma research company Evotec, ViroBlock's new technology platform demonstrated the potential to rapidly provide solutions for treating current and emerging viral threats, including COVID-19 and variants, influenza, Zika, West Nile, and Hepatitis B. The study showed that channel blockers it identified could protect cells from viral-induced death alongside dramatically lowering the amount of viral progeny.

ViroBlock's antiviral drug candidates inhibit two targets in the virus: the E (envelope) protein and the 3a protein. The E protein is an ion channel, a type of protein family expressed by virtually all living cells that because of its structure has served as a frequent target for pharmaceutical point interventions. For example, while the spike proteins of SARS-CoV-2 and SARS-CoV-1 (the 2003 virus) are only about 75% identical, their E proteins are roughly 95% alike. This means the ViroBlock drugs would likely remain effective even when the virus mutates.

"With our propriety technology, ViroBlock can identify targets in a new viral threat (or variant), develop inhibitors against it, and determine the resistance potential of the virus against the new drug, all at an unprecedented pace," Arkin says.

The next phase of clinical trials will test the efficacy of this anti-viral approach for humans. The company also has drugs in the pipeline produced by the platform currently being tested that could be effective against other viruses.

ViroBlock was founded in 2020 by Yissum, the Hebrew University technology transfer company.