

More Breakthroughs for Humans without Animal Experiments March 2023
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Recent advances in medicine without animals are bringing new hope for serious diseases.

Studying human stem cells from patients, scientists at the National Institutes of Health are closing in on the cause of a rare facial deformity that causes babies to be born without a nose, and believe these insights offer new hope for a cure.

Other exciting breakthroughs in human-relevant research include a microfluidic model of the blood brain barrier that can aid in developing treatments for brain tumors and other brain disorders, and a way to study the impact of space travel on the human brain without harming animals.

Toxic protein linked to muscular dystrophy and arrhinia



A new human-based study led by researchers at the National Institutes of Health gained key insights into a [potential cause of two rare genetic disorders](#), muscular dystrophy and arrhinia, that are caused by mutations in the SMCHD1 gene.

Studying stem cells from patients with facioscapulohumeral muscular dystrophy (FSHD) and arrhinia, a very rare disorder in which the external nose fails to develop, scientists created cranial placode cells that are responsible for the development of the body's sensory organs. Scientists observed that in both cases, a toxic protein called DUX4 was produced which led to cell death.

They theorize that it is a combination of the gene mutation and exposure to a virus that triggers the DUX4 protein.

Building off these uniquely human insights, scientists hope to discover treatments for these severe illnesses.

A microfluidic model to study the blood-brain barrier



The blood-brain barrier is the body's natural defense to keep harmful substances in the bloodstream from entering the brain. Learning more about the blood-brain barrier, and what enables a substance to pass through it, is essential to finding treatments for diseases such as brain tumors. However, scientists have been limited by inadequate models, including animal experiments that do not accurately mimic human physiology.

Now, scientists from ETH Zurich have created an [open-microfluidic 3D blood-brain barrier model](#) consisting of blood-brain barrier cells and high-resolution time-lapse microscopy on a microfluidic platform that utilizes gravity to mimic the way fluid flows in the body.

The researchers have confirmed the functionality of this completely human-based model and believe it will allow them to better study the process by which the blood-brain barrier works and how to bypass it to treat various diseases.

Space travel influences the way the brain works



Though animals have been sent into space for decades, those studies have failed to elicit the real-world impact of space travel on the human body. A new study [examines the impact of the weightlessness of outer space](#) on astronauts' brains through human based methods.

Fourteen astronauts underwent magnetic resonance imaging (MRI) before and several times after a 6-month mission to outer space. The MRI images were taken during the brain's resting-state.

They found alterations in brain connectivity in areas related to the integration of multiple types of information. In some cases, the altered communication patterns returned to normal after the astronauts had returned to earth, and in others, they continued to be altered 8 months after returning.

This information, impossible to obtain through sending animals up in space, will aid in understanding how to prepare astronauts for longer space missions.