

NIH RESEARCH MATTERS

2019 Research Highlights

With NIH support, scientists across the United States and around the world conduct wide-ranging research to discover ways to enhance health, lengthen life, and reduce illness and disability. Groundbreaking NIH-funded research often receives top scientific honors. In 2019, these honors included two [NIH-supported scientists who earned Nobel Prizes](#). Here’s just a small sample of the NIH-supported research accomplishments in 2019. For more health and medical research findings from NIH, visit [NIH Research Matters](#).

Human Health Advances Disease Prevention, Diagnosis, and Treatment



[Drugs reduce risk of death from Ebola](#)

Researchers have been working to develop treatments for the Ebola virus, which kills about half of those who contract the disease. In a trial conducted during an Ebola outbreak in the Democratic Republic of Congo, two experimental drugs reduced the risk of death from the virus. The study also found that people who sought medical help soon after their symptoms developed were less likely to die than those who waited.



[Gene therapy reverses rare immune disorder](#)

Children born with a rare genetic disorder called X-linked severe combined immunodeficiency (X-SCID) lack a functioning immune system. As a result, they cannot fight infections and usually die within the first few years of life. Eight infants with X-SCID had their immune systems repaired by a new gene therapy approach. The infants are now developing normally and producing the immune cells needed to fight off disease.



[Eating highly processed foods linked to weight gain](#)

Previous research suggested a link between diets high in “ultra-processed” foods—those containing ingredients like high-fructose corn syrup and hydrogenated oils—and health problems. A carefully controlled study at the NIH Clinical Center found that people consumed more calories and gained more weight when eating a diet full of ultra-processed foods than a minimally processed diet. The results reinforce the importance of identifying and eating healthier foods.



[Bioengineered vessels transform into living blood vessels](#)

People with kidney failure can use a dialysis machine to filter blood. The blood is removed from a vein in the arm and filtered outside the body. But this can damage blood vessels if done frequently. Researchers created bioengineered blood vessels called human acellular vessels to aid in dialysis. When implanted into adults with kidney failure, the bioengineered vessels matured into living blood vessels and integrated into human tissues.



[African American children may need different asthma treatments](#)

Asthma disproportionately affects African American children in the U.S. However, they have been underrepresented in past asthma research. A study found that about half of African American children with poorly controlled asthma benefited more from higher-dose steroids than adding a bronchodilator to treatment. The results contrast with those seen in white children in previous studies, highlighting the importance of enrolling populations of diverse ages and races in clinical trials.



[Emphasizing flavor boosts vegetable consumption](#)

Most Americans don't eat the recommended number of vegetables. Public health campaigns have urged people to eat more vegetables by emphasizing their health benefits. A study in college dining halls found that labels promoting tastiness increased vegetable selection by 29% and consumption by 39% compared with labels touting health benefits. The study suggests that emphasizing the enjoyable aspects of healthy foods may do more to boost consumption than promoting nutritional qualities.



[Blood test may detect myalgic encephalomyelitis/chronic fatigue syndrome](#)

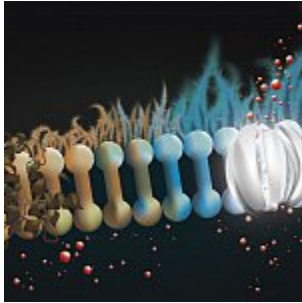
There are currently no diagnostic tests for myalgic encephalomyelitis/chronic fatigue syndrome (ME/CF), a complex, debilitating disease marked by profound exhaustion. In a pilot study, researchers developed a blood test that accurately identified people with ME/CF. If validated in larger studies, the test could one day help diagnose the disease and enable researchers to test potential treatments.



[Artificial pancreas improves type 1 diabetes management](#)

Researchers have developed all-in-one diabetes management systems. These "artificial pancreas" systems continuously track blood glucose levels, calculate when insulin is needed, and automatically deliver it using an insulin pump. A study of an artificial pancreas system found that it improved blood glucose control throughout the day and overnight for people with type 1 diabetes. The technology may help reduce the daily burden of managing diabetes.

Promising Medical Findings Results with Potential for Enhancing Human Health



[Replacing function of impaired cystic fibrosis protein](#)

Cystic fibrosis is a genetic condition that causes thick mucus to clog the lungs. This can lead to repeated infections, scarring, and gradual deterioration. In laboratory experiments using lung cells from patients with cystic fibrosis, researchers found that an antifungal drug could replace the function of the mutated protein that causes the disease. The results suggest a potential therapy for treating people with this life-threatening genetic disorder.



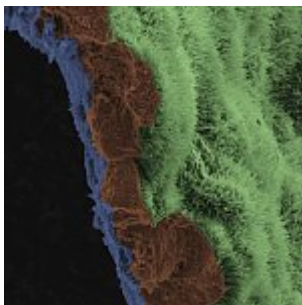
[Language patterns may predict psychosis](#)

Psychotic disorders such as schizophrenia can be highly disabling. If researchers could identify when people with psychotic disorders are verging on psychosis, promising methods to delay or stop the process could be tested. In a proof-of-concept study, spoken language patterns predicted which people at risk for psychosis would progress to full psychosis within two years with 93% accuracy.



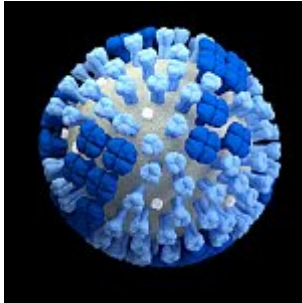
[Understanding recurrent tonsillitis](#)

Tonsillitis, or swelling of the tonsils, is usually caused by a viral infection. But it can also be caused by strep bacteria. Researchers found that in children with recurrent tonsillitis, these bacteria can trick immune cells into destroying each other instead of remembering the bacteria. The discovery points to potential strategies to reduce the risk of recurrent tonsillitis.



[Patch replaces damaged retinal cells](#)

Macular degeneration is a leading cause of vision loss among people over 50. This disease damages an area near the center of the retina, the light-sensitive tissue in the eye. Scientists developed a patch for replacing diseased cells in the eye with healthy ones. It provides a biodegradable scaffold for a patients' own cells to grow on. The patches integrated into animal eyes, providing the basis for preliminary safety tests in people.



Advances in flu treatment and prevention

Each year, millions of people get influenza, or flu. However, the flu virus evolves quickly, making it difficult to develop vaccines and treatments. Two new studies looked at ways to target many strains of flu at once. Researchers identified [three antibodies that protect against multiple strains of flu](#) by targeting the surface protein neuraminidase. Scientists also developed and tested [a drug in mice that mimicked the neutralizing antibodies found in people who've had flu](#). These findings will help aid the development of improved vaccines and treatments against flu viruses.



[Lower magnetic field broadens MRI applications](#)

MRI is a non-invasive imaging technology that produces 3D images of structures in the body. Newer MRI systems tend to have higher magnetic field strengths to boost the signal intensity. But these introduce image distortions and additional costs. Scientists developed a low magnetic-field MRI system that improves image quality of the lungs and other internal structures. The technology could be used for image-guided procedures and other new clinical applications in the future.



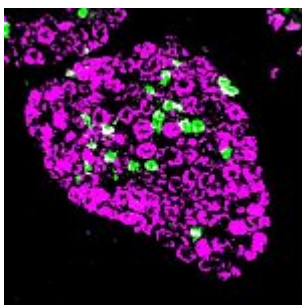
[Extending preservation time for donated livers](#)

With existing techniques, human organs can be preserved for an average of nine hours. Depending on where a donor and recipient live, this may not be enough time to transport the organ and prepare for surgery. A new preservation method protected human livers during cooling and kept them healthy for more than 24 hours. Prolonging the storage life of donated organs could eventually help increase the number of potential transplants.



[Primate study shows progress with cryopreserved testicular tissue](#)

Advances in treatment mean that more children with cancer are living into adulthood. But a side effect of some cancer treatments is infertility. Researchers used tissue containing sperm-producing stem cells from prepubescent monkeys to successfully produce live sperm by grafting it back into the monkey months later. The study resulted in the first primate baby born using “cryopreserved” tissue. These results move fertility preservation for young boys closer to clinical studies.

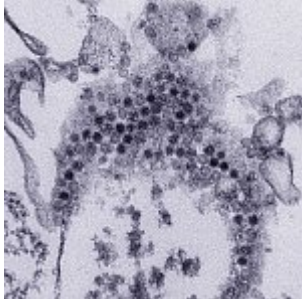


[Compound reduces chronic itch in mice](#)

Chronic itch affects millions of Americans. It occurs in many medical conditions and in response to certain drugs. The condition can be debilitating, and existing medications don't provide reliable relief. Researchers identified a compound that reduced itch in mice by blocking a receptor in the spinal cord—both after exposure to irritating substances and in a model of chronic itch. Future studies are needed to develop a drug that could be tested in people.

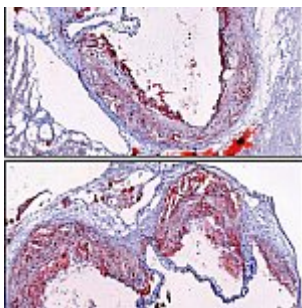
Basic Research Insights

Noteworthy Advances in Fundamental Research



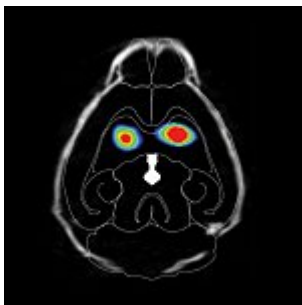
[Enterovirus infection linked to acute flaccid myelitis](#)

Since 2014, hundreds of children in the U.S. have been afflicted with a condition called acute flaccid myelitis (AFM), which can cause paralysis. Researchers have not yet found the cause of AFM. This makes it difficult to develop prevention and treatment strategies. In a new study, evidence of infection with an enterovirus was found in about 80% of people with AFM. More work is needed to understand whether enterovirus infection contributes to AFM.



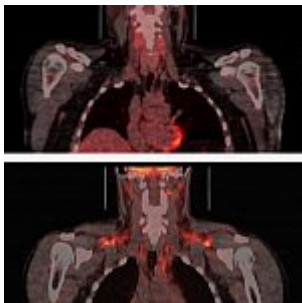
[How disrupted sleep may lead to heart disease](#)

Studies have linked poor sleep to an increased risk of heart disease and other health conditions. But the molecular mechanisms underlying the link between sleep and heart disease has been unclear. Researchers found that sleep disruption activates a molecule that triggers inflammation and leads to fatty buildup in mouse arteries. The findings underscore the importance of getting enough quality sleep to maintain heart health. It also suggests new targets for fighting heart disease.



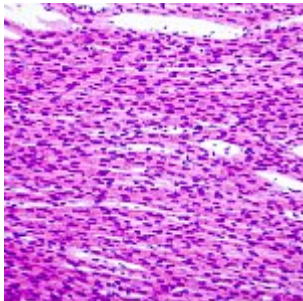
[Tracking the spread of Parkinson's proteins from gut to brain](#)

The brains of people with Parkinson's disease contain abnormal clumps largely made up of the protein alpha-synuclein. Abnormal clusters of alpha-synuclein have also been found in the guts of people with Parkinson's disease. Researchers were able to track alpha-synuclein from the gut to the brain by way of the vagus nerve in mice. Finding a way to stop the spread of this protein from gut to brain might help prevent Parkinson's disease in people.



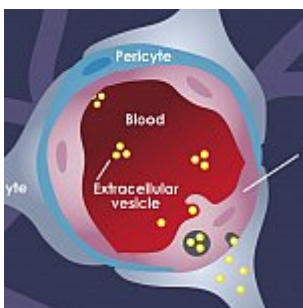
[How brown fat improves metabolism](#)

Brown fat breaks down blood sugar and fat molecules to create heat and help maintain body temperature. Researchers have been working to harness brown fat's activity in order to treat metabolic diseases. A new study in mice provided key insights into brown fat's effects on the body's metabolism. The findings reveal molecular targets for developing new treatments for obesity, diabetes, and other metabolic disorders.



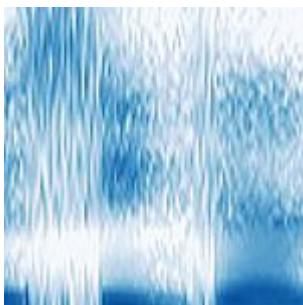
[Blocking a pathway to heart failure](#)

More than 5.6 million adults in the United States are living with heart failure, where the heart can't pump enough blood to meet the body's needs. Researchers identified a molecular pathway with higher activity in older adults and in people with heart failure. Blocking this pathway with a drug improved heart function in mice with heart failure. The study's findings may help pave the way for new approaches to treat heart failure in people.



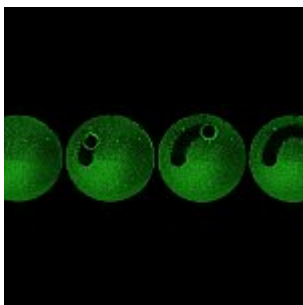
[How cancer vesicles breach the blood-brain barrier](#)

The blood-brain barrier helps protect the brain from threats like infection. But cancer cells can sometimes get past it and establish metastatic tumors in the brain. Researchers discovered how small particles from cancer cells called extracellular vesicles cross the blood-brain barrier to make the brain more hospitable to metastatic tumors. Understanding this process could guide strategies to stop brain metastases as well as methods to deliver drugs to the brain.



[Scientists create speech using brain signals](#)

Technology has helped people who can't speak to communicate through devices that translate head or eye movements into speech. But these systems are slow and laborious to use. Scientists used brain signals recorded from patients with epilepsy to program a computer to mimic natural speech. Listeners could accurately identify more than half of the synthesized words. This advance could one day help certain patients without the ability to speak to communicate more easily.



[Nanoparticle robots sweep away biofilms](#)

A biofilm is a layer of microbes that can grow on many kinds of surfaces, including inside the body. Infections that involve biofilms are challenging to treat, because the microbes in a biofilm live together in a protective, sticky matrix. Researchers developed magnetic nanoparticle robots that can destroy and remove biofilms from surfaces. After further development, this technology could provide a new method of biofilm removal for teeth, medical implants, and medical devices.