

NIH RESEARCH MATTERS

2022 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 2022, these honors included [two NIH-supported scientists who received Nobel Prizes](#). Here's just a small sample of the NIH-supported research accomplishments in 2022. For more health and medical research findings from NIH, visit [NIH Research Matters](#).

Human Health Advances

Disease Prevention, Diagnosis, and Treatment



Insights into Covid-19 vaccines

NIH researchers continued to make advances toward understanding the immune system's complex response to vaccines against SARS-CoV-2, the virus that causes COVID-19. These insights could lead to more effective COVID-19 vaccines. [Booster doses of COVID-19 vaccine](#) were shown to elicit neutralizing antibodies against a range of SARS-CoV-2 variants, including the Omicron variant that gained dominance in 2022. Other researchers found the immune cells that make antibodies [continue to evolve for months after vaccination](#), which improves protection over time. Scientists reported that immune cells called T cells [play a crucial role in protecting against COVID-19](#), too. Studies also showed that [COVID-19 vaccines do not reduce fertility](#) nor do they significantly affect [menstrual cycle length](#).



Long COVID symptoms linked to inflammation

The effects of COVID-19 can persist long after initial symptoms fade. The lingering effects, called Long COVID, can include brain fog, fatigue, and dizziness. Scientists found that after infection with the virus that causes COVID-19, prolonged inflammation led to lasting problems, such as lung and kidney damage, in an animal model. Inflammation also affected the brain and correlated with behavioral changes. The results suggest a mechanism to explain the symptoms of Long COVID in people.

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Advances for type 1 diabetes

In type 1 diabetes, the immune system attacks insulin-producing cells in the pancreas. Affected people must depend on insulin treatments to survive. Researchers found that a common blood pressure drug called verapamil could [protect insulin-producing cells in the pancreas](#) of people with type 1 diabetes and reduce the need for insulin treatments. Other scientists developed a “[bionic pancreas](#)” that helped manage blood glucose levels in people with type 1 diabetes better and with less user input than existing methods. Notably, in November 2022 the FDA approved the first-ever

treatment to delay the onset of type 1 diabetes, based in part on [NIH-supported clinical trials](#) completed the previous year.



[Improved dietary supplement for age-related macular degeneration](#)

Age-related macular degeneration (AMD) is the most common cause of blindness in older Americans. An NIH-funded study 20 years ago showed that a dietary supplement could slow AMD progression, but the safety of one ingredient in the supplement has been questioned. A new supplement formulation replaced the questionable ingredient. A follow-up study showed that the new supplement was safer and better at slowing AMD progression over a 10-year period than the earlier supplement.



[Testing ways to encourage exercise](#)

Fewer than 1 in 4 adults in the U.S. get the amount of exercise recommended to maintain health and prevent chronic disease. A large nationwide study identified inexpensive interventions that boosted weekly gym visits by up to 27%. The results point to affordable strategies to help increase the amount of exercise Americans get on a regular basis.



[Robotic exoskeleton helps people walk](#)

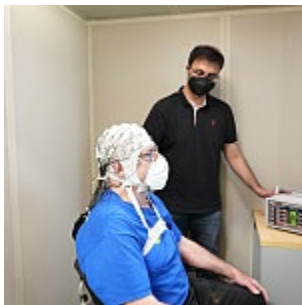
Researchers created an ankle-worn robotic device, called an exoskeleton, that provides personalized walking assistance under real-world conditions. Compared with walking in normal shoes, the exoskeleton increased walking speed by 9% on average while expending 17% less energy. Robotic exoskeletons could help people who have mobility impairments or physically demanding jobs, such as firefighters or laborers.

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Treating opioid use disorder

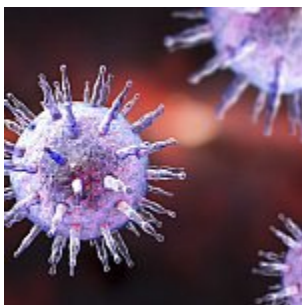
The class of drugs called opioids is a mainstay of pain treatment, but opioids can lead to dependency or addiction when misused. A study found that [people with opioid use disorder who received telehealth services](#) during the COVID-19 pandemic were more likely to keep taking their medications to treat opioid use disorder. They also had a lower risk of overdose. Other scientists found that men in a rural jail who received medications to treat opioid use disorder had a [reduced likelihood of being arrested or returning to jail or prison](#) after release. Researchers have also been making progress in finding [alternatives to opioids](#).



Brain stimulation can affect memory in older adults

A noninvasive method that stimulates specific brain regions led to month-long memory improvements in older adults. The approach hints at the potential for a drug-free treatment to reverse or prevent memory loss in the aging population. More research is needed to see if this experimental technique can have longer-lasting effects or help improve memory in people with brain disorders.

Promising Medical Findings **Results with Potential for Enhancing Human Health**



Study suggests Epstein-Barr virus may cause multiple sclerosis

The underlying causes of multiple sclerosis, a devastating autoimmune disease that affects the central nervous system, have been unclear. Using blood samples from more than 10 million people, researchers found that previous infection with Epstein-Barr virus dramatically increased the odds of developing multiple sclerosis. The finding suggests that vaccines against Epstein-Barr could help prevent the disease.

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**Getting ahead of COVID-19 variants**

Vaccines and treatments have lowered the risk of severe disease and death from SARS-CoV-2, the virus that causes COVID-19, but new variants continue to pose challenges. Researchers have refined how to [use wastewater sampling to track variants of the virus](#) throughout entire cities. Others confirmed that rapid tests developed for earlier versions of SARS-CoV-2 can [still identify current variants of concern and interest](#). Scientists developed new treatments now undergoing further testing, such as [a nasal spray to prevent or treat COVID-19](#). And an experimental vaccine, tested in animals, [produced an immune response to a wide range of coronaviruses](#), including some that weren't part of the vaccine—suggesting the vaccine could protect against future variants of SARS-CoV-2 as well as other coronaviruses.

**Highlighting the importance of sleep**

A good night's sleep is vital for health at all ages. In a randomized clinical trial, [overweight adults who increased how much they slept also took in fewer calories](#), with enough of a reduction to lead to clinically important weight loss over time. Another large study found that pre-teens who slept less than nine hours daily [had differences in brain structure and more problems with mood and thinking](#) compared to those who got sufficient sleep. These results highlight the importance of adequate sleep to improve both physical and mental health.

**[Restoring cell and organ function after the heart stops](#)**

Without a steady supply of oxygen from the blood, the process of cell death begins within minutes. In a new study, researchers developed a system that restored cellular function in a pig's organs more than an hour after its heart stopped. With further improvements, such technology could eventually help repair organ damage from heart attack or stroke. It might also be used to preserve organs for transplantation.

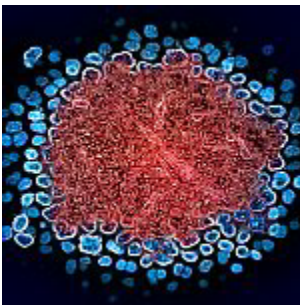
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**Impacts of racial segregation on health**

Racial residential segregation—in which racial or ethnic groups live in separate, unequal neighborhoods—tends to concentrate factors that contribute to racial disparities in health. In a study of housing and health, researchers found that [racial residential segregation may compound the harms of lead exposure](#) and impede children's cognitive development. Another study found that air pollution in racially segregated communities [contained more toxic metals than in well-integrated communities](#). These results show the importance of a holistic approach, including health, environment, and society, to reducing such disparities.

**[Night breathing patterns identify people with Parkinson's disease](#)**

Currently, there are no markers that can be easily measured in the blood or with imaging tests to diagnose Parkinson's disease. In a new study, an advanced computer program was able to identify people with Parkinson's disease from their breathing patterns during sleep. It could also track small changes in the disease over time. If these results are confirmed, such a program could help in the early detection of Parkinson's disease.

**Progress toward an eventual HIV vaccine**

Developing a vaccine against HIV has been challenging because there are countless variants worldwide, and the immune system doesn't normally make antibodies that can protect against such wide-ranging variants. Researchers have made recent progress in overcoming these hurdles. In one new study, scientists delivered an experimental HIV vaccine to monkeys using increasing doses over several days. This slow vaccine delivery [led to long-lasting and diverse antibody production](#). In other research, an experimental HIV vaccine [elicited broadly neutralizing antibody precursors in people](#), a crucial step toward making antibodies that can neutralize many HIV strains at once. With further development, such approaches could eventually lead to an effective vaccine strategy for HIV and AIDS.

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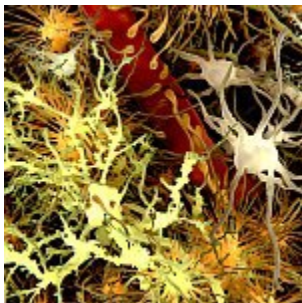


[Machine learning approach detects brain tumor boundaries](#)

Glioblastoma, a type of brain tumor, can be hard to distinguish from normal brain tissue, complicating treatments such as surgery. In a new study using technology called federated machine learning, data from thousands of patients with glioblastoma were used to develop an accurate model for detecting tumor boundaries while preserving patient privacy. This approach could be adapted to provide insights in other fields where data are scarce, such as rare diseases or underrepresented populations.

Basic Research Insights

Noteworthy Advances in Fundamental Research



Understanding Alzheimer's disease

NIH-funded research enhanced our understanding of Alzheimer's disease and suggested new treatment strategies. Scientists found that the gene *APOE4*, which has long been linked to an increased risk of dementia in Alzheimer's disease, [disrupts cholesterol management in the brain and weakens insulation around nerve fibers](#). A drug that promotes cholesterol transport led to improved learning and memory in mice with the gene. [Blocking a hormone called FSH](#) also reduced Alzheimer's symptoms in mice. Boosting a type of immune cell that [helps clear waste products in the brain](#) did, too.

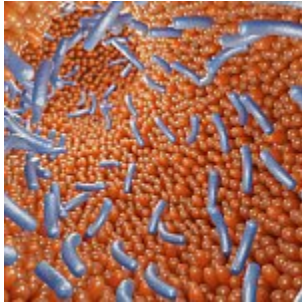
Other researchers found that higher blood levels of [certain antioxidants, but not others](#), were associated with a reduced risk of a person developing Alzheimer's disease or other dementias.



[Obesity alters response to anti-inflammatory treatment](#)

Obesity is thought to impact the immune system. Researchers found that a treatment for severe skin inflammation that works well in lean mice made the condition worse in obese mice. This, they found, was because of differences in immune cells between the lean and obese mice. The results highlight how obesity can alter the immune response. Treatments for inflammatory conditions may thus need to account for body composition.

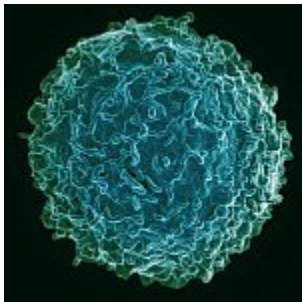
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How the microbiome impacts health and disease

Researchers found several new ways that the microbiome—the collection of bacteria and other microbes living in and on our bodies—affects human health. People who ate a high-fiber diet, which promotes healthy gut microbes, [lived the longest](#) after immunotherapy for melanoma. Meanwhile, changes in gut microbes caused by high sugar intake [led to weight gain and early signs of diabetes](#) in mice. Other researchers found that viruses [can play a role in inflammatory bowel disease](#). And [COVID-19 was found to disrupt the gut microbiome](#) in ways that may increase the risk of secondary infections.

Researchers also discovered how a bacterium that lives on the skin helps [protect the skin from water loss and damage](#).



Genetic driver of some cases of lupus identified

The causes of autoimmune diseases such as lupus are complex and not well understood. Scientists sequenced the whole genome of a 7-year-old girl with a rare case of severe childhood lupus. They found a gene mutation that caused autoimmune attack when engineered into mice. Blocking a protein controlled by this gene stopped lupus from developing in the mice. This suggests a potential new approach for treating some people with the disease.



How mosquitoes find us

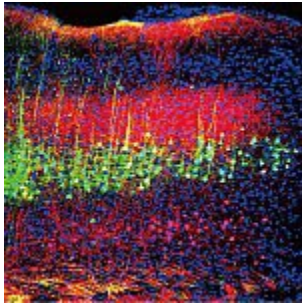
NIH-funded researchers increased our understanding of how mosquitoes locate their hosts. One group found that [human and animal odors](#) evoke activity in different areas of the mosquito brain. This explains how certain mosquitoes can distinguish humans from other animals. Another group found that people with higher levels of certain compounds on their skin were [more attractive to mosquitoes](#). These findings could guide the development of better mosquito control strategies to prevent the spread of mosquito-borne illnesses.



Brain cells that control sickness symptoms

When you get an infection, both physiological and behavioral changes occur that help to get rid of the infection. These symptoms are governed by the brain, rather than the immune system, but it hasn't been clear how. Researchers identified a group of neurons in mice that trigger sickness symptoms in response to infections. The findings may one day lead to better ways to reverse these symptoms when they become dangerous to a person's health.

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[Understanding how sound suppresses pain](#)

Studies have shown that music and other kinds of sound can help reduce acute and chronic pain in people. How the brain produces this pain reduction has been less clear. Scientists identified brain circuits in mice through which sound can blunt pain. These circuits connect the auditory cortex to the thalamus. The findings could lead to the development of safer methods for treating pain in people.



How infections helped shaped human evolution

Two studies revealed how ancient infections affected human evolution. Researchers identified [genetic variants that helped the immune system fight the Black Death](#)—the fourteenth-century bubonic plague pandemic that killed up to half the population in Europe, the Middle East, and North Africa. But this quick burst of immune system evolution may also have had the lasting side effect of increasing susceptibility to autoimmune diseases. In another study, researchers found that stretches of viral DNA long embedded in the human genome can produce [proteins that help block infection by viruses](#). Further identification and study of these protective virus-based proteins could provide new insights for fighting viral infections.