2025 NIH 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. Here's just a small sample of the NIH-supported research accomplishments in 2025. For more health and medical research findings from NIH, visit *NIH Research Matters*.

Human Health Advances

Disease Prevention, Diagnosis and Treatment

Progress in brain-computer interfaces

Brain injury from conditions like stroke can cause paralysis, including loss of the ability to speak. Scientists developed a brain-computer interface that can quickly translate brain activity into audible words. Other researchers designed a brain-computer interface to decode inner speech in real time from activity in the brain's motor cortex. In another advance, tiny electrodes placed precisely in the brain let people with spinal cord injuries feel sensations of shape, motion, and the orientation of objects on the skin. Coupled with further advances in bionic limbs, this technology might lead to an artificial sense of touch.

Treatments for rare diseases in children

Researchers used a personalized gene-editing approach to mend a faulty gene in a baby born with a rare, often deadly disorder. This type of gene-editing method could be used to create personalized therapies for treating additional genetic disorders. Other scientists used an experimental small molecule to alleviate CoQ_{10} deficiency and reverse associated brain damage in a boy with a rare disease caused by particular genetic mutations. Understanding the molecular causes of rare diseases can lead to effective cures and treatments.

Benefits of treating opioid use disorder in county jails

The opioid epidemic in the U.S. led to more than 80,000 deaths in 2023 alone. People who use opioids are more likely to be incarcerated than the general population. Providing medications for opioid use disorder in jails led to lower rates of overdose, death, and reincarceration after release. The findings suggest that treating opioid use disorder in jails could save lives.

Cervical cancer advances

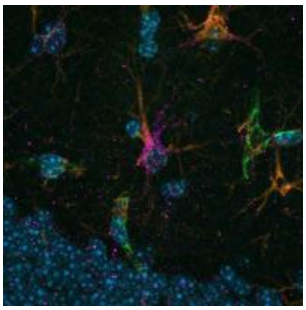
Cervical cancer is one of the most common cancers among women worldwide. About 4 of every 5 cases are caused by the human papillomavirus (HPV). HPV vaccination, which involves two doses, can prevent most cervical cancers, but global uptake has been low. Researchers found that only one dose provided protection as good as the current standard of two. In another finding, scientists found that women who used at-home screening kits for cervical cancer were more than twice as likely to complete screening than women who received only telephone reminders.

Difference in kidney function tests predicts health risks

Kidneys protect our health by filtering toxins, electrolytes, and excess water out of our blood. Unfortunately, more than 35 million people nationwide have chronic kidney disease. Researchers found that people with chronic kidney disease faced a higher risk of death and serious health problems when two tests of kidney function didn't agree with each other. The findings suggest that using both tests could help identify people at increased risk for health problems.

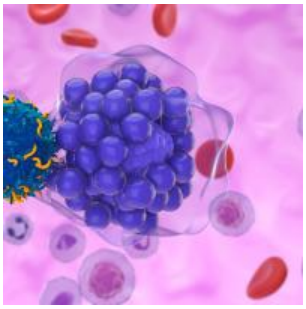
Promising Medical Findings

Results with Potential for Enhancing Human Health



Alzheimer's disease insights

Previous research suggested that the balance of metals in the brain may play a role in the development of Alzheimer's disease. But the nature of this role has been unclear. NIH-funded researchers found evidence that lithium deficiency could be a cause of Alzheimer's disease. Other scientists uncovered a new biomarker that may help more accurately predict cognitive decline in people with Alzheimer's. Yet another biomarker for the early detection, prognosis, and monitoring of Alzheimer's could be measured noninvasively with diffusion MRI. And work in a mouse model yielded insights into how exercise alters brain cells to protect them against Alzheimer's disease.

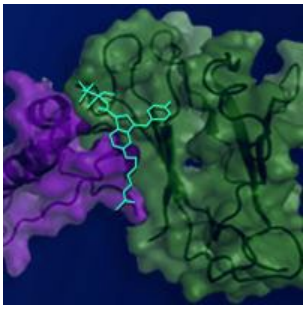


Engineering immune cells within the body

CAR T cell therapies use a patient's own T cells—the body's primary killer of infected and other diseased cells—to attack cancer cells. But making CAR T cells is complex and costly, and can't currently be done on a large scale. Researchers developed a way to engineer T cells within a living organism. The approach could make these therapies more accessible for treating cancer and autoimmune diseases.

Overactive immune responses in ME/CFS

Myalgic encephalomyelitis/chronic fatigue syndrome, or ME/CFS, involves unexplained fatigue that may worsen after exertion and cause problems with thinking and memory that last at least six months. Affected people often report symptoms consistent with infection before ME/CFS developed. Yet no single microbe has been found responsible. Researchers uncovered signs of overactive immune responses in people with ME/CFS. This suggests it may be caused by a general immune response to infection.



Non-opioid compound for chronic pain relief

Chronic pain affects nearly 25% of adults in the U.S. Opioids can be very effective for treating chronic pain, but have potential for abuse and are lethal when overdosed. Scientists developed a compound that relieved pain in mice without adverse side effects. The finding could lead to more effective alternatives to opioids for chronic pain treatment.

Urban design affects walking levels

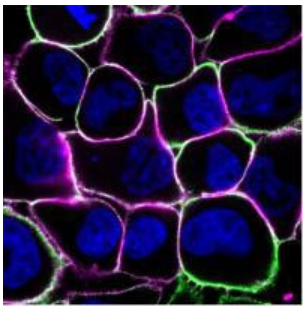
Many Americans don't get the recommended amounts of physical activity. Lack of physical activity increases the risk of many serious conditions, like heart disease, diabetes, and cancer. A large study using smartphone data found that moving to different communities can affect how much you walk. The results suggest that the design of a community can play a role in levels of physical activity.

Basic Research Insights

Noteworthy Advances in Fundamental Research

Effects of repeated head trauma in young athletes

Researchers gained new insights into the changes in the brains of young athletes that may lead to chronic traumatic encephalopathy. The findings suggest that repetitive head impacts cause brain changes much earlier than previously thought. Understanding how these changes occur, and how to detect them during life, could lead to better prevention strategies and treatments to protect young athletes.

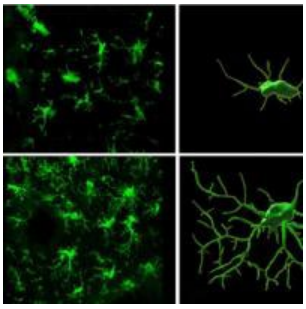


Cancer cells can cooperate to grow

Cancer cells often compete with each other and surrounding normal cells for nutrients, oxygen, and other resources. However, studies suggest that cells in tumors may sometimes need to cooperate to survive. Scientists found that, when deprived of amino acids, cancer cells can cooperate to extract and share them from their environment. Blocking a certain protein shut down this cooperation, suggesting a potential target for cancer treatment.

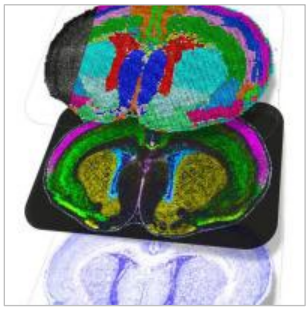
Progress toward a broad-spectrum antiviral

Broad-spectrum antibiotics can combat a wide range of bacteria that cause infections. But there hasn't been a similar broad-spectrum treatment against viruses that's approved for human use. Scientists identified small molecules that bind to carbohydrates on viral surfaces to block infections by a wide range of viruses. The findings suggest it may be possible to develop a broad-spectrum antiviral drug to combat serious viral infections.



Sound waves stimulate stroke recovery in mice

Each year nearly 800,000 Americans experience a stroke. Researchers used high-frequency sound waves in mouse models of stroke to clear away harmful cellular debris and improve outcomes. This noninvasive approach might be used to more safely and quickly treat people with strokes caused by burst blood vessels.



Understanding the developing brain

Researchers in the NIH-funded BRAIN Initiative Cell Atlas Network (BICAN) released comprehensive cell atlases of the developing human, mouse, and non-human primate brains. In a series of several papers, they described the complex events that create different cell types, revealing features common to mammals and those unique to the human brain.