

NIH RESEARCH MATTERS

2015 Research Highlights

With NIH support, scientists across the United States and the world conduct wide-ranging research to improve the health of our nation. Groundbreaking NIH-funded research often receives top scientific honors. In 2015, these honors included 3 NIH-supported Nobel Prize winners and 2 NIH-funded recipients of top awards from the Lasker Foundation. Here's just a small sampling of the research accomplishments made by NIH-supported scientists in 2015. For more health and medical research findings from NIH, visit [NIH Research Matters](#).

Clinical Advances

Prevention, Diagnosis, and Treatment of Human Disease



[Comparing blood pressure control targets](#)

A large clinical study revealed that adults treated at a target blood pressure level lower than commonly recommended (less than 120 mm Hg systolic, compared to the 140 mm Hg standard) had a reduced risk of cardiovascular disease and death. While there were some adverse effects with the lower target, the results suggest that, in this population of adults age 50 and older, the benefits outweighed the risks.



[Breast cancer tumor test to tailor treatments](#)

Not all women with early-stage breast cancer need to receive chemotherapy, which can be costly and inconvenient. Researchers determined that a gene expression-based test could successfully identify women with a specific type of breast cancer who didn't need to undergo chemotherapy. In the future, gene testing may be used to help guide treatment choices.



[Genetics help predict heart disease risk, statin benefits](#)

Researchers found that a set of genetic variants could identify people at risk for coronary heart disease, even after adjusting for traditional risk factors such as age, cholesterol levels, and smoking history. The set of variants also predicted the people who would benefit most from statin therapy, which lowers LDL cholesterol. The findings may one day lead to targeted therapies for patients at risk for heart disease.



[**Paralyzed men gain movement without surgery**](#)

Last year, [researchers reported](#) that a surgically implanted stimulating device allowed men to regain some leg movement after spinal cord injuries. In further work, the team used a noninvasive treatment to help 5 men with complete muscle paralysis in the lower body voluntarily move their legs in a step-like pattern. The treatment, called transcutaneous stimulation, may help reactivate dormant nerve connections between the brain and spinal cord.



[**Biomarkers and questionnaires predict suicide risk**](#)

Finding a way to objectively measure a person's risk for suicide is an important step in suicide prevention. Researchers identified several genes in blood whose activity is related to suicidal thoughts and actions in men with psychiatric disorders. The team also developed 2 apps that use questionnaires to measure risk factors for suicide. By combining the two, the scientists developed a tool that may help clinicians predict which patients are likely to attempt suicide.



[**End-of-life costs for dementia far greater than for other diseases**](#)

Health care costs can rise dramatically with age—especially for long-term conditions like heart disease or dementia. Researchers determined that health care costs for people with dementia were significantly higher in their last years of life than for those who died from other diseases, including cancer and heart disease. The findings provide important insights into the financial burden that families and society may face for end-of-life care for older adults.



[**Peanut consumption in infancy lowers peanut allergy**](#)

The standard approach to food allergy prevention is for infants at high risk for allergy to avoid allergenic foods, such as peanuts. In a closely monitored trial, infants who regularly consumed peanut-containing foods from infancy to age 5 were less likely to become allergic to peanuts than those who avoided peanut entirely. The researchers are continuing to monitor the children to determine if protection against peanut allergy persists.



[**Immune system reset may halt multiple sclerosis progression**](#)

Multiple sclerosis (MS) is an autoimmune disease in which the immune system attacks the central nervous system. Interim results from a clinical trial suggest that depleting and then re-establishing the immune system can alleviate a type of early-stage MS. With further development and evaluation, this approach could become an option for treating people with this often-debilitating disease.

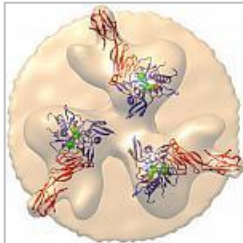
Promising Medical Advances

Findings with Potential for Enhancing Human Health



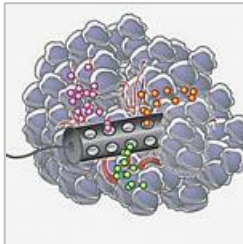
Ebola research advances quickly

Researchers at NIH and the Walter Reed Army Institute of Research found that [an investigational Ebola vaccine called VSV-ZEBOV](#) was safe and produced robust antibody responses in healthy adults. The vaccine is 1 of 2 experimental Ebola vaccines now being tested in a clinical trial in Liberia. Other scientists reported that [a newly designed agent](#) was effective in treating monkeys infected with Ebola virus. The therapy is being evaluated in Sierra Leone in infected people.



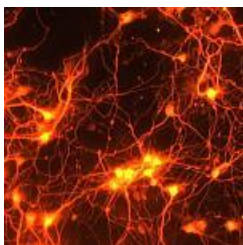
Progress in fighting HIV

Even as [researchers continue to refine current AIDS treatments](#), NIH-funded teams are making significant progress on other fronts. An experimental HIV immunotherapy [reduced HIV levels in infected people for as long as 28 days](#). Scientists created [a compound that could protect animals](#) against a wider range of HIV strains than any previous approaches. And 3 research teams [achieved important steps](#) needed to create an effective vaccine against HIV.



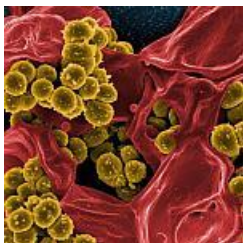
Devices assess cancer drugs in tumors

Although numerous drugs are available to treat cancers, determining which ones to use in which patients can be challenging. Two devices, developed independently, can gauge how tumors will respond to various drugs. With further development, these technologies could help doctors determine the ideal treatment for each person's particular cancer.



Molecule proves key to brain repair after stroke

Scientists found that a molecule known as growth and differentiation factor 10 (GDF10) plays a key role in repair mechanisms following stroke. The findings advance our knowledge of how the brain heals itself from the devastating effects of stroke and may also help guide efforts to develop new therapeutic strategies to promote stroke recovery.



Antibiotic combinations may combat MRSA infections

MRSA has evolved from a controllable nuisance into a serious public health concern. Researchers showed that a trio of antibiotics that had become powerless against MRSA decades ago were effective in infected mice when used together. Although more testing is needed, the results suggest that combinations of already-approved antibiotics might add to our options to combat MRSA infections.



[Bone risks linked to genetic variants](#)

Over 10 million people nationwide have osteoporosis, in which bones become susceptible to fracture. A large-scale genomic study—involving data from over a half million people—uncovered novel genetic variants and led researchers to an unexpected gene that affects bone density and fracture risk. The results provide insights into the genetics underlying osteoporosis and may lead to new ways to prevent bone loss and fractures.



[Allergy drug treats hepatitis C in mice](#)

Hepatitis C is an infectious disease caused by a virus that attacks the liver. Many who become infected with hepatitis C virus (HCV) are unable to rid the virus from their bodies. Researchers screened a comprehensive library of approved drugs for anti-HCV activity and found a common over-the-counter allergy drug that lowered HCV levels in infected mice. The drug is currently being tested in patients with chronic hepatitis C.



[Repairing nerve pathways with 3-D printing](#)

Treatment for damage to peripheral nerves, which extend from the brain and spinal cord out to the rest of the body, is often challenging. Scientists used 3-D printing to create custom scaffolds that helped damaged rat nerves regenerate and improved the animals' ability to walk. With further development, the technique might be used to create a range of scaffolds to aid tissue regeneration.

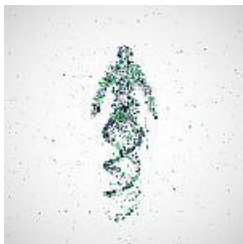
Insights from the Lab

Noteworthy Advances in Basic Research



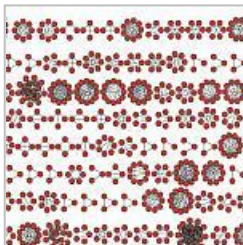
[Charting genetic variation across the globe](#)

An international team of scientists created the world's largest catalog of human genetic differences in populations around the globe. The researchers examined the genomes of more than 2,500 people from 26 populations across Africa, East and South Asia, Europe, and the Americas. The resource provides a powerful tool for studying how genetic variation can contribute to disease risk and drug response.



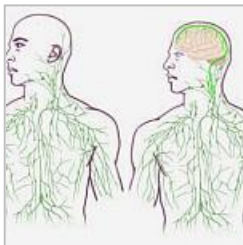
[Epigenetics emerging](#)

The “epigenome” refers to modifications that don't affect the DNA sequence itself but affect how cells use the same genome to form different cells and tissues. Scientists [analyzed more than 100 reference human epigenomes](#) from a broad range of cell and tissue types. In another effort, researchers [analyzed gene activity in more than 1,600 samples](#) taken from 175 people. These approaches are yielding new insights into human biology and disease.



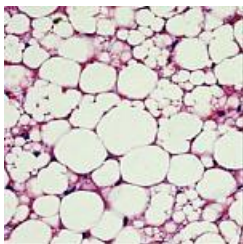
[The interactome: mapping protein interactions](#)

Genomics is the study of an organism's DNA. Proteomics is the study of proteins and their functions. Proteins interact to form functional complexes that can be tricky to study. Researchers created a draft map of over 1 million protein interactions—an “interactome”—across more than 100 animal species, including people. Understanding such interactions will improve our understanding of how the human body works and what can go wrong to cause disease.



[Lymphatic vessels discovered in central nervous system](#)

The brain has long been thought to lack lymphatic vessels, which carry white blood cells and other immune cells throughout the body. Scientists discovered that the brains of mice contain functional lymphatic vessels that can carry fluid and immune cells from cerebrospinal fluid. Further work will explore whether problems in this system might play a role in neurological disorders such as Alzheimer's disease, meningitis, and multiple sclerosis.



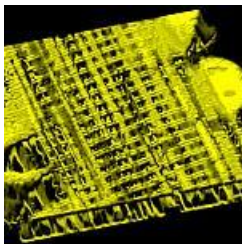
[Insights into energy-burning fat cells](#)

Humans have 2 main types of fat: white fat, which stores excess calories, and brown fat, which burns energy to create heat and help maintain body temperature. Researchers identified and characterized a specific type of fat cell in humans, known as beige, that has some characteristics of brown fat. The findings may lead to new ways to engineer fat cells to fight obesity.



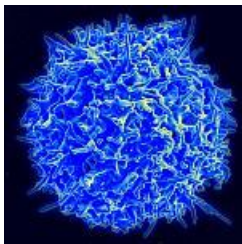
[Skin microbes and the immune response](#)

Skin is a barrier that helps defend the body against harmful microbes. Specialized immune cells within skin aid in fighting invading organisms. Yet the skin hosts communities of beneficial bacteria as well. Researchers demonstrated in mice that certain skin microbes help the immune system protect against pathogens. The findings help clarify the protective role of skin microbes and may lead to a better understanding of various skin disorders.



[Muscle mitochondria may form energy power grid](#)

Muscle cells contain mitochondria, commonly referred to as the cell's "power plants." Using high-resolution 3-D imaging and specially designed optical probes, researchers found that mitochondria in mouse muscles not only produce energy, but can quickly distribute it across the muscle cell through a grid-like network. The findings reveal a major mechanism for energy distribution in skeletal muscle cells, and could provide new insights into diseases linked to energy use in muscle.



[Autoimmune disease super-regulators uncovered](#)

The immune system has a complex, delicately orchestrated balance. Some cells in the system activate immune responses; others constrain immune responses. Scientists discovered key genetic switches, called super-enhancers, involved in regulating the human immune system. The finding opens the door to new research into autoimmune disorders such as inflammatory bowel disease and rheumatoid arthritis.