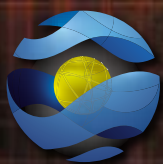


FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

Federal Funding

FOR BIOMEDICAL AND RELATED LIFE SCIENCES RESEARCH

FY 2016



FASEB

Federation of American Societies
for Experimental Biology

www.faseb.org

Executive Summary

The Federation of American Societies for Experimental Biology (FASEB) is composed of 27 societies with more than 120,000 members, making it the largest coalition of biomedical research associations in the United States. FASEB enhances the ability of scientists and engineers to improve the health, well-being, and productivity of all people through research.

Investment in biomedical and biological research has produced new knowledge, improved health, and created pioneering industries that generated economic growth. Sustained and predictable funding is critical to maintain a highly productive research enterprise and pursue the exceptional scientific opportunities that are available today. This report presents FASEB's fiscal year (FY) 2016 funding recommendations for the following five federal research agencies:

- **National Institutes of Health (NIH)**
FASEB recommends a minimum of \$32 billion for the NIH in FY 2016
- **National Science Foundation (NSF)**
FASEB recommends a minimum of \$7.72 billion for the NSF in FY 2016
- **Department of Energy Office of Science (DOE SC)**
FASEB recommends a minimum of \$5.34 billion for the DOE SC in FY 2016
- **Veterans Affairs Medical and Prosthetic Research Program (VA)**
FASEB recommends a minimum of \$622 million for the VA Medical and Prosthetic Research Program in FY 2016
- **United States Department of Agriculture (USDA)**
FASEB recommends a minimum of \$450 million for the USDA Agriculture and Food Research Initiative (AFRI) and \$1.189 billion for the Agricultural Research Service (ARS) in FY 2016

Introduction

Decades of investment in research have made the United States (U.S.), the world leader in biological and medical sciences. Newly created knowledge has led to enhanced quality of life and increased longevity, novel treatments for devastating diseases, advances in innovation, establishment of a multi-billion dollar biotechnology industry, and improvements in the world's food supply. These achievements represent a remarkable return on investment for the American public.

Federal investments in basic research provide the fundamental insights for the next generation of innovation. This research is a high-risk, often decades-long endeavor, making it unattractive to profit-oriented firms; due to its scale and scope, there is no substitute for federal support. Industry investments, concentrated in areas of market strength, are heavily weighted toward application and development. Charitable foundations lack the funds and the mandate required to sustain a diversified and broad-based national research enterprise, and tend to support projects focused on specific diseases. However, the private sector relies on federal investment in research and development (R&D) for the insights used to create new consumer products and foster economic growth. Government funding for high-speed networks made the digital age possible and supported the development of core technologies that contributed to the success of the smartphone and other electronic devices used in daily life, including touch-screens and global positioning systems.¹

Our future progress is jeopardized by constrained research budgets, delayed decisions on appropriations, and threats of future funding cuts. U.S. government spending on R&D has not grown since 2003. China, on the other hand, has been accelerating its investment in R&D with expenditures rising at a rate of 20 percent annually. If these patterns remain unchanged, China's funding for R&D will surpass that of the U.S. in the year 2020. This would cede world leadership in science and innovation to one of our competitors, a situation that most Americans would find unacceptable. The economic, political, and security consequences could be disastrous.

We need to change this pattern to return the nation to the course that brought us so much success in the last century. Increased R&D funding will help, but a commitment to sustained, predictable growth in investment would be most beneficial. A long-term plan would enable the most efficient use of funding and allow other participants in the research enterprise (businesses, state and local governments, philanthropies, institutions, students, and researchers) to plan their investments accordingly.

¹ *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, Mariana Mazzucato, Anthem, 2013.

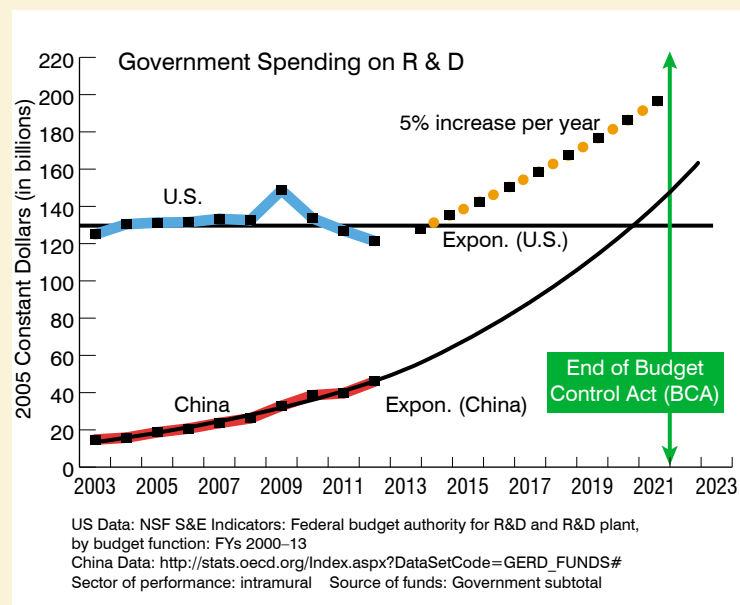
A five year commitment to increases in federal R&D investment of at least five percent annually would substantially "bend the curve" and ensure that our leadership in science and technology would not be eclipsed in the next four years. This goal is broadly similar to several other recommendations made for U.S. science:

- ***It would continue the trend of growth proposed in the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act of 2010.***²
- ***It is roughly similar to the recommendation of the American Academy of Arts and Sciences which called for the U.S. to strive to exceed "a sustainable real growth rate of at least 4 percent in the federal investment in basic research, approximating the average growth rate sustained between 1975 and 1992."***³
- ***It would restore the constant dollar losses in NIH funding that have reduced its budget by 25 percent since 2003.***

We urge Congress to act now while there is still time to ensure future prosperity.

² <http://www.nsf.gov/statistics/about/BILLS-111hr5116enr.pdf>

³ American Academy of Arts and Sciences, *Restoring the Foundation: The Vital Role of Research in Preserving the American Dream*, Cambridge, Mass, 2014.



National Institutes of Health

The National Institutes of Health (NIH) is the largest source of funding for biomedical research in the world. More than eighty-three percent of NIH funds are distributed through competitive grants to over 300,000 scientists employed at universities, medical schools, and other research institutions in all 50 states and nearly every congressional district. To date, 145 Nobel Laureates were funded by NIH over the course of their careers, including the 2014 winner of the Nobel Prize in Chemistry.

NIH has produced an outstanding legacy of discoveries that have improved health, saved lives, and generated new knowledge. Many of these advances arose from scientists investigating questions designed to explain fundamental molecular, cellular, and biological mechanisms. Research supported by NIH has also expanded our understanding of the molecular roots of various cancers and led to important insights into how microbial communities affect a range of chronic diseases including obesity and diabetes. In addition, research supported by NIH led to the development of innovative technologies and created entirely new global industries that are a critical component of our nation's economic growth.

Investment in biomedical research funded by NIH has supported discoveries that lowered death and disability from polio, heart disease, and cancer, prolonging life and reducing suffering. New scientific breakthroughs have given us the opportunity to dramatically accelerate desperately needed progress on therapies for thousands of diseases and conditions. A study published by the National Academy of Sciences found that the key enabling discovery that led to the development of 16 out of 21 drugs with the highest therapeutic impacts was made as a result of federally supported research.

NIH-funded research is continuing to produce the insights that are needed for tomorrow's improvements in health and clinical care. Recent discoveries include:

- **Engineering Immune Cells to Improve Cancer Treatment Options:** Researchers funded by NIH continue to make progress on immunotherapy which uses the human immune system to fight cancer. Promising results have been reported from several small clinical trials testing adoptive cell transfer (ACT) on patients with acute lymphoblastic leukemia. ACT is a technique that engineers an individual's immune cells to identify and kill tumors. Another form of ACT involves the addition of special receptors, chimeric antigen receptors, to T cells in order to change or improve their specificity.
- **Creating Organs on a Chip:** A new experimental technology supported through investigator-initiated research uses a series of micro-chambers, fluids, and human cells to simulate a person's internal organs. One example, lung-on-a-chip, mimics the site of oxygen exchange in the lungs, and is being developed to study lung inflammation and infection. Other organs-on-a-chip such as kidney, liver, and heart are also in development. An artery-on-a-chip was created that effectively imitates the molecular and flow conditions of early plaque development in coronary arteries. This chip was used to gauge the disease risk of individuals with high blood lipids and coronary artery plaque, and proved to be an accurate predictor of the extent of disease.
- **Developing an Artificial Pancreas:** NIH-funded researchers have developed an artificial pancreas that is capable of monitoring blood sugar and delivering appropriate amounts of hormones to control fluctuations. A sensor implanted under an individual's skin measures his or her blood sugar and transmits the information to a smartphone application that determines the amount of insulin necessary. An implantable pump provides the insulin. This device is a critical tool for individuals with type-1 diabetes who must constantly monitor their blood sugar levels to prevent hypoglycemia and other life-threatening complications.
- **Editing the Human Genome:** A new transformative technology that is revolutionizing biomedical research emerged from investigations of a primitive immune-like system in bacteria. Like humans, bacteria can be infected with harmful viruses. To fight off these infections, bacteria evolved a system in which they incorporate parts of the invading viral deoxyribonucleic acid (DNA) into their own genomes. This DNA serves as both a memory of prior infection (similar to human antibodies) and the basis for directing specific and selective degradation of the viral DNA. NIH-funded investigators reasoned that this system, known as Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR), might be repurposed to edit genes in humans and other mammals. CRISPR has already been used to modify genes in bacteria and eliminate Human Immunodeficiency Virus from infected cells in culture. It has also been effective in altering stem cells, which could potentially help treat a wide range of diseases.
- **Identifying Compounds That May Lead to Blood Tests for Alzheimer's:** As many as five million Americans over age 65 may have Alzheimer's disease today, and that number is projected to triple within the next 35 years. There is no definitive method of diagnosing Alzheimer's in individuals before symptoms appear. Using advanced technologies, a group of NIH-supported researchers analyzed the blood of individuals who had either impaired memory or Alzheimer's to search for biomarkers for early stages

of the disease. They found a series of ten compounds in blood that might be able to determine which older adults are at risk for developing cognitive impairment or Alzheimer's. Further evaluation of blood samples from patients produced a preliminary test that was 90 percent accurate in differentiating healthy individuals with no cognitive impairment from those who developed memory problems within two or three years.

Stable, Predictable Funding Is Critical to Sustain Discovery

Stable and predictable increases in federal funding for research supported by NIH are necessary to take advantage of unprecedented opportunities to improve quality of life, address the rising costs of caring for our aging population, and protect us from new and emerging diseases. As NIH Director Francis S. Collins, MD, PhD, wrote in a recent viewpoint for the *Journal of the American Medical Association*, "The 21st century is the century of biology. The nation that invests in biomedical research will reap untold rewards in its economy and the health of its people."¹

Appropriations for NIH have failed to keep up with inflation since 2003, reducing the agency's capacity to support research by nearly 23 percent. The fact that the NIH budget has not kept pace with rising costs also led to a 34 percent decrease in the number of R01-equivalent awards—

the primary mechanism for supporting investigator-initiated research—between 2003 and 2013. In addition, the number of investigators with NIH funding for six consecutive years declined from 10,030 in the FY 2000-2005 period to 9,127 in FY 2008-2013, a reduction of 11 percent.²

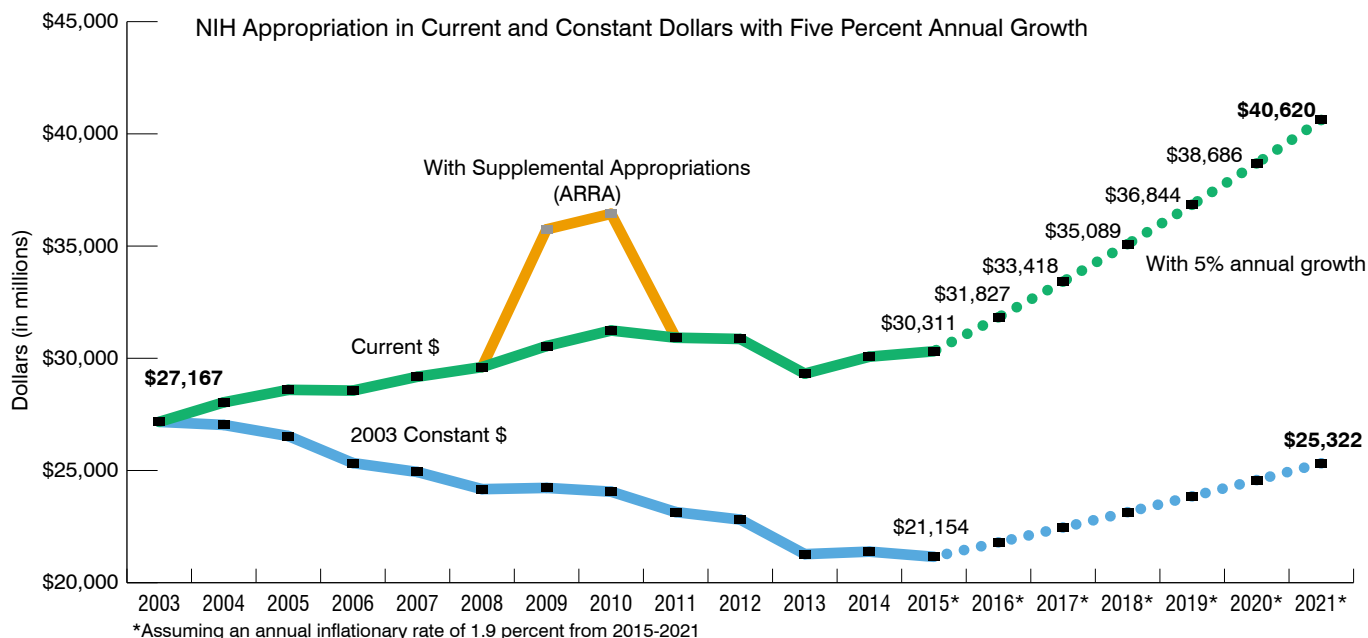
Basic research discoveries and their subsequent translation to clinical applications can take multiple years of collaboration. Budgets that are uncertain and vary in grant support from year to year make such planning difficult. The loss of personnel and scientific expertise may have long-term consequences as highly trained researchers seek employment in other fields.

Congress took an important step in the right direction by providing desperately needed increases for NIH in the FY 2014 and FY 2015 omnibus appropriations bills. However, the additional funding did not restore the lost purchasing power or fully replace money that was cut in 2013 due to sequestration. We estimate that with a budget of \$32 billion (an increase of \$1.69 billion), NIH could support 522 new research project grants at current funding levels with commensurate growth for other vital agency programs.

To prevent further erosion of the nation's capacity for biomedical research, and as a first installment of a multi-year program of sustainable increases, FASEB recommends an appropriation of at least \$32.0 billion for NIH in FY 2016.

¹ Collins, F. (2015, January 13). Exceptional Opportunities in Medical Science: A View From the National Institutes of Health. *Journal of the American Medical Association*.

² Data Hound (Berg J). Minding the Gap. *Data Hound Blog, Sciencetopia*. May 15, 2014.



National Science Foundation

The National Science Foundation (NSF) is the only federal agency supporting all fields of fundamental science and engineering. NSF's mission is "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..."¹ The agency has supported revolutionary research in every field of science and engineering and funded over 200 Nobel Laureates. Its fellowship programs support the education and training of thousands of graduate students pursuing advanced degrees in science, technology, engineering, and mathematics, ensuring a robust and competitive workforce.

The vast majority of NSF funding is distributed, through merit-based reviews, to 200,000 scientists, engineers, educators, and pre- and post-doctoral students across all 50 states. NSF funds approximately 24 percent of all federally-supported basic research through an average of 11,000 new competitive awards per year.²

Recent highlights from NSF-funded research include:

- **Understanding the Brain:** Researchers at the University of Arizona have demonstrated that brain structures responsible for learning and memory are nearly identical across a wide variety of animal species, including insects, crustaceans, mollusks, and worms. This similarity indicates a common evolutionary pathway, and the neuroanatomy and chemical composition of the structures mirror areas in the human brain that are implicated in neurological disorders involving learning and memory, such as Alzheimer's disease and Down syndrome.³
- **Developing Wearable Medical Monitors:** A team of engineers at the University of California, Berkeley, funded by NSF, have developed an organic, fabric-like pulse oximeter, which measures pulse and blood oxygenation levels. Traditional oximeters, used in every hospital in America, are rigid and expensive to produce. The new model will be "as cheap as a Band-Aid" and is as accurate as the product currently in use. This revolutionary technology has the potential to catalyze a new industry to develop affordable, wearable medical sensors.⁴

¹ <http://www.nsf.gov/about/glance.jsp>

² <http://www.nsf.gov/about/glance.jsp>

³ <http://uanews.org/story/of-bugs-and-brains>

⁴ <http://newscenter.berkeley.edu/2014/12/10/organic-electronics-cheap-wearable-medical-sensors/>

- **Fighting Antibiotic Resistance:** NSF-funded researchers found that a member of Archaea, a group of single-celled organisms best known for living in extreme environments like hydrothermal vents, produces compounds that kill a group of bacteria that includes drug-resistant pathogens like *Staphylococcus aureus*, *Bacillus anthracis* (which causes anthrax), and *Clostridium difficile* (which causes gut infections). This discovery could lead to the identification of new antimicrobial drugs that will help combat the serious problem of antibiotic resistance.⁵

⁵ <http://news.vanderbilt.edu/2014/11/lifes-extremists-may-be-an-untapped-source-of-antibacterial-drugs/>



NATIONAL SCIENCE FOUNDATION



- **Reducing Sleep Disorders:** The NSF funds a collaborative project between mathematicians and neuroscientists to study sleep-wake cycles using mathematical models. These models, which are tested with data from rodent studies and human patients, are revealing how the structure of the massive neuronal network in the brain affects the timing of sleep-wake cycles. Successful models could potentially be used to develop insomnia treatments, effective remedies for medical condition-induced sleep disorders, or strategies to reduce jet lag more quickly.⁶
- **New Methods of Producing Biofuels:** NSF-funded research led to the discovery that certain symbiotic bacteria that live in the gills of marine clams provide the animals with the enzymes they need to digest the cellulose in wood, thereby yielding energy for the clams

⁶ http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=130787&org=NSF

to survive. These enzymes have potential economic value because they convert wood into soluble sugars that can be fermented into renewable biofuels, such as ethanol. They can also be used in production or processing of paper, textiles, detergents, food, animal feed, and waste materials.⁷

Maintaining Global Leadership in Innovation

Progress in science and technology is becoming increasingly interdisciplinary, as discoveries in one field fuel advancement in another. The broad research portfolio of discovery science at NSF is especially critical for our nation's capacity for generating new knowledge that benefits society, improves quality of life, and strengthens the economy. In a recent speech at the United Nations Educational, Scientific and Cultural Organization, NSF Director France Córdova, PhD, said, "...the key to innovation—it is to invest in discovery-based research."⁸

Steady, sustainable funding increases are the best way to ensure that the next period of transformative discovery takes place in America. NSF should be granted the resources it needs to enhance innovation and train the next generation of leaders in science and engineering. According to our estimate, providing NSF with \$7.72 billion (\$380 million above the FY 2015 level) would enable NSF to support approximately 400 more research grants at current funding levels.

In FY 2016, FASEB recommends a minimum of \$7.72 billion for NSF. This sustainable increase is an important first step in ensuring a competitive basic research enterprise.

⁷ <http://www.sciencedaily.com/releases/2014/11/141110211028.htm>

⁸ http://www.nsf.gov/news/speeches/cordova/15/150119_unesco.jsp



Department of Energy
Office of Science

The Department of Energy Office of Science (DOE SC) is the lead federal sponsor of fundamental energy research and the largest supporter of basic physical sciences research. DOE SC awards competitive, merit-based grants to researchers in all 50 states, operates ten of the seventeen world-class National Laboratories, and manages state-of-the-art facilities used by more than 29,000 scientists and engineers annually. Researchers supported by DOE SC have been awarded 115 Nobel Prizes.

The entire research community benefits from the unmatched scientific and technological instrumentation maintained by DOE SC, such as supercomputers, X-ray light sources, and particle accelerators. Discoveries made possible by such technologies improve health, spur economic growth, and support a secure and sustainable energy future.

Examples of DOE SC-funded research include:

- **Building Devices to Detect Cancer:** Researchers at Argonne National Laboratory, in partnership with scientists at the University of South Florida, have made a dramatic advance in surface acoustic wave (SAW) biosensors, which are used to detect ovarian cancer and other diseases. The new model improves the device's sensitivity, while simultaneously reducing power consumption. The next step in development will enable SAW sensors to be battery-operated and small enough to be hand-held.¹
- **Novel Method to Target Influenza Virus:** A team of researchers working at DOE's Stanford Linear Accelerator Center National Accelerator Laboratory has

¹ <http://www.anl.gov/articles/researchers-develop-new-acoustic-sensor-chemical-and-biological-detection>



identified an antibody that binds to a wide variety of influenza strains. Because the antibody is conserved in so many strains, it provides a new target for structure-based drug discovery as well as potential innovative methods for vaccine design.²

- **Visualizing Fragile Biological Samples:** Using two DOE SC User Facilities, engineers have combined X-ray lasers and robotics to visualize the structure of nanoscale proteins and other biological molecules. The new system, the Linac Coherent Light Source (LCLS), helps scientists determine the structure of molecules that are too small or too delicate for conventional analysis. LCLS has immediate applications in the burgeoning field of nanotherapeutics.³



- **Discovering Treatments for Hepatitis C:** DOE SC-funded researchers from Rutgers University and Emory University School of Medicine, in partnership with the Brookhaven National Laboratory, have determined the three-dimensional structure of the hepatitis C virus. Using the National Synchrotron Light Source, the team developed a model of the exterior structure of the virus, the first step in vaccine development for this infectious disease that affects more than 160 million people worldwide.⁴

² <https://www6.slac.stanford.edu/news/2014-12-08-study-may-help-slow-spread-flu.aspx>

³ <https://www6.slac.stanford.edu/news/2014-11-21-robotics-meet-x-ray-lasers-cutting-edge-biology-studies.aspx>

⁴ <http://www.bnl.gov/newsroom/news.php?a=25256>



Protecting the World-Class Infrastructure for Discovery Research

Discovery science provides a stable foundation for innovation, driving the frontiers of knowledge and generating the industries of the future. Instrumentation, visualization platforms, and many other tools at the National Labs and User Facilities provide a nexus where nearly every field of science and engineering converge. The large-scale scientific technologies at DOE SC labs are also critical to the research and development capabilities of major companies in the automotive, healthcare, and pharmaceutical industries, as well as dozens of small businesses.

Opportunities for advancement in energy research are countless. Stable and predictable funding growth for DOE SC will provide the agency with additional resources to deliver scientific discoveries and tools to transform our understanding of nature and strengthen our national security. Increased investment will also allow DOE SC to support ongoing efforts to upgrade the infrastructure of the National Labs and maintain U.S. leadership in the physical and life sciences.

To promote sustainable growth, FASEB recommends a minimum of \$5.34 billion for DOE SC in FY 2016. This increase represents a commitment to the critical research supported by the agency, and would preserve the capacity of our National Labs and User Facilities.

Veterans Affairs Medical and Prosthetic Research Program

The Department of Veterans Affairs (VA) Medical and Prosthetic Research Program is the primary federal effort focused on discovering knowledge and developing innovations that advance health care for our veterans and the nation. It is an obligation to provide the highest quality care to those who have made great sacrifices in service to this country. More than 70 percent of VA researchers are also clinicians who provide direct patient care, allowing the agency to quickly translate discoveries in the laboratory to health care improvements.

VA-funded research has produced significant returns, from advancing basic knowledge about disease mechanisms and detection to the development of new treatments and therapies. Partnerships between VA and biomedical and biotechnology companies have led to the creation of state-of-the-art prosthetics, including a bionic ankle-foot that is now in clinical use.

Additional examples of VA research include:

- **Predicting the Onset of Flu Season with Greater Accuracy:** VA researchers and several universities developed a new statistical method that can be used to determine the earliest stages of flu season. An algorithm called the Above Local Elevated Respiratory Illness Threshold uses routine information, such as the number of influenza cases confirmed per week in a region, to identify events that signal the start of an outbreak. It will allow the public health community to better manage resources and target the response where it is most needed. This method may also be useful in predicting other infectious diseases that occur annually such as West Nile virus¹.
- **Demonstrating the Benefits of Early Use of Antiretroviral Therapy:** A study of service members with Human Immunodeficiency Virus (HIV) found that those who received antiretroviral therapy within a year of infection were 50 percent less likely to develop Acquired Immune Deficiency Syndrome compared with those who were not treated. The findings contradict traditional HIV treatment methodology, which often encourages

physicians to wait until patients reach certain infection thresholds before recommending antiretroviral therapy. Frequent HIV testing followed by rapid initiation of antiretroviral therapy could also have a major effect on the number of transmissions and on the long-term health of infected people.²

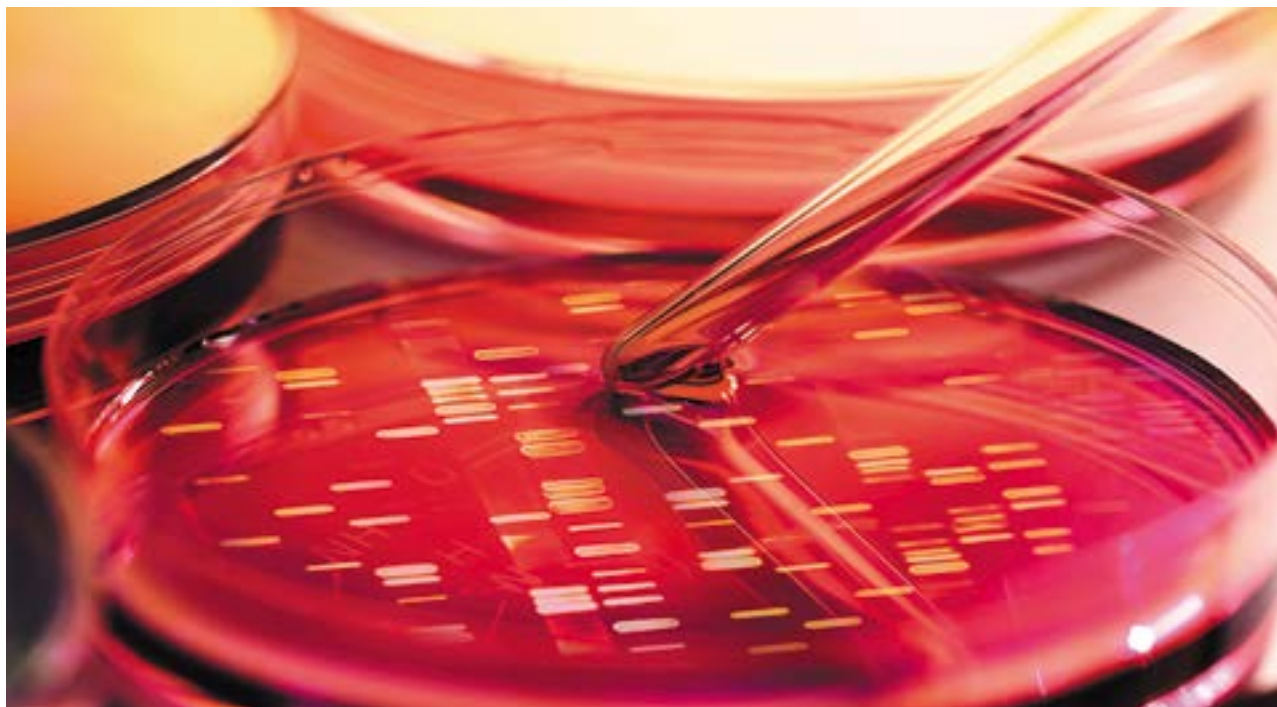
- **Developing Less Toxic Chemotherapy:** Researchers supported by the VA discovered that a nanocapsule bonded with Bombesin peptides found in the skin of the European fire-bellied toad could be used to deliver anti-cancer drugs that effectively and efficiently penetrated tumors without the normal side effects of traditional chemotherapy. Bombesin can be created artificially in labs and programmed to find and target many types of tumorous cells without damaging other parts of the body.³
- **Preventing Further Organ Damage after a Heart Attack:** A group of researchers created a special gel that attempts to stop damage to the left ventricle after a heart attack. An experimental version of the gel that was tested in adult pigs showed promise in preventing additional heart failure in animals that had experienced

² <http://www.research.va.gov/currents/winter2015/winter2015-4.cfm>

³ <http://www.research.va.gov/currents/fall2014/fall2014-4.cfm>

¹ <http://www.research.va.gov/currents/fall2014/fall2014-28.cfm>





medically-induced heart attacks. Adult pig hearts are considered biologically comparable to those of humans, suggesting such a technique might translate well from animal experiments into a treatment for people.⁴

New Resources Are Needed to Continue Progress and Meet the Growing Demand for Services

Recent overseas conflicts have created new demand for services to treat post-traumatic stress disorder (PTSD), depression, and suicide. One in five Iraq and Afghanistan veterans has been diagnosed with PTSD at a cost to the country of at least two billion dollars to date. Since 2000, the VA has experienced an increase of more than seventy percent in the total number of veterans seeking prosthetics, sensory aids, and related services.

The VA budget also supports research on chronic conditions that are prevalent among aging veterans. Current projections indicate that approximately 218,000 veterans will be diagnosed with dementia in 2017, an increase of more than 40,000 since 2008. VA researchers are at the forefront of improving methods of early detection for those with memory impairments.

To sustain ongoing research efforts on conditions common among service members injured in recent combat operations and improve the quality of care for aging

⁴ <http://www.research.va.gov/currents/spring2014/spring2014-30.cfm>

veterans, the VA Medical and Prosthetic Research Program will need an increase of at least \$30 million. New resources are also needed for the Million Veteran Program (MVP), a multi-year effort to develop one of the world's largest databases of genetic information. Tissue samples collected from MVP participants may help identify the genetic basis for a variety of diseases and could be used to determine which treatments work better. The VA is also collaborating with NIH on a new precision medicine initiative. In addition, the VA is engaged in a five-year joint effort with the Department of Defense to rapidly advance research on traumatic brain injury, the third most prevalent service connected disability⁵.

The budget of the VA Medical and Prosthetic Research Program grew by less than one percent between FY 2012 and FY 2014. During this same time period, the number of disabilities among all veterans receiving care from the VA increased by 11 percent⁶.

FASEB recommends funding the VA Medical and Prosthetic Research Program at a minimum of \$622 million in FY 2016 to address the health care problems of the veteran population and ensure they receive the high quality care they have earned.

⁵ <http://www.benefits.va.gov/REPORTS/abr/ABR-Compensation-FY13-09262014.pdf>

⁶ Ibid

United States Department of Agriculture Research Programs

The United States Department of Agriculture (USDA) funds research through a competitive grants system, the Agriculture and Food Research Initiative (AFRI), and an “in-house” effort administered by the Agricultural Research Service (ARS). These programs support research that addresses some of the grand challenges of our time: global food security, human nutrition, climate change, and sustainable bioenergy. In addition to the fundamental knowledge generated in these areas, USDA also funds translational research to create useable solutions and technologies from cutting-edge science.

Opportunities for agricultural research are growing, as Congress recognized by expanding USDA’s research mandate in the 2012 Farm Bill. Harnessing this potential would generate new knowledge in the food, nutrition, and agricultural sciences, and translate those fundamental discoveries into practical solutions that benefit all sectors of society and every geographic region in the country.

Examples of promising USDA-funded research include:

- **Developing Heat-Resistant Lettuce Crops:** USDA-funded researchers at the University of California, Davis have discovered a way to allow lettuce seeds to grow at higher temperatures than previously possible. Wild lettuce from Peru has a gene that allows for germination at a higher temperature, and the research team incorporated the gene into commercial crops. The new lettuce type requires less water to cool the soil, conserving resources and saving farmers money.¹
- **Reducing Allergens in Peanuts:** Peanut allergies are the most severe of all food allergies in the United States, affecting 2.8 million people. Scientists at North Carolina Agricultural and Technical State University have developed a method to remove up to 98 percent of the allergen by soaking roasted, shelled peanuts

¹ http://www.csrees.usda.gov/about/pdfs/nifa_2014_impact_rep_fnl.pdf





in a solution of enzymes. Human clinical trials have been completed, and the hypoallergenic peanuts are expected to be available in stores soon.²

- **Sustaining American Corn Production:** Commercial corn crops covered 95 million acres of American soil and generated \$65 billion in revenues in 2013. However, corn production is threatened by extreme weather events. In order to improve communication, analysis, and data sharing about corn farming practices, a partnership known as the Sustainable Corn Project has been launched as a collaboration between scientists at Iowa State University, USDA ARS, and ten land-grant universities. This USDA-funded project is also training 159 students to become the next generation of agricultural scientists.³

- **Using Mobile App Technology to Support Farmers:** Farmers are required by the Environmental Protection Agency and state oversight bodies to submit nutrient management plans and other data on their soil and

crops. This administrative burden placed on farmers reduces efficiency, costing farmers time and money. A USDA-funded team of engineers and scientists from the University of Vermont have developed a mobile application to help farmers meet their obligations and avoid potential fines for non-compliance. The app will also assist farmers to reduce nutrient runoff, saving time and increasing productivity.⁴

Unleashing the Potential of Agricultural Research

ARS and AFRI researchers address key agricultural and national priorities like ensuring access to high-quality, safe food, sustaining an internationally competitive agricultural industry, adapting to a changing climate, and assessing and monitoring the nutritional status of Americans. Agency funds also support training programs for the next generation of agricultural researchers.

The 2012 Farm Bill renewed the AFRI program, recommending an authorized level of \$700 million annually. This legislation also expanded AFRI's research priorities to include diseases that can be transmitted from animals to humans, the effectiveness of conservation practices in addressing nutrient losses, and the economic costs, benefits, and viability of producers adopting conservation practices. Steady, sustained increases for AFRI are critical for meeting the program's expanded goals and continuing to build a foundation of knowledge that will help solve current and future societal challenges.

FASEB recommends a minimum of \$450 million for AFRI and \$1.189 billion for ARS in FY 2016. This funding level represents a continuing commitment to the vital field of agricultural research.

² http://www.csrees.usda.gov/about/pdfs/nifa_2014_impact_rep_fnl.pdf

³ http://www.csrees.usda.gov/about/pdfs/nifa_2014_impact_rep_fnl.pdf



⁴ http://www.csrees.usda.gov/newsroom/blogs/blog_gocrop_march_2014.html



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In addition, FASEB thanks our member societies' executive officers and public affairs staff for their contributions to this report and the discussions that shaped it.



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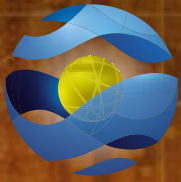
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FASEB Member Societies

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