Testimony of the
Federation of American Societies for Experimental Biology
On
Driving Innovation through Federal Investment
Submitted to the
U.S. Senate Committee on Appropriations
April 24, 2014

Senator Barbara A. Mikulski, Chair
Senator Richard C. Shelby, Ranking Member

The Federation of American Societies for Experimental Biology (FASEB) appreciates the opportunity to share its thoughts with the Committee on how federal research investment affects the health and prosperity of the nation. As a federation of 26 scientific societies, FASEB represents more than 120,000 researchers, making it the largest coalition of biomedical research organizations in the United States.

Throughout U.S. history, federal funding has been a crucial driver of innovation. The Morrill Act, "An Act Donating Public Lands to the Several States and Territories which may provide Colleges for the Benefit of Agriculture and the Mechanic Arts," passed by Congress in 1862, provided land grants to the states that could be sold and used to fund public colleges that focused on agriculture and the mechanical arts. Today, these land grant colleges and universities are among the world's leading teaching and research institutions.

Federal investments in research have protected the nation in war and in peace time. The discovery of radar and sonar defended us from attacks by land and by air. During World War II, the Manhattan Project gave us global leadership in nuclear physics and enabled us to develop and control a key technology before our adversaries.

Our economy has been transformed and our quality of life enhanced by the innovative products and technologies that have emerged from federally funded research. The digital age was made possible by federal funding for early high-speed digital networks. Consumer products that revolutionized communication around the globe are based on discoveries arising out of publicly funded basic research. Many of the core technologies that contributed to the success of the iPhone and the iPad (such as touch-screen technology and global positioning systems) were first developed and funded by the U.S. government.[1]

Basic research funded by the National Institutes of Health (NIH) and the National Science Foundation and conducted by scientists and engineers at research institutions all across the nation has enabled us to prolong life, reduce suffering, and improve treatment for many devastating diseases. In a study published by the National Academy of Sciences, researchers

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

examined the origins of 21 drugs with the highest therapeutic impact and found that in 16 cases (76 percent) the key enabling discovery was made with public support.[2]
We are on the threshold of spectacular breakthroughs that will dramatically improve our health and quality of life. Scientists have recently identified components of blood (biomarkers) that can be used to diagnose and track the progress of some our most devastating diseases. Funding from NIH allowed scientists from multiple US universities and medical institutions to identify and analyze ten different biomarkers that might be able to distinguish individuals who will develop Alzheimer's disease from those who will not. With an estimated 115 million people projected to be affected by 2050, researchers are seeking methods to allow physicians the ability to identify patients earlier in the disease process and begin treatment before irreversible brain damage occurs.

At the Stanford University School of Medicine, researchers are in the process of developing a blood test that can identify patients with early stage lung cancer. The test, which was developed using funds from NIH's National Cancer Institute, is able to distinguish minute quantities of DNA shed from the tumor from the vast amount of other DNA within the blood. The researchers are hoping to optimize this methodology for all solid tumor types, which could reduce the need for invasive testing procedures and biopsies to monitor the amount of cancer in the body.

Amazing progress is also being made in treatments for spinal cord injury, giving once paralyzed individuals the ability to regain movement. Using funds from NIH's National Institute of Biomedical Imaging and Bioengineering, scientists at the University of Louisville determined that electrodes implanted just below the site of a spinal cord injury in paralyzed individuals could elicit voluntary movement when the electrodes were stimulated. Combined with physical therapy, researchers say that this discovery has the potential to change the prognosis for paralyzed individuals even years after initial spinal cord damage.

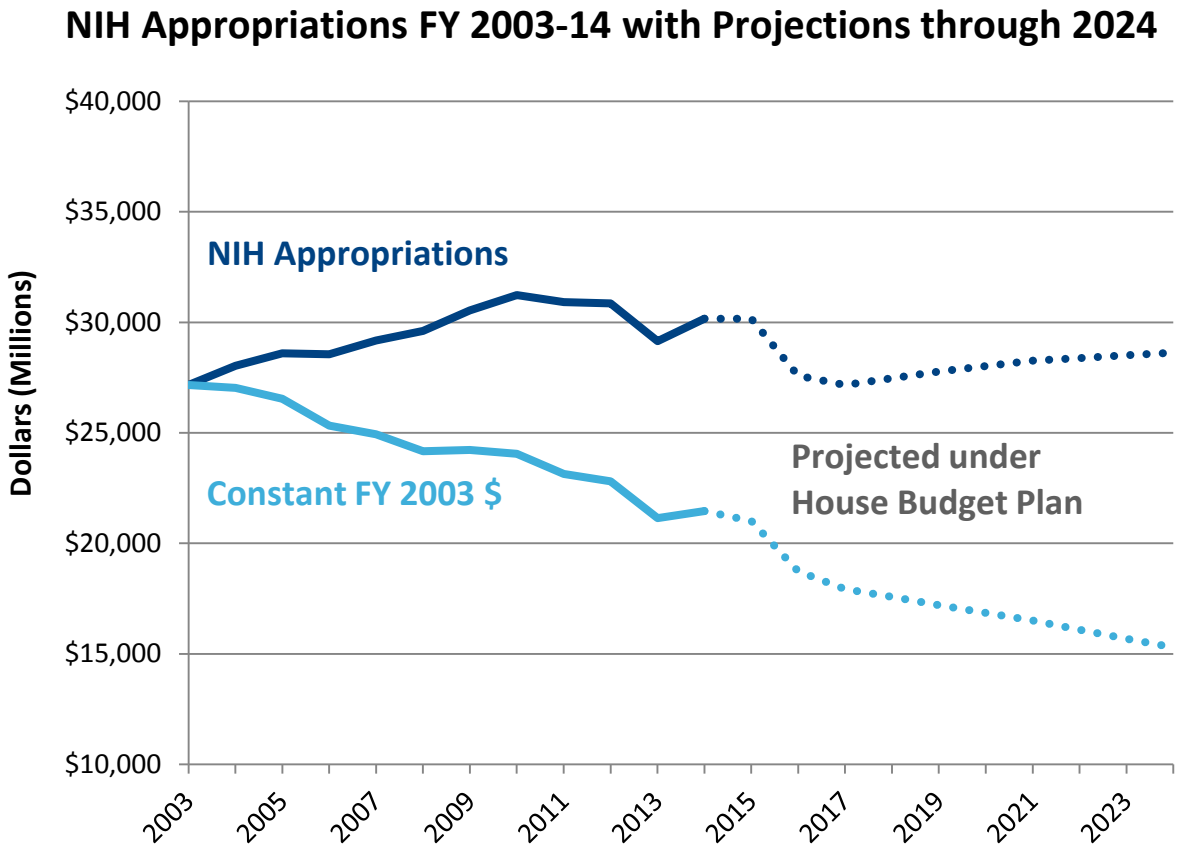
A new experimental technology being pioneered by NIH's National Center for Advancing Translational Sciences and other federal agencies, "organs-on-a-chip," uses a series of micro-chambers, fluids, and human cells to simulate a person's internal organs. One example of this technology, "lung-on-a-chip," mimics the site of oxygen exchange in the lungs and is being used to study lung inflammation and infection. Other "organs-on-a-chip" such as kidney, liver, and heart are in development with the hope that many of these different "organs" can be connected to replicate an entire human's physiological make-up. While years away, researchers anticipate that this technology will expedite the development and approval of new therapeutics.

Unfortunately, due to shrinking research budgets, we are unable to keep pace with the profound opportunities before us. In the words of NIH Director Francis Collins,[3] "without sustained investment, many high-priority efforts would move at a substantially slower pace, and years of effectively flat funding for biomedical research have left scientists facing the lowest chances in history of having their research funded by NIH."

We are turning away from the investments that have been the source of our security and prosperity. Today, the budget of the NIH is smaller than it was in 2010. If the out-year cuts to

[2] Iain Cockburn, et al., "Pharmaceuticals and Biotechnology," *U.S. Industry in 2000*, National Academy Press, Washington, DC, 1999
[3] Francis Collins, *The Washington Post*, December 25, 2013.

funding for non-defense discretionary programs outlined in the FY 2015 House Budget Resolution[4] are applied to NIH, funding for biomedical research will decrease through 2024.



When adjusted for the rising cost of biomedical research, the situation is even bleaker. Since 2003, funding for the agency has failed to keep up with inflation. Losing $5.7 billion over the past 11 years, the purchasing power of the NIH budget is now 21 percent less than it was in 2003. If the cuts projected in the House Budget Resolution are applied to the constant dollar budget, the purchasing power of the NIH budget in 2024 will be a mere 56 percent of its 2003 level.

While we are reducing funding for research and development (R&D), other nations are increasing theirs. Between 1995 and 2011, the U.S. share of global R&D expenditures declined from 43.0 percent to 36.9 percent, while China's grew from 1.6 percent to 10.9 percent.[5]

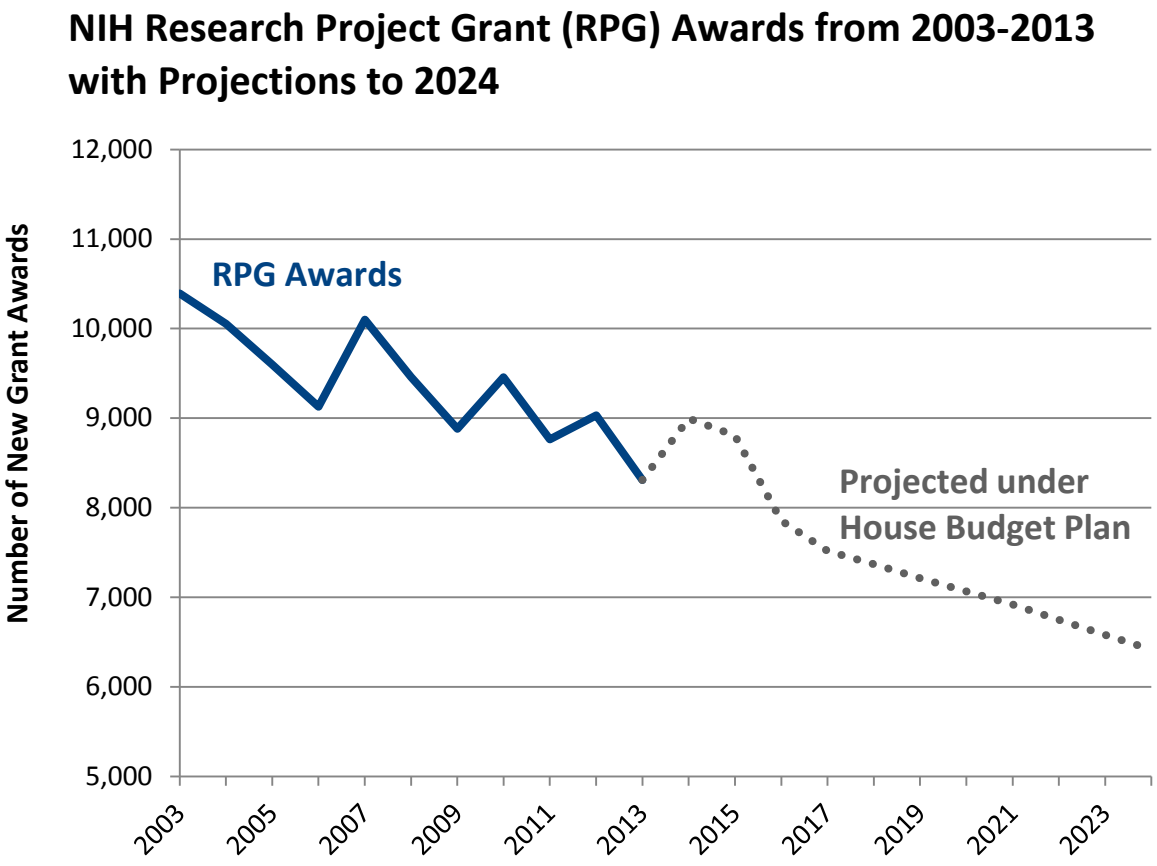
Changes in funding translate directly into changes in innovation. Our shrinking investment in research has led to a diminished share of the world's research publications. Between 1995 and 2011, the U.S. contribution to the production of science and engineering articles fell from 34.2

[4] U.S. House of Representatives, Committee on the Budget, Fiscal Year 2015 Summary Tables http://budget.house.gov/uploadedfiles/fy2015_summary_tables.pdf

[5] National Science Board, 2012 and 2014, *Science and Engineering Indicators*, (NSB 12-01 and 14-01) Arlington, VA

percent to 25.7 percent of the world total while China's share rose from 2.6 percent to 9.4 percent.[6]

The inability of the NIH budget to keep pace with the rising costs of research has led to a decrease in the number of research project grants (RPG) funded. In 2013, NIH funded 8,310 RPGs, 2,083 fewer than in 2003. This is a loss of 20 percent over the 11-year period. Losses are even greater for the critical R01 grants. The number of R01 awards has plummeted from 7,430 in 2003 to 4,902 in 2013, a loss of 34 percent.



If the out-year cuts outlined in the House Budget Resolution are applied to NIH, we estimate that this will limit the number of RPG awards to 6,414 per year in 2024, just over 60 percent of the number awarded in 2003.

For the past decade we have been slowing the pace of discovery, losing talented researchers, and failing to prepare for the future. Failure to adequately invest in research will wreak enormous damage on an enterprise that has been so critical in assuring the security, prosperity, and health of the U.S. The situation is desperate. We urge Congress to act now before further harm is done.

FASEB thanks the Committee for the opportunity to contribute to this important discussion.

[6] Ibid.