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Reinvesting in US Biomedical Research—The Time is Now

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It is undisputed that the National Institutes of Health (NIH) has played a fundamental role in improving the health of the people of the United States over the last half a century. Through supporting innovative and transformative biomedical research aimed at discovering disease mechanisms, the NIH facilitates the improvement of every aspect of health care including diagnosis, prevention, and intervention of disease. This level of support has also propelled the US to become the most powerful and productive nation on earth in medical science and technology. Discoveries made through support of the NIH have also resulted in a shift in the paradigm in the landscape of disease from acute to chronic diseases and, in the foreseeable horizon, to the management of disease by predictive and personalized approaches.

However, it is well recognized that federal funding for biomedical research has stagnated in the last few years. Since 2003, the total budget of the NIH has experienced no real growth and in fact, a 10% decline after adjusted for inflation (Figure 1)¹. Of particular concern is the decline in the amount of awards to both new and continuation R01-equivalent grants², which are the cornerstones of fundamental biomedical research (Figure 2). Fewer awards translates into a steady decline in the success rates of both new and continuation R01-equivalent grants for close to a decade (Figure 3). In 2008, the success rate of a new R01 grant upon first submission bordered around a paltry 8%, which implies that only one in roughly 13 grants will get funded during the first try. This dismal level of funding has resulted in many horror stories³ and is putting an entire generation of science at risk⁴. One can also surmise that if the current trend continues, the US will likely lose its competitive edge in biomedical research.

As a presidential candidate, Senator Obama ran on the platform of improving America's competitiveness and the lives of Americans. Among the agenda during his campaign was an emphasis on technology, education, and health care. With the rapid economical decline following his election, President Obama signed into law the American Recovery and Reinvestment Act on February 13, 2009. It is gratifying to see that the NIH is getting an infusion of 10.4 billion dollars in the next two years as part of the stimulus package. The monies will be spent on improving infrastructure, purchasing equipment, hiring personnel, and funding highly innovative and transformative “challenge” grants. This welcoming move shows the commitment of the new administration and congressional leadership to the stimulation of economic growth by investing in research and development.

Will a single infusion of short-term cash reverse the declining trend in biomedical research? The answer is that it will help, but only to a certain extent. Scientific discovery is a time-consuming process that often takes even longer time for the results to be translated into clinical practice. Take the production of drugs by recombinant DNA technology, for example. It took close to 20 years for the discovery of the structure of DNA (1953) to lead to the first recombinant DNA experiment (1972). It then took another 10 years for the first recombinant DNA drug (insulin) to hit the market (1982). Numerous other examples follow this pattern of development for a discovery to make its way from the bench to the bedside. It is thus not difficult to see that while a short-term investment such as the recovery act will rejuvenate some aspect of biomedical research by improving infrastructure and replenishing lost momentum, a sustained commitment is essential for the long-term vitality of the biomedical research enterprise.

In conjunction with the recovery plan, several recent events have provided encouraging signs for the revitalization of biomedical research. Among a few examples are the lifting of the ban on NIH funding for stem cell research by President Obama and the appointment of world-class scientists to serve in the cabinet of the new administration, such as the Nobel laureate Steven Chu to the post of Energy Secretary. During the senate confirmation hearing for the Secretary of Health and Human Services, Kansas Governor Kathleen Sebelius said “we will lead progress in U. S. health with science”. The NIH has also made major and renewed commitments to new and early stage investigators as well as to revising the peer-review criteria to better identify highly meritorious grants for funding. From the digestive disease perspective, the recent release of the final research plan for digestive diseases based on the recommendations of the National Commission on Digestive Diseases⁵ cannot occur at a more opportune time and will serve as a roadmap for the advance of digestive disease research in the coming decades.

What are some of the additional outstanding and pressing issues in strengthening U. S. biomedical research? Clearly, sustainability in federal commitment and support for the NIH is crucial. There needs to be predictability and stability in the level of funding for both basic and clinical research at the level of established and new investigators. The maintenance of a pipeline of new and early stage investigators in biomedical research is a must. The government and the public must be constantly reminded that investment in biomedical research is a safeguard to the wellbeing of the nation. We as scientists have an obligation in educating the public about the value of biomedical research and informing the public of the progress and return that we achieved on a recurrent basis. Last but not least, the selection of a visionary and effective leader as the next NIH director is also critically important in times of tough challenges. As of the writing of this commentary, the former Human Genome Project leader Francis Collins has been nominated for that post. It is reassuring to hear that Dr. Collins has promised to make the important work of the NIH more understandable to not only patients but to lawmakers who hold the NIH's purse strings.

The 2007 report by the National Academies entitled “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future” stated that as much as 85% of measured growth of U. S. income per capita is due to technological change⁶. The time is now for the nation to recommit itself to the constant and steady growth of its biomedical research program.

References

1. Data in Figures 1 to 3 are derived from the NIH website, Research Portfolio Online Reporting Tool (RePort; <http://report.nih.gov/>).
2. R01-equivalent grants include mostly R01 grants and a small number of R29 and R37 grants.
3. See, for example, Wadman, Meredith. Closing Arguments. *Nature* (News Feature) 2009;475:650–5.
4. “Why consecutive years of flat funding of the NIH is putting a generation of science at risk”, a testimony before the Senate Committee on Health, Education, Labor and Pensions by Harvard University President, Drew Faust; March 11, 2008 (http://www.president.harvard.edu/speeches/faust/080311_NIH.php).
5. See “Opportunities and Challenges in Digestive Diseases Research: Recommendations of the National Commission on Digestive Diseases”, National Institute of Diabetes and Digestive and Kidney Diseases (<http://www2.niddk.nih.gov/AboutNIDDK/CommitteesAndWorkingGroups/NCDD/FinalResearchPlanPosting.htm>).
6. See The National Academies Press website http://www.nap.edu/catalog.php?record_id=11463.

Figure 1.
The total NIH budget in actual dollars from 1999 to 2008.

Figure 2.
The total dollars awarded to new and continuations R01-equivalent grants from 1999 to 2008.

Figure 3.
The success rates of new and continuations R01-equivalent grants from 1999 to 2008.