



**Testimony
Before the
Subcommittee on Health
Committee on Energy and Commerce
United States House of Representatives**

**“The NIH Reform Act of 2006:
Progress, Challenges, and Next
Steps”**

Statement of

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In 1944, Congress passed the Public Health Service Act, which laid the foundation for a modern National Institutes of Health (NIH) to support biomedical research through extramural grants, largely to academic research institutions. This basic system remains in place and has served the Nation – indeed the world – very well. With over a half century of advances supported by the Agency, NIH is comprised of 27 Institutes and Centers based on the burden of disease; race, gender and demographic disparities; and individual organ systems of the human body. The field of biomedical research burgeoned as life was extended, diseases were conquered and knowledge was expanded.

These past 64 years have been a distinctive period in the history of scientific inquiry. Yet what lies ahead in the near future will likely be even greater scientific and medical advancements. As the Director of NIH, I am witnessing an unprecedented explosion of research advances and discoveries.

The field of medical research is breaking down human biology into its basic components as never before. We have sequenced the human genome, giving us our biological instruction book. We can increasingly track molecular pathways, providing more precise understandings of how disease develops. We are acquiring new information about DNA and proteins and their role in disease processes.

We have the ability to obtain biological data, and integrate and manage new knowledge faster and with more accessibility. We are seeing and understanding cellular interactions, causes and effects that are leading us to a transformation of medical treatment, where disease will be preempted before symptoms appear and suffering begins.

One major breakthrough is new knowledge indicating commonalities among diseases. For example, we are discovering similar genetic variations occurring among multiple diseases, such as cancer and type 2 diabetes. This convergence of science strongly suggests that cross-cutting, multi-disciplinary research, unencumbered by arbitrary structures and narrow approaches, is the critical way of advancing medical research. Cellular mechanisms involving genes, molecules, proteins and other biological components of the human body are the underpinnings of all disease. They must be better understood before discoveries are applied to individual diseases, and with our new knowledge and tools, comprehension will increase.

The approaches mandated by the NIH Reform Act of 2006, P.L. 109-482, will require NIH to seek new ways of conceptualizing and addressing scientific questions. The translation from discovery to patient care will be better facilitated.

The scientific boundaries between NIH's Institutes and Centers have become blurred by the interdisciplinary coordination among them. The functional integration required by the Act has helped this process. As you consider NIH issues in the future, I caution you that it would be a

grave mistake to go backwards in mandating disease-specific research at a time when barriers need to be torn down, not rebuilt.

The timing of the consideration and passage of the Act intersected quite well with the convergence of science. The Act contains authorities and mechanisms that are facilitating and speeding trans-NIH research. It requires greater transparency from the Agency. It calls for innovation, particularly in the area of high-risk, high-reward research, and across scientific disciplines in both the life and physical sciences. And it requires more accountability. The Act was an elegant response to the science of our day to the opportunities of this moment in the annals of medical research, and a stimulus for experimentation with new and bold approaches to science and public health.

Two years after passage of the Act, I am here to tell you that the vision of its crafters is being fulfilled. We are using new authorities to enable and expedite trans-NIH research, funded through the new Common Fund, an appropriations line item authorized by the Act. We have issued a new Biennial Report, required by the Act, which explains NIH programs to Congress in one consolidated and transparent publication. We are moving ahead on an open and electronic disease funding report, as required by the Act. And today, I am announcing the composition of the Scientific Management Review Board, a panel mandated by the Act, which I believe will be an effective mechanism for continuously monitoring and improving NIH's organization and performance over time, thus avoiding the ad hoc approaches of the past.

The following is a summary of the implementation status of the various provisions of the NIH Reform Act:

Trans-NIH Research

Prior to the Act's establishment of a Common Fund to support Trans-NIH research, NIH had established the Roadmap for Medical Research, which was funded through voluntary contributions from NIH's Institutes and Centers and supplemented by direct appropriations from the Office of the Director (OD) of NIH. Funding for the Roadmap consisted of \$131.9 million in FY04 (of which \$38.4 million was OD funding), \$239.7 million in FY05 (of which \$64.0 million was OD funding) and \$332.6 million in FY06 (of which \$85.3 million was OD funding).

Following enactment of the NIH reauthorization, in FY07 \$483 million was provided for the Common Fund, and \$498.2 million was provided in FY08. The President's budget request for FY09 includes \$534 million for the Common Fund. We are using the Common Fund to specifically support high-risk and potentially high-reward, cross-cutting, innovative research that no single Institute or Center could accomplish alone. Research supported by the Common Fund is focused on moving medical discoveries from the bench to the bedside to improve health outcomes, and will fill vital gaps in our knowledge of human biology. Also, it allows NIH to be nimble and more responsive to emerging issues and opportunities. Common Fund projects include:

- **The Human Microbiome Project (HMP).** Within the body of a healthy adult, microbial cells are estimated to outnumber human cells by a factor of ten to one. These hidden communities of cells are the unexplored planets of human biology. They are largely unstudied, and their effect on human development, physiology, immunity, and nutrition is unknown. This research is the next step after the sequencing of the human genome. To take advantage of recent technological advances developed for the human genome project and to create new ones, the NIH Roadmap initiated the HMP with the mission of generating resources enabling comprehensive characterization of the human microbiota and analysis of its role in human health and disease. The knowledge gained from this initiative will dramatically enhance our understanding of disease interactions, possibly leading to new and more effective treatments. This project took less than two years from concept to launch. The authorities contained in the Act helped NIH to continue to move quickly.
- **The Epigenome Project.** The Human Genome Project provided the sequencing of genes. The Epigenome Project will determine the factors, such as the environment, that regulate or turn genes on and off. In order to explore this emerging frontier of science, NIH will launch an integrated series of initiatives beginning this very month. Upon completion, we expect the Project will produce a map of the epigenomes of normal human cells to serve as a reference for diseased cells; develop an integrated Data Coordinating Center to enhance data sharing worldwide; discover novel regulators of epigenomic structure; and compare epigenomes from normal and diseased cells.

- **The Structural Biology Roadmap.** The Structural Biology Roadmap is a strategic effort to create a comprehensive gallery of three-dimensional shapes of proteins in the body. This research investment involves the development of methods to produce protein samples that scientists can use to determine the three-dimensional structure, or shape, of a protein. This effort will catalyze what is currently a hit-or-miss process into an organized, coordinated, systematic and streamlined routine, helping researchers clarify the role of protein shape in health and disease. During the first phase of the Structural Biology Roadmap (FY2004-2008), the NIH funded two Centers for Innovation in Membrane Protein Production that enabled interdisciplinary groups of scientists to develop innovative methods for producing large quantities of membrane proteins. In addition, a number of small exploratory and regular research grants were awarded to individual investigators to broaden the base of innovative ideas under development. These investments in Centers and in investigator-initiated research projects have produced considerable advances in methods and several important solved structures, including that of the beta-2 adrenergic receptor. This protein is the target of numerous drugs and a prime example of a large family of important cell regulatory molecules known as G-protein coupled receptors (GPCRs). Just last month, we discovered the structure of the voltage dependent anion channel, a protein that plays a key role in the life and death of cells by controlling the flow of electrically-charged particles across all cell membranes.
- **Clinical and Translational Science Awards.** A major goal of the NIH Roadmap was the reengineering of the clinical research enterprise in the United States by bringing diverse areas of science into an integrated system through innovative approaches that will speed

the translation of basic discoveries to clinical treatment. The centerpiece of this effort was the Clinical and Translational Science Awards program which has continued on after the conclusion of the Roadmap. Using the Common Fund and support from NIH's National Center for Research Resources, NIH is funding a consortium of clinical research centers at medical schools across the country. A requirement of funding is that the centers expand their areas of expertise and scope, the most dramatic change in clinical research in 50 years. Working together, these sites will serve as discovery engines that will improve medical care by applying the latest scientific advances to real world practice. Among the goals of the program are the training of a new generation of clinical investigators, enhancement of the clinical research enterprise, more effective methods of translational research, and linkages through the most modern systems of bioinformatics.

Transparency and Accessibility

NIH wholly supports the Administration's goal for Federal agencies to be more transparent organizations. For example, every grant we support is available for public viewing. But some of our reporting methods have sometimes lacked sufficient transparency and accessibility. One area in which the Act has mandated improvements is reporting of disease funding. The Act directs the Agency to "establish an electronic system to uniformly code research grants and activities" of all NIH programs.

This provision is intended to correct long-standing deficiencies, such as lack of uniformity and transparency, associated with disease funding collection and reporting. Our response to the

statutory mandate is the creation of the Research, Condition, and Disease Categorization (RCDC) system, a computer based tool that will apply a uniform process of accounting accompanied by fully transparent lists of grants underlying and supporting the amounts for each reporting area. NIH will unveil the first RCDC reports as part of the release of the President's 2010 budget request.

Conceptually, RCDC development had begun prior to the Reform Act but has been greatly enhanced as a result of the new authority. Such an undertaking is a venture into uncharted territory for NIH. Using computer technology for the first time in an NIH-wide accounting of disease funding will help with consistently collecting data and producing reports, but inevitably as in any new data collection effort, will be imperfect at first. We expect the RCDC to evolve over several years as the system is refined and adjusted. Any inconsistencies and early flaws in the system will be identified and reported to Congress as we proceed. However, we expect the initial product to be an enormous improvement over past practices because it will, for the first time, have a uniform methodological basis, and will, also for the first time, be fully transparent.

The new system will generate web-based summary tables that the public can view and download. These data tables will include complete project listings of NIH research activities divided into hundreds of research areas, diseases and conditions. The RCDC will offer opportunities for dialogue with the public about refinements in the system over time.

We are particularly excited about the prospect of public input into the RCDC. Taxpayers must have access to reliable information about how public funds are used to finance biomedical

research, and we will welcome their participation in the evolution of the new, congressionally mandated system.

The Act also consolidated NIH's various congressional reporting requirements, replacing dozens of individual reports with a single compilation, the NIH Biennial Report. The first Biennial Report has been completed and submitted to this and other committees of jurisdiction. As it is the first report, I expect subsequent Biennials to be even better. The Biennial Report clearly will enhance the ability of Congress to understand and oversee NIH's various research programs by bringing clarity to the process of information dissemination.

Accountability, Effectiveness and Continued Improvement

While there have been various ad hoc assessments of NIH by Congress, the Institute of Medicine, the General Accountability Office and others over the past 50 years, there has not been a consistent, ongoing review of our programs by a permanent panel of experts in medical research and organizational effectiveness. This weakness has been addressed by the Act's creation of the Scientific Management Review Board (SMRB). The Act mandated that the Board conduct periodic organizational reviews, issue reports on organizational issues, and advise the NIH on the use of its management authorities. The SMRB was chartered in August 2007. For the past year we have been selecting and vetting the SMRB's members. I am pleased to announce today, for the first time, the membership of the Board, which is attached. As you can see, the members represent the brightest, most knowledgeable segment of medical research and management experts. And, based on their track records, they will be independent. While the

scope and breadth of their work will be determined by their own independent judgments, I would be willing to provide input on their planning and on topics of inquiry.

Innovation

The Act encourages NIH to support innovative research, particularly areas of inquiry that are high-risk but will yield high rewards. NIH is striving daily to meet this goal. Following are some examples:

- **The NIH Director's New Innovator Award.** This award was launched last year to cultivate new investigators and support innovative ideas by encouraging and rewarding creativity. These investigators propose bold and highly innovative new research approaches that have the potential to produce solutions for broad, important problems in biomedical and behavioral research. The research proposed need not be in a conventional biomedical or behavioral discipline but must be relevant to the mission of NIH. The New Innovator Awards complement ongoing efforts by NIH and its Institutes and Centers to fund new investigators through R01 grants, which continue to be the major sources of NIH support for new investigators. In 2007, 30 new investigators were provided New Innovator Awards under the Roadmap to initiate their own new five-year research programs. The awards provide brilliant young scientists with the resources, time and freedom to pursue their creative ideas.

- **The NIH Director’s Pioneer Award Program.** This program, first announced in 2004, is a high-risk research initiative. Pioneer Awards are designed to support individual scientists of exceptional creativity who propose pioneering – and possibly transforming approaches - to major challenges in biomedical and behavioral research. The term “pioneering” is used to describe highly innovative approaches that have the potential to produce an unusually high impact on a broad area of biomedical or behavioral research, and the term “award” is used to mean a grant for conducting research, rather than a reward for past achievements. An example of a scientific advance as a result of this program includes research by Dr. George Daley of Children’s Hospital in Boston. Dr. Daley pioneered methods to establish non-embryonic stem cells from patients in an effort to accelerate research into a variety of human diseases. Dr. Daley and colleagues succeeded in converting skin cells from patients with a variety of genetic diseases, including Gaucher’s disease, Duchenne muscular dystrophy, Down syndrome, Parkinson’s disease, and others, into cells that look and act like embryonic stem cells. The resulting cell lines, called induced pluripotent stem cells (iPS), can potentially form any cell type in the body. iPS cells derived from patients allow a new way for scientists to model human diseases and may one day provide raw material for cell therapies to reverse leukemia, diabetes, Parkinson's disease, and paralysis, among other devastating conditions.
- **Transformative R01 Research Projects Program (T-R01).** The goal of this program, which we expect to launch this fall, is to provide support for individual scientists or collaborative investigative teams who propose transformative approaches to major

contemporary challenges. The primary objective of the T-R01 initiative is to create a program that is specifically designed to support exceptionally innovative, high risk, original and/or unconventional research with the potential to create new or challenge existing scientific paradigms. This program is a High Risk/High Reward Demonstration Project that will be supported by the Common Fund.

Summary

NIH has fully implemented the Reform Act. In some cases, such as the RCDC and the SMRB, it will be several more years before we know the full impact of implementation. But in most areas addressed by the Act, we have already seen the benefits. Trans-NIH research, in particular, is already producing research awards and results that will lift all medical research, regardless of the nature of disease or disability being studied. The Act has helped to facilitate greater collaboration across all Institutes and Centers while giving NIH new tools to be more strategic and adaptive. Consequently, the integration and convergence of life sciences research will occur at faster rates, as will discoveries, and we will further diminish the burden of disease here and across the globe.

Thank you for the opportunity to provide this information to you. I will be happy to answer any questions you may have.

ATTACHMENT

2008 Scientific Management Review Board Nominees

Norman R. Augustine has been nominated to serve as the board's first chairman. Mr. Augustine is chairman of the executive committee of Lockheed Martin Corporation.

Additional nominees to the SMRB Board are:

Jeremy Berg, Ph.D., Director, National Institute of General Medical Sciences

William R. Brody, M.D., Ph.D., Johns Hopkins University

Gail Cassell, Ph.D., Vice President, Scientific Affairs and Distinguished Lilly Research Scholar for Infectious Diseases, Eli Lilly

Anthony Fauci, M.D., Director, National Institute of Allergy and Infectious Diseases

Dan Goldin, former NASA administrator

Richard Hodes, M.D., Director, National Institute on Aging

Stephen Katz, M.D., Director, National Institute of Arthritis and Musculoskeletal and Skin Diseases

Thomas Kelly, M.D., Ph.D., Director, Sloan-Kettering Institute, Memorial Sloan-Kettering Cancer Center

Story Landis, Ph.D., Director, National Institute of Neurological Disorders and Stroke

Elizabeth G. Nabel, M.D., Director, National Heart, Lung, and Blood Institute

John E. Niederhuber, M.D., Director, National Cancer Institute

Deborah Powell, M.D., Dean and Assistant Vice President for Clinical Science, University of Minnesota Medical School

Griffin Rodgers, M.D., Director, National Institute of Diabetes and Digestive and Kidney Diseases

William Roper, M.D., Vice Chair of Health, former CDC and CMS head, University of North Carolina

Arthur Rubenstein, M.D., Executive Vice President, University of Pennsylvania for the Health System; Dean, University of Pennsylvania School of Medicine

Solomon H. Snyder, M.D., Professor of Psychiatry, Neurosciences and Pharmacology, Johns Hopkins University

Lawrence Tabak, Ph.D., Director, National Institute of Dental and Craniofacial Research

Harold Varmus, M.D., President, Memorial Sloan-Kettering Cancer Center

Eugene Washington, M.D., Executive Vice Chancellor, Professor and Chair, Obstetrics, Gynecology, and Reproductive Sciences; and Professor, Epidemiology and Biostatistics, University of California, San Francisco

Huda Zoghbi, M.D., Professor, HHMI Investigator, Baylor College of Medicine