

Appropriations Subcommittee Statement on the Fiscal Year 2014 Budget

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June 4, 2013

Mr. Chairman and Members of the Committee:

I am pleased to present the President's Budget for the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health (NIH). The fiscal year (FY) 2014 budget of \$2,401,011,000 includes a decrease of \$24,511,000 below the comparable FY 2012 level of \$2,425,522,000.

Basic discovery for better health is the past, present and future of NIGMS. Today, amid the breakneck speed of progress in biomedical and information science technology, truly phenomenal opportunities for progress are at our doorstep.

In one recent example of the merit of joining the biological and information sciences, scientists with the NIGMS-led NIH Pharmacogenomics Research Network (PGRN) devised a computer algorithm to sift through millions of reports to the U.S. Food and Drug Administration to predict dangerous, yet unsuspected interactions between medications such as those between antidepressants and a common blood-pressure medication. In another case, researchers with the Institute's flagship Protein Structure Initiative (PSI) solved the three-dimensional atomic structure of the molecule on the surface of brain cells that attaches to opioids and is centrally involved in pleasure, pain, addiction, depression, psychosis and related conditions. By linking these conditions in molecular terms, the research may well lead to better, more targeted drug therapies for a range of brain-related conditions. A third example comes from investigators with the NIGMS-funded Models of Infectious Disease Agent Study (MIDAS) program. They showed that methicillin-resistant *Staphylococcus aureus*, or MRSA, infections are better prevented when hospitals cooperate and coordinate their infection control procedures. This research points to policy-related measures that could have a significant impact on public health.

From Bench to Bedside and Back

For several decades, NIGMS has provided a home for research conducted in emergency care settings. The Institute's burn and trauma centers have made many discoveries that have been implemented clinically. These include the development of artificial skin for burn victims, nutritional standards for the care of severely injured patients and new understanding of how inflammation affects injury and healing in people who have experienced severe physical trauma.

This past year, NIGMS announced the formation of the Office of Emergency Care Research (OECR). This office is the culmination of several years of discussions between NIH and the emergency medicine community and responds to reports about the nation's emergency medical system issued in 2006 by the Institute of Medicine. Although OECR does not have funding authority, it will provide agency-wide coordination toward speeding diagnosis and improving care for the full spectrum of conditions that require emergency treatment.

Another compelling example of the clinical relevance of NIGMS-supported basic research is the Developmental Genome Anatomy Project (DGAP), which employs a model of "patient as laboratory." DGAP scientists identify abnormalities in the DNA of people with a disorder that is not well understood and then follow up with laboratory studies to further probe the molecular defect in animal models. One exciting DGAP discovery is a prenatal diagnostics method that analyzes DNA in amniotic fluid using customized whole-genome sequencing.

Basic Discoveries for Better Health

NIGMS-supported research employs a range of non-human model organisms to ask and answer questions about human biology. One example is research to understand circadian rhythms, commonly known as the biological clock. The foundation of knowledge gathered over the years in this area of science is now coming together to help explain how various diseases and conditions are influenced by the time of day. Recent NIGMS-funded studies have shown that circadian rhythms have a major influence on the production of the basic units of metabolism such as amino acids, sugars and fats. Researchers learned that about 60 percent of these essential metabolites that sustain and promote cell health and growth are synchronized with the body's clock system. These findings are important because of their connection to other NIGMS-supported research established a link between circadian rhythms and chronic conditions like diabetes and obesity, which involve activities linked to time of day including eating, sleeping and physical activity. Integrating knowledge from basic metabolism and circadian biology has implications for managing the many conditions related to our biological clocks.

Aside from their use as models for basic cell biology, genetics, and metabolism, bacteria are a focus of study for NIGMS-supported researchers in another way: the study of bacterial communities called biofilms. Many individual microbes do not cause disease; indeed, they aid in normal digestion and perform other vital roles in the body. Yet, when some otherwise non-harmful strains of bacteria assemble into a film structure, they can clog medical devices like heart valves and catheters. Using powerful microscopes and time-lapse imaging, NIGMS-supported scientists watched biofilms form, as microbes joined together to create slimy ribbons that ensnared other bacteria as they traveled

through narrow, fluid-filled tubes mimicking implanted medical devices. The researchers were surprised to learn just how fast this clogging occurred and with no apparent warning. These research results could be used toward the development of clog-resistant medical devices.

Enabling Technology That Advances Discovery

Technology is a key driver of progress in biomedicine. NIGMS considers its support of resource development a vital component of the Institute's investment in allowing creative scientists to uncover new knowledge and make breakthrough discoveries.

One example of NIGMS-supported resource development is the NIGMS Biomedical Technology Research Centers program, a synergistic interaction of technical and biomedical expertise. These Centers promote the widespread and routine application of pioneering technologies and methods, and apply them to a broad range of basic, translational, and clinical research efforts. The resources—ranging from electron microscopes to bioinformatics platforms to mass spectrometers and other technologies—are used by thousands of NIH-supported scientists each year.

A second example is the Institute's investment in research on chemistry methods that can be used and re-purposed by both academia and industry. In one recent instance, scientists used NIGMS research funds to make a chemistry toolkit that can quickly and easily generate dozens or even hundreds of versions of a single molecule, toward the testing and refining of such molecules as potential drugs. This research is important because companies are unlikely to sponsor the development of broad-based resources like this. A key advantage of this new technique is that it simplifies complicated and potentially hazardous chemical reactions such that they can be automated and can be performed in a water-based environment without the use of harmful chemicals.

Strategy for the Future

NIGMS has always planned strategically for the future, since biomedical research is a long-term commitment to supporting creative people to develop and test new ideas. Part of this process is keeping an eye on the evolution of biomedicine as new tools emerge and new disease threats come to light. In recent years, NIGMS has published companion strategic plans that chart the Institute's course for research and research training, noting the tight link between the two. The Institute continues to invest funds and resources toward activities that reflect the content of these plans. NIGMS strives for a healthy balance within its scientific portfolio between small projects that are conducted by individual scientists within their laboratories and larger consortia (like the PGRN, PSI and MIDAS) that enable researchers to work together on problems that call for a broader range of expertise,

samples and resources than can be managed reasonably and successfully by individual scientists.

NIGMS is pleased that many of its research and research training efforts underway resonate so well with recommendations put forth last year by the NIH Advisory Committee to the Director on NIH's role in research training and in promoting a diverse biomedical workforce. Toward building a strong evidence base in workforce-related issues, NIGMS has funded grants that investigate factors contributing to gender and ethnic/racial disparity in workforce representation, to increase diversity. Emerging concepts include eliminating unconscious bias, career flexibility and the value of good mentoring. This growing body of work will be pivotal to effecting change on a larger scale.

NIGMS recognizes its vital role in supporting basic research for better health. In so doing, the Institute contributes in a sustained fashion to the health of the American people and to maintaining America's leadership role in science.