THE ORTHOPAEDIC FORUM

Musculoskeletal Research at the National Institute of Arthritis and Musculoskeletal and Skin Diseases: A Snapshot

By Stephen I. Katz, MD, PhD

I want to thank *The Journal of Bone and Joint Surgery* for inviting the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) and other relevant institutes at the U.S. National Institutes of Health (NIH) to communicate to you through these pages. We hope to provide two or three updates on information of interest to the musculoskeletal communities annually.

NIAMS, a part of the NIH, has long been a major contributor to musculoskeletal research in the United States. Thanks to our partnership with the musculoskeletal community, our program of research, training, and information dissemination continues to fare well in a climate of fiscal challenges. Reflecting today's economic realities, the President's fiscal year 2009 budget request for NIAMS is \$509,080,000, just a slight increase over the fiscal year 2008 appropriated level of \$508,586,000. Nevertheless, we are buoyed by our present successes, outlined below, and by the extraordinary oppor-

tunities we see for scientific progress that promises to bring improved musculoskeletal health to our nation.

NIAMS has taken its emphasis on musculoskeletal development and on tissue engineering and regeneration to a new level. In fiscal year 2007, we formally reorganized portions of our bone biology, cartilage and connective tissue, and orthopaedics portfolios into a new Extramural Research Program for Musculoskeletal Development, Tissue Engineering, and Regenerative Medicine. We believe that musculoskeletal research will benefit from the increased coordination provided by this arrangement that will also provide a home for our involvement in trans-NIH bioengineering research efforts. We are confident that the research supported under the new program will improve the lives of millions of Americans with disabling conditions such as osteoarthritis, degenerative disc disease, fractures, bone defects, and sports injuries.

Last year, NIAMS invited representatives from the scientific community and the public to discuss musculoskeletal injury and trauma as part of our annual series of research roundtables designed to highlight research needs and inform the Institute's scientific planning. Basic-science, clinical and epidemiological research, as well as translational research and regenerative medicine were the main areas addressed. The discussions touched on many topics, including animal models and outcomes research, and emphasized the need for collaboration among basic scientists, bioengineers, and clinicians in the development and testing of new therapies. A complete report on the roundtable can be viewed at http://www.niams.nih.gov/News_and_Events/Meetings_and_Events/Roundtables/2007/roundtable_trauma.asp.

This and other roundtable discussions about the importance of collaboration and multidisciplinary approaches resulted in our issuing a request for

Disclosure: The author did not receive any outside funding or grants in support of his research for or in preparation of this work. Neither he nor a member of his immediate family received payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, division, center, clinical practice, or other charitable or nonprofit organization with which the author, or a member of his immediate family, is affiliated or associated.

applications emphasizing collaboration, entitled Building Interdisciplinary Research Team (BIRT). The BIRT initiative will promote collaborations among groups of investigators who have not interacted in the past but who share an area of scientific interest and opportunity in specific NIAMS fields. We will provide up to one year of research revision support (formerly termed supplements) to establish high-risk and potentially high-impact collaborations in pilot areas, such as tissue engineering, autoimmunity, and soft-tissue biology. More information about BIRT is available at http://www.niams.nih.gov/Funding/Funding_Opportunities/Supported_Scientific_Areas/Musculoskeletal_Diseases/birt_faqs.asp.

Building on a memorandum of understanding that the NIAMS spearheaded in 2007 on behalf of NIH and in partnership with the National Aeronautics and Space Administration, the Institute is leading a trans-NIH effort to encourage researchers to develop projects that could be conducted in the micro-gravity environment of the International Space Station. The space station will provide a unique setting where researchers can explore fundamental questions about human health issues, including how the body heals itself, fights infection, or develops diseases. Both bone loss and tissue regeneration, for example, are areas of potential investigation.

Another exciting collaboration links NIAMS to the Department of Defense's new Armed Forces Institute of Regenerative Medicine (AFIRM), which consists of two academic consortia developing therapies for war-related wounds. Among the treatments under study will be craniofacial and limb reconstruction, regeneration, and transplantation; therapies developed by AFIRM will also serve trauma and burn patients in the public at large. We have joined several other NIH Institutes, the departments of Defense and Veterans Affairs, and other partners to help to fund AFIRM's budget of more than \$250 million over the first five years of its operation.

In 2006, we launched a new research mechanism, Centers of Research

Translation (CORT), which brings together basic and clinical studies in a way that helps to translate fundamental discoveries into new diagnostics and treatments. One of the newest CORTs, at the University of Rochester, is investigating the biological basis of fracture-healing and the efficacy of a potential new treatment, teriparatide, for healing fragility fractures in the elderly. We look forward to the findings, which could impact this growing segment of the U.S. population.

Collaboration is also at the root of our commitment to public-private partnerships to address the research issues with scopes too great for one institution to engage. In the musculoskeletal area, the Osteoarthritis Initiative is designed to improve prevention and treatment of osteoarthritis. The Osteoarthritis Initiative, a long-term collaborative effort, has created a publicly available research resource to identify and evaluate biomarkers of osteoarthritis for use in clinical research. By the spring of fiscal year 2008, approximately 900 researchers from forty-eight countries had registered to access Osteoarthritis Initiative data, and 1459 clinical datasets had been downloaded for analysis.

NIAMS has long been a driving force in the Federal Working Group on Bone Diseases. We and other Working Group members, including the American Academy of Orthopaedic Surgeons, share research information on osteoporosis, Paget disease, and other bone disorders and help in the early development of collaborative research activities. In 2007, we organized three meetings of the Working Group, at which topics such as the role of vitamin D in bone health and the value of genome-wide association studies in bone-related research were discussed.

Scientific progress and the communication of research results are central to the mission of NIAMS, and NIAMS remains committed to disseminating musculoskeletal health information. For example, people can now give their bones a checkup using an interactive web tool we developed called "Check Up on Your Bones" (www.niams.nih.gov/bone).

Based on information from "Bone Health and Osteoporosis: A Report of the Surgeon General" <http://www.surgeongeneral.gov/library/bonehealth>, the tool reflects the value of personalized medicine, helping people to understand how the information in this important public health report relates to them as individuals. Visitors to the web site are invited to fill out a personal profile, which the tool uses to create individualized information about each person's risk factors for osteoporosis as well as the factors that protect his or her bones. We encourage patients to access the web site.

We also endeavor to communicate what we do with regard to funding policies for various types of applications that we receive. I encourage everyone to go to our web site where we communicate this information as soon as we have a budget and a funding plan. More information about NIAMS' grants policy and guidance can be found at <http://grants.nih.gov/grants/policy/policy.htm>.

We are now entering what could become known as a golden age for musculoskeletal research. The U.S. population is at once becoming older and more active. Imaging modalities are becoming more sensitive, available, and cost-effective, and technologies for repair, replacement, and regeneration of damaged bones, joints, cartilage, and muscle are becoming increasingly sophisticated. With the help of the musculoskeletal research community, NIAMS is well positioned to help to bring about the critical discoveries that will improve our nation's health.

Stephen I. Katz, MD, PhD
Director, National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health, Building 31, Room 4C32, 31 Center Drive, Bethesda, MD 20892.
E-mail address: katzs@od.niams.nih.gov

Reference

1. U.S. Department of Health and Human Services. Bone health and osteoporosis: A report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General; 2004. <http://www.surgeongeneral.gov/library/bonehealth>