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NIH Funds Four Centers of Excellence in Genomic Science

New Efforts Will Focus on Psychiatric Disorders, Gene Regulation

The National Human Genome Research Institute (NHGRI) and National Institute of Mental Health (NIMH), both part of the National Institutes of Health, today announced grants expected to total approximately \$45 million to establish new Centers of Excellence in Genomic Science at the Medical College of Wisconsin and University of North Carolina, Chapel Hill as well as to continue support of existing centers at Johns Hopkins University and the University of Southern California.

The Centers of Excellence in Genomic Science program, begun in 2001 by NHGRI, assembles interdisciplinary teams dedicated to making critical advances in genomic research. The new center at the Medical College of Wisconsin in Milwaukee will receive about \$8 million over three years and the new center at the University of North Carolina, Chapel Hill will receive about \$8.6 million over five years. The existing center at the University of Southern California, Los Angeles will receive about \$12 million over five years and the existing center at Johns Hopkins University in Baltimore will receive about \$16.8 million over five years.

NHGRI will provide funding to all four centers. The first two years of the University of North Carolina center will be funded by NIMH, which will contribute about \$6 million through the 2009 American Recovery and Reinvestment Act. In addition, NIMH will also provide approximately \$1.7 million, in non-Recovery funds, of the total funding awarded to the Johns Hopkins center.

“Our aim is to foster the formation of innovative research teams that will develop genomic tools and technologies that help to advance human health,” said Alan E. Guttmacher, M.D., NHGRI’s acting director. “Each of these centers is in a position to tackle some of the most challenging questions facing biology today.”

For example, the new Center for Integrated Systems Genetics at University of North Carolina, Chapel Hill will strive to develop new approaches for identifying genetic and environmental factors that underlie and contribute to impairments associated with psychiatric disorders. The team, led by Fernando Pardo Manuel de Villena, Ph.D., will integrate the study of genetics and neurobehavior using unique strains of laboratory mice to define the genetic and environmental factors that occur in human psychiatric conditions.

To validate this approach, researchers will then generate novel strains of mice to study relevant behavioral traits. The resulting predictive mouse models could then be used as a resource by the scientific community in subsequent genetic and genomic studies focused on human psychiatric disorders and other health conditions as well as predicting treatment outcomes in relevant human populations.

“NIMH is pleased to partner with NHGRI and to be able to support this innovative study with funding through the American Recovery and Reinvestment Act of 2009,” said NIMH Director Thomas R. Insel, M.D. “These sophisticated genetic models will provide new opportunities to accelerate the pace of scientific discovery and to make progress toward understanding how genes shape behavior.”

At the Medical College of Wisconsin, the new center will be led by Michael Olivier, Ph.D., and include researchers from Marquette University in Milwaukee and the University of Wisconsin-Madison. This research team will focus on identifying regulatory mechanisms that turn genes on and off and determining how they may be altered by critical biological processes, diseases or environmental factors, such as drugs.

Rather than using the traditional approach of identifying the DNA sequences where regulatory factors bind, these researchers plan to develop novel technologies that identify the proteins that bind to particular DNA regions. Through this approach, the team may be able to identify entirely new regulatory proteins. The researchers’ ultimate goal is to develop a toolbox that can be used to better understand the relationship between changes in protein-DNA interactions and the underlying complex machinery controlling genes.

Over the past five years, an interdisciplinary team of researchers led by Andrew Feinberg, M.D., at Johns Hopkins University’s Center for Epigenetics of Common Human Disease, has developed the novel statistical and analytical tools necessary to identify epigenetic modifications across the entire human genome. Epigenetic modifications, or marks, involve the addition of certain molecules, such as methyl groups, to the backbone of the DNA molecule. This action may turn genes on and off, thereby spurring or blocking the production of proteins.

The Johns Hopkins team has already used the new tools to identify epigenetic marks associated with certain types of cancer, depression and autism. Now, Feinberg and his colleagues will work on refining their approach so that it can be used efficiently and cost effectively in larger studies. The team specifically hopes to apply their tools to studies focusing on bipolar disorder, aging and autism. The researchers also will explore how various other factors, such as a person’s genetic makeup, lifestyle choices and environmental exposures, interact with epigenetic factors to cause disease.

At the USC center, established in 2003, a team led by Simon Tavaré, Ph.D., will continue its work to improve the computational and statistical tools needed to understand genetic variation and its relationship to human disease. Recently, scientists have used genome-wide association studies to identify hundreds of regions of the genome that contain variants that contribute to the risk of common health conditions, such as cardiovascular disease and Type 2 diabetes.

Follow-up studies are needed to pinpoint exactly which genetic variants cause the increased risk, and to learn more about the function of these genetic variants. To help facilitate such work, the research team will now focus on how data from genome-wide association studies translate into observable traits, such as weight or blood pressure. Using fruit flies and other model organisms, the researchers plan to develop a framework for a map that would tie together genetic variants with their corresponding observable traits.

Besides carrying out their research missions, Centers of Excellence in Genomic Science serve as a focal point for providing education and training about genomic research to under-represented minorities. Participants range from college undergraduates to post-doctoral fellows. More information on this program is available at www.genome.gov/14514219.

In addition to the centers included in the latest round of funding, other Centers of Excellence in Genomic Science are:

Marianne Bronner-Fraser, Ph.D., California Institute of Technology, Pasadena, Calif.

George Church, Ph.D., Harvard Medical School, Boston.

David M. Kingsley, Ph.D., Stanford University, Stanford, Calif.

Deirdre R. Meldrum, Ph.D., Arizona State University, Tempe, Ariz.

Michael P. Snyder, Ph.D., Yale University, New Haven, Conn.

Marc Vidal, Ph.D., Dana-Farber Cancer Institute, Boston.

For more details about the research being conducted by the centers, go to <http://www.genome.gov/10001771>.

NHGRI is one of 27 institutes and centers at the NIH, an agency of the Department of Health and Human Services. The NHGRI Division of Extramural Research supports grants for research and for training and career development at sites nationwide. Additional information about NHGRI can be found at its Web site, www.genome.gov.

The mission of the NIMH is to transform the understanding and treatment of mental illnesses through basic and clinical research, paving the way for prevention, recovery and cure. For more information, visit the [NIMH website](http://www.nimh.nih.gov).

The National Institutes of Health (NIH), the nation's medical research agency, includes 27 Institutes and Centers and is a component of the U. S. Department of Health and Human Services. It is the primary Federal agency for conducting and supporting basic, clinical, and translational medical research, and it investigates the causes, treatments and cures for both common and rare diseases. For more information about NIH and its programs, visit <http://www.nih.gov>.

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