At the leading edge of precision medicine and personalized care

Vanderbilt is a national and global leader in precision medicine approaches and personalized care for patients. Using advanced approaches to data collection and analysis that rapidly assimilate unprecedented amounts of personal health data, as well as behavioral and environmental data, the goal of precision medicine is to match individuals with treatments and preventive strategies that are most likely to work for them.

Vanderbilt’s biobank, BioVU, is an incredible asset in these efforts. With more than 200,000 DNA samples, BioVU is one of the world’s leading DNA repositories supporting genomic and genetic research. Vanderbilt is also the coordinating center for the Electronic Medical Records and Genomics (eMERGE) Network funded by the National Human Genome Research Institute (NHGRI). eMERGE combines DNA biorepositories with electronic medical record (EMR) systems for large scale, high-throughput genetic research.

In 2015, a working group convened by NIH visited Vanderbilt for a two-day public workshop devoted to planning the federal Precision Medicine Initiative (PMI). From planning to implementation, Vanderbilt bio-informaticists, pharmacologists, oncologists, and medical professionals from many other research and clinical fields have been in the vanguard of bringing new and individually tailored diagnostics, treatments, and cures to patients.

In 2016, Vanderbilt was selected to lead the Direct Volunteers Pilot Studies under the first grant to be awarded in the federal PMI Cohort Program. The PMI Cohort Program’s objective is to build a broad and diverse national research cohort of one million or more U.S. volunteers. The objective of the Direct Volunteers Pilot Studies is to create a prototype set of technologies and experiments that will inform the successful approach for such a large research cohort.

Engineering bionic limbs

With NIH and Department of Defense funding support, a team of engineers at Vanderbilt’s Center for Intelligent Mechatronics has developed revolutionary “bionic” prosthetics, including a robotic leg that reproduces the natural movement of a human leg, a robotic hand with dexterity that approaches that of the human hand, and an advanced exoskeleton that allows paraplegics to stand up and walk. The exoskeleton work has led to the development of a commercial

In 2015, Vanderbilt University School of Medicine was among the top 10 U.S. medical schools in total grant support from NIH.

$350 million
NIH funding at Vanderbilt in FY 2015

$70 million
from the National Cancer Institute (NCI)

$50 million
from the National Heart, Lung, and Blood Institute (NHLBI)

$42 million
from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

$34 million
from the National Institute of Allergy and Infectious Diseases (NIAID)
product licensed to Parker Hannifin Corporation and called Indego®. In early 2016, Indego® was approved for sale and use in the U.S. by the Food and Drug Administration (FDA). The device has also been approved in Europe. Additional studies are ongoing to demonstrate the rehabilitation and quality of life benefits of this technology for spinal cord injury patients, including veterans.

**Outstanding cancer research**

NCI supports a multitude of research programs at the Vanderbilt-Ingram Cancer Center (VICC), the only NCI-designated comprehensive cancer center in Tennessee to treat both adults and children. The nearly 300 researchers and physician-scientists at VICC are leading the fight for cancer cures, engaging in an array of individual research programs and clinical trials, and disseminating newly discovered knowledge through tools like MyCancerGenome.org, a personalized cancer medicine knowledge resource for physicians, patients, caregivers, and researchers.

To highlight two recent accomplishments of Vanderbilt faculty researchers, Chair of the Department of Cell and Developmental Biology Ian Macara in 2015 won one of NCI’s coveted Outstanding Investigator Awards. Providing nearly $6.6 million of support over seven years, this award recognizes the “unusual potential” of Dr. Macara’s research, which seeks to understand and predict cancer cell “behavior.” Vanderbilt leadership is also playing a role in the development of the National Cancer Moonshot initiative. VICC Director Jennifer Pietenpol, B. F. Byrd Jr. Professor of Oncology, was selected to serve on the blue ribbon panel of scientific experts to advise NCI on this endeavor.

**Providing national leadership as the NIH CTSA Coordinating Center**

Since 2007, Vanderbilt University Medical Center has received NIH support through the Clinical and Translational Science Award (CTSA) program, which seeks to reduce the time it takes for laboratory discoveries to become treatments for patients, to engage communities in clinical research efforts, and to train a new generation of clinical and translational researchers. The Vanderbilt Institute for Clinical and Translational Research (VICTR) is one of more than sixty CTSA located across the country and, in June 2011, was named the coordinating center for the entire network of CTSA, making Vanderbilt a core resource for clinical research for the nation. VICTR and the CTSA Coordinating Center are the largest federal grants Vanderbilt has received, totaling nearly $80 million.

**Founding partner of Tennessee Center for AIDS Research**

Vanderbilt University received a five-year grant from NIH to establish the Tennessee Center for AIDS Research with Meharry Medical College and the Tennessee Department of Health. The center’s primary aim is to coordinate institutional and community resources and focus efforts on high-priority targets to most effectively reduce the burden of HIV/AIDS. Particular focus is placed on strengthening the care continuum and personalized HIV care, as well as supporting the development of the next generation of investigators.

**Undiagnosed Diseases Network (UDN)**

Joining the NIH’s successful Undiagnosed Diseases Program in Bethesda, Vanderbilt University Medical Center is now one of six additional clinical sites around the country in network together to develop effective approaches for diagnosing some of the hardest to solve medical cases.

The Vanderbilt UDN clinical site has a particular emphasis on heritable lung diseases in adults and children, heritable and other heart problems including arrhythmias and autonomic disorders in adults, and metabolic and other genetic problems in children. The program aims to offer patients a long-awaited diagnosis—and sometimes treatment—while building up data for scientists studying the genetic basis of rare diseases. The Vanderbilt UDN site began enrolling patients in 2015 and is supported by a $7.2 million grant from the NIH.

**Tissue on a chip**

An interdisciplinary team of researchers from Vanderbilt University Medical Center, the School of Engineering, and the College of Arts and Science are working with colleagues from other institutions on a grant from the National Center for Advancing Translational Science to create a “microbrain bioreactor,” an organ simulator containing a small population of human cells that can be used to test new drugs. This grant is part of the $70 million “Tissue Chip for Drug Testing” program, a five-year program that is a cooperative effort on the part of NIH, the Defense Advanced Research Projects Agency (DARPA), and the FDA.

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