PREPARED STATEMENT OF CHRISTOPHER P. AUSTIN, M.D.,
DIRECTOR, NATIONAL CENTER FOR
ADVANCING TRANSLATIONAL SCIENCES

Mr. Chairman and Members of the Committee: I am pleased to present the President's Fiscal Year (FY) 2017 budget request for the National Center for Advancing Translational Sciences (NCATS) of the National Institutes of Health (NIH).

TRANSLATION

NCATS defines *translation* as the process of turning observations in the laboratory, clinic and community into interventions that improve the health of individuals and the public – from diagnostics and therapeutics to medical procedures and behavioral changes. An overarching need to translate research discoveries more efficiently and effectively led to the creation of NCATS. NCATS is advancing the relatively new field of translational science, through which investigators seek to understand the scientific and operational principles underlying each step of the translational process. These efforts serve as a basis for system-wide improvements in translational efficiency and effectiveness to ultimately get more treatments to more patients more quickly.

Following are examples of NCATS programs directed at overcoming major scientific and operational bottlenecks in the translational research process.

TRANSFORMING THE NATION'S
CLINICAL RESEARCH NETWORK CAPACITY

NIH's Institutes, Centers and Offices have a long, distinguished history of funding landmark clinical trials including those for coronary bypass surgery, treatments for breast cancer, and anti-retroviral drugs for people at high risk for HIV/AIDS infection. NCATS is addressing issues common to all clinical trials including approval and oversight of research protocols and timely participant recruitment, which have often resulted in high cost burdens for studies and frequent delays in implementation. These problems have led some investigators and companies to conduct their research outside of the United States, and this threatens our Nation's innovative capacity and competitiveness, reduces economic opportunities, and deprives patients of the option to participate in research. In addition, when clinical investigators set up a clinical trial, they often create agreements and processes from scratch and abandon those tools at the end of the study, rather than making use of the existing structure and agreements for any future studies.

To address these pitfalls and inefficiencies, through its Clinical and Translational Science Award (CTSA) Program, NCATS has launched several initiatives designed to work together to strengthen and streamline our nation's network capacity to conduct clinical research. There are more than 50 CTSA Program medical research institutions across the country that serve as clinical and translational research hubs. Hub

investigators collaborate to support high-quality clinical and translational research locally, regionally and nationally, fostering innovation in training, patient involvement and new methodologies.

NCATS is expanding the networking capacity of the CTSA Program with the addition of Trial Innovation Centers (TICs) and Recruitment Innovation Centers (RICs) that address key roadblocks to high-quality, harmonized, accelerated, efficient and effective multisite clinical trials. Through TICs, investigators will explore innovative approaches in streamlining trial implementation and disseminate best practices. RICs are intended to improve participant recruitment into clinical trials by using innovative means to assess the availability of potential participants and to enroll them in a timely manner. NCATS will make TIC and RIC awards later in FY 2016. When fully implemented, these centers will be crucial resources for NCATS' CTSA Program clinical trial innovation network. By making the clinical trial network available to any investigator or organization wishing to conduct a clinical trial, the CTSA Program will benefit all clinical research, including that of other NIH Institutes and Centers (ICs), as well as other government, industry, academic, and patient advocacy group sponsors.

INNOVATION TO ADVANCE
PRE-CLINICAL TRANSLATIONAL SCIENCE

Too often, the laboratory tests that scientists conduct during the pre-clinical phases of the translational process – research on a drug or other intervention conducted prior to testing in humans – fails to predict the safety and effectiveness of a treatment in humans. NCATS is studying, and developing solutions to overcome, the scientific and operational roadblocks in this part of the translational research spectrum as well.

An example is the Tissue Chip for Drug Screening program, which supports the creation of bioengineered devices to improve the process of predicting whether drugs will be safe and effective in humans. NCATS collaborates with the Defense Advanced Research Projects Agency (DARPA) and FDA to support the development of these three dimensional (3-D) platforms, sometimes called tissue chips or organs-on-chips, engineered to mimic the structure and function of living human tissues. Since the program's inception in 2012, scientists have developed more than 10 different types of individual organ chips. The program is now focused on integration of organ chips, making it possible to model the complexity of organ-to-organ interactions in response to drugs. One such success was the creation of EVATAR™, a miniaturized 3-D representation of the female reproductive tract and liver on a handheld, interconnected platform. This advance required a team effort of scientists from Northwestern University, Charles Stark Draper Laboratory and the University of Illinois at Chicago (UIC) collaborating to design the model for use in drug testing and to study the basic biology of female reproduction. The current success of the Tissue Chip is indicating future directions for the NCATS program, with some investigators already using the technology to develop disease models on chips to both understand the basis for diseases and identify treatments for them.

In a complementary program, NCATS is developing 3-D bioprinted human tissues to be used in the earliest stages of drug discovery. This initiative has the potential to accelerate the drug discovery process, enabling treatments to be developed faster and at a lower cost by bridging the predictability gap between the lab test and the test in humans. The manufacturing technique used to build live tissue structures results in a product that mimics natural live tissue. Live cells are harvested and dispensed into spatially-controlled patterns, layer-by-layer, to generate 3-D arrangements. These structures undergo further biological treatment until they form tissue-like structures. The ability to develop 3-D tissue structures on demand will enable the generation of data that are more relevant to the whole body response than traditional means, which use two-dimensional, single-layer cell cultures grown on plastic plates.

Of all translational tools, the most enabling is information, so NCATS also is developing a variety of informatics resources to collate and disseminate data that will help advance translational research. For example, using the flexible funding mechanisms available through NCATS' Cures Acceleration Network (CAN), NCATS is developing a breakthrough translational informatics "matrix" that will incorporate data about all diseases, including signs, symptoms, signaling pathways, genes and treatments. This effort will help empower the generation of new disease hypotheses and connections, as well as testable predictions of potential treatments. This is an unprecedented assembly of disparate data types into a multi-dimensional relational informatics platform and will be usable by doctors, researchers and non-experts. As such, it will require extensive and complex teamwork among the scientific, healthcare and patient communities, and we anticipate the need to use our CAN Other Transactions Authority. We expect the NCATS' matrix project to spur innovation in methods, techniques, prevention and treatments, and to help move from the "one disease at a time, one organ at a time" therapeutic model toward a far more efficient approach of studying diseases and potential interventions, including generating new hypotheses that could be tested across related diseases.

CONCLUSION

These projects are just a few examples of the exciting activities planned or already underway at NCATS. Though NCATS is still relatively new, we operate following the NCATS 3Ds: *developing* new approaches, technologies, resources, and models; *demonstrating* their usefulness; and *disseminating* the data, analysis and methodologies to the community. Our early successes demonstrate how this approach can help solve some of the most challenging problems in translational science. I look forward to sharing more of our achievements with you as NCATS continues to evolve.

Christopher P. Austin, M.D.
Director, National Center for Advancing Translational Sciences

Dr. Austin is director of the National Center for Advancing Translational Sciences (NCATS) at the National Institutes of Health (NIH). Dr. Austin leads NCATS's work to improve the translation of observations in the laboratory, clinic and community into interventions that reach and benefit patients – from diagnostics and therapeutics to medical procedures and behavioral changes. Under his direction, NCATS researchers and collaborators are developing new technologies, resources and collaborative research models; demonstrating their usefulness; and disseminating the data, analysis and methodologies for use by the worldwide research community.

Dr. Austin's career has spanned the spectrum of translational research in the public and private sectors. He joined NIH in 2002 as the senior advisor to the director for translational research at the National Human Genome Research Institute (NHGRI), where he was responsible for conceptualizing and implementing research programs to derive scientific insights and therapeutic benefits from the results of the newly completed Human Genome Project. While at NHGRI, Dr. Austin founded and directed the NIH Chemical Genomics Center (now the NCATS Chemical Genomics Center), Therapeutics for Rare and Neglected Diseases program, Toxicology in the 21st Century initiative, and NIH Center for Translational Therapeutics. When NCATS launched in late 2011, Dr. Austin became the inaugural director of the Center's Division of Pre-Clinical Innovation, and then was appointed as the NCATS director in 2012. Before joining NIH, Dr. Austin worked at the pharmaceutical company Merck, where he directed programs on genome-based discovery of novel targets and drugs, with a particular focus on treatments for schizophrenia and Alzheimer's disease.

Dr. Austin is trained as a clinician and geneticist, and he is a member of the National Academy of Medicine (formerly the Institute of Medicine). He earned an M.D. from Harvard Medical School and an A.B. *summa cum laude* in biology from Princeton University. He completed a research fellowship in developmental neurogenetics at Harvard, studying genetic and environmental influences on stem cell fate determination. Dr. Austin also trained in internal medicine and neurology at the Massachusetts General Hospital in Boston, after which he practiced medicine in academic and community hospitals, providing primary care in urban settings and in rural Alaska and Africa.