

# Why Translational Research Matters

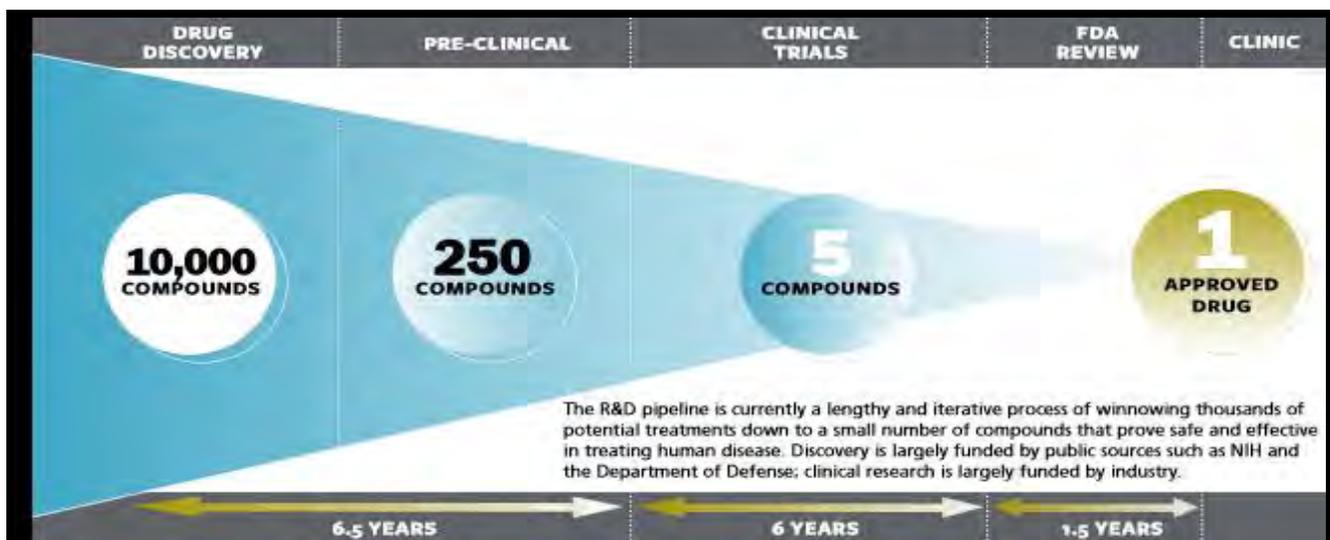
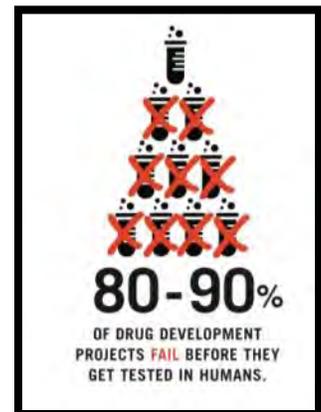
The past few decades have brought **enormous breakthroughs** in the fundamental knowledge necessary to understanding, preventing, diagnosing, and treating many diseases – advances such as the sequencing of the human genome, new ways to target therapies directly at cancer cells, and the ability to use stem cells to treat human disease.

But our ability to translate exciting new discoveries into products that can help patients is severely lagging behind the pace of discovery. There remains a formidable list of diseases for which there are no cures or even meaningful treatment options.

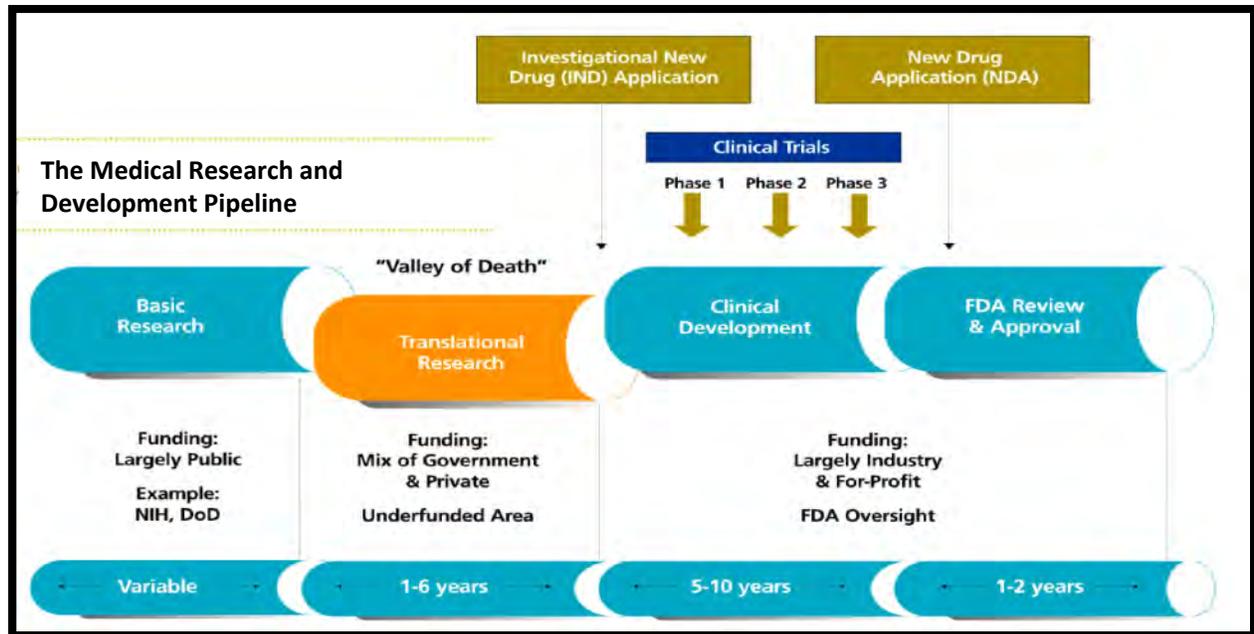
The fact is that many basic discoveries barely get to start the journey down the therapeutic development pipeline. Fascinating observations and creative insights often get lost in translation because they lack funding, incentives, and technical expertise to advance any further. They get stuck in an ever-widening gap in funding and support for the kind of research that moves basic science down the path toward treatments. That translational gap has come to be called by many the "*Valley of Death*."

According to the National Institutes of Health (NIH), 80 to 90 percent of research projects fail before they ever get tested in humans. By industry's reckoning the number may be even higher— for every **5,000-10,000 compounds tested**, only 5 make it to clinical trials, and **only one is ever approved** by the Food and Drug Administration. Half of all experimental drugs in Phase III trials never become approved medicines.

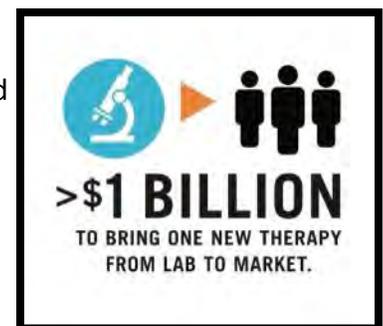
Everyone who cares about getting more and better treatments to patients sooner should be concerned about the lack of therapies that reach the stage of clinical testing and the even smaller number of therapies that ultimately are approved and made widely available.



## What are the stages of medical research?



- **Basic research or basic discovery** is the earliest stage of research, carried out for the advancement of knowledge. Our current publicly-funded academic research infrastructure, as guided by the policies and practices of NIH, has led to many advances in our understanding of human and disease biology.
- **Translational research** is the process of applying ideas, insights, and discoveries generated through basic scientific inquiry to the treatment and prevention of human disease – the critical bridge between basic and clinical research. As a scientific discovery moves through the development process, the cost of further advancement increases exponentially. The steps in translational research are designed to ensure that the discoveries that advance into human trials have the highest possible chance of success in terms of both safety and efficacy. Weeding out failures earlier in the process can significantly decrease the overall cost of developing new products.
- **Clinical research** is research in human subjects aiming toward approved therapies for patients. In general, costs increase while failure decreases as a project moves down the development pipeline. As ideas survive the steps in the process, they become relatively less risky, but the research involved in moving them forward becomes exponentially more expensive, especially in later-stage trials in humans.



## Who is translating science into cures?

The success of the translation from laboratory bench to patient bedside depends on the joint efforts of all funders, including NIH, academic institutions, nonprofit foundations, and the pharmaceutical and biotechnology industries. The translational research *Valley of Death* is a very real and significant challenge, but there are some hopeful signs of movement to bridge the divide in a variety of places.

- **National Institutes of Health.** NIH has made tremendous progress, within its existing structures and with limited funding, toward promoting translational research with the creation of the **National Center for Advancing Translational Sciences** (NCATS) in December 2011. NCATS provides our nation with an opportunity to forge a new paradigm for translational research that involves government, academia, industry, philanthropy, and patient advocacy groups.

The Center convenes expert teams from diverse scientific disciplines to reduce, remove or bypass significant bottlenecks across the entire continuum of translation. NCATS is intended to complement, not compete with, the private sector.

**Collaborations with industry to identify new uses for existing compounds**

For example, just last week, the NIH awarded \$12.7 million to match nine academic research groups with a selection of pharmaceutical industry compounds to explore new treatments for patients in eight disease areas, including Alzheimer’s disease, Duchenne muscular dystrophy, and schizophrenia. The collaborative pilot initiative, called Discovering New Therapeutic Uses for Existing Molecules, is led by NCATS and funded by the NIH Common Fund. AbbVie (formerly Abbott); AstraZeneca; Bristol-Myers Squibb Company; Eli Lilly and Company; GlaxoSmithKline; Janssen Research & Development, LLC; Pfizer; and Sanofi are participating in the pilot phase of the program.

Additionally, NCATS’ Clinical and Translational Science Awards (CTSA) program seeks to strengthen the full spectrum of translational research. Currently, approximately 60 medical research institutions in 30 states and the District of Columbia are active members of the CTSA Consortium. Its goals are to accelerate the process of translating laboratory discoveries into treatments for patients, to engage communities in clinical research efforts, and to train a new generation of clinical and translational researchers.

- **Nonprofits.** Forward-thinking philanthropic funders of disease research – foundations such as the Michael J. Fox Foundation for Parkinson’s Research, the Cystic Fibrosis Foundation, and a growing number of others – can play an absolutely critical role in stimulating research in under-resourced disease areas, and helping to bridge the Valley of Death. Free of the pressures of publication and career advancement in academia and the bottom-line imperatives of the private sector, nonprofit foundations are ideally positioned to make relatively high-risk investments that could significantly move a field of research forward and increase the likelihood that other parties also will invest.
- **Biotechnology and pharmaceutical industries.** Within the pharmaceutical industry, the realization is sinking in that the productivity gap is unsustainable and that the blockbuster model of drug development can no longer be relied upon. Experts are advocating for a “quick win, fast fail” paradigm for drug development that would result in earlier proofs-of-concept and fewer therapeutic candidates advancing into Phases II and III. Companies are also demonstrating themselves to be interested in new and more partnerships with other funders, including government, universities, and nonprofits – and even with other companies.

*Sources: National Center for Accelerating Translational Sciences, National Institutes of Health, Pharmaceutical Research and Manufacturers of America*

**About FasterCures**

*FasterCures, a center of the Milken Institute, is an 'action tank' that works to improve the medical research system - so that we can speed up the time it takes to get important new medicines from discovery to patients. [www.fastercures.org](http://www.fastercures.org)*





## Transforming Translational Research

The National Center for Advancing Translational Sciences (NCATS) is the newest of 27 Institutes and Centers (ICs) at the National Institutes of Health (NIH). NCATS was established in December 2011 to transform the translational science process so that new treatments and cures for disease can be delivered to patients faster.

### Bridging the Gap

The current process of translating a new discovery into a therapy is slow and expensive. The average length of time from discovery to approval of a new drug is more than 13 years, and the failure rate exceeds 95 percent. As a result, of the several thousand known human diseases, only about 500 have a treatment approved by the Food and Drug Administration (FDA). Even when a new treatment is shown to be effective, it can take several years to identify and serve all patients who could benefit.

Translational scientists aim to address that gap by taking basic discoveries about the causes of a disease and transforming this knowledge into a new treatment, such as a drug, device, diagnostic or behavioral intervention. The last half century has yielded many basic discoveries. Now more than ever, the potential for science to improve human health is enormous, but many scientific and organizational roadblocks can stand in the way of realizing that potential. Obstacles along the path to translation include:

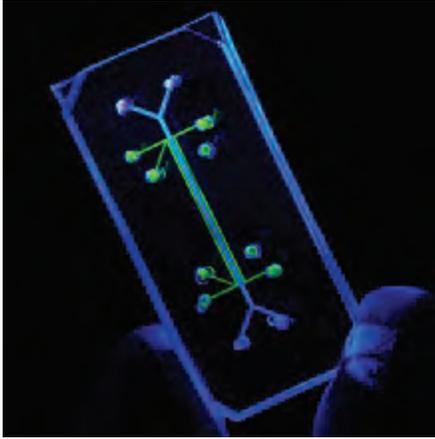
- Lack of understanding about the science of translation, leading to unpredictability and frequent failure of possible interventions.
- A shortage of qualified investigators.
- Organizational structures and incentives that do not encourage the teamwork essential to translational science.
- Inflexible, inefficient clinical trial designs and low participation in studies.
- Regulatory science issues.

NCATS develops new technologies and ways of operating that are designed to overcome these roadblocks and accelerate the translational process for all.

### Translation Is a Team Sport

The translational journey from a basic discovery to a demonstrated improvement in public health requires a team of scientists and clinicians with wide-ranging expertise. NCATS develops and supports innovative collaborations across traditionally separate scientific disciplines and organizations, including government agencies, academia, industry and nonprofit patient organizations. Serving as a hub for translational science, the Center convenes teams with diverse expertise — in disease biology toxicity, informatics, biomarkers, clinical trials, public health and other areas — to reduce, remove or bypass significant bottlenecks across the entire continuum of translation.

[ncats.nih.gov](http://ncats.nih.gov)



Wyss Institute Photo

## For More Information

### About NCATS

[ncats.nih.gov/about.html](http://ncats.nih.gov/about.html)

### NCATS Programs

[ncats.nih.gov/programs.html](http://ncats.nih.gov/programs.html)

### Frequently Asked Questions

[ncats.nih.gov/faq.html](http://ncats.nih.gov/faq.html)

### Contact

[info@ncats.nih.gov](mailto:info@ncats.nih.gov)  
301-435-0888

## A Distinctly Different Organization

NCATS is a distinctly different entity. Many other NIH ICs, research organizations and foundations focus on specific organ systems (e.g., heart and blood) or types of disease (e.g., cancer). Rather than targeting a particular disease, NCATS focuses on what is common across diseases; instead of targeting fundamental science, the Center focuses on translational science. NCATS emphasizes innovation and deliverables by developing, demonstrating and disseminating advances in translational science that bring about tangible improvements in human health.

## Spanning the Full Spectrum of Translation

NCATS' **organizational structure** spans the entire spectrum of translational science. Through its Division of Pre-Clinical Innovation, the Center supports advances in the early stages of the translational process, from target validation to first-in-human studies. For example, the **Therapeutics for Rare and Neglected Diseases (TRND)** program supports drug discovery and development research collaborations among NIH and academic scientists, nonprofit organizations, and pharmaceutical and biotechnology companies working on rare and neglected illnesses.

In the Division of Clinical Innovation, NCATS advances the clinical and translational process through its **Clinical and Translational Science Awards (CTSA)** program. CTSA-supported institutions strengthen the research pipeline by developing and providing the expertise, tools, training and collaborations needed to bring new and better treatments to patients nationwide.

The **Office of Rare Diseases Research (ORDR)** coordinates research on rare disease to serve the needs of patients, health care providers, patient advocacy groups and scientific communities involved in efforts to improve the lives of individuals with rare diseases.

NCATS also supports several cross-cutting efforts in translational science, including innovative strategic alliances aimed to overcome scientific and organizational barriers in the translational research process. For example, the **Tissue Chip for Drug Screening (Tissue Chip)** initiative, a partnership with the Defense Advanced Research Projects Agency and the FDA, is designed to develop 3-D human organs-on-chips that accurately model the structure and function of human organs. These devices can help predict whether drugs will be safe in humans.

Through another breakthrough NCATS initiative, the **Discovering New Therapeutic Uses for Existing Molecules (New Therapeutic Uses)** pilot program, the Center used a crowdsourcing approach to create collaborations between pharmaceutical companies and academic researchers. These partnerships are designed to rapidly test the best ideas for new therapeutic uses of existing compounds from pharmaceutical companies.

NCATS serves as an adaptor to enable other parts of the research system to work more effectively. In this way, NCATS is complementing — not duplicating or competing with — the work of other NIH ICs, the private sector and the nonprofit community. The Center aims to catalyze system-wide improvements that make the translational process more efficient and that deliver on the promise of science for the health of all.