TRANSLATIONAL RESEARCH TRAINING AND CAREERS

Translational research programs bring together physicians, bench scientists, bioengineers, epidemiologists, patent experts, and more. The goal is learning to communicate across disciplines to achieve advances in health care. By Chris Tachibana

The way I treat cancer today is completely different from 10 years ago because of translational research, says Mary (Nora) Disis, oncologist and principal investigator of the Institute of Translational Health Sciences at the University of Washington. Look at drugs like Gleevec, Avastin, and Herceptin, she says. All are examples of translational researchers converting molecular knowledge about specific cancer cells into effective, targeted therapies. The efficient movement of basic science discoveries into clinical applications—often described as “bench to bedside” work—is the goal of translational research. Disis thinks the field is so promising she hopes her kids grow up to work in it.

FLUENT IN MANY LANGUAGES, COMFORTABLE IN MANY CULTURES

Future translational researchers of all ages must be adaptable, lifelong learners, says Disis. “They have to be highly curious about a lot of different things, collecting data and ideas from the basic literature and creatively applying these to disease solutions. This means being outside your comfort zone, reading literature that is way outside your field.” “Translating” is exactly what these scientists do—taking information from one domain and expressing it in another, and communicating daily with people who speak different scientific languages: laboratory scientists, clinicians, patent and regulatory experts, biostatisticians, epidemiologists, and patients. A translational scientist should be able to move an idea all the way from basic research to a clinical application and back to the lab to inform more basic science. Handing off projects from one expert to another doesn’t work, says Disis. Success requires someone who understands the idea intimately, and who can build a multidisciplinary team to guide it along the translational path.

It’s a long journey with physical hurdles, since basic and clinical research labs usually reside in separate departments. There are also intellectual and cultural barriers. Basic science starts with a hypothesis and designs experiments that validate or reject it, with the goal of acquiring knowledge. Translational science starts with a health need and looks for scientific insights or tools to address that need. Its goal is improving health, explains Barry Coller, vice president for medical affairs and physician-in-chief at Rockefeller University, in a 2008 Mount Sinai Journal of Medicine article. The successful translational researcher needs to be comfortable in both of these cultures, be fluent in many fields, and thrive on collaboration.

For those with medical training, this might mean learning hypothesis-driven science and designing experiments and assays. For those with a research background, it could mean learning clinical study design and the bioethics of human research. In either case, the goal is becoming competent to interpret, evaluate, and discuss different types of research, rather than conducting it all yourself, says Doris Rubio, professor of medicine, biostatistics, nursing, and clinical and translational science at the University of Pittsburgh. In her translational science training program, she says, “I have a bioengineer who can now design a clinical trial. I love that he can do that, and he says it gives him a deeper understanding of his own research.” Formalized training is important because translational science is so complex and getting exposure to all the elements is difficult outside of a specific program, says Rubio.

BEING A MULTIDISCIPLINARY TEAM PLAYER

Training options include a Ph.D., Master’s degree, or certificate in translational science. For those who already have an M.D. or Ph.D., career development awards can provide support during the training period. Classes explain the basics of study design and methods, biostatistics, and bioethics. Because developing a new drug, device, or procedure is a team project, coursework might include team dynamics and management. However, for most trainees, the most valuable aspects of a training program are mentoring and hands-on experience in multidisciplinary research. continued »

UPCOMING FEATURES

Biotech and Pharma: Moving Up the Industry Ladder—June 17
BS/MS Scientists: Careers in Bioprocess (online only)—July 15
Postdoc Survey—August 26
In the United States, most training opportunities are through the Clinical and Translational Science Awards (CTSAs), which were launched in 2006 based on the 2003 National Institutes of Health (NIH) Roadmap for Medical Research. This set of guidelines encourages cross-disciplinary, team-based research as a way to overcome obstacles to turning scientific discoveries into health solutions. Currently, CTSAs have been granted to 55 institutions, with a plan to fund 60 institutions by 2012. The goal is to fund the consortium of award recipients with approximately $500 million annually. The NIH continues to promote translational research with the creation of the National Center for Advancing Translational Sciences (NCATS) as a “bold, new, focused center systematically engineered to accelerate translation.” The CTSAs will be the cornerstone of the NCATS. However, NCATS has been controversial for the speed at which the center is being created and the effect of reorganization on other programs currently housed with the CTSAs under the NIH National Center for Research Resources.

The Howard Hughes Medical Institute also funds translational science training through its Med into Grad Initiative, which has awarded various institutions a total of $16 million as of 2010. The programs introduce elements of clinical training into basic science graduate work. They vary by institute, but range from Ph.D. programs in translational research to mentoring opportunities that pair graduate students with a physician advisor.

M.D.-Ph.D. degrees train individuals in clinical and basic research, but translational research programs strive to integrate these two sides of medical science by connecting people and building networks. Liz Broussard is a gastroenterologist who is finishing a University of Washington Institute of Translational Health Sciences training program. “There’s absolutely no way a junior researcher could launch a translational research career without this training,” she says, pointing out the benefits of everyday experience in a multidisciplinary team of scholars. “My first year, we had a psychiatrist, a surgeon, a social worker, a cardiologist, and a pharmacist in the program.” A particularly useful activity, she says, is weekly discussions of project ideas and works in progress. These are guided by senior faculty, who also give advice on “their career trajectory, resources, funding mechanisms, partnerships that were successful—essentially life experience, and teaching us how to succeed in research.” For a physician, Broussard said the value of a training program is lessons in research methods and thinking scientifically, and learning to ask whether the story in your project and funding application makes sense and has logically supported specific aims.

For a bench scientist, a background in translational research turns the medical objective that is often written into a grant application into a real and achievable goal. Ian Lanza earned a Ph.D. in kinesiology, and is now a senior research fellow in the Mayo Clinic CTSA Mentored Career Development Program. This gives him both a postdoctoral research opportunity and guidance towards his long-term goal: “That my research has a high impact on public health.” Lanza’s project involves collaborating with an endocrinologist and a radiologist, and he says, “It has been very seamless working with both, with a lot of collegiality between the departments.” In fact, one way that translational science programs integrate disciplines is to have students and young investigators act as liaisons between senior faculty in different departments. In turn, says Lanza, trainees benefit from having established clinical researchers as mentors and from working with experienced investigators from several disciplines. Lanza’s project illustrates another aspect of translational research: It’s not always about designing the next cancer drug. It can be traditional bench work with an eye toward how the results might be applied to everyday health care. Lanza is not currently planning any clinical trials for his work on muscle mitochondrial physiology and function, but looking ahead, says, “I hope to provide some concrete recommendations for cost-effective, straightforward lifestyle choices that can preserve quality-of-life as people get older, not necessarily increasing their lifespan, but their health span.”

To get a sense of the variety and diversity of translational research and the educational options, look through the online offerings hosted by each CTSA-funded site. Depending on the institution, these include online case studies, podcasts and webcasts of seminars, and continuing medical education courses on topics such as statistical methods, or engaging the community in research. These web-based resources also extend the network of translational research into the global scientific community.

INTERNATIONAL AND INTERDISCIPLINARY

Translational research is not just multidisciplinary, it’s multinational. “Translational research is an emerging field in China,” says Depei Liu, president and professor of the Chinese Academy of Medical Sciences and Peking Union Medical College in Beijing. “For now there are no classes called ‘translational research,’ although related skills and experience are widely taught.” Formal training includes an option at some medical schools including Peking Union Medical College that provides eight months of research training after the clinical program. Another program allows qualified medical school graduates to earn a Master’s degree in a basic research field. Informally, “doctors are encouraged to do basic research, to apply for funding and to publish papers and collaborate with specialists in genetics and molecular biology, and doctors and basic researchers often hold meetings together. In addition, there are many short courses and training programs in the fields of basic research and clinical research.”

FEATURED PARTICIPANTS

- **Chinese Academy of Medical Sciences**
  - www.cams.ac.cn

- **European Commission**
  - www.ec.europa.eu/index_en.htm

- **Institute of Translational Health Sciences at the University of Washington**
  - www.iths.org

- **Mayo Clinic**
  - ctsa.mayo.edu

- **Peking Union Medical College**
  - english.pumch.cn/english

- **Rockefeller University**
  - www.rockefeller.edu

- **University of Pittsburgh**
  - www.pitt.edu

- **Wellcome Trust**
  - www.wellcome.ac.uk
“We’ve embedded clinical researchers and facilities in academic hospitals, with close links to the research environment around them, including access to technology for ‘omics and imaging.”

—John Williams

research,” says Liu. Translational research centers have been established in major research cities, he says, for example the SIBS-Novog Nordisk Translational Research Center for Pre-Diabetes in Shanghai. Current government support includes Chinese National Science Foundation funding for applied medical research, broad support for science and technology projects from the National Basic Research (973) Program, and Science and Technology Special Projects support for basic research in drug discovery and infectious disease.

In Europe, one opportunity for translational research training is the Marie Curie Actions, part of the European Union (EU) Seventh Framework Programme for Research and Technological Development. Project support is available at the doctoral, postdoctoral, and career development level as well as for partnerships between industry and academia and for multisite studies. In keeping with the translational science goals of building networks, collaborations between countries are a focus, as is researcher mobility from one EU country to another. The budget for translational health research since 2007 has been 12 million euros, representing 3% of health research training programs for the Marie Curie Actions, according to Georges Bingen, the European Commission’s head of unit for the Marie Curie Actions People Programme.

In the United Kingdom, another stakeholder—the pharmaceutical industry—is involved in translational science training. The Translational Medicine and Therapeutics Programmes were established two years ago at University of Cambridge, University of Newcastle, Imperial College London, and a consortium of Scottish institutions. Funding is in the form of 11 million pounds from the Wellcome Trust, a London-based foundation that supports research on animal and human health, and contributions to individual institutions from companies such as GlaxoSmithKline, Pfizer, Roche, AstraZeneca, Sanofi-Aventis, Sirtris Pharmaceuticals, and PTC Therapeutics. “We recognized a need to train a new type of researcher who is comfortable in the creative space between academics and pharma,” says John Williams, head of clinical activities and head of neuroscience and mental health for the Wellcome Trust. “To do this, we partnered institutions with high-quality academics and health care facilities with world-class pharmaceutical companies.” Training programs can be individualized, but usually guide physicians through a Ph.D. project with an emphasis on teamwork, group support, and mentoring. Currently, 6 to 10 fellowships are awarded per year. Bidirectional communication between the lab and the clinic is facilitated by physical proximity. “We’ve embedded clinical researchers and facilities in academic hospitals, with close links to the research environment around them, including access to technology for ‘omics and imaging,” says Williams. “This allows subject phenotyping and tissue sampling to be brought into research labs to do the high-technology work that reflects today’s bioscience.”

Regardless of the geographic setting, the goals and challenges of translational research are the same, says Liu: Getting funding and infrastructure support from the government, training young investigators, creating a multidisciplinary community of researchers who can effectively communicate with each other, and finding ways to systematically implement translational research results into clinical practice.

A GROWING FIELD IN A SHIFTING BACKGROUND

Scientists beginning a career in translational science also need to consider the changing emphasis of medical research, particularly in the United States, where health care reform is currently under way. Doris Rubio says, “we’re seeing a shift to personalized medicine and medicine that’s more evidence-based. The field is also expanding into patient-centered outcomes research, so not just comparing drug A with a placebo, but drug A versus drug B.” In spite of the uncertainties, she says, “It’s an exciting time because we have a lot to learn.”

Changes in the business sector also affect the translational researcher. John Williams of the Wellcome Trust says, “Pharma is looking to change its discovery models, and as painful as that reconfiguration may be, it creates wonderful opportunities in the space between pharma and academia. We hope it will inspire the most creative minds to participate in this exciting time in biomedical and translational research.”

Even in the changing health research landscape, postdoctoral fellow Ian Lanza is positive about his career path. He sees the field as growing, and feels that the NIH generally supports young investigators. Gastroenterologist Liz Broussard says although she could make five times as much money in clinical practice, this would probably mean “doing colonoscopies eight hours a day,” and she finds her work on a colon cancer vaccine much more inspiring. “I enjoy the clinical work I do now,” she says, “but ultimately, translational research can affect patients by changing the current standard of care. I am optimistic about it because I can see myself doing a small part to advance science. It’s exciting and, despite funding woes, that keeps me going.”

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