University of Rochester Medical Center

PhD in Translational Biomedical Science Program

Science of the Highest Order for the Betterment of the Human Condition

The University of Rochester School of Medicine and Dentistry is pleased to offer an innovative PhD Program in Translational Biomedical Science, one of the first of its kind nationally. The goal of this exciting new program is to prepare individuals for investigative and clinical careers relating to the translation of basic biomedical research into clinical strategies to improve health, and to stimulate targeting of basic scientific research towards pursuit of mechanisms and causes of and optimal therapies to prevent and cure human disease.

To improve human health, fundamental scientific discoveries and critically evaluated clinical observations must be translated into practical clinical applications. Important discoveries from "the bench" of basic biomedical research performed at the molecular or cellular level must progress to the clinical level, to the "bedside." Key observations at "the bedside" stimulate scientists to examine pathophysiologic phenomena and to devise new approaches to elucidate disease mechanisms and therapeutic approaches based on such demonstrated causes.

Specific program objectives of the University of Rochester's Ph.D. Program in Translational Biomedical Science include:

- Prepare individuals in fundamentals of basic disease pathophysiology.
- Provision of in-depth mentoring to assure productive research training.
- Education for transition of scientists and clinicians to independent research careers.
- Teach fundamental theory and knowledge in the subject areas of biostatistics, epidemiology, laboratory methods and analytical procedures essential to clinical research.
- Provide a critical environment fostering inquiry, integrity, teaching skills and high productivity.

Dr. PJ Simpson-Haidaris
Director of the PhD Program in Translational Biomedical Science (TBS)

Information Inside:

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Translation:

"Myriad detours, speed traps, roadblocks, and potholes limit the movement of treatments from bench to practice. They include the limited external validity of randomized controlled trials, the diverse nature of ambulatory primary care practice, the difference between efficacy and effectiveness, the paucity of successful collaborative efforts between academic researchers and community physicians and patients, and the failure of the academic research enterprise to address needs identified by the community."

From Practice-Based Research, "Blue Highways" on the NIH Roadmap. Article written by Dr. John M.Westfall, Dr. James Mold, and Dr. Lyle Fagnan.

JAMA. 2007; 297:403-406.

A World of Resources in One Place

At the University of Rochester, students and faculty move seamlessly between the School of Arts, Sciences, & Engineering and the School of Medicine and Dentistry. The University of Rochester boasts one of the best academic environments in the country. The staff and faculty involved in education on this campus have a wide range of expertise. Collaboration is a tradition, a rule – not an exception. It happens in classrooms, at patient bedsides, in the cafeterias, in the laboratories. Anywhere there are people, there are translational biomedical pursuits.

The University of Rochester's Clinical and Translational Science Institute (CTSI) also offers many resources to researchers. These resources include consulting services, regulatory and compliance support, research funding opportunities, and use of the Clinical Research Center (CRC). The CRC is located within the University of Rochester Medical Center and offers an optimal environment for medical investigators to conduct safe, controlled, inpatient and outpatient studies of both children and adults.

Translational Research: A Rochester Tradition

George Hoyt Whipple, the founding dean of the University of Rochester School of Medicine and Dentistry, set the stage for translational research at Rochester. Whipple devoted much of his research energy to anemia and the physiology of the liver. His work, along with others, led to the use of raw liver as a treatment for pernicious anemia. A classic example of basic research transformed into a patient-focused treatment, it also resulted in a shared Nobel Prize in 1934 for Whipple. Since then, research from Rochester has created new treatments that have changed the world in many ways. Here are a few examples.

Lung Surfactant

Medical Center researchers were the first to administer lung surfactant to premature infants, dramatically improving the survival rates of babies born more than 12 weeks premature from 50 to 90 percent. In 1981, Robert Notter, M.D., Ph.D., and other Rochester scientists studied a preparation called Calf Lung Surfactant Extract as a potential clinical surfactant. Medical Center physicians started treating premature infants and other newborns with lung development problems in 1983 with surfactant made in Notter's lab. The researchers published clinical papers documenting the efficacy of the surfactant extract in premature infants in 1985. The extract was used to treat patients into the 1990s. Today, various surfactants save lives around the world.

Haemophilus Influenza b (Hib) Vaccine

URMC scientists developed the Haemophilus influenza b (Hib) vaccine, virtually eradicating a leading cause of meningitis in preschoolers. Three Rochester pediatric researchers – the late David Smith, M.D. (M'58), Porter Anderson, Ph.D., and Richard Insel, M.D. – were among the first to develop and test a "conjugate" vaccine, a method to make a vaccine more effective by linking it to a protein that incites a more powerful immune system response to fight an infection. The Hib vaccine was approved by the federal Food and Drug Administration in 1990, then the first vaccine in 20 years to be recommended by the FDA for universal use in children. It has virtually wiped out infection by Hib bacteria, which was a leading cause of meningitis in children under the age of 5. Another vaccine based on the technology, Prevnar, was introduced in 2000. It prevents invasive infections by pneumococcal bacteria, which cause meningitis, ear infections, pneumonia, and other diseases. Today, the David H. Smith Center for Vaccine Biology and Immunology builds on the heritage of such strong basic science research to help design the next generation of vaccines.

Cervical Cancer Vaccine

In June 2006, the FDA approved a vaccine with a Rochester lineage that can prevent a high percentage of cervical cancer. The vaccine utilizes 20 years of research by a trio of University virologists – Richard Reichman, M.D., William Bonnez, M.D., and Robert Rose, Ph.D. The vaccine targets a group of viruses known as human papillomaviruses (HPV), which cause 12,000 cases of cervical cancer in women in the United States annually. Virus-like particles, or VLPs, are key to the vaccine. The Rochester virologists began studying how a person's immune system fights HPV infection, eventually focusing on the actual viral particle that causes the disease. After finding that the body produces antibodies that could neutralize the virus, they learned how to make harmless virus-like particles to trigger the same immune response. They accomplished this by putting an HPV gene into insect cells using a virus called baculovirus, which infects insects; the HPV gene then produces particles that mimic the shape of real HPV particles. In early 1997, the trio began one of the world's first tests in humans of a vaccine to prevent HPV infection that was based on the patented Rochester technology. The study found the vaccine was safe and triggered an immune response. The University has licensing agreements with major drug makers for the vaccine.

LASIK Surgery

Customized LASIK surgery grew out of laboratory work in the early 1990s by a team led by David Williams, Ph.D., director of the University's Center for Visual Science. The team discovered how to use a laser beam to take extraordinary images of the inner human eye, enabling the mapping of dozens of defects or aberrations of the eye that were previously unknown. Scott MacRae, M.D., surgeon and professor of ophthalmology, applied the technology in his pioneering development of customized LASIK surgery, which dramatically enhances vision.

Disparities and Vaccinations

In an important "bench to community" study – the branch of translational research that evaluates the benefits and effectiveness of treatments – Peter Szilagyi, M.D., M.P.H., professor of pediatrics, found that a coordinated city-wide program that involves careful tracking of children's immunizations, and use of outreach workers to call on those families whose children fall behind on their shots and help overcome barriers to care, can dramatically increase the number of children who are vaccinated – as well as increase the likelihood of those children returning for regular preventive checkups. The intervention boosted immunization rates among children in the city of Rochester to a level nearly identical to suburban children. The program is considered a national model, and has been adopted by other cities and urban areas.

Gabapentin and Hot Flashes

Rochester researchers have investigated new therapies for hot flashes for several years. Thomas J. Guttuso Jr., M.D., a former neurologist at Strong Memorial Hospital, first observed the unlikely connection between the seizure/migraine medication and hot flashes back in 1999. A female patient who was prescribed gabapentin for headaches told Guttuso that it did a better job at taming her hot flashes. This information led Guttuso to investigate further. His study was the first, randomized, placebo-controlled clinical trial to confirm the observation that gabapentin relieves hot flashes.

Rochester researchers reported that gabapentin is as effective as estrogen, which used to be the gold standard treatment for menopause symptoms. Sireesha Y. Reddy, M.D., assistant professor of obstetrics and gynecology at the University, was the lead author of the study, the first to compare gabapentin and estrogen. The University holds a patent on the use of gabapentin for hot flashes.

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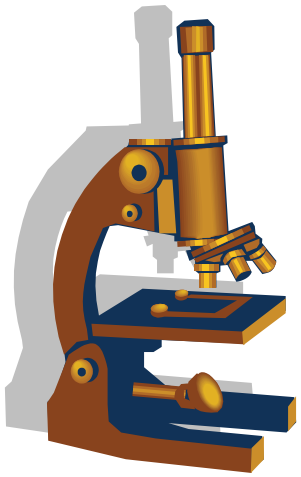
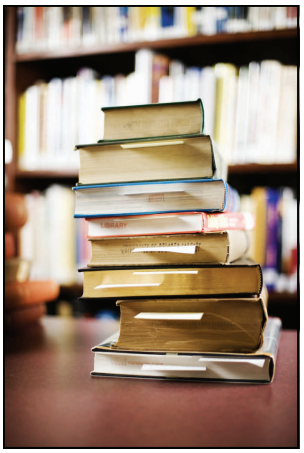


The PhD Program in Translational Biomedical Science is one of thirteen interdisciplinary PhD programs offered at the University of Rochester Medical Center.

The educational experience you share here provides maximum flexibility, allowing you to pursue intellectual challenges in your specific field as well as other related areas of interest. The nature of modern scientific exploration is interdisciplinary, so you are encouraged to avail yourself of a broad spectrum of course work as well as our significant research opportunities.



Okay… So What Exactly Would I Do? (Required Coursework)

Ph.D. Students

Year 1 Summer (optional)

- Introduction to Clinical Research
- Clinical Shadowing Experience
- Summer in Residence

Year 1 Fall

- Ethics in Research (IND 501 or IND 503)
- Introduction to Biostatistics (BST 463)
- Pathways of Human Disease I (PTH 509)
- Either Introduction to Epidemiology (PM 415) or Advanced Biochemistry (IND 418)
- CTSI Seminar Series
- Mentored Research

Year 1 Spring

- Pathways of Human Disease II (PTH 510)
- Workshop in Scientific Communication (PM 478)
- Elective Related to Research Interest and/or Year 2 Course Choice Prerequisites
- CTSI Seminar Series
- Mentored Research

Year 2 Summer

- Clinical Shadowing Experience
- Summer in Residence

Year 2 Fall

- Lab Methods for Translational Research (PM 462)
- Either Cell and Molecular Physiology (PM 403) or Molecular Basis of Disease (PTH 571)
- CTSI Seminar Series
- Mentored Research

Year 2 Spring

- Measurement and Evaluation of Research Instruments (PM 472)
- Either Experimental Therapeutics (PM 488) or Principles of Pharmacology (PHP 404) or Design of Clinical Trials (BST 465)
- Practical Skills in Grant writing (PM 438)
- CTSI Seminar Series
- Mentored Research

The University of Rochester was one of the first centers funded by the NIH for establishment of a Clinical and Translational Science Institute (CTSI)

MD-Ph.D. Students

M.D./Ph.D. students will follow course requirements similar to those listed above for Ph.D. students. However since most M.D./Ph.D. students enter the Ph.D. program after completion of two years of the Medical Curriculum, these students can use 12 credit hours from completion of the first two years of Medical School towards course requirements.

Learning Cannot be Confined to the Classroom

Skill-building Workshops and Seminars

The University of Rochester Clinical and Translational Science Institute has developed a series of skill-building workshops and seminars that bring together scholars and trainees in many training programs. These opportunities provide hands-on training and practical knowledge necessary to carry out a successful research program, and also create a community of scholars devoted to translational science.

Research Rotations

Rotations in the first year of study and the summer before and after in different laboratories introduce the student to the scientific thought and method. Students gain experience in research, attend research seminars, and practice their communication skills. Furthermore they become familiar with prospective research advisors for their thesis project. At the end of the first year, students choose a permanent advisor and embark on a Ph.D. thesis research program. Students may choose as their primary research advisor any faculty member on the School of Medicine and Dentistry Interdisciplinary Graduate Program faculty of designated mentors with an appropriate research program and funding mechanism to support the student.

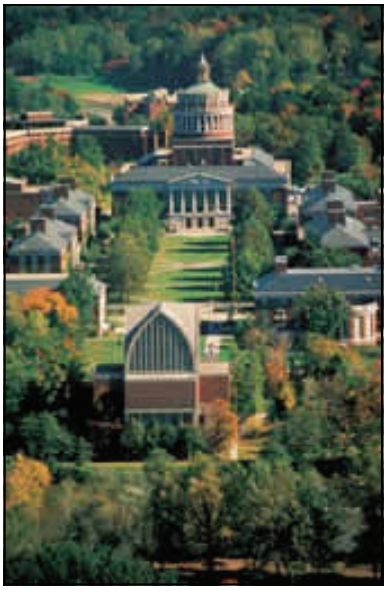
"Medicine, to Produce Health, Must Examine Disease"

- Plutarch

Qualifying Examination

The qualifying examination at the end of the fourth semester (or with committee permission by the end of the sixth semester) consists of an oral examination by the student's advisory/ mentoring committee, composed of co-advisors (Clinical Translational Investigator and a Basic Science Investigator appropriate to the research area) and two additional faculty members from different disciplines relevant to translational research. The examination is based on a written proposal reflecting the chosen research project and will emphasize ability to utilize information to analyze and offer solutions to problems, and propose unique directions for future research. No comprehensive examination of formal coursework is intended, however, adequacy of knowledge and appreciation are assessed. The qualifying examination is chaired by the TBS Program Director or another TBS mentoring faculty member so appointed to represent the University Dean of Graduate Studies.

Pictured Below: University of Rochester River Campus

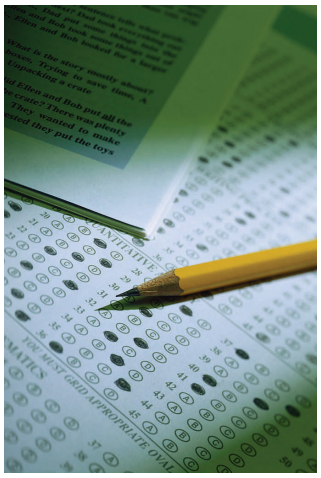


About the University of Rochester Medical Center

One of the nation's top academic medical centers, the University of Rochester Medical Center forms the centerpiece of the University's health research, teaching, patient care, and community outreach missions. With more than $186 million in federal research funding, UR School of Medicine research funding ranks in the top one-quarter of U.S. medical centers, while the School of Nursing ranks 12th highest in funding. The University's health care delivery network is anchored by Strong Memorial Hospital—a 739-bed, University-owned teaching hospital—which boasts programs that consistently rank among "America's Best Hospitals," according to *U.S. News & World Report*. Our patients benefit from the Medical Center's robust teaching and biomedical research programs. Our mission is to use education, science, and technology to improve health—transforming the patient experience with fresh ideas and approaches steeped in disciplined science, and delivered by health care professionals who innovate, take intelligent risks, and care about the lives they touch.

Sample Elective Courses

As a student in the Translational Biomedical Science PhD Program there are many elective course options open to you. You can find a sample listing of available elective courses below.



Biochemistry

- 412 Advanced Topics in Biological Macromolecules
- 510 Enzyme Mechanisms

Biophysics

- 411 Structural Biology Methods
- 447 Signal Transduction
- 490 Radiobiology
- 507 Molecular Biophysics

Microbiology

- 414 Mechanisms in Microbial Pathogenesis

Immunology

- 421 Microbial Genetics
- 431 Microbiologic Physiology
- 456 General Virology
- 473 Immunology
- 483 Neuroimmunology Interactions
- 540 Advanced Topics– Immunology

Neurobiology and Anatomy

- 512 Cellular Neuroscience
- 530 Neural Basis of Learning Memory and Higher Function

Neuroscience

- 508 Neural Plasticity in Learning and Development
- 523 Biology of Neurological Diseases
- 531 Integrated Systems Neuroscience
- 540 Principles of Behavior Analysis

Pathology

- 504 Current Topics in Experimental Pathology
- 507 Cancer Biology
- 593 Molecular Mechanisms of Disease

Pharmacology and Physiology

- 407 Pharmacology and Physiology: A Disease-Based Approach
- 440 Topics in Vascular Biology
- 550 Ion Channels and Disease

Toxicology

- 493 Special Topics in Toxicology– Toxicology in the Workplace
- 521 Biochemical Toxicology
- 530 Reproductive and Developmental Toxicology
- 533 Neurotoxicology
- 594 Molecular Toxicology

"A College Degree is not a Sign that One is a Finished Product, but an Indication that One is Prepared for Life"

-Reverend Edward Malloy

I'm Hooked, How Do I Apply?

Ph.D. Admissions – Online Application

Step #1:

Select an interdisciplinary program to which to apply. You must apply to an interdisciplinary program, not a department.

Step #2:

- Submit a complete application by January 1 for fall doctoral admission. A complete application includes:
- Online application
- Personal and research statements
- 3 recommendations
- Official transcript(s)
- Official test scores

Detailed instructions and updated information are available at:
http://www.urmc.rochester.edu/education/graduate/prospective-students/admissions/

You Need This By When???

Application Timeline For Ph.D. Programs For Admission to Fall Semester

January 1

Complete applications are due, including supporting materials

February

Interviews are conducted at the University of Rochester Medical Center

March

Acceptance letters are mailed

April 15

Student reply to offer of admission due

Additional Information about the PhD in Translational Biomedical Science Program can be found at:

http://www.urmc.rochester.edu/education/graduate/phd/translational-biomedical-science/

PhD Program Contact Information

Program Director

Patricia J. (PJ) Simpson-Haidaris, Ph.D.

Office: University of Rochester Medical Center, Room 3-7220 & Saunders Research Building, CTSI Directors' Suite, Room 1.211

Phone: 585-275-8267 (Med Center) or 585-275-0737 (Saunders Research Building)

Email: pj_simpsonhaidaris@urmc.rochester.edu

Program Support

Katie Libby

Office: Saunders Research Building, CTSI Directors' Suite

Phone: 585-275-0656

Email: katherine_libby@urmc.rochester.edu

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