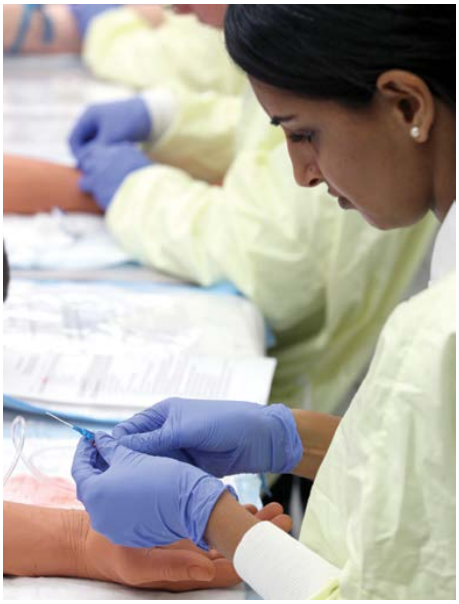


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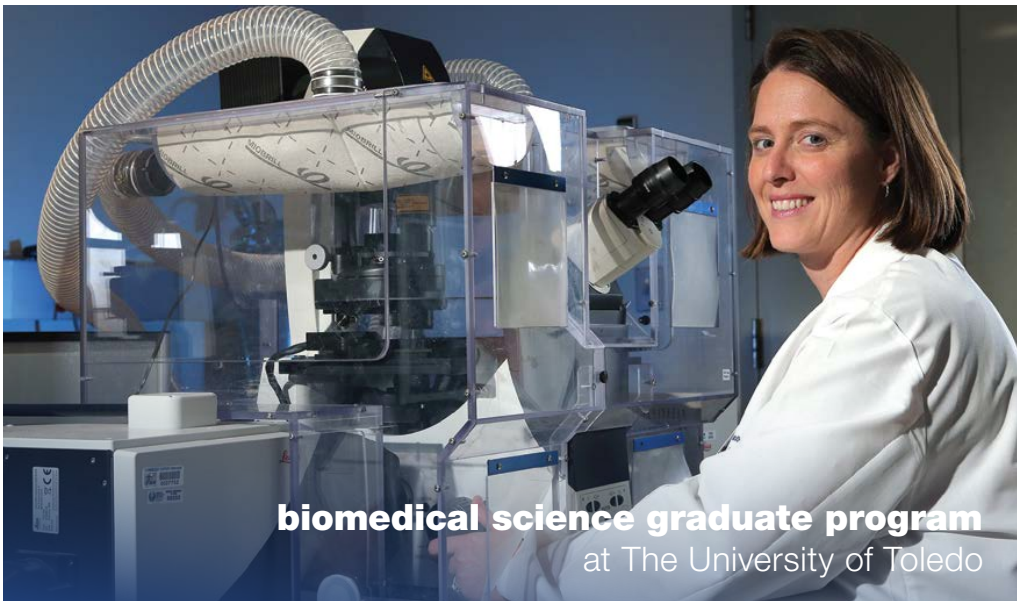
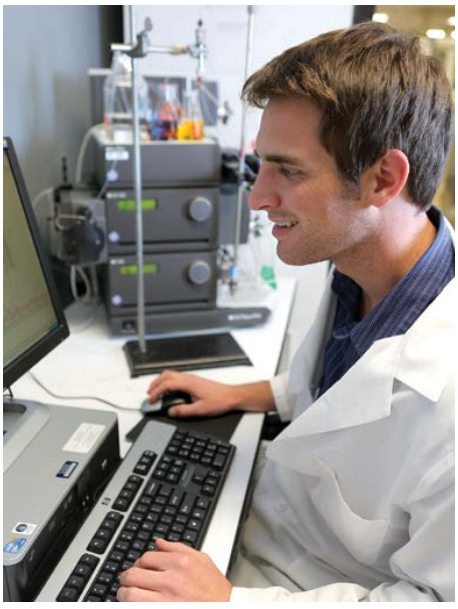
COLLEGE OF MEDICINE
AND LIFE SCIENCES
THE UNIVERSITY OF TOLEDO


biomedical science graduate program
at The University of Toledo



biomedical sciences

COLLEGE OF MEDICINE AND LIFE SCIENCES
THE UNIVERSITY OF TOLEDO

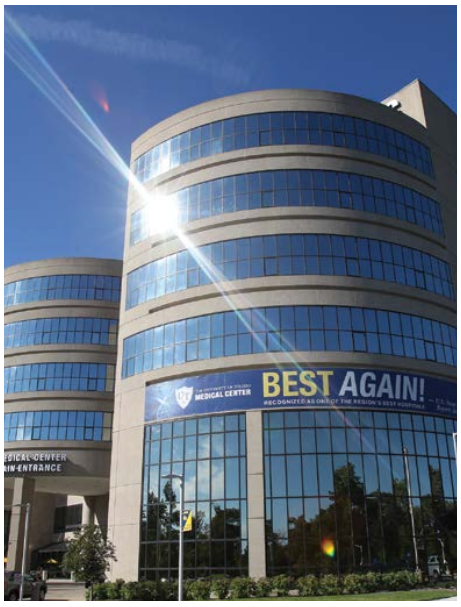
Greetings! With the great advances in molecular biology and genetics, medical diagnosis, and therapies for disease and injury that have been made over the last two decades, today's careers in biomedical research are exciting and rapidly evolving.

If you are considering Ph.D. or M.S. education in biomedical science, please consider the biomedical science program within the College of Medicine and Life Sciences at The University of Toledo. We offer outstanding teachers, research scientists and facilities; faculty and staff dedicated to providing you with the best education possible; modern and sophisticated classrooms and laboratories; and a beautiful, safe and friendly campus.

I invite you to take a look and see for yourself.

Kandace Williams, Ph.D.

Associate Dean for College of Medicine and Life Sciences Graduate Programs

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biomedical science graduate program

Advance your knowledge in biomedical sciences and receive state-of-the-art research training in human diseases and basic cellular processes by joining the Biomedical Science Graduate Program at The University of Toledo College of Medicine & Life Sciences.

- Study with expert faculty mentors and work with leading-edge laboratory facilities and equipment.
- Specialize in cancer biology, cardiovascular and metabolic disease mechanisms, microbial pathogens and immunology, or neurosciences and neurological disorders.
- Engage in translational research that brings findings from the lab bench to the patient's bedside.

The Biomedical Science (BMS) Graduate Program prepares students for an independent career in research through advanced courses complemented by active participation in faculty-mentored laboratory research in one of four BMS Research Tracks.

The tracks are organized around research themes that relate to human disease processes. They are affiliated with basic science departments but are interdisciplinary and draw faculty members with common research interests from a variety of basic science and clinical departments.

THE CANCER BIOLOGY TRACK (CB) takes an integrated approach to training the next generation of cancer researchers. Students develop depth and breadth of knowledge in cancer biology by course work aimed at understanding the molecular nature of cancer and mentored research in cancer biology disciplines. Graduates will be equipped with scientific expertise and leading-edge research skills for the fight against a disease that affects the lifespan and quality of life of millions of individuals.

AREAS OF FACULTY RESEARCH

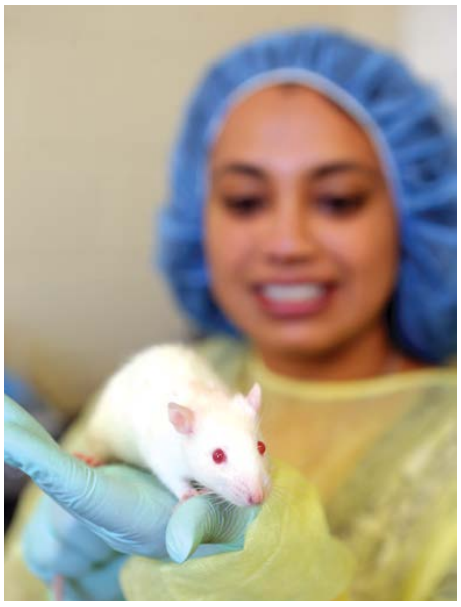
- Autophagy
- Brain, breast, colon, lung, prostate cancers
- Cancer stem cells
- Cancer initiation
- Cancer cell invasion and metastasis
- Cell-cell communication
- Cell death: Apoptotic and non-apoptotic mechanisms
- Cell cycle and cell signaling
- Chromosomal instability and gene expression
- Chromatin structure and epigenetic mechanisms
- Chemoprevention and toxicology
- DNA damage and repair
- Drug delivery
- Genetically engineered mouse models
- Genomics, gene activation and gene regulation
- Melanoma
- Protein trafficking
- Raf signaling
- Retrotransposons and telomeres
- Small molecule drug design and development

Related Diseases: Cancers of the brain, breast, colon, lung, prostate, lymphoma, melanoma, sarcoma, neuronal tumors

AREAS OF FACULTY RESEARCH

- Atherosclerosis
- Cardiomyopathy
- Diabetes
- Fatty liver disease
- Genetics of cardiac performance
- Genomics and proteomics
- Heart failure and ischemic heart disease
- Hypertension
- Infertility
- Ion transporters
- Obesity
- Cell signaling
- Renal failure
- Stress-related disorders
- Transgenic and knockout mouse technology

Related Diseases: Atherosclerosis, diabetes and obesity, fatty liver disease, heart failure, cardiac hypertrophy, ischemic heart disease, hypertension, infertility and reproduction, renal failure and uremic cardiomyopathy, stress-related disorders



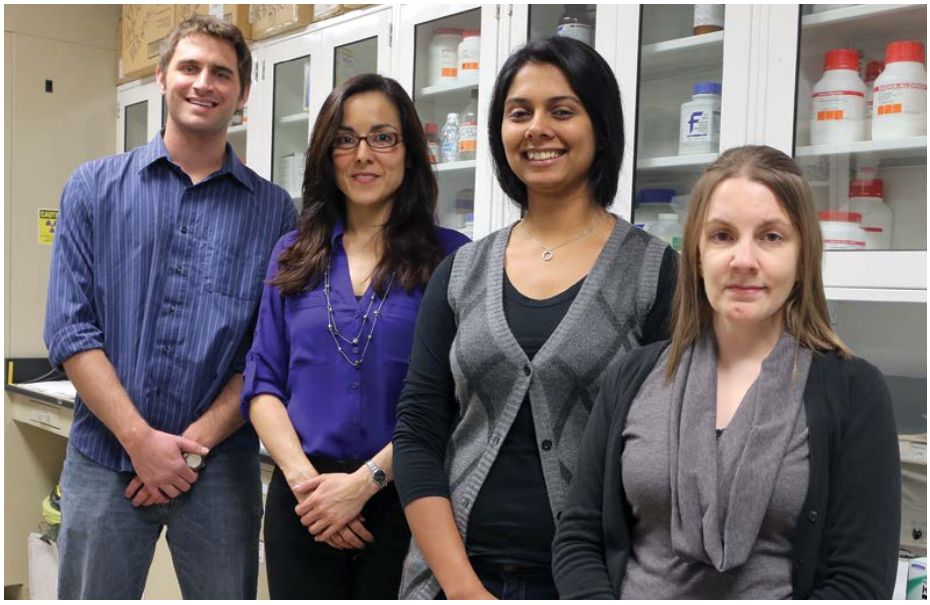
THE CARDIOVASCULAR AND METABOLIC DISEASES TRACK (CVMD) trains students in the genetics and pathophysiology of diabetes, obesity, fatty liver disease, infertility and cardiovascular diseases, such as hypertension, heart failure and atherosclerosis. The track emphasizes the use of genetically engineered rodents as a first step toward translating basic science research to the clinic. Graduates are prepared for active and independent research careers targeting these diseases, which constitute the major causes of death in the United States.

THE INFECTION, IMMUNITY AND TRANSPLANTATION TRACK (IIT) provides students an education and training in the microorganisms relevant to human health and in the immune system that allows us to overcome infection but also rejects transplanted organs and can cause autoimmune diseases. Faculty members study individual microbes (bacteria, viruses or fungi), with particular emphasis on biology, evolution or pathogenic mechanism; the autoimmune diseases of asthma, lupus and rheumatoid arthritis; and the development, differentiation and activation of the innate and adaptive immune systems.

AREAS OF FACULTY RESEARCH

- Antigen presentation
- Autoimmune and allergic diseases
- Bioinformatics
- Biology, evolution and pathogenesis of microbes
- Cytokines and signaling
- Gene regulation
- Graft rejection
- Host response to infection
- Molecular genetics
- Persistent/chronic viral and bacterial diseases
- Regulation of innate and adaptive immune systems
- Vaccine development

Related Diseases: Autoimmune and allergic diseases, graft rejection, infectious diseases, persistent viral infections

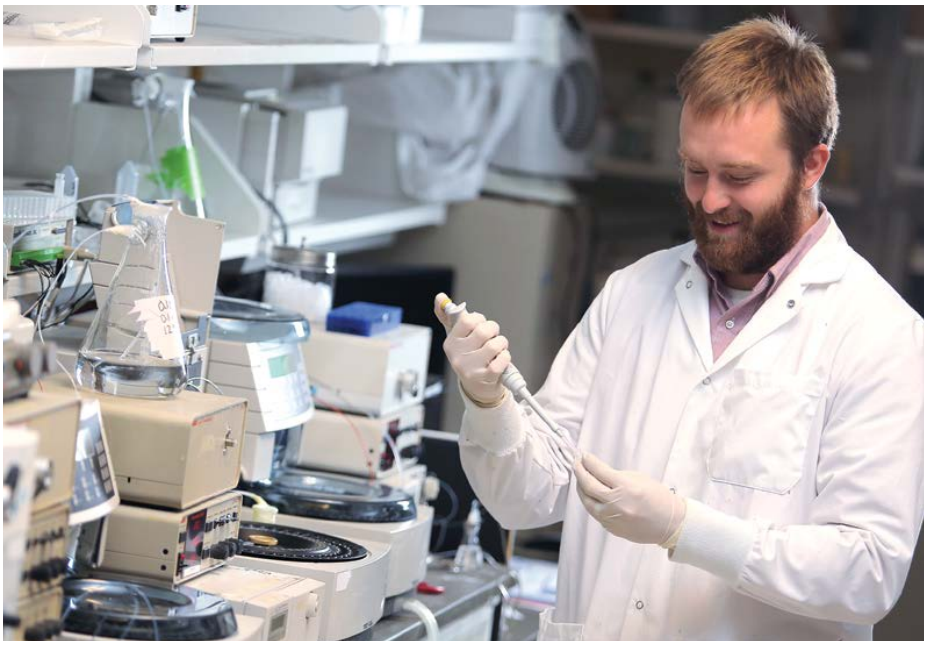


THE NEUROSCIENCES AND NEUROLOGICAL DISORDERS TRACK (NND) emphasizes training in both basic and translational neuroscience. Students gain hands-on experience using a variety of state-of-the-art cellular/molecular biological, neuroanatomical and physiological approaches to investigate fundamental questions relating to synaptic function, neuronal signaling and development and plasticity of the nervous system. Areas of study emphasize normal function in the nervous system and the processes underlying neurodevelopmental disorders and neurological diseases.

AREAS OF FACULTY RESEARCH

- Alzheimer's disease
- Cell signaling and secretion
- Epilepsy
- Functional confocal microscopy
- Headache and hearing disorders
- Ion channel regulation
- Mechanisms of neurological disease
- Molecular development and stem cell biology
- Neuroblastoma and neuroendocrine tumors
- Neurodevelopmental disorders
- Nervous system plasticity
- Pain mechanisms, regeneration, and repair
- Parkinson's disease
- Somatosensory system function
- Stroke prevention
- Substance abuse
- Transcriptional regulation of neural genes

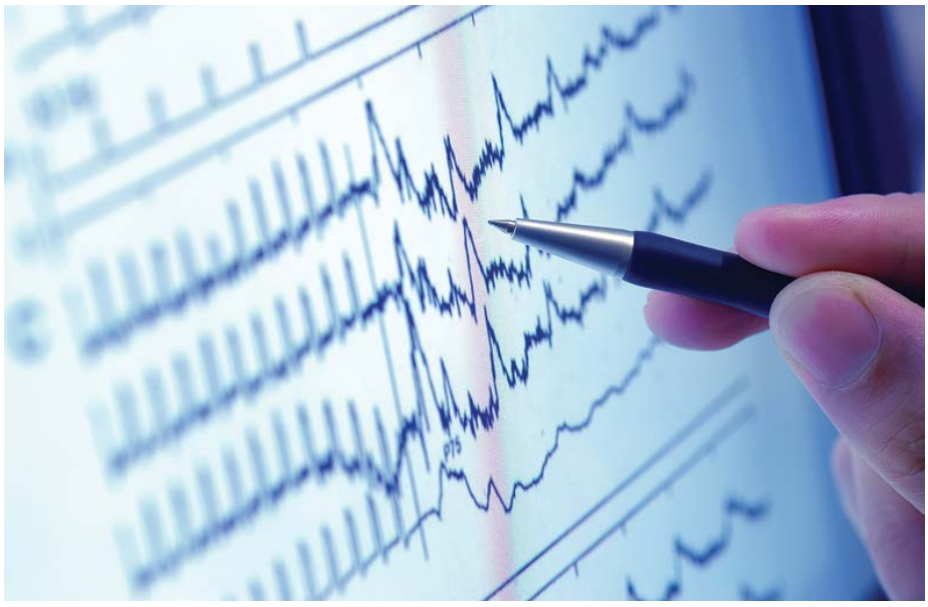
Related Diseases: Alzheimer's disease, epilepsy, headache disorders, hearing disorders, neuroblastoma and neuroendocrine tumors, neurodevelopmental disorders, Parkinson's disease, stroke and stroke prevention, substance abuse disorders



bioinformatics and proteomics/genomics

In addition to the above four biomedical science research tracks for Ph.D. and M.S. students, The University of Toledo offers four related degree programs:

- Certificate in biomarkers and bioinformatics. This program involves completing four core courses. The certificate program can be completed in association with the Ph.D. or M.D. as the courses are available online for those who cannot attend in person. This certificate is jointly offered by the Bioinformatics Program on Biomarker Research and the Individualized Medicine Center.
- M.S. in bioinformatics and proteomics/genomics. This program includes the same core courses that biomedical sciences M.S. students take, as well as independent research and electives in areas of interest. Both certificate and M.S. students are trained in the theory, methods and applications of bioinformatics, proteomics,and genomics. This training is foundational for biomedical research, modern medicine, genetic counseling, intellectual property law and many other fields.
- B.S./M.S. dual degree pipeline in bioinformatics and proteomics/genomics. UT offers a combined B.S. in Biology/M.S. in Bioinformatics and Proteomics/Genomics dual degree path that enables students to earn both degrees in approximately 5.5 years. Ohio residents in this program may be eligible for full tuition support (junior, senior and graduate years) through Choose Ohio First.
- PSM in biomarkers and diagnostics. The Professional Science Masters is a new degree program designed for those interested in a biotechnology/pharmaceutical industry career. It resembles the M.S. program described above, but includes additional courses in business and an industrial internship in place of thesis research. Ohio residents in this program may be eligible for full tuition support through Choose Ohio First.

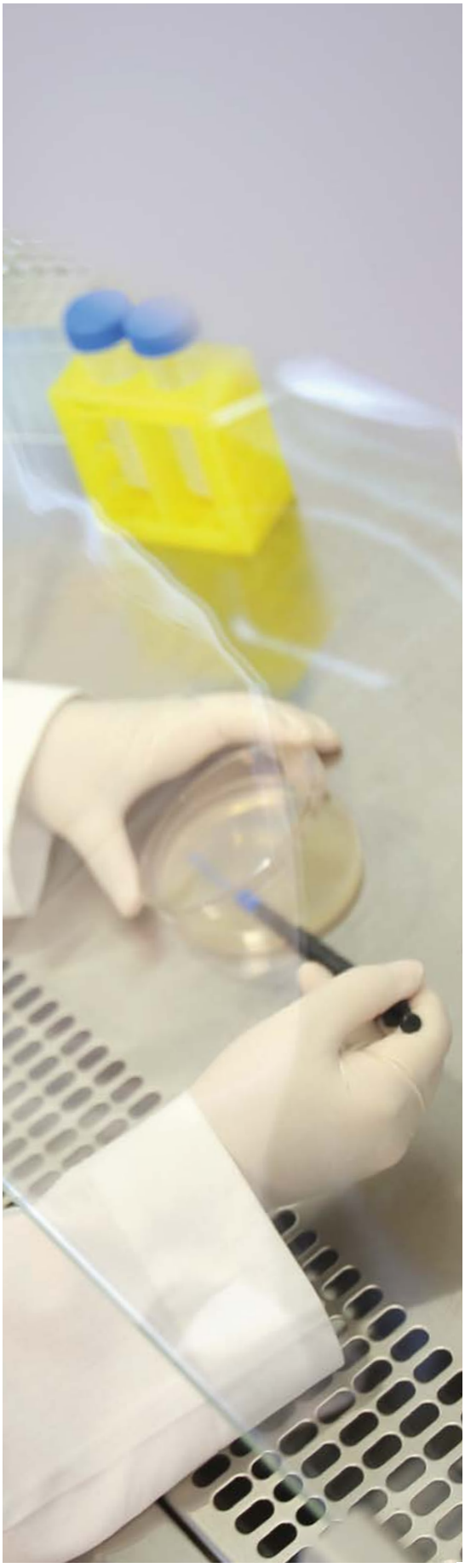


outline of the biomedical science graduate program

- All biomedical science students enter the program as a member of one of the research tracks. It typically takes 4 to 5 years to complete the Ph.D. degree requirements and 2.5 years to complete the M.S. degree requirements.
- During the first year of study, all M.S. and Ph.D. students follow a core curriculum that includes the study of genes, proteins, cell processes, biomembranes and signaling, pathophysiology of major systems, research methods, and the responsible conduct of research and scientific ethics.
- Mentored research rotations within the first year introduce students to research laboratories, faculty mentors and scientific methods. Students also attend seminars by local and invited experts.
- By the end of the first year, M.S. and Ph.D. students identify a faculty mentor and laboratory in which they will complete their dissertation/ thesis research.
- Track-specific courses are available in later years to expand and strengthen a student's background.
- All M.S. and Ph.D. students are also required to pass a qualifying examination after the first year to continue their dissertation/thesis research.
- Students also receive training in the presentation of their research in annual research forums to hone their communication skills for research presentations at national/international scientific meetings.

admission standards

- To be admitted into the Ph.D. or M.S. in Biomedical Science, an applicant must hold an earned baccalaureate degree (or equivalent) from an accredited college or university and have a minimum overall GPA of 3.0 on a 4.0 scale.
- Typically, applicants have an undergraduate major in biology or a related discipline such as biochemistry or biophysics, but students with other scientific majors such as chemistry or physics are encouraged to apply.
- Students with non-biological majors should have taken several semesters of biology. In addition, the GRE exam is required, with scores above the 50th percentile recommended.
- For international students, the TOEFL test is required and scores above the 50th percentile are recommended.
- For all applicants, laboratory research experience is not required but is highly recommended. A prior master's degree is not required for the Ph.D. program.



financial support and other degree opportunities

FINANCIAL SUPPORT

- Ph.D. students (domestic and international) in good academic standing will receive financial support that consists of a full tuition scholarship and a stipend that is at the National Institutes of Health/National Research Service Award level.
- Financial support (tuition and stipend) is also available to M.S. students on a competitive basis to students who have a minimum 3.0 GPA.
- Students are not required to be teaching assistants to receive financial assistance, but exposure to teaching is available to interested students.

DUAL AND PARALLEL DEGREE PROGRAMS

- The four BMS Tracks also offer Ph.D. and M.S. degrees in biomedical science in combination with the doctor of medicine degree (M.D.).Students accepted into the College of Medicine's combined M.D./Ph.D. or M.D./M.S. degree programs complete their research training after the first two years of medical school. After finishing the Ph.D. or M.S. degree requirements, students return to medical school and complete the last two years of their medical training.
- Scholarships and financial assistance are available to well-qualified M.D./Ph.D. degree students on a competitive basis.
- Parallel degree programs may be arranged in which a student pursues two degrees in tandem (e.g. Ph.D. and J.D., Ph.D. and M.P.H. or Ph.D. and M.B.A.).

summer undergraduate research opportunities and fellowships

- A 10-week summer undergraduate research fellowship (SURF) is available to undergraduate students who are interested in exploring a biomedical research career.
- Summer research fellows work full-time on a biomedical research project alongside graduate students and learn a variety of techniques and procedures while receiving hands-on experience in biomedical research.
- SURF fellows also participate in weekly seminars that cover topics related to scientific research and bioethics, including how to succeed in graduate school, grant writing and career opportunities in academia and the pharmaceutical and biotech industries.
- Each SURF fellow will receive a stipend for the 10-week, full-time research experience.
- The SURF program begins in June and ends mid-August. Applications are due in February.

WEBSITE ADDRESSES

Cancer Biology track (CAB)
utoledo.edu/med/grad/biomedical/biochem

Cardiovascular and Metabolic Disease track (CVMD)
utoledo.edu/med/grad/biomedical/cvmd

Infection, Immunity, and Transplantation track (IIT)
utoledo.edu/med/grad/biomedical/iit

Neuroscience and Neurological Disorders track (NND)
utoledo.edu/med/grad/biomedical/neuro

Bioinformatics & Proteomics/ Genomics
utoledo.edu/med/depts/bioinfo/degrees.html

College of Graduate Studies (COGS)
utoledo.edu/graduate

College of Medicine & Life Sciences (COM & LS)
utoledo.edu/med

MD/PhD dual-degree program
utoledo.edu/med/mdphd

Summer Undergraduate Research Fellowship (SURF)
utoledo.edu/med/grad/surf.html

COLLEGE OF MEDICINE AND LIFE SCIENCES

THE UNIVERSITY OF TOLEDO

ADDITIONAL INFORMATION

If you would like further information about any of these programs, please contact:

The University of Toledo Health Science Campus
College of Graduate Studies
Mail Stop 1042
3000 Arlington Avenue
Toledo, OH 43614

Email: hscgradschool@utoledo.edu
utoledo.edu/med/grad/biomedical

or contact:

Dr. Kandace Williams
Associate Dean COM & LS Graduate Programs
The University of Toledo College of Medicine & Life Sciences
Mail Stop 1010
3000 Arlington Avenue
Toledo, OH 43614

Office: 419.383.4135
Email: kandace.williams@utoledo.edu

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