Biomedical Science

Director
- Daniel Thomas Tranel

Graduate degrees: M.S. in biomedical science; Ph.D. in biomedical science
Website: https://medicine.uiowa.edu/biomed/

The Biomedical Science Program offers over 300 faculty laboratories under the diversity of a large umbrella program. Students conduct groundbreaking research on a campus that ranks among the top public institutions in the country in research activity, federal funding, graduate education, and core facility support. Ph.D. students benefit from the extensive scope of the program and the support of a cohesive academic campus.

Students select from one of nine subprograms:
- biochemistry
- cancer biology
- cell and developmental biology
- free radical and radiation biology
- immunology
- microbiology
- molecular medicine
- molecular physiology and biophysics
- pharmacology

Successful completion culminates with a Ph.D. in biomedical science and affiliation with a respective subprogram. Three closely related Ph.D. programs—genetics, human toxicology, and neuroscience—complete the complement of biomedical programs on campus. Visit the Biomedical Science Program website for more information.

Programs

Graduate Programs of Study

Majors
- Master of Science in Biomedical Science
- Doctor of Philosophy in Biomedical Science

Admission

The Biomedical Science Program is sufficiently flexible to accommodate students with a relatively wide range of backgrounds. Students with a bachelor's degree in any of the biological, biochemical, engineering, or physical sciences who have a strong desire to pursue a research-oriented career are encouraged to apply. Students must have:

- a bachelor's degree from a regionally accredited American college or university or an equivalent degree from another country as determined by the Office of Admissions; and
- a minimum g.p.a. of 3.00 or higher or the equivalent from another country as determined by the Office of Admissions.

Facilities

Biomedical science researchers benefit from state-of-the-art core research facilities and research support facilities.

Much of the research is interdisciplinary, with collaborations coordinated through major research centers, institutes, and programs.

Financial Support

Students receive a stipend and tuition support. Continued support beyond the first year is guaranteed, provided that satisfactory progress toward degree completion is accomplished. Sources of support include departmental funds, training grants, research grants, and individual fellowships.

Career Advancement

The Biomedical Science Program prepares students for successful careers as researchers, educators, and future leaders in the international biomedical workforce.

Courses

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• Cancer Biology Courses [p. 1]

Biomedical Science Courses

BMED:5205 Practical Bioinformatics 1 s.h.
Formal instruction on the use and application of bioinformatics for bench scientists; bioinformatics, resources, genome annotations, sequence analysis, comparative genomics, expression analysis, and systems biology. Requirements: biostatistics.

BMED:5207 Principles of Molecular and Cellular Biology 3 s.h.
Structure of DNA, RNA, and Protein; DNA replication, genetic and epigenetic regulation; RNA production and processing; protein production and post-translation modification; cellular membranes and trafficking; cytoskeleton and regulation of cell junctions and migration; signal transduction and regulation of cell cycle and apoptosis; didactic lectures and group discussion of primary research publications.

BMED:7270 Scholarly Integrity/Responsible Conduct of Research I 0 s.h.
Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects). Requirements: successful completion of CITI online training (greater than 80 percent score for each module) and enrollment in Graduate College degree-seeking program. Recommendations: minimum first-year graduate standing (Ph.D., M.S./M.A.), and involvement in mentored research activities (extramurally or intramurally funded).
**BMED:7271 Scholarly Integrity/Responsible Conduct of Research II**  
0 s.h.  
Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects). Requirements: successful completion of CITI online training (greater than 80 percent score for each module) and enrollment in Graduate College degree-seeking program. Recommendations: minimum of first-year graduate standing (Ph.D., M.S./M.A.) and involvement in mentored research activities (extramurally or intramurally funded).

**BMED:7604 Scholarly Integrity/Responsible Conduct of Research I**  
0 s.h.  
Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects); meets responsible conduct of research training obligation for postdocs and faculty holding an NIH K award. Requirements: successful completion of CITI online training (greater than 80 percent score for each module).

**BMED:7605 Scholarly Integrity/Responsible Conduct of Research II**  
0 s.h.  
Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects); meets responsible conduct of research training obligation for postdocs and faculty holding an NIH K award. Requirements: successful completion of CITI online training (greater than 80 percent score for each module).

**Cancer Biology Courses**

**CBIO:3310 Introduction to Data Science and Bioinformatics**  
3 s.h.  
Understanding how to access large biological data sets and use them to answer biological questions is an important skill for researchers; immersive introduction to computational handling of data; how to access and analyze publicly available data; critically evaluate data quality and analysis in context of measuring gene expression; basic coding in R/RStudio, plotting and data display, fitting and regression, statistical inference, statistical models, downloading and data wrangling; basic introduction to machine learning (clustering); for students with no computational background. Prerequisites: BIOL:1411 with a minimum grade of C- and BIOL:1412 with a minimum grade of C-. Requirements: college algebra. Recommendations: BIOL:3110, or BIOL:3120 and BIOL:3130, or other upper-level life sciences courses. Same as BIOL:3310, MMED:3310.

**CBIO:5000 Experimental Methodologies**  
2 s.h.  
Practical experience in common laboratory methods including polymerase chain reaction (PCR), western blotting, immunostaining, cell culture, and bioinformatics. Requirements: admission to cancer biology graduate program.

**CBIO:5500 Topics in Cancer Biology**  
1 s.h.  
Discussion and presentation of new scientific literature in cancer biology fields; how to evaluate and critically interpret scientific literature, data, and conclusions; journal club format. Requirements: admission to cancer biology graduate program.

**CBIO:6000 Seminar: Cancer Research**  
1 s.h.  
Attendance at seminar presentations of cutting-edge science in the field of cancer biology; presentations by experts in the field and trainees. Requirements: admission to cancer biology graduate program.

**CBIO:6500 Research in Cancer Biology**  
arr.  
Research experience through research rotations and conduction of dissertation research in cancer research laboratories. Requirements: admission to cancer biology graduate program.

**CBIO:7000 Clinical Connections**  
1 s.h.  
Shadowing experiences arranged with clinicians who are treating cancer patients at University of Iowa Hospitals & Clinics. Requirements: admission to cancer biology graduate program.

**CBIO:7500 Crafting a Scientific Proposal**  
1 s.h.  
Training in areas of scientific writing and development of a scientific proposal; students develop a proposal related to, but not identical to, the proposal for the comprehensive exam. Requirements: admission to cancer biology program.