Degree Offered: Doctor of Philosophy

Program Description

As a member of the Biochemistry PhD program at MCW you will have the opportunity to investigate the mechanistic basis of diseases including cancer, neurodegeneration, heart failure, diabetes and others, using state-of-the-art facilities and instrumentation for structural biology, metabolism, signal transduction, and drug discovery.

Admission Requirements

In addition to the general Graduate School admission requirements, this program has additional specific requirements.

Admission to the Biochemistry Graduate Program is through the Interdisciplinary Program in Biomedical Sciences (IDP), Neuroscience Doctoral Program (NDP), or Medical Scientist Training Program (MSTP). After completion of the first-year curriculum of that program, students who choose to complete their dissertation research project with faculty of the Biochemistry Graduate Program will have the opportunity to continue their graduate studies by selecting from among a wide range of courses that are offered within the Biochemistry Graduate Program as well as other programs at MCW. Courses to be taken are based on the student

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functioning of mannose 6-phosphate receptors

(MPRs) in mammalian cells.

- Molecular regulation of nutrient utilization in metabolic syndrome, atherosclerosis and inherited diseases of fat metabolism.
- Molecular mechanisms governing G protein-coupled receptor signaling in mammalian cells.
- Structural biochemistry of multi-protein machinery (RNA polymerases and associated factors) involved in gene transcription and RNA processing in the eukaryote.
- Oxidative stress, reactive oxygen/nitrogen species, cell membrane lipids, lipid peroxidation and mechanisms of oxidative apoptosis.
- The role of metabolic modifications such as acetylation. The role of topological stress in DNA. The role of accessory proteins in modulating histone DNA interactions.
- Structure-function relationship of enzymes and receptors using X-ray diffraction methods.
- Characterization of molecular mechanisms of protein dynamics and protein-protein interactions using solution NMR and other biophysical techniques.
- In vivo mechanisms controlling developmental and cardiovascular specific gene expression.
- Druggability of proteins involved in mitochondrial homeostasis and genome maintenance.

02207 Enzyme Kinetics and Receptor Binding.

02235 Biomolecular NMR: Protein Dynamics and Binding.

NMR spectroscopy is one of the most powerful tools of contemporary structural biology. Multiple NMR applications enable structural, thermodynamic, and kinetic analysis of proteins and nucleic acids under physiological conditions with site-specific resolution. The course "Biomolecular NMR: Protein Dynamics and Binding" discusses applications of NMR to protein dynamics, conformational transitions, and ligand binding. The topics include NMR line shape analysis and spin relaxation methods that are used to extract structural, thermodynamic, and kinetic parameters of conformational transitions and ligand binding in proteins. The course is directed to students who would like to utilize NMR spectroscopy as a part of the dissertation research.

02301 Seminar.
Students are given practice in presenting and evaluating their research data. Solutions to research problems encountered are also discussed. Seminar is required beginning in the second semester and continues throughout each student's program.

16274 Metabolism.