The Graduate Program

The graduate program offered by the Group in Biomedical Sciences is designed to lead to the Ph.D. degree through a combination of didactic study, laboratory rotations, and thesis research in basic biomedical sciences. Research experiences are wide and varied, permitting students the options of selecting molecular, cellular, or organ and integrated systems approaches in their research programs. Students are encouraged to design and execute investigation in a self-critical and independent manner. Under-graduate preparation must include courses in mathematics (through calculus), chemistry (including organic,
the group, faculty within the program are the directors of four specialized centers of research at the university focusing on cancer, myocardial ischemia, hypertension, and atherosclerosis. Other faculty are directors of training grants for programs in pulmonary physiology, oncogenes, cardiovascular physiology, cellular and molecular pharmacology, hypertension, metabolic diseases, cell and molecular biology, genetics, digestive diseases, and cancer cell biology.

The graduate program in biomedical sciences is also designed to educate physician-scientists through the School of Medicine's Medical Scientist Training Program. Students already admitted to the School of Medicine are eligible for admission to our program for Ph.D. training. Such students generally apply in the first or second year of their medical studies and enter graduate studies following completion of their second year of medical school. Normative time for M.D./Ph.D. students is seven years.

Examinations

Students obtain letter grades in the program's basic courses. Candidacy for the Ph.D. degree is determined by a two-part examination. The first part, the minor proposition examination, tests the student's competence and ability to design a pertinent research problem in an area unrelated to his or her major interest. The second part, the major proposition examination, deals with the dissertation problem and should be completed between the spring of the third year and the beginning of the fourth year of residence in the program. After the preparation of the dissertation, an oral defense of the thesis completes the requirement for the Ph.D. degree.

COURSES

202. Carcinogenesis and Drug Metabolism (3)

This elective will explore relationships between drug metabolism and carcinogenesis at cellular, molecular and etiological levels. Guided by faculty, students will research and present key papers and principles underlying the biochemistry, genetics, biophysics, and computer-assisted aspects of several assigned topics. Prerequisites: biology and chemistry. Cell biology, biochemistry, and molecular biology may be taken concurrently.

204. Evolution of Modern Concepts in Pharmacology (2)

This course details the evolution of modern principles of pharmacology from first evidences to the present level of knowledge. The course will be independent of but complement general principles of pharmacology courses for medical and graduate students. Prerequisite: prior or concurrent Principles of Pharmacology, or equivalent course.

206. Organ Physiology (9)

Building on the student's basic knowledge of cellular biology and biochemistry, this course develops fundamental concepts of organ physiology. Major areas include autonomic, cardiovascular, gastrointestinal, renal, and respiratory physiology. Clinical correlation sessions relate physiological principles to clinical situations. Prerequisites: BMS 210, 211, 212, 213 or equivalent background in biology and chemistry. For students not in the School of Medicine, consent of instructor. (W)

206L. Organ Physiology and Pharmacology, Laboratory Course (3)

Selected laboratory exercises demonstrating basic principles of pharmacology and organ physiology. Subjects covered include electrophysiology, hormone, cardiovascular, respiratory, renal, gastrointestinal and enteric physiology and their neural and hormonal control. Pharmacologic studies of drug action at the molecular and biochemical levels include studies of receptor structure and function, genetic and recombinant DNA methods to analyze ligand-receptor interactions, regulation of gene expression and signal transduction, and biophysical approaches to defining neurotransmitter and hormone action. Molecular and cell biological approaches are being applied to the study of major issues in cell biology, including the regulation of protein targeting and intracellular membrane traffic, hormone and growth factor receptors, endothelial cell biology, molecular motors, RNA splicing, and mitosis, among others. Eukaryotic regulatory biologists are using the most advanced molecular biological techniques to study developmental and homeostatic regulation of gene expression in primarily mammalian systems. As evidence of the research strength of the group, faculty within the program are the

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229. Methods in Pharmacology (3)
A combination of lecture and lab exercises presented by the faculty of the Group in Biomedical Sciences, designed to introduce biomedical science graduate students to the essential techniques employed in molecular and cellular pharmacology. Prerequisites: BMS 212, OR, CBB, biochemistry, molecular biology, biomedical sciences or consent of instructor. (S)

230. Receptors and Signal Transduction (3)
An examination of the molecular and biochemical bases of drug and neurotransmitter action. Topics include molecular basis of drug specificity, receptor mechanisms, neuropharmacology, signal transduction from the cell surface to the nucleus, and drug action on excitable tissues. Prerequisite: course in biochemistry. (F)

231. Contemporary Topics in Pharmacology (2)
A selection of short courses in the biomedical and pharmacological sciences offered by resident experts. Topics will vary annually. Each short course will last one to two weeks, meeting five hours a week. Prerequisite: consent of instructor. (F, W, S) (Not offered in fall 1997.)

233. Molecular Biology of Human Retroviruses (3)
Replication cycle and gene regulation of HIV. Molecular approaches to therapy and vaccines. Prerequisites: undergraduates lower-division courses in Biology, BMM 100, BICD 100, BIBC 100, BIBC 102.

236. Maternal and Placental Physiology (2)
This course provides a broad based coverage of the physiology of maternal changes during pregnancy as well as physiology of the placenta. Included are endocrine, cardiovascular, respiratory, fluid balance, metabolism, nutrition, lactation, immune and postpartum aspects as well as problems of pregnancy. Prerequisites: Med. 206 (OPP) and Med. 209 (ERM), or equivalent. (F)

237. Fetal Physiology (2)
This course provides a broad based coverage of the physiology of the fetus, including growth and development, metabolism, neurology and endocrine development, regulation of the cardiovascular system, endocrine, renal, and gastrointestinal systems, development of the lungs, immune system, abnormal development genetic problems, and diseases. Prerequisites: same as 236. (W)

240. Critical Reading in Cell Biology (3)
This course will focus on critical reading and understanding current areas in Cell and Molecular Biology. The exact topic will vary, but will include such topics as Protein Trafficking, Cell Division, Intracellular Movement, Cell Interaction, and Cell Cycle.

242. Seminar in Genetics (1)
Intended for graduate students interested in principles of classical and molecular genetics. Will attend weekly genetics seminar and participate in didactic/discussion preparatory session. Prerequisite: consent of instructor.

243. Human Genetics (3)
Advanced aspects of human genetics and human diseases, including principles of Mendelian and non-Mendelian inheritance, monogenic and polygenic traits, anticipation, penetrance, and genomics. Course will consist of alternating didactic sessions and seminars in which students will present papers.

245. Cancer Genetics (3)
Intended for graduate students interested in genetics. Course will cover genetic basis for cancer related diseases. Prerequisites: graduate-level course in cell biology and molecular biology.
Prerequisites: completion of minor proposition examination and two years of graduate work. (F,W,S)

296. Directed Reading (1-4)
Reading of special topics under the direction of a faculty member. Exact subject matter to be arranged in individual cases. Prerequisite: consent of instructor.

297. Progress in Signal Transduction (1)
Papers describing recent progress in signal transduction from the cell-surface to the nucleus will be chosen from recent research literature. Two papers will be discussed and criticized in detail each week for one hour. Prerequisites: graduate level Biochemistry, Cell Biology, and Molecular Biology; registered as second year and above graduate student in Biomedical Sciences, Biology, or Chemistry. (F,W,S)

298. Directed Study (1-12)
Reading and laboratory study of special topics under the direction of a faculty member. Exact subject matter to be arranged in individual cases. (F,W,S)

299. Independent Study or Research (1-12)
Independent study or research. Prerequisite: consent of instructor. (F,W,S)