Molecular Pathology

OFFICE: 1012 Basic Science Building
School of Medicine

Professors

Stephen Baird, M.D., *Pathology (Academic Senate Distinguished Teaching Award)*
Roland C. Blantz, M.D., *Medicine*
Dennis Carson, M.D., *Medicine*
Kenneth R. Chien, M.D., *Medicine*
Lynette B. Corbeil, D.V.M., Ph.D., *Pathology*
Jack Dixon, Ph.D., *Medicine/Pharmacology*
Daniel J. Donoghue, Ph.D., *Chemistry and Biochemistry*
Sylvia M. Evans, Ph.D., *Pharmacology*
Marilyn G. Farquhar, M.D., *Cellular and Molecular Medicine (Chair)*
James Feramisco, Ph.D., *Medicine/Pharmacology*
Joshua Fierer, M.D., *Medicine/Pathology (In-Residence)*
Xiang-Dong Fu, Ph.D., *Cellular and Molecular Medicine*
Frances D. Gillin, Ph.D., *Pathology (In-Residence)*
Mark Ginsberg, M.D., *Medicine*
Christopher Glass, M.D., Ph.D., *Cellular and Molecular Medicine*
Steven L. Gonias, M.D., Ph.D., *Pathology*
Paul Insel, M.D., *Pharmacology*
Randall Johnson, Ph.D., *Biological Sciences*
Martin F. Kagnoff, M.D., *Medicine*
Mark P. Kamps, Ph.D., *Pathology*
Michael Karin, Ph.D., *Pharmacology*
Thomas Kipps, M.D., Ph.D., *Medicine*
Edward Koo, M.D., *Neurosciences*
Eliezer Masliah, M.D., *Neurosciences/Pathology*
Andrew Mizisin, Ph.D., *Pathology*
Henry C. Powell, M.D., *Pathology*
C. Ann Rearden, M.D., *Pathology*
Sharon Reed, M.D., *Pathology*
Douglas Richman, M.D., *Pathology/Medicine (In-Residence)*
Michael G. Rosenfeld, Ph.D., *Medicine*
Sanford Shattil, M.D., *Medicine*
Deborah H. Spector, Ph.D., *Biological Sciences*
David Tarin, M.D., Ph.D., *Pathology*
Ajit P. Varki, M.D., *Medicine*
Gernot Walter, Ph.D., *Pathology*
Tony Yaksh, Ph.D., *Anesthesiology/Pharmacology*

Associate Professors

Nigel Calcutt, Ph.D., *Pathology*
Ju Chen, Ph.D., *Medicine*
Richard Gallo, M.D., Ph.D., *Medicine (In-Residence)*
John Guatelli, M.D., *Medicine*
Dzung Le, Ph.D., *Pathology*
Fred Levine, M.D., Ph.D., *Pediatrics (In-Residence)*
Victor Nizet, M.D., *Pediatrics*
Joe Vinetz, Ph.D., *Medicine*

Assistant Professors

Katerina Akassoglou, Ph.D., *Pharmacology*
Steffan Ho, Ph.D., *Pathology*
Bing Ren, Ph.D., *Cellular and Molecular Medicine*

Adjunct Professors

Kathryn Ely, Ph.D., *Pathology*
Eva Engvall, Ph.D., *Pathology*
Hudson Freeze, Ph.D., *Medicine*
Minoru Fukuda, Ph.D., *Pathology*
Fred Gage, Ph.D., *Neurosciences*
Martin Haas, Ph.D., *Cancer Center*
Michael Kalichman, Ph.D., *Pathology*
Stuart Lipton, Ph.D., *Neurosciences*
Mark Mercola, Ph.D., *Pathology*
Robert Oshima, Ph.D., *Pathology*
Manuel Perucho, Ph.D., *Pathology*
James Quigley, Ph.D., *Pathology*
Diane Shelton, D.V.M., *Pathology*
Ian Wilson, Ph.D., *Pathology*

Associate Adjunct Professors

Jacques Corbeil, Ph.D., *Medicine*
Gen-Sheng Feng, Ph.D., *Pathology*
Roberta Gottlieb, M.D., *Pharmacology*
Elena Pasquale, Ph.D., *Pathology*
David W. Rose, Ph.D., *Medicine*
Guy Salvesen, Ph.D., *Pathology*

The Graduate Program

The goal of the molecular pathology program is to produce outstanding researchers focused on the molecular basis of human disease who also understand disease at levels of histology and pathology. The molecular pathology graduate program in an interdepartmental and inter-institutional program administered by the UCSD Department of Pathology in affiliation with The Burnham Institute. The program provides a comprehensive knowledge of normal and abnormal biological processes, with a particular emphasis on the molecular mechanisms of human diseases. Faculty research focuses on determining how normal cellular processes are altered in human disease. Research falls within six areas: cancer cell biology; stem cell and developmental biology; neurobiology and neurologic disease; structural biology and signal transduction; microbiology and immunology; and cardiovascular, muscle, and organ development/disease. Most program faculty reside in the Departments of Pathology, Medicine, and Pediatrics at the UCSD School of Medicine, in The Burnham Institute, and in The Scripps Research Institute.

Course Work

The core science curriculum includes classes in Molecular Biology of the Cell, Methods in Cellular and Molecular Pathology, The Molecular Pathology of Cancer, and Neurologic and Muscle Disease. Learning is focused on reading and evaluating current scientific literature, with special attention to identifying the major open questions within a field and designing an effective experimental plan to answer these questions. Two elective classes (6 units total) are required. Electives taught by program faculty are offered in Microbial Pathogenesis (4 units) and Mouse Models for Human Disease (2 units). Electives may also be selected from graduate-level courses offered by other medical school programs or by other campus departments (e.g., Division of Biological Sciences, Department of Chemistry and Biochemistry, and Department of Bioengineering). This option allows students the opportunity to acquire advanced training in areas they have selected for graduate research. Popular electives are Molecular Modeling, Macromolecular Recognition, Molecular Biology of the Cardiovascular System, and graduate-level courses in Signal Transduction, Immunology, Animal Virology, Developmental Biology, Genetics, and Neurobiology. An education in histology and pathology is acquired by taking the School of Medicine course in Histology and an overview course in human pathology developed by pathology faculty for molecular pathology and pharmacy students. Students may elect to take in-depth pathology training in their particular disease(s) of interest by attending a set of comprehensive lectures (8 to 12) taught as part of the comprehensive medical school pathology curriculum. Concurrent with their thesis research, third-year students can acquire a practical consideration of the clinical treatment of

disease by attending pathology conferences: Breast Pathology Conference, Tumor Board, Pediatric Autopsy, Neuropathology "Brain-Cutting" Conference, Infectious Disease Rounds, or Hematology Conference. In such conferences, students learn how disease presents and progresses, how physicians currently treat disease, what the practical obstacles are in disease treatment, and where opportunities are for development of molecular therapeutics.

Examinations

First Qualifying Examination (Minor Proposition)

The purpose of this examination is to test the student's ability to choose a research problem in molecular pathology and to propose an experimental approach to its solution. The problem should be unrelated to the student's thesis project. The student is expected to demonstrate knowledge in molecular biology and basic pathology. The first qualifying examination will be taken by the end of the fall quarter of the second year.

Second Qualifying Examination (Major Proposition)

The second qualifying examination, a university requirement, consists of an oral report by the student about research accomplished and the goals to be achieved for completion of the examination, the student will advance to candidacy. The second qualifying examination should be complete by the end of the third year and must be completed by the end of the fourth year.

Departmental Ph.D. Time Limit Policies

Students must be advanced to candidacy by the end of four years. Total university support cannot exceed six years. Total registered time at UCSD cannot exceed seven years.

COURSES

PATH 208G. Human Disease (8)
An integrated consideration of the general principles of pathology and microbiology, epidemiology, and medical therapeutics of the important diseases. An example of their application to a specific organ system will be included.

PATH 220. Molecular Pathology of Disease (4)
This course will explore the molecular pathology associated with various diseases other than cancer. Emphasis will be placed on understanding the abberant cellular processes, caused by mutation or environmental factors, that are associated with the disease state. Cardiovascular, neurological, immunological, and other diseases will be investigated.

PATH 221. Molecular Pathology of Cancer (4)
The purpose of this course is to present exciting new developments in molecular carcinogenesis, with particular emphasis on oncogene expression and functions of oncogenic proteins. The relevance of molecular mechanisms for understanding human cancer will be discussed.

PATH 222. Microbial Pathogenesis (4)
Topics covered in this course include molecular and cellular mechanisms of viral, bacterial, and protozoan pathogenesis. Host response and microbial mechanisms of host defense will also be discussed. Sessions will consist of faculty and student presentations of current literature.

PATH 225. Molecular Pathology Research Seminar (2)
Group and individual discussion of current literature and ongoing research activities. The format of SOM 225 will encourage student participation. Students are to present on their rotation work or current research project.

PATH 230G. Molecular Biology of the Cell (6)
This course offers a concise overview of the biochemical basis of gene expression and of diverse signal transduction pathways, and integrates this background in the context of cellular processes such as cell division, development, cell-cell interactions, and inflammation. This course will highlight recent discoveries in cellular and molecular biology and will highlight human diseases that result from inappropriate regulation of cellular processes.

PATH 231. Modern Methods in Molecular and Cell Biology (4)
This course presents key concepts and methodologies used in cellular and molecular pathology research. Topics include protein purification, biochemical characterization, identification of post-translational modifications, DNA/protein microinjection, immunofluorescence, digital imaging, electron microscopy, stem cell culture, gene/promoter analysis, protein-protein interaction analysis using the yeast 2-hybrid system, transgenic and knockout mouse construction, analysis of bacterial virulence factors, and genomic/proteinomic approaches to disease analysis.

PATH 232. Statistical Methods and Experimental Design
This course will emphasize the relationships between experimental design, statistical methods, and biomedical research. The content of the course will include basic issues in experimental design and commonly used statistical methods. The assumptions behind the statistical tests, their appropriate use, and examples of misuse will be discussed.

PATH 296. Directed Reading (1-4)
Reading and laboratory study of special topics under the direction of a faculty member. Exact subject matter to be arranged in individual cases.

PATH 299. Independent Study or Research (1-12)
Independent study or research.

SOM 213. Histology (2)
This course teaches the structural basis of normal and abnormal function at the cellular and tissue levels. Emphasis is based on microscopic study conducted in small laboratory groups under close faculty supervision.

SPPS 215. Human Disease (3)
This introduction to human disease includes etiology and mechanisms of common disease states and integrates pathology with previous core curriculum. The focus will be to understand disease processes and the dynamics of changes related to drug thearapy. Our goal is to give the student an overview of the illnesses and disorders of human organs, systems and functions, in other words, human disease, with the hope that this background will lead the students to clinical understanding of patients and future insight into the pathogenesis of disease and new treatments. This course will include general pathology and system based pathology, taught in lecture, case discussion, and lab format.