Combined MD/PhD - MD from JiaoTong University School of Medicine

 PhD from Temple University School of Medicine

MD/PhD Program - <http://www.temple.edu/medicine/education/dualdegree/mdphd.htm>

Biomedical Sciences - <http://www.temple.edu/medicine/biomedical_sciences/index.htm>

All MD/PhD students earn a PhD in Biomedical Sciences. Students choose an area of concentration from one of five clusters listed below. Many faculty participate in 2 clusters that are related to their research interests.

**Cancer Biology and Genetics**

The Cancer Biology and Genetics cluster offers educational and research opportunities in the areas of cancer and the genetic and molecular basis of human disease within the Biomedical Sciences Graduate Program at Temple University School of Medicine. The Cancer Biology and Genetics cluster provides students the opportunity to work with faculty from the Fels Institute for Cancer Research and Molecular Biology and the Fox Chase Cancer Center, as well as basic science and clinical departments at TUSM. Students have their choice of numerous research laboratories to obtain training in Cancer Biology including mechanisms of transformation and tumorigenesis, signal transduction, the cell cycle and DNA repair using novel model systems and other cutting edge techniques. Other investigators studying the genetics and epigenetics of normal and diseased states use state of the art genomic and epigenomic techniques and analyses. In addition to mechanistic studies, Cancer Biology and Genetics investigators are developing novel therapeutics for both the treatment and prevention of cancer and other diseases. Moreover, other Cancer Biology and Genetics faculty members specialize in Cancer Prevention and Control, and Cancer Immunology. A total of 45 faculty members participate in the Cancer Biology and Genetics Cluster. A few of these include:

Alfonso Bellacosa, MD/PhD

Associate Professor, Fox Chase Cancer Center and Microbiology and Immunology

Research Interests: DNA repair in cancer and development, genetic and epigenetic alterations in cancer cells

Jean-Pierre Issa, MD

Director of the Fels Institute for Cancer Research and Molecular Biology, Professor of Medicine

Research Interests: Epigenomics and genomics in normal, aging and cancer cells, basic mechanisms in

epigenetics, pre-clinical and clinical research in epigenetic therapy

Tomasz Skorski, MD, PhD, Dsc

Professor of Microbiology and Immunology and Fels Institute for Cancer Research and Molecular Biology

Research Interests: Identification of the leukemogenic mechanisms activated by BCR-ABL1 oncogenic tyrosine kinase produced by the Philadelphia chromosome

Joseph Testa, PhD

Professor, Fox Chase Cancer Center and Fels Institute for Cancer Research and Molecular Biology

Research Interests: Molecular biology of malignant mesothelioma/AKT function and oncogenic activity

**Infectious Diseases and Immunity**

The Infectious Disease and Immunity cluster brings faculty together from basic science and clinical departments as well as research centers including the Temple Autoimmunity Center, Center for Inflammation, Translational and Clinical Lung Research and Center for Neurovirology to train students within the Biomedical Sciences Graduate Program at Temple University School of Medicine. The Infectious Disease and Immunity cluster provides educational and research opportunities focused on the overlapping fields of Microbiology and Immunology. Investigators study basic aspects of bacterial physiology, the molecular biology of DNA and RNA viruses, with a particular emphasis on viruses important in human health such as Human Immunodeficiency Virus (HIV) and Epstein Barr Virus (EBV), and how innate recognition systems within the immune system, such as Toll-like receptors, function during host defense. Other investigators are examining specific aspects of the immune system, for instance at unique sites of infections such as the skin or the lungs, immune system dysfunction and how immune system functions are modulated by interactions with drugs of abuse such as opioids, methamphetamine, and cannabinoids. A total of 36 faculty members participate in the Infectious Diseases and Immunity Cluster. A few of these include:

Doina Ganea, PhD

Chairperson and Professor of Microbiology and Immunology

Research Interests: Neuroimmunology and lipid immunology

Stefania Gallucci, MD

Associate Professor, Microbiology and Immunology

Research Interests: Biology of dendritic cells, role of dendritic cells in systemic lupus pathogenesis

Wen-Zhe Ho, MD, MPH

Professor of Pathology and Laboratory Medicine

Research Interests: Innate immunity, innate immunity based therapies, neuroAIDS, and viral infections

Thomas Rogers, PhD

Director of Center for Inflammation, Translational and Clinical Lung Research, Professor of Pharmacology

Research Interests: Cross talk between G-protein coupled receptors, specifically chemokine, opiod and formyl peptide receptors, involved in regulation of regulation of inflammatory responses

**Molecular and Cellular Biosciences**

The Molecular and Cellular Biosciences cluster provides educational and research opportunities related to biochemistry and molecular biology within the Biomedical Sciences Graduate Program at Temple University School of Medicine. Faculty are associated with many research centers including the Cardiovascular Research Center, Fels Institute for Cancer Research and Molecular Biology, Center for Translational Medicine, Sol Sherry Thrombosis Research Center, and Center for Inflammation, Translational and Clinical Lung Research. The Molecular and Cellular Biosciences offers opportunities for students to become skilled and creative research scientists, providing the tools to develop into independent researchers. Graduate training within the MCB cluster is focused on understanding the structure, function, and regulation of the essential molecules within cells, including proteins, nucleic acids, lipids, and carbohydrates, and to determine their role in the assembly and operation of major cellular entities including protein and enzyme complexes, cellular membranes, chromosomes, organelles, and operational targets for drugs and bioactive agents. The training emphasizes the integration of understanding of molecular structure and function of these at different levels of biological organization including molecules, cells and tissues. The focus of training is to combine basic molecular and cellular studies within a strong translational research emphasis. The research areas of the MCB faculty include cell signaling, growth and differentiation, cellular and molecular pharmacology, stem cells and regeneration, developmental biology, structural biology, membrane biophysics, metabolism, regulation of gene expression, and protein structure and function. A total of 78 faculty members participate in the Molecular and Cellular Biosciences Cluster. A few of these include:

Madesh Muniswamy, PhD

Associate Professor of Biochemistry

Research Interests: Mitochondria and calcium homeostasis in health and disease

Bassell Sawaya, PhD

Professor of Neurology

Research Interests: HIV-1 associated neurocognitive disorders (HAND)

Xiao-feng Yang, MD, PhD

Professor of Pharmacology

Reseach Interests: Endothelial cells-conditional innate immune cells, immunology and atherosclerosis

**Neuroscience**

The Neuroscience cluster is an educational working group, supporting educational/research programs within Temple University School of Medicine’s Biomedical Sciences Graduate Program. This cluster provides thematic courses, research opportunities, and educational activities related to neuroscience, bringing together faculty members from basic science and clinical departments, as well as research centers—Center of Substance Abuse, Center for Neurovirology, Comprehensive NeuroAIDS Center, and Shriner’s Hospital Pediatric Research Center. Neuroscience is an extremely broad field encompassing the mechanisms involved in central and peripheral nervous system development, neuronal function, injury, and repair. These mechanisms contribute to memory, emotion, sensory (including pain), motor, and cognitive functions. The Neuroscience cluster offers exposure to a number of areas of basic neuroscience research and education with the goal of translating basic research advances into treatments for neurological and neuropsychiatric disorders. Indeed, the breadth and depth of the faculty members encourages an interdisciplinary approach to neuroscience education that will prepare our graduate students with an understanding of neurodegenerative disease processes, neural injury, and promote the development of effective therapeutics and modalities for repair. A total of 55 faculty members participate in the Neuroscience Cluster. A few of these include:

Peter Crino, MD, PhD

Professor of Neurology

Research Interests: Role of mTOR signaling in epilepsy, autism and brain development

Kamel Khalili, PhD

Chairperson and Professor of Neuroscience, Director for Center of Neurovirology and Neuro AIDS Center

Research Interests: Neurotrophic viruses, JCV and HIV, and control of neural cell function, growth and differentiation

Yuri Persidsky, MD,PhD

Chairperson and Professor of Pathology

Research Interests: Blood brain barrier in HIV infection, CNS injury caused by HIV, methamphetamine and HIV-1 induced cell injury, alcohol abuse and HIV.

Domenico Pratico, MD

Professor of Pharmacology

Research Interests: Clinical pharmacology associated with cellular and molecular aspects of cell oxidative biology and bioactive lipids in a number of diseases including cardiovascular and Alzheimer disease.

Ellen Unterwald, PhD

Director of Center for Substance Abuse, Professor of Pharmacology

Research Interests: Cellular and molecular mechanisms involved in drug addiction

Gil Yosipovitch, MD

Chairperson and Professor of Dermatology

Research Interests: Itch, skin neurophysiology, brain imaging of itch, itch psychophysics, skin pharmacology

**Organ Systems and Translational Medicine**

The Organ Systems and Translational Medicine cluster is designed to provide student training at the interface between biology and medicine. The Organ Systems and Translation Medicine cluster provides educational and research opportunities for students within the Temple University School of Medicine’s Biomedical Sciences Graduate Program. Organ System and Translational Medicine faculty are from a variety of basic science departments, including Anatomy and Cell Biology, Pharmacology and Physiology, research centers (Cardiovascular Research Center; Center for Translational Medicine; Center for Inflammation, Translational and Clinical Lung Research; Sol Sherry Thrombosis Research; Center for Metabolic Disease Research) and clinical departments. The Organ System and Translational Medicine cluster promotes collaborations between clinical and basic scientists and offers an interdisciplinary training environment for students interested in translational biology. Research programs available for trainees include cardiovascular disease, vascular biology, molecular pharmacology, metabolic disorders, stem cell biology, and lung and skeletal muscle function and dysfunction. A total of 60 faculty members participate in the Organ Systems and Translational Medicine Cluster. A few of these include:

Joseph Cheung, MD,PhD

Chairperson and Professor of Medicine

Research Interests: Calcium and heart failure, regulation of sodium-calcium exchanger by phospholemman, TRPM2 channels in heart failure, regulation of L-type calcium channels by phospholemman, TRPC channels in erythropoiesis

Arthur Feldman, MD,PhD

Executive Dean and Professor of Medicine

Research Interests: Molecular and cellular pathways that are responsible for the development of heart failure

Steven Houser, PhD,

Director of Cardiovascular Research Center, Chairperson and Professor of Physiology,

Research Interests: Processes that maintain the electrical and contractile properties of the normal heart and the defects in these processes that lead to electrical instability (arrhythmias and sudden death) and poor cardiac pump performance (congestive heart failure)

Walter Koch, PhD

Director of Center for Translational Medicine, Chairperson and Professor of Pharmacology

Research Interests: Molecular mechanisms involved in the regulation of signaling through cardiovascular adrenergic receptors and their role in heart disease, primarily heart failure

Satya Kunapuli, PhD

Director of Sol Sherry Thrombosis Research Center, Professor of Physiology

Research Interests: Molecular pharmacology and physiology of nucleotide receptors in cardiovascular

disease, molecular mechanisms of ADP induced platelet aggregation

Hong Wang, MD, PhD

Director of Center for Metabolic Disease Research, Professor of Pharmacology

Research Interests: Identification of biochemical mechanisms of vascular disease and discovering therapeutic targets and strategies for treatment of vascular disease