Department of Genetics and Complex Diseases

The complex interplay of biological processes with environmental factors as they apply to chronic, multigenic, and multifactorial diseases is the focus of the new Department of Genetics and Complex Diseases. Department faculty, drawn from the former Department of Cancer Cell Biology and the Department of Nutrition, aim to elucidate the molecular mechanisms underlying the intricate interaction between genetic determinants and its divergent responses to environmental signals to affect the health of human populations.

The research and training activities in the Department of Genetics and Complex Diseases address the molecular, cellular, and organismic adaptations and responses to stress, toxins, radiation, and nutrients and explore the genetic basis controlling the heterogeneity of these interactions in human populations. Department faculty members are interested in an integrated approach to understand, prevent, and treat complex human disease.

Research focuses on several broad categories, including stress and inflammatory signaling, molecular transport, and genomic instability. The diseases under study include obesity, diabetes, cardiovascular diseases, cancer, and aging, both at the mechanistic level and in the context of population studies. Department faculty are involved in multidisciplinary collaborations with faculty members in other HSPH departments and Harvard-affiliated centers as well as other institutions.

Degree Programs in Genetics and Complex Diseases

As described below, the department offers the doctor of philosophy (PhD) program.

Students wishing to study disease mechanisms and the integrated biology of chronic complex diseases (including cancer and metabolic disorders), as they pertain to major problems in public health, should apply to the PhD program offered by the Division of Biological Sciences through Harvard University's Graduate School of Arts and Sciences. For more information about the PhD program, see page 53.

LAURA MCLAUGHLIN

Doctoral student, Department of Genetics and Complex Diseases

Laura McLaughlin is currently finishing up her fourth year as a doctoral candidate in the Department of Genetics and Complex Diseases. As an undergraduate studying molecular and cell biology at UC Berkeley, she became interested in the molecular biology of aging and age-related disorders. "I was learning that oxygen, while essential for life, is also a prevalent source of damage to cells." After college her interests spurred her to study the role of antioxidants in countering the detrimental effects of oxygen.

While investigating graduate schools, McLaughlin found a good fit with the work of Professor Bruce Demple at HSPH. What further attracted her to the PhD Program in Biological Sciences in Public Health at the school is the emphasis on prevention, "which went along with what I had learned about aging and how age-related diseases are treated."

At HSPH her research has focused on nitrosative stress, as caused by a small yet reactive molecule, nitric oxide. Nitric oxide is produced not only in the environment but also within our own bodies, where it plays important roles in cell signaling and the body's immune response. Like oxygen, however, nitric oxide can also be damaging to cells. McLaughlin's current research focuses on the mechanisms by which nitric oxide exerts these toxic effects, as well as the resistance mechanisms cells use to cope with nitrosative stress.

"The most valuable thing about HSPH is its interdisciplinary nature," says McLaughlin, who relishes opportunities to explore outside topics relevant to her own work. For the future she plans to expand her research to include other environmental toxicants and to study how such compounds affect public health.

Related Offerings

Interdisciplinary concentration in genetic and molecular epidemiology, see page 55.

Contact Information

For more information about research and training in genetics and complex diseases, please contact Julie Gound, Department of Genetics and Complex Diseases, 665 Huntington Avenue, Boston, MA 02115.
Phone: 617-432-0054
Fax: 617-432-5236
E-mail: jgound@hsph.harvard.edu

Department Faculty

Please note that some faculty members may be on leave during academic year 2003–04.

Department chair: Gökhan S. Hotamisligil, MD, PhD; James Stevens Simmons Professor of Genetics and Metabolism. Molecular basis of metabolic diseases; studies on regulatory pathways; signal transduction in mammalian cells; biology of fatty-acid binding proteins.

Bruce Demple, PhD; Professor of Toxicology. Repair enzymes for oxidative DNA damage; molecular biology of cellular responses to oxidative stress.

Karl T. Kelsey, MD, MOH; Professor of Cancer Biology and Environmental Health. Occupational and environmental carcinogenesis, including molecular epidemiologic studies of the determinants of somatic genetic changes in cancer; cancer susceptibility.

Guy L. Reed III, MS, MD; Associate Professor of Immunology. Elucidation of molecular processes leading to cardiovascular disease and stroke; identification of genetic polymorphisms that alter disease risk.

Marianne Wessling-Resnick, MS, PhD; Professor of Nutritional Biochemistry. Regulation of the cellular uptake of macromolecular nutrients; molecular basis of iron transport.

Dieter A. Wolf, MD; James Steven Simmons Associate Professor of Toxicology. Maintenance of normal genome copy through replication control and genetic identification of conserved components; role of proteolysis in replication control.

Zhi-Min Yuan, MD, PhD; James Stevens Simmons Associate Professor of Radiobiology. Cancer biology; radiation research; cell-cycle regulation; signaling pathways.

Courses of Instruction

Please note that the courses listed are subject to change and some are not offered every year. Complete course descriptions are available at http://www.harvard.edu/registrar/courses.

Principles of Toxicology

Introduction to Cancer Biology

Biomarkers in Cancer Research

Independent Study, Tutorials