

# Environmental Health Sciences

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## Overview

The Division of Occupational and Environmental Medicine in the Department of Medicine provides graduate training in environmental health sciences and offers the M.S. and Ph.D. degrees in Environmental Health Sciences. The Environmental Health Sciences program is also an official graduate program of the Program in Public Health. The Ph.D. program offers tracks in Environmental Toxicology and in Exposure Sciences and Environmental Epidemiology. The program in Environmental Health Sciences provides students with the knowledge and skills necessary and appropriate to teach and/or conduct basic and applied research programs in inhalation/pulmonary toxicology, neurotoxicology, reproductive and developmental toxicology, chemical pathology, toxicokinetics, radiation toxicology, exposure sciences, environmental epidemiology, and risk assessment.

Environmental Toxicology involves the scientific study of the entry, distribution, biotransformation, and mechanism of the action of chemical agents that are harmful to the body. The graduate program interprets environmental toxicology as the study of the effects and mechanisms of action of hazardous chemicals in food, air, water, and soil in the home, the workplace, and the community. It considers experimentally and theoretically such diverse research problems as:

- new scientific approaches to toxicological evaluation of environmental chemicals such as air and water pollutants, food additives, industrial wastes, and agricultural adjuvants at the molecular, cellular, and organism levels
- mechanisms of action in chemical toxicity
- the molecular pathology of tissue injury in acute and chronic toxicity

Exposure Sciences involves the study of human exposures to environmental contaminants in different media such as air, water, and food and via multiple routes including inhalation, ingestion, and dermal absorption. Environmental Epidemiology examines the effects of exposure to environmental pollutants and other factors on health outcomes. Research in the Exposure Sciences and Environmental Epidemiology Track includes:

- new approaches to the evaluation of human exposures to environmental chemicals, including exposure modeling and biomonitoring
- modeling individual level exposures to environmental pollutants and examining associations of these exposures with health and disease outcomes
- exposure to physical and psychosocial work environment hazards and health outcomes

Students entering the program have varied backgrounds, including chemistry, biology, and physiology. The curriculum is based on a foundation of basic and health sciences with applications of scientific principles to environmental exposures and their potential health effects. Formal course work is enriched by a strong commitment to student-professor interaction throughout the program. An important and integral part of the learning process is an early and intensive involvement of the student in ongoing original research projects in environmental health sciences, especially inhalation/pulmonary toxicology, reproductive and developmental toxicology, biochemical toxicology, chemical pathology, neurotoxicology, exposure sciences, environmental epidemiology, and risk assessment.

In addition to meeting the general admission requirements set by the Graduate Division, applicants must be admitted by an Admissions Committee composed of faculty members of the graduate program. Candidates will be selected on the basis of a balanced evaluation of the following criteria, with no one factor having more influence (1) prior scholastic performance, including a consideration of grades, course load, nature of courses taken, and college attended; (2) recommendations by professors and others; (3) scores for the general Graduate Record Examination test (GRE); (4) an interview by members of the Admissions Committee and other faculty members, when feasible; and (5) experience in undergraduate research.

Undergraduate preparation of applicants should include one year of biology (one quarter of molecular biology or biochemistry is strongly recommended) one year of mathematics (calculus and/or statistics), and one year of chemistry. Outstanding applicants who lack one or two of these prerequisites may be given an opportunity to take the required course(s) either before admission or during the first year in the graduate program; in such circumstances, none of these required undergraduate courses may be used to satisfy the program elective or core course requirements. Upper-division or graduate science courses may be considered as substitutes for the above prerequisites by the Admissions Committee.

## Doctor of Philosophy in Environmental Health Sciences

All courses must be passed with an average grade of B or better.

### Program-wide Core Curriculum

A. Select one of the following:

PUBHLTH 206

or EPIDEM 200

Principles of Epidemiology

## B. Select two of the following:

EHS 202	Principles of Environmental Toxicology
EHS 206A	Target Organ Toxicology I
EHS 206B	Target Organ Toxicology II

## C. Complete the following:

EHS 264	Introduction to Environmental Health Science
EHS 298	Seminar in Environmental Health Sciences <sup>1</sup>
EHS 299	Research Problems <sup>2</sup>

**Select one track and complete track-specific requirements:**

## 1. Environmental Toxicology Track

## D. Select one of the following:

PUBHLTH 207A or EPIDEM 204	Probability and Statistics in Public Health Biostatistics I
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## E. Select one of the following (the one not taken to fulfill program-wide core course requirement):

EHS 202	Principles of Environmental Toxicology
EHS 206A	Target Organ Toxicology I
EHS 206B	Target Organ Toxicology II

## F. Complete:

EHS 201	Case Studies in Environmental Toxicology
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## G. Complete 16 units from the approved elective pool.

## 2. Exposure Sciences and Environmental Epidemiology Track:

## H. Complete:

PUBHLTH 283	Geographic Information Systems for Public Health
PUBHLTH 207A- 207B	Probability and Statistics in Public Health and Analysis of Public Health Data Using Statistical Software
EPIDEM 205	Environmental Epidemiology

## I. Select one of the following:

PUBHLTH 279	Special Topics in Environmental & Occupational Health (Human Exposure Modeling, course # pending)
EHS 275	Environmental Modeling and Risk Management

## J. Complete 8 units from the approved elective pool.

**Approved elective pool for both tracks: <sup>3</sup>**

EHS 203	Psychosocial Occupational Epidemiology
EHS 204	Neurotoxicology
EHS 212	Inhalation Toxicology
EHS 220	Industrial Toxicology
EHS 269	Air Pollution, Climate, and Health
EHS 270	Human Exposure to Environmental Contaminants
EHS 294	Occupational Health Psychology
EPIDEM 244	Toxic Chemicals in Environment
ANATOMY 203A	Human Microscopic Anatomy
ANATOMY 203B	Human Microscopic Anatomy
DEV BIO 231B	Cell Biology
MOL BIO 203	Nucleic Acid Structure and Function
MOL BIO 204	Protein Structure and Function
PHYSIO 206A	Introduction to Medical Physiology
PHYSIO 206B	Introduction to Medical Physiology
PUBHLTH 265	Advanced Environmental Health Science

## K. Fulfill the following:

Comprehensive Exam

Qualifying Exam

Teaching Requirement

### Research Dissertation

- <sup>1</sup> All graduate students in the program will be required to take EHS 298 every academic quarter they are enrolled in the graduate program.
- <sup>2</sup> Enroll during research rotations and dissertation research.
- <sup>3</sup> Track-specific core courses for one track may be taken as electives for other track.

The normative time for advancement to candidacy is three years. The normative time for completion of the Ph.D. is five years, and the maximum time permitted is seven years.

## Master of Science in Environmental Health Sciences

All courses must be passed with an average grade of B or better.

A. Complete the following:

PUBHLTH 206

or EPIDEM 200

Principles of Epidemiology

EPIDEM 204

Biostatistics I

or PUBHLTH 207A

Probability and Statistics in Public Health

B. Select two of the following:

EHS 202

Principles of Environmental Toxicology

EHS 206A

Target Organ Toxicology I

EHS 206B

Target Organ Toxicology II

C. Complete the following:

EHS 264

Introduction to Environmental Health Science

EHS 298

Seminar in Environmental Health Sciences <sup>1</sup>

EHS 299

Research Problems <sup>2</sup>

EHS 290

Independent Study in Environmental Toxicology <sup>3</sup>

Eight units from the approved elective pool.

D. Complete one of the following plans:

Plan I:

Under the direction of a faculty advisor, prepare a thesis that is acceptable to the thesis committee

Plan II:

1. Under the supervision of a faculty member, prepare a scholarly paper based on individual study in an area of toxicology

2. Pass the written comprehensive examination.

- <sup>1</sup> All graduate students in the program will be required to take EHS 298 every academic quarter they are enrolled in the graduate program.
- <sup>2</sup> Applies to Plan I.
- <sup>3</sup> Applies to Plan II.

Opportunities for individual training and independent research experience exist in inhalation and pulmonary toxicology, atmospheric chemistry and aerosol science, neurochemistry and neurotoxicology, reproductive and developmental toxicology, toxicology of naturally occurring compounds, exposure modeling, risk assessment, chemical pathology, environmental microbiology, and environmental chemistry. Research grants and contracts are available to support qualified doctoral students as research assistants.

## Faculty

Dean B. Baker, M.D. University of California, San Diego, *Professor Emeritus of Medicine; Environmental Health Sciences; Program in Public Health*

Scott Bartell, Ph.D. University of California, Davis, *Associate Professor of Program in Public Health; Environmental Health Sciences; Social Ecology; Statistics*

Bruce Blumberg, Ph.D. University of California, Los Angeles, *Professor of Developmental and Cell Biology; Biomedical Engineering; Environmental Health Sciences; Pharmaceutical Sciences* (gene regulation by nuclear hormone receptors in vertebrate development physiology, endocrine disruption)

Stephen C. Bondy, Ph.D. University of Birmingham, *Professor of Medicine; Environmental Health Sciences; Pharmacology; Program in Public Health*

Vincent J. Caiozzo, Ph.D. University of California, Irvine, *Professor in Residence of Orthopaedic Surgery; Environmental Health Sciences; Physiology and Biophysics*

Jefferson Chan, Ph.D. University of California, San Francisco, *Professor of Pathology and Laboratory Medicine; Environmental Health Sciences*

Bongkyoo Choi, Sc.D. University of Massachusetts, *Assistant Professor of Medicine; Environmental Health Sciences; Program in Public Health*

Derek Dunn-Rankin, Ph.D. University of California, Berkeley, *Department Chair and Professor of Mechanical and Aerospace Engineering; Civil and Environmental Engineering; Environmental Health Sciences* (combustion, optical particle sizing, particle aero-dynamics, laser diagnostics and spectroscopy)

Rufus D. Edwards, Ph.D. Rutgers, The State University of New Jersey, *Professor of Program in Public Health; Environmental Health Sciences; Epidemiology*

C. Sunny Jiang, Ph.D. University of South Florida, *Department Chair and Professor of Civil and Environmental Engineering; Environmental Health Sciences* (water pollution microbiology, environmental biotechnology, aquatic microbial ecology)

Virginia Kimonis, M.B.B.S., D.C.H., M.R.C.P. University of Southampton, *Professor of Pediatrics; Environmental Health Sciences; Genetic Counseling*

Masashi Kitazawa, Ph.D. Iowa State University, *Associate Professor of Medicine; Environmental Health Sciences* (impact of neuroinflammation on the molecular pathogenesis of Alzheimer's disease and how aging and/or environmental exposure perturb physiological functions of astrocytes and microglia and disrupt inflammatory microenvironment in the brain)

Michael T. Kleinman, Ph.D. New York University, *Adjunct Professor of Community & Environ Medicine; Environmental Health Sciences; Program in Public Health*

Charles E. Lambert, Ph.D. University of California, Irvine, *Assistant Adjunct Professor of Environmental Health Sciences*

Charles L. Limoli, Ph.D. University of California, San Diego, *Professor of Radiation Oncology; Environmental Health Sciences*

Ulrike Luderer, M.D., Ph.D. Northwestern University, *Director of the Environmental Health Sciences Graduate Program and Professor of Medicine; Developmental and Cell Biology; Environmental Health Sciences; Program in Public Health* (reproductive toxicology, developmental toxicology, developmental basis of ovarian toxicity, ovarian cancer)

Oladele A. Ogunseitan, Ph.D. University of Tennessee, *Department Chair and Professor of Program in Public Health; Environmental Health Sciences*

Kathryn Osann, Ph.D. University of California, Berkeley, *Adjunct Professor of Medicine; Environmental Health Sciences*

Robert F. Phalen, Ph.D. University of Rochester, *Professor of Medicine; Environmental Health Sciences*

John L. Redpath, Ph.D. University of Newcastle, *Professor Emeritus of Radiation Oncology; Environmental Health Sciences*

Ronald C. Shank, Ph.D. Massachusetts Institute of Technology, *Professor Emeritus of Medicine; Environmental Health Sciences*

Veronica M. Vieira, D.Sc. Boston University, *Professor of Program in Public Health; Environmental Health Sciences*

Jun Wu, Ph.D. University of California, Los Angeles, *Associate Professor of Program in Public Health; Environmental Health Sciences*