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## PhD in PHYSIOLOGY

Physiology is the branch of biology dealing with the processes, activities, and dynamics of life and living organisms. The focus of physiology is on function, rather than on the individual processes that contribute to that function. Traditional physiologic approaches have emphasized studies in intact animals and organs. However, modern technological advances have allowed physiologic studies to extend these living system models to cellular and molecular levels. The Division has a primary focus on the physiology of the lung. The lung is the major target organ for environmental air pollutants, and lung disease is a major international public health problem. Faculty and students are involved in investigating basic mechanisms in lung disease and the interactions with toxic gases, airborne particles, and biological agents.

Research toward a doctoral degree in physiology leads to competency in at least one of several domains focused on cardiopulmonary pathophysiology, involving tissues such as lung epithelium, airway smooth muscle, pulmonary and bronchial blood vessels, lung interstitium, and immunologic cells. Students develop knowledge and expertise in general subject areas relevant to structure/function relations in human and animal models, including genetic and environmental factors underlying lung disease—particularly asthma, emphysema, and other inflammatory airway diseases; contemporary imaging technology; and writing scientific papers and grant proposals. Students in this program may have backgrounds in biology, biomedical engineering, chemistry, physics, pharmacology, or toxicology.

### DIVISIONAL SEMINAR

Current Research in Physiology (183.861) is required in each academic term during the entire training program. This course involves presentations by students, fellows, and faculty expounding their ongoing research, or in the case of new students, their research interests. Students must present at least once per year.

## THE RESEARCH ROTATION PROGRAM

Each predoctoral student must complete at least three research rotations. The purpose of these research rotations is first to expose the students to the spectrum of physiologic research questions and laboratory methods, and second to help students select a lab for their own thesis research. Selection of the laboratories for these rotations depends upon the needs and interests of the student – the specific labs are chosen in discussions with the academic advisor and the Divisional director.

The research rotation program is structured as follows:

1. Objective and duration: The goal and plan for each rotation must be agreed upon before it begins through discussions between the student and the faculty member. The duration will depend upon the time the student can devote to the lab but should typically be 6 to 8 weeks.
2. At the end of each rotation, students must prepare 2-3 page report summarizing the goals, results, and conclusions drawn from the research experience.
3. Students must complete their rotations by the end of the 2nd year, by which time they must select their thesis advisor.

## TRAINEE SUPPORT

The major source of support for pre- and postdoctoral students in the Division of Physiology is a training grant funded by the National Health, Lung, and Blood Institute (NHLBI). Each student on the training grant receives a stipend, health insurance coverage, and tuition. Training grant support for predoctoral students is limited to five years. In addition, the training grant provides travel to a relevant scientific meeting, and students are strongly encouraged to attend at least one major meeting during each year in the program. All trainees are expected to indicate on their Curricula Vitae (CV) that they were NHLBI trainees supported by training grant HL07534. This support should also be acknowledged in all publications resulting from pre- and postdoctoral research.

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## **GRADE REQUIREMENTS**

All students must maintain at least a 3.0 average to remain in the program. Furthermore, the faculty members expect that students will not obtain any grade below a “B”. It is the general policy of this program that students may not have more than one “C” remain on their transcript. Exceptions may be made for Physiology students taking courses designed for M.D. students in the School of Medicine. No grade of less than “C” is considered acceptable. Any course where a grade less than “C” is obtained must be taken over and a grade of “B” or higher achieved. A student with more than one “C” will be placed on academic probation and undergo a formal academic review by the faculty. Based on the outcome of this review, she/he may be asked to leave the program.

In order to monitor and document adequate academic performance and progress, the student’s advisor performs an assessment at the end of the first year of the program. The advisor assesses coursework performance (e.g., GPA), lab rotations, and general interactions with faculty, and *must* sign off for the student to continue (via a formal End of the First Year Report). The student has an opportunity to add comments to the review form and must also sign the form, which should be submitted to the Office of Educational Programs.

## **ATTENDANCE AND VACATION**

Students are expected to attend classes regularly, including Journal Clubs and Seminars. Scheduling conflicts that arise must be discussed with the student’s advisor. Since research is a fundamental part of the curriculum, it is expected that students will work in the laboratory during term breaks and summers. Generally, students will take no more than two weeks vacation per year. The advisor should be informed of vacation plans and of any plans to be absent for extended periods.

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**Department of Environmental Health Sciences**  
**PhD in Physiology**  
**Core Curriculum Schedule – 1st Year**

**First Term**

120.602 Introduction to Molecular Biology	TTh 1:30-2:50	4 units
180.609 Principles of Environmental Health I	MW 1:30-3:20	4 units
183.840 Special Studies/Research (Physiology)	TBA	4 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit
187.610 Public Health Toxicology	WF 3:30-4:50	4 units
550.865 Public Health Perspectives on Research I	F 1:30-2:50 <i>or</i> T 10:30-11:50	<u>1 unit</u> 18 units

**Second Term**

120.603 Molecular Biology of Disease	Th 1:30-3:20	3 units
180.610 Principles of Environmental Health II	TTh 8:30-10:20	4 units
183.840 Special Studies/Research (Physiology)	TBA	4 units
183.631 Fundamentals of Human Physiology	MW 1:30-3:20	4 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit
550.860 Research Ethics (306.665 may be taken instead during 3rd term)	Internet	1 unit
550.866 Public Health Perspectives on Research II	F 1:30-2:50 <i>or</i> T 10:30-11:50	<u>1 unit</u> 18 units

**Third Term**

140.615 Statistics for Laboratory Scientists I <i>(Note: May be taken during 2<sup>nd</sup> year)</i>	MWF 10:30-11:20 *	4 units
183.840 Special Studies/Research (Physiology)	TBA	6 units
183.642 The Cardiopulmonary System Under Stress	Th 3:00-5:00	2 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit
306.665 Research Ethics and Integrity <i>(550.860 may be taken instead during 2nd term)</i>	TTh 1:30-2:50	3 units

**Recommended Elective Courses:**

180.640 Molecular Epidemiology and Biomarkers in PH	TTh 2:30-3:50	4 units
183.635 Mathematical Approaches to Physiological Problems	TBA	3 units
187.632 Molecular Toxicology	MWF 10:30-11:50	<u>4 units</u> 16-20 units

**Fourth Term**

183.840 Special Studies/Research (Physiology)	TBA	4 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit
360.720 Organ Systems/Physiology (SOM)	[days and times vary]	7 units

**Recommended Elective Courses:**

183.641 The Health Effects of Indoor and Outdoor Air Pollution <i>(Note: Every other year.)</i>	TTh 1:30-2:50	3 units
188.860 Tutorial in Tissue Injury, Inflammation, and Repair <i>(Note: Every other year.)</i>	TBA	3 units
187.634 Molecular Dosimetry and Biomarkers	MWF 10:30-11:50	<u>4 units</u> 16-20 units

TBA: Will be determined by the instructor in consultation with the student(s) at the time the course is offered.

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**Department of Environmental Health Sciences**  
**PhD in Physiology**  
**Core Curriculum Schedule – 2nd Year**

**First Term**

183.840 Special Studies/Research (Physiology)	TBA	4 units
183.638 Mechanisms of Cardiopulmonary Control	Th 3:00-5:00	2 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit
550.865 Public Health Perspectives on Research I	F 1:30-2:50 <i>OR</i> T 10:30-11:50	1 unit

Recommended Elective Courses:

260.611 Principles of Immunology I (Part I of II)	TTh 8:30-10:20	4 units
317.600 Introduction to the Risk Sciences and Public Policy	MW 5:00-6:30	3 units
340.601 Principles of Epidemiology	MWF 8:30-9:20 *	<u>5 units</u>
		16-20 units

**Second Term**

183.840 Special Studies/Research (Physiology)	TBA	4 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit
550.866 Public Health Perspectives on Research II	F 1:30-2:50 <i>OR</i> T 10:30-11:50	1 unit

Recommended Elective Courses:

187.630 Xenobiotic Metabolism	MWF 10:30-11:50	3 units
260.612 Principles of Immunology II (Part II of II)	TTh 8:30-10:20	<u>4 units</u>
		16-20 units

**Third Term**

140.615 Statistics for Laboratory Scientists I <i>(Note: May be taken during 1<sup>st</sup> year)</i>	MWF 10:30-11:20 *	4 units
183.840 Special Studies/Research (Physiology)	TBA	4 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit

Recommended Elective Courses:

180.640 Molecular Epidemiology and Biomarkers in Public Health	TTh 2:30-3:50	4 units
182.626 Tropical Environmental Health	T 8:30-10:20	2 units
182.640 Food- and Water-borne Diseases	TTh 1:30-2:50	3 units
183.635 Mathematical Approaches to Physiological Problems	TBA	3 units
187.632 Molecular Toxicology	MWF 10:30-11:50	4 units
187.641 Environmental Immunology <i>(Note: Every other year)</i>	TTh 1:30-2:50	3 units
260.665 Biological Basis of Aging <i>(Note: Every other year)</i>	TTh 1:30-2:50	<u>3 units</u>
		16-20 units

**Fourth Term**

140.616 Statistics for Laboratory Scientists II	MWF 10:30-11:20 *	4 units
183.840 Special Studies/Research (Physiology)	TBA	4 units
183.643 Essentials of Pulmonary Function Measurements	TBA	3 units
183.861 Current Research in Physiology	W 12:00-1:20	1 unit

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### Recommended Elective Courses:

182.615 Airborne Particles	F 9:30-11:50	3 units
183.641 Health Effects of Indoor and Outdoor Air Pollution (Note: Every other year)	TTh 1:30-2:50	3 units
187.620 Toxicological Pathology (Note: Every other year)	WF 3:00-4:50	4 units
187.634 Molecular Dosimetry and Biomarkers	MWF 10:30-11:50	4 units
187.661 Environmental Hlth in Neurotox & Mental Disorders (Note: Every other year)	TTh 1:30-2:50	3 units
188.860 Tutorial in Tissue Injury, Inflammation, and Repair (Note: Every other year)	TBA	<u>3 units</u> 16-20 units

TBA: Will be determined by the instructor in consultation with the student prior to the term when the course is offered.

\* Check current schedule for lab times (<http://commprojects.jhsph.edu/courses>)

### **School Requirements**

The following courses fulfill the School requirements for all research students. Doctoral students who have earned a MPH Degree within the last ten years are waived from the 550.865-866 requirements. In addition, all students are required to complete the Academic Ethics Module (on-line course), which is located at <http://apps1.jhsph.edu/academicethics/>. This module should be completed within two terms of matriculation and must be completed before graduating.

550.865 Public Health Perspectives on Research I	T 10:30-11:50 <i>OR</i> F 1:30-2:50 1 <sup>st</sup> term	1 unit
550.866 Public Health Perspectives on Research II	T 10:30-11:50 <i>OR</i> F 1:30-2:50 2 <sup>nd</sup> term	1 unit
306.665 Research Ethics and Integrity <i>or</i> 550.860 Research Ethics	TTh 1:30-2:50 3 <sup>rd</sup> term Internet 2 <sup>nd</sup> term	3 units 1 unit
Academic Ethics Module	Internet	