

# ENVH 505: Fundamentals of Environmental and Occupational Toxicology

Spring 2020, 4 credits

Prerequisites: 2 quarters of biology, 2 quarters of chemistry; or permission of instructor

Lectures: Mon, Wed, Fri 11:30 - 12:20 pm

Graduate Student Presentations: Tue 1:30 – 2:20 pm

Office Hours by appointment only

## Instructors

Rebekah Petroff (she/her/hers) – [petroffr@uw.edu](mailto:petroffr@uw.edu)

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Dr. Lucio Costa (he/him/his) – [lqcosta@uw.edu](mailto:lqcosta@uw.edu)

## Guest Lectures

Dr. Julia Cui – [juliacui@uw.edu](mailto:juliacui@uw.edu)

Dr. Chase Williams – [crw22@uw.edu](mailto:crw22@uw.edu)

Dr. David Scoville – [dkscov@uw.edu](mailto:dkscov@uw.edu)

Dr. Brit Weldon – [brittany.a.weldon@gmail.com](mailto:brittany.a.weldon@gmail.com)

## Textbooks

**Required:** Casarett & Doull's Essentials of Toxicology, 3rd Edition, Curtis D. Klaassen & John B Watkins III, McGraw Hill, 2010.

**Available as an eBook through the UW Libraries or [online at this website](#).**

**Optional:** Introduction to Toxicology, 3rd Edition by John Timbrell, Taylor & Francis, 2002

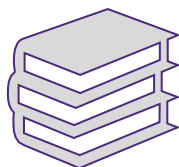
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## Course Resources



*Email me here!*



*Online Textbook*



*The University of Washington acknowledges the Coast Salish peoples of this land, the land which touches the shared waters of all tribes and bands within the Suquamish, Tulalip and Muckleshoot nations.*

# 1. Course Description

This graduate level course is designed for non-toxicology majors and covers the basic principles governing the behavior and effects of environmental contaminants on biological systems, including: toxicity testing; disposition of environmental contaminants in the body; modifiers of response; fate and health effects of environmental contaminants, including damage to major organ systems; cancer; birth defects; and risk assessment and government regulation of environmental contaminants. The focus is on human health impacts of environmental contaminants in a public health context. Additional readings and presentations/discussions provide graduate-level coverage of related issues.

As per UW oversight, this course will be taught remotely. **We will use Zoom to share the lecture live, at the scheduled time.** Lectures will not be recorded, but slides will be available online. Please be patient throughout the quarter, as there will be technical difficulties. I will do my very best to keep these to a minimum. Please contact me if you have any questions or concerns with this technology.

## Learning Objectives

- Explain the principles of dose-response and the descriptors used to define individual susceptibility to environmental contaminants.
- Discuss the different types of testing paradigms used to evaluate the adverse health effects of contaminants.
- Explain the concepts of absorption, distribution, metabolism and excretion, and their integral roles as determinants of adverse health outcomes.
- Discuss the impact of genetic variation, diet, age, gender, and infectious disease status on contaminant disposition and dose-response relationships.
- Discuss the consequences of contaminant exposure for different organs, especially the liver, the kidneys, the brain, and respiratory systems, and why some contaminants target these organs.
- Identify susceptible periods of embryonic/fetal development that predispose to various kinds of contaminant-induced birth defects.
- Describe the basic processes of chemical carcinogenesis that lead to cancer.
- Discuss occupational practices and regulations designed to limit exposures and toxicity in the workplace, biomonitoring, and the roles of occupational health professionals in workplace safety.
- Categorize contaminant with respect to chemical class, mode of action, and potency.
- Describe the major sources of pollution in air, water and soil, the contaminants of concern in the environment, and the distribution, fate and ecological effects of various pollutants.
- Integrate the concepts of exposure and hazard as they relate to risk, distinguish between risk assessment scenarios that assume threshold vs. non-threshold responses, and discuss various risk management strategies used to limit contaminant exposures.
- Define the statutory authority governmental agencies use to control contaminant releases to the environment, exposures in the workplace, and clean-up of contaminants; describe the means by which exposure criteria and standards are established, and discuss the economic, political, and ethical dilemmas associated with the regulation of contaminants.
- Lead discussion and effectively interpret and communicate the findings of current research papers in the field.

## 2. Grading

Exam I	25%
Exam II	25%
Exam III	25%
Class Presentation	25%

Exams will be worth a total of 100 points each.

**Exams will be timed and administered entirely via Canvas.**

If you have any concerns about the class, please contact me ([petroffr@uw.edu](mailto:petroffr@uw.edu)) to arrange a meeting on Zoom. If you are still not satisfied with the response that you receive, you may contact my faculty oversight, Dr. Lucio Costa ([lgcosta@uw.edu](mailto:lgcosta@uw.edu)), or the DEOHS Department Chair. You may also contact the Graduate School by phone at (206)685-3519 or by email at [gsacad@uw.edu](mailto:gsacad@uw.edu).

### Academic Integrity Statement

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity.

The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part.

Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the [SPH Academic Integrity Policy](#). Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, please feel free to review the [University of Washington Community Standards and Student Conduct](#).

## 3. Course Schedule

<u>Date</u>	<u>Topic</u>	<u>Lecturer</u>	<u>Reading</u>
March 30	Introduction/History of Toxicology	Petroff/Gallagher	Ch. 1
March 31	Intro to Presentations		
April 1	Basic Principles of Tox	Gallagher	Ch. 2
April 3	Disposition I – Absorption/Distribution	Petroff	Ch. 5, 7
April 6	Disposition II – Metabolism	Gallagher	Ch. 6
April 7	Presentation 1		
April 8	Disposition III – Excretion	Petroff	Ch. 5, 7
April 10	Toxicity Testing/Routes of Exposure	Petroff	Ch. 2
April 13	Modifying Factors of Toxic Responses	Gallagher	Ch. 3
April 14	Presentation 2		

April 15	Developmental and Reproductive Toxicology	Petroff	Ch. 10, 20
April 17	Toxicity of the Liver	Cui	Ch. 13
April 20	Toxicity of the Nervous System	Petroff	Ch. 16
April 21	Presentation 3		
<b>April 22</b>	<b>Exam 1 (material through April 15)</b>		
April 24	Toxicity of the Gut Microbiome	Cui	Handout
April 27	Toxicity of the Lung	Scoville	Ch. 15, 29
April 28	Presentation 4		
April 29	Genetic Toxicology	Petroff	Ch. 9
May 1	Chemical Carcinogenesis	Gallagher	Ch. 8
May 4	Ecotoxicology	Gallagher	Ch. 30
May 3	Presentation 5		
May 6	Toxic Metals I	Williams	Ch. 23
May 8	Toxic Metals II	Williams	Ch. 23
May 11	Industrial Tox	Weldon	Ch. 24, 34
May 12	Presentation 6		
<b>May 13</b>	<b>Exam 2 (material April 16-May 8)</b>		
May 15	Food Additives and Contaminants	Costa	Ch. 31
May 18	Pesticides I	Costa	Ch. 22
May 19	Presentation 7		
May 20	Pesticides II	Costa	Ch. 22
May 22	Natural Toxins	Petroff	Ch. 26
<b>May 25</b>	<b>Memorial Day – NO CLASS</b>		
May 26	Presentation 8		
May 27	Emerging Contaminants	Petroff	Handout
May 29	Emerging Contaminants in Puget Sound	Gallagher	Handout
June 1	Risk Assessment	Gallagher	Ch. 4
June 2	Presentation 9		
June 3	Regulation	Petroff	Handout
June 5	Review and Course Summary	Petroff/Gallagher	
<b>June 10*</b>	<b>Final Exam (material May 11-end)</b>		

\*held at 2:30-4:30 pm, per UW schedule

## 4. Equity, Diversity, Inclusion and Accessibility

I value your learning and experience in this course. We all need accommodations and adjustments to best succeed in life. If there are aspects of this course that detract from your

learning or exclude you, please let me know as soon as possible. I am happy to work with you and any resources at UW to accommodate your needs.

Below are the official statements from UW SPH on related topics and accommodations. Note that these are the minimum standards that I follow. I will work with you above and beyond these policies to reasonably adapt the course for you and your learning.

### UW Disability Statement

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or [uwdrs@uw.edu](mailto:uwdrs@uw.edu) or [disability.uw.edu](http://disability.uw.edu). DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructors, and DRS. I strongly agree with and abide by the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

### Religious and Hardship Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy](#). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form](#).

### Equity, Diversity and Inclusion (EDI) Statement

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, students are expected:

- To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
- To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
- To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program's director.

Please visit the link above for an in-depth statement on our commitment to diversity.

## Bias Concerns

The Office of the Dean has a [student concern policy](#), a faculty concern policy and standard HR procedures for staff concerns. Our 2018 climate survey states that most people in SPH do not report bias incidents because they do not know where to go. Students are encouraged to report any incidents of bias to someone they feel comfortable with, including instructors, advisers or department staff. They can email [dcinfo@uw.edu](mailto:dcinfo@uw.edu) for immediate follow up. Bias concerns can be anonymously and confidentially reported at [this link](#). Data is collected by the Assistant Dean for EDI and the Director of Program Operations for Student and Academic Services and tracked for resolution and areas are identified for further training.

## 5. Supplemental Materials

### Presentation Guidelines

As part of a group, you will have the responsibility of presenting/discussing one presentation during the quarter (typically 2-3 students/group). The presentation will focus on a current chemical (or group of chemicals) of your choosing for which there is controversy regarding a major aspect of its human or environmental health risk.

One approach would be for Student 1 to provide a 10- to 12-minute introduction to the compound in controversy, including background, sources and magnitude of toxicant exposure, and modes of toxicity. Following the introduction, Student 2 may present an argument supporting that the compound is of low health risk, and Student 3 may provide a case for potentially banning the compound due to an unacceptable level of risk. All students should present a succinct but high-level discussion of these issues based upon the most current scientific literature and allowing 5-10 minutes for class discussion. Your group presentation should be no more than 35 minutes to allow for class discussion. All students should participate in weekly discussions of the presented topics.

It is important when citing scientific papers to critically evaluate the methods used for testing any hypothesis associated with a paper, and to be critical of potential artifacts or shortfalls to the best of your ability. You may want to discuss in detail one or two tables or figures in a paper that you feel are particularly crucial to the topic, but it is not necessary to discuss in detail every table or figure. A list of some current toxicology-oriented journals can be found [here](#).

I will evaluate each presentation based on the knowledge of the topic and the discussion of points/questions related to journal articles published on this topic. Other students in the class are encouraged to submit constructive comments/feedback, and I will blind them and forward them to the presenters.

**On the Monday before your presentation, please upload electronic copies of a key paper for discussion and your group's presentation (MS Power Point or PDF format) to [Canvas](#).**

### General Guidelines and Suggestions while Reviewing Literature

1. Examine papers with the perspective of the level of the current journal, e.g. don't hold a paper in the *Bulletin of Environ Contam* to the same standards as a paper submitted to *Biological Chemistry*.

2. Is the topic of the paper current and relevant to the field of toxicology? Has this work been accomplished elsewhere (i.e. is it original)? This point is critical and may require some diving into the literature to answer the question.
3. Does the paper address a mechanism of toxicity?
4. Is it hypothesis driven? If not, is there an implied hypothesis or an objective stated in the paper early on that is clearly evaluated later in the paper?
5. Are the methods current and appropriate to test the hypotheses /objective(s) presented? Can you suggest better experimental approaches?
6. Do the authors indeed measure what they say they're measuring (e.g. is the sample prep and handling appropriate, are the assays optimized and specific for the endpoints of interest, etc.)? What are the chances that the results obtained are due to artifacts (statistical or otherwise)? Do you "believe" the data?
7. Are the statistical analyses appropriate?
8. Are the figures of high quality? Are there excess figures in the manuscript, i.e., can the data be better presented in a table? Should certain figures or tables be omitted from the manuscript or perhaps placed in supplementary files?
9. Are the references current or out of date?
10. Does the paper make a significant contribution to the field of toxicology?