

ENV H 514 A Au 21: Fundamentals Of Toxicology

[Jump to Today](#)
 [Edit](#)

Autumn Quarter, 2021

Classes will take place in person on **Monday** and **Wednesday 1:00-2:20pm** in **HSB BB1602**. Campus map can be found [here ↗ \(https://depts.washington.edu/disteche/images/healthsciencesmap.pdf\)](https://depts.washington.edu/disteche/images/healthsciencesmap.pdf). The first class will take place on **Monday October 4th at 1:00pm**. All class sessions will also be recorded and post on Canvas after each session. Please refer to the [Modules](#) page for links to recorded sessions and other course materials.

For details on course schedule please refer to the [course schedule](#) page, also pasted below for direct access:

2021 ENV H 514 Schedule

Date	Topic	Proposed Lecturers	Chapters in textbook
10/04	History of Toxicology	Julia Yue Cui	Unit I, Chapter 1
10/06	Principles of Toxicology	Julia Yue Cui	Unit I, Chapter 2
10/11	Mechanisms (Step 1)	Julia Yue Cui	Unit I, Chapter 3
10/13	Mechanisms (Step 2)	Julia Yue Cui	Unit I, Chapter 3
10/18	Mechanisms (Step 3)	Julia Yue Cui	Unit I, Chapter 3
10/20	Mechanisms (Step 4)	Julia Yue Cui	Unit I, Chapter 3
10/25	Block I optional review Q&A	Julia Yue Cui	Unit I, Chapters 1-3
10/27	Risk Assessment	Elaine Faustman	Unit I, Chapter 4
11/01	BLOCK I EXAM		
11/03	ADME I	Julia Yue Cui	Unit II, Chapter 5
11/08	ADME II	Julia Yue Cui	Unit I, Chapter 4
11/10	Biotransformation I	Julia Yue Cui	Unit II, Chapter 6
11/15	Biotransformation II	Julia Yue Cui	Unit II, Chapter 6
11/17	Biotransformation III	Julia Yue Cui	Unit II, Chapter 6
11/22	Toxicokinetics	Edward Kelly	Unit II, Chapter 7
11/24	BLOCK II EXAM		
11/29	Toxicogenomics/epigenetics	Julia Yue Cui	N/A
12/01	Microbiome and metabolome and applications in toxicology research	Julia Yue Cui	N/A
12/06	Chemical Carcinogenesis	Tom Kensler	Unit III, Chapter 8
12/08	BLOCK III EXAM		
12/13	FINAL EXAM		

Students are encouraged to use the [Modules](#) page for each lecture.

Course Director:

Julia Yue Cui, PhD, DABT

Sheldon Murphy Endowed Associate Professor

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Guest Lecturers:

Elaine Faustman <faustman@uw.edu (<mailto:faustman@uw.edu>)>

Edward Kelly <edkelly@uw.edu (<mailto:edkelly@uw.edu>)>

Thomas Kensler <tkensler@fredhutch.org>

I. Course Overview

In this class, we will discuss fundamental cellular processes and core areas of toxicology, including dose response and toxicity testing, absorption, distribution, metabolism, and excretion of toxicants, mechanisms of intoxication and detoxification, risk assessment, drug biotransformation, toxicokinetics, proteomics, toxicogenomics/toxico-epigenetics, and chemical carcinogenesis. With the information provided from this class, students will be able to have a good appreciation for how foreign chemicals, including therapeutic drugs, dietary factors, and environmental chemicals, interact with cellular pathways to affect toxicological outcomes. Guest lecturers will provide valuable input in the course to provide coverage of subject areas within their respective areas of expertise.

II. Learning Objectives

At the end of this course, the students will be able to:

- Explain dose-response theory
- Describe the process of absorption, distribution, metabolism, and excretion (ADME) of toxicants
- Describe biochemical mechanisms of toxicity
- Describe reactions and enzymes/transporters involved in biotransformation of toxicants
- Explain risk assessment
- Identify signaling transduction pathways that govern the expression and activities of xenobiotic biotransformation related genes
- Define basic principles of toxicokinetics
- Discuss toxicogenomics and toxico-epigenetics
- Discuss proteomics
- Describe basic principles of genetic toxicity, different stages and key players of chemical carcinogenesis

III. Intended Student Audience

The ENVH 514 serves as one of the core toxicology course curriculums for graduate students who are pursuing a graduate degree in the Department of Environmental and Occupational Health Sciences. It is also appropriate for senior undergraduate students or graduate students from other allied biomedical science departments, e.g. Pharmacology, School of Pharmacy, Chemistry, Molecular & Cellular Biology, Genome Sciences, Epidemiology,

Fisheries etc., who are interested in gaining a basic understanding of toxicology. Prerequisites for this class include a year of undergraduate general biology, two quarters of chemistry, and/or biochemistry.

IV. Course Resources

- **Required Reading:** [Handout materials](#) will be provided for most classes and are the focus of class material.
- **Reference textbook for ENVH 514:** [Casarett & Doull's Toxicology, The Basic Science of Poisons 9th Edition \(2019\)](#) ↗ (<https://accesspharmacy-mhmedical-com.offcampus.lib.washington.edu/book.aspx?bookid=2462>)

This textbook is also available as an eBook and can be accessed from UW Libraries

Search <http://www.lib.washington.edu/> ↗ (<http://www.lib.washington.edu/>) (need to type the textbook information in the search box). Direct access: [Content available: McGraw-Hill's AccessPharmacy view license terms](#) ↗ (<https://accesspharmacy-mhmedical-com.offcampus.lib.washington.edu/book.aspx?bookid=2462>)

If you wish to purchase a hard copy as a reference (optional), it can be obtained from various resources such as www.amazon.com ↗ (<http://www.amazon.com>)..

Students are strongly encouraged to read the corresponding book chapters for each class.

- **Additional online resources - The Eminent Toxicologist Lectures**

<http://www.toxicology.org/education/edu/minent.asp> ↗
(<http://www.toxicology.org/education/edu/minent.asp>)

This online course series developed by the Society of Toxicology are historically relevant and high quality presentations that are valuable resources for graduate students and the general public.

V. Grading: The final grade for this class will include the following components (total: 100 points):

- Block I Exam (30 points)
- Block II Exam (30 points)
- *Case Studies: "Man-made Disasters of the 21st Century" (10 points) **This will be carried out in group presentations format - contact me (juliacui@uw.edu (<mailto:juliacui@uw.edu>)) if you are not able to attend classes in person for an alternative assignment.*
- Final Exam (30 points)

Grades will be converted into a 4.0 scale based on the calculations [here](#).

**More information on Case Studies: "Man-made Disasters impacting the 21st Century":*

You do the teaching this time!

Each student will be able to choose to participate in 1 of the 5 [research topics](#) and work as a team to perform literature search and develop a 10 min PPT presentation to address the following 4 key points using the knowledge you have learned from this class:

- Research on the topic that you have selected. Identify the key toxic agent(s) involved in this historical incidence, and its impact on public health

- How does this toxicant enter the body and reach the target organs, and what are the mechanisms of toxicity?
- How does the body detoxify/eliminate this toxicant (if possible), and are there any antidotes available? What are the therapeutic management options or preventive measures that one could take to mitigate the toxicity or reduce the exposure risks?
- What has happened since this man-made disaster occurred? How does this incidence affect our society's response and policy-making about environmental health hazards?

Students from each group will take turns to present their PPT slides in class (10 min presentation + 5 min Q&A). Recommended numbers of slides: 10-15, including a title slide with all presenters' names, a conclusion slide, and a slide on references cited).

Suggestions on credible sources: primary literature (e.g. [PubMed ↗ \(https://pubmed.ncbi.nlm.nih.gov/\)](https://pubmed.ncbi.nlm.nih.gov/), [Web of Science ↗ \(https://www.webofscience.com/wos/woscc/basic-search\)](https://www.webofscience.com/wos/woscc/basic-search), [UW Libraries ↗ \(https://www.lib.washington.edu/\)](https://www.lib.washington.edu/)), general search engines (e.g. [google](https://www.google.com/)), [↗ \(https://www.google.com/\)](https://www.google.com/) high quality news sources (e.g. [New York Times ↗ \(https://www.nytimes.com/\)](https://www.nytimes.com/), [BBC ↗ \(https://www.bbc.com/\)](https://www.bbc.com/), [CNN ↗ \(https://www.cnn.com/\)](https://www.cnn.com/), etc.).

Grading rubric for the group presentations (10 points):

- Clarity in delivering the presentation (2 pts)
- Focus and scope (being able to address all the key points) (2 pts)
- Content (evidence of critical thinking and accurate evaluation of the topic) (3 pts)
- Research (sources effectively and accurately support the statements) (1 pts)
- Q&A (being able to address the questions from the audience accurately and thoroughly) (2 pts)

Please [sign up](#) (first come, first serve) and choose your topics by 12/01 11:59pm.

VI. Absence Policy

While attendance at all discussion sessions is required, we understand that extenuating circumstances may arise. Valid excuses for missing class include a) participation in an official school activity (e.g., athletic event) or b) illness with valid doctor's note. All other situations will be handled on a case-by-case basis. If the absence is planned, a written notice (via email) must be submitted to the instructors no less than one week prior to the discussion session (earlier is better). If the absence is unforeseen, a written explanation must be submitted within one week of returning to school.

VII. Access and Accommodations

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 visit the website: [http://depts.washington.edu/uwdrs/ ↗ \(http://depts.washington.edu/uwdrs/\)](http://depts.washington.edu/uwdrs/). 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 instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

VIII. Religious 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](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/) ↗ (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). Accommodations must be requested within the first two weeks of this course using [the Religious Accommodations Request form](https://registrar.washington.edu/students/religious-accommodations-request/) ↗ (<https://registrar.washington.edu/students/religious-accommodations-request/>).

IX. Academic Integrity

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. In addition to earning a grade of zero on the assignment or exam, all cases will be referred to the University Disciplinary Committee. For more information, see the [University of Washington Community Standards and Student Conduct website](https://www.washington.edu/cssc/) ↗ (<https://www.washington.edu/cssc/>).

X. Diversity and Inclusion

The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. Diverse backgrounds, embodiments, and experiences are essential to the critical thinking endeavor at the heart of university education. Therefore, I expect you to follow the UW Student Conduct Code in your interactions with your colleagues and me in this course by respecting the many social and cultural differences among us, which may include, but are not limited to: age, cultural background, disability, ethnicity, family status, gender identity and presentation, citizenship and immigration status, national origin, race, religious and political beliefs, sex, sexual orientation, socioeconomic status, and veteran status. Please talk with me right away if you experience disrespect in this class, and I will work to address it in an educational manner. DCinfo@uw.edu (<mailto:DCinfo@uw.edu>) is a resource for students with classroom climate concerns.

XI. COVID-related expectations

Per UW policy, this class will be conducted in person. Therefore, unless you meet the criteria for an accommodation from Disability Resources for Students (DRS) or a special arrangement approved by the SPH Office of the Dean that allows you to take the course remotely [[see student communications here](#)] ↗ (https://sph.washington.edu/sites/default/files/2021-08/UWSPH_RTC_Student-Email.pdf) you should only register for this class if you can attend in-person.

- Please contact UW Disability Resources for Students (DRS) directly if you feel you may be eligible for an accommodation based on your status as an immunocompromised individual or based on other diagnosed physical or mental health conditions that might prevent you from being able to take classes in-person.
- If you are a student enrolled in a program in SPH, and you are either living with an individual who is immunocompromised, OR you are unable to obtain a visa to travel to the US, you may be eligible for a “special arrangement” that will allow you to take this course remotely. Requests for special arrangements to take the class remotely should have been submitted to and approved by the Students and Academic Services team in the Office of the Dean before the beginning of the quarter. If you have questions about this type of arrangement, please reach out to Student and Academic Services by email at sphsas@uw.edu (<mailto:sphsas@uw.edu>).

All UW students are expected to complete their [vaccine attestation](#) ↗

(<https://www.washington.edu/coronavirus/vaccination-requirement/>) before arriving on campus and to follow the campus-wide face-covering policy at all times. You are expected to follow state, local, and UW COVID-19 policies and recommendations. If you feel ill or exhibit possible COVID symptoms, you should not come to class. If you need to temporarily quarantine or isolate per CDC guidance and/or [campus policy](#) ↗

(<https://www.washington.edu/coronavirus/2021/08/31/autumn-quarter-health-and-safety-measures-message-to-uw-personnel/>), you are responsible for notifying your instructors as soon as possible by email. **If you receive a positive COVID-19 test result, you must report to campus Environmental Health & Safety (EH&S) by emailing covidehc@uw.edu (<mailto:covidehc@uw.edu>) or calling 206-626-3344.**

No food or drinks are allowed in the classroom.

Please check your email daily BEFORE coming to class. If we need to conduct class remotely because the instructor or a guest speaker is complying with UW policies and unable to attend in person, we will send all registered students an email with a Zoom link for remote instruction. Thank you for your patience and support as we all transition together back to in-person learning!

Course Summary:

Date	Details	Due
Mon Nov 1, 2021	 <u>BLOCK I EXAM</u> (https://canvas.uw.edu/courses/1478676/assignments/6617832)	due by 2:20pm
Tue Nov 16, 2021	 <u>BLOCK II EXAM</u> (https://canvas.uw.edu/courses/1478676/assignments/6617831)	due by 4:50pm
Wed Nov 24, 2021	 <u>Sign up for group presentations by 11/24</u>	to do: 11:59pm
Wed Dec 8, 2021	 <u>Case Study: Man-made Disasters Impacting the 21st Century</u>	to do: 1pm
Thu Dec 16, 2021	 <u>FINAL EXAM</u> (https://canvas.uw.edu/courses/1478676/assignments/6617830)	due by 5:40pm

Date	Details	Due
	<p> <u>2020 Poll everywhere pre-class survey</u> (https://canvas.uw.edu/courses/1478676/assignments/6617833)</p>	
	<p> <u>Additional resources for Lecture 2: Dr. Curtis Klaassen's Eminent Toxicology Lecture</u> (https://canvas.uw.edu/courses/1478676/assignments/6617834)</p>	
	<p> <u>Biotransformation</u> (https://canvas.uw.edu/courses/1478676/assignments/6617835)</p>	
	<p> <u>Chemical carcinogenesis and toxicokinetics</u> (https://canvas.uw.edu/courses/1478676/assignments/6617836)</p>	
	<p> <u>Lecture 1 History of Toxicology Poll quiz</u> (https://canvas.uw.edu/courses/1478676/assignments/6617837)</p>	
	<p> <u>Poll Everywhere quiz Mechanisms III and Risk Assessment</u> (https://canvas.uw.edu/courses/1478676/assignments/6617840)</p>	
	<p> <u>Poll everywhere quiz Principles and Mechanisms I</u> (https://canvas.uw.edu/courses/1478676/assignments/6617841)</p>	
	<p> <u>Poll Everywhere Quiz: ADME I and ADME II</u> (https://canvas.uw.edu/courses/1478676/assignments/6617839)</p>	
	<p> <u>Polleverywhere: Metabolomics and genotoxicity</u> (https://canvas.uw.edu/courses/1478676/assignments/6617838)</p>	
	<p> <u>Toxicogenomics/epigenomics</u> (https://canvas.uw.edu/courses/1478676/assignments/6617842)</p>	