

## Protein Toxins Syllabus Fall 2022

Week	Date	Lecture Topic	Guidebook Chapter	Due Dates	Discussion Activities
1	27-Sep	Introduction	preface		
	29-Sep	Cholera Toxin / Pertussis Toxin	2		
2	4-Oct	Diphtheria Toxin / Ricin	3		
	6-Oct	Anthrax LF and EF	5		
3	11-Oct	<i>Discussion 1</i>			Science Paper Styles
	13-Oct	Botulinum Neurotoxin	6		
4	18-Oct	<i>Tetanus Neurotoxin</i>	6		Online web assignment
	20-Oct	Snail/Spider Toxins	9		
5	25-Oct	AChR Toxins	10	<b>Midterm 1</b>	
	27-Oct	PLA2 and Iatrotoxin	12		
6	1-Nov	Glycerotoxin and Invasins	12		
	3-Nov	<i>Discussion 2</i>			Papers #2-6
7	8-Nov	Helicobacter toxins		<b>Midterm 2</b>	
	10-Nov	<i>Discussion 3</i>			individual presentations
8	15-Nov	<i>Discussion 4</i>		<b>Abstract for Final</b>	individual presentations
	17-Nov	<i>Discussion 5</i>			individual presentations
9	22-Nov	<i>Discussion 6</i>			individual presentations
	24-Nov	<b>TG</b>			individual presentations
10	29-Nov	<i>Discussion 7</i>			individual presentations
	1-Dec	<i>Discussion 8</i>			individual presentations + proposals
11	6-Dec	(this is different from the scheduled final)		<b>Final Exam</b>	

### ***Instructor:***

Philip Washbourne

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### **Office hours:**

Tuesdays 11-12am via Zoom (Passcode: Botox)

or by appointment

### ***Suggested prerequisites:***

Either Cell Biology 322 or Neurobiology 360

**Credits:** 4

***Course Description and Goals:***

This course investigates the mechanisms used by protein toxins to kill or debilitate humans and other animals and how they have been used as molecular scalpels to dissect important questions in cell and neurobiology. Bacterial pathogens, predatory animals and prey have devised toxins to kill or defend themselves from being killed. These toxins have been studied in order to treat humans against these medical challenges. The research has led, however, to understanding fundamental questions of cell and neurobiology such as neurosecretion, membrane trafficking, synapse formation and membrane channel properties. Toxins covered include tetanus toxin, botulinum neurotoxin (Botox), anthrax, cholera toxin, various snake toxins and ricin. This course not only aims to inform students of mechanisms involved in these kinds of intoxication, but hopes to show how using toxins as molecular tools can greatly advance cell biology.

***Course requirements:***

Students are required to attend class, to read the assigned material and to participate in class discussions. There will be the same number of scientific papers to read as there are students in the class. All students are expected to read all papers. Each student will present a scientific paper within a discussion group. There will be two graded mid-term research essays and a graded take-home final exam.

***Reading:***

In addition to the assigned primary papers, reviews (on Blackboard) and chapters in **Protein Toxins and their Use in Cell Biology**, Rappuoli and Montecucco (Editors), Oxford University Press, will be assigned. Chapters will be provided in Canvas.

***Class Schedule:***

Each week there will be two 1.5 hour classes via Zoom (passcode: Botox).

Discussion classes will use primary scientific papers to understand a toxin and/or its involvement in a facet of cell biology or neuroscience.

**Exams:**

2 Midterms:           Take home essay

Final Exam:           Take-home essay

For their final exam, graduate students must choose a toxin and describe how they would use it in a novel experiment to understand some aspect of cell biology. This will be a written paper and presented to the class.

**Student workload expectations:***Inside class:*

Attend class lecture

Participate in discussions and class activities

Present a paper from primary literature

*Outside class:*

Reading textbook and primary literature (5 hrs per week)

Preparing class presentation or research paper (1 hr per week)

Write and present an original research proposal (grad students; 2 hrs per week)

**Basis for Grading***Undergraduate*

Midterms (incl. Final prep):	40%
Class Presentation:	25%
Final:	20%
Participation:	15%

*Graduate*

Midterms (incl Final prep):	40%
Research Proposal Presentation:	10%

Class presentation:	15%
Final:	20%
Participation:	15%

The goal of the presentations is to get students used to reading, understanding, summarizing and presenting research papers. The presentations will be graded based on the following:

Flow	5 pts	clarity of presentation and use of audio-visual media
Intro	5 pts	understanding of the overall question / hypothesis
Results	5 pts	understanding of the techniques used and of the results obtained
Conclusions	5 pts	understanding of the impact and scope of the study

### **Graduate vs Undergraduate Workload**

Graduate students write a research proposal paper for their final exam. They also present their research proposal to the class. This presentation is in addition to a paper presentation.