ENV H 452/542: Environmental & Occupational Health Microbiology II: Detection and Control of Environmentally Transmitted Pathogens

Winter Quarter, 2021
Monday and Wednesday, 9:30-10:20.
https://canvas.uw.edu/courses/1434420

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OFFICE HOURS: Friday 9:30-10:30 or by appointment

TA: Sarah Philo (sphilo@uw.edu)

COURSE DESCRIPTION: This course will review environmental detection and control of pathogenic organisms. The first half of the course will cover methods of sample collection, processing and target detection. The second half will examine methods of decontamination and disinfection, as well as other engineered controls for environmentally transmitted pathogens. This course will be of use for public health and health care professionals, microbiologists, civil and environmental engineers, environmental scientists and bio-defense specialists.

COURSE OBJECTIVES: At the conclusion of this class, students should be able to:

1. Outline the various types of sampling plan and define their appropriate use;
2. Describe and distinguish the major methods of sample collection and processing from various environmental media;
3. Categorize the various methods to detect environmentally transmitted pathogens;
4. Explain the advantages and disadvantages of each type of detection methods;
5. Identify major approaches to control and prevent environmentally transmitted pathogens
6. Distinguish between sterilization, disinfection, and preservation methods
7. Identify different classes of disinfectants and explain disinfection kinetics
8. Describe several methods to decontaminate infectious wastes and acceptable biosafety practices in the laboratory

9. Summarize the importance of clinical hygiene and institutional infection control practices
10. Explain the principles of a multi-barrier approach to controlling microbial hazards

ADDITIONAL GRADUATE COURSE OBJECTIVES: At the conclusion of this class, students in the graduate section (ENVH 542) should be able to:

1. Formulate, plan and recommend a sampling/detection strategy for detection of a selected pathogen or other microbial hazard in a specific environmental medium.
2. Propose and communicate a control plan for microbial hazards in a specific scenario
3. Anticipate and assess obstacles or barriers to implementation of both the sampling/detection strategy and control plan.

TEXTS AND REFERENCES: The recommended text for this course is the Third Edition of Environmental Microbiology (Pepper, Gerba, and Gentry, Academic Press). Additional Readings and course materials will be available through the course webpage. The following texts are recommended references for more in-depth detail on course topics:

Books-
Manual of Environmental Microbiology, 4th edition, ASM Press
Disinfection, Sterilization and Preservation, 6th edition, LWW
Metcalf and Eddy's Wastewater Engineering: Treatment and Reuse, McGraw-Hill
Water Quality and Treatment, 6th edition, AWWA
Bioaerosols Handbook, Lewis

Journals-
Journal of Applied Microbiology
Letters in Applied Microbiology
Applied and Environmental Microbiology
Journal of American Water Works Association
Journal of Water and Health
Journal of Food Protection
International Journal of Food Microbiology
Water Science and Technology
Water Research
Indoor Air
Emerging Infectious Disease
Journal of Clinical Microbiology

READINGS: Students will typically be assigned readings for each class session. These readings will typically be 20-25 pages in length (though combined readings may be assigned for multiple sessions within a module exceeding this length). Readings will commonly be chapters from the recommended text or other reference texts, but may include website or journal articles.

COURSE FORMAT:
The course will be organized in 5 modules. Most of the material will be available asynchronously. However, course will meet synchronously on Zoom Monday's and Wednesday's for group discussions, guest lectures, or Q&A with the instructor. The instructor and/or TA will also be available Fridays for drop-in office hours on Zoom.

GRADING OPPORTUNITIES: Letter and numerical grades will typically be distributed according to the university grading scale between the following standards:

A (4.0)= Excellent and exceptional work (typically >95% of available points)

D (1.0) = Deficient work (typically <66% of available points)

It is expected that most students will perform at a level between 3.0 and 3.5, though the typical number of 4.0s is quite high.

Graduate student points will be available according to the following % breakdown:

Introduction Video (5%): Each student is required to submit a 1-2-minute long introduction video. The video should indicate the students name, what they like to be called, what degree program they are in, any experience they have that is relevant to the class, and what they hope to get out of the class. Students that do not have the capacity to record a video (though most should on their phones) may submit a 1-2 page-long statement describing the same information. Videos/Statements will be due by the beginning of the third class period.

Quizzes (20%): Students will have the opportunity to complete 4 quizzes. Quizzes will be due at 5 pm on the day indicated in the course outline. Late quizzes may be penalized 10% of point value for each class period that they are late.

Midterm Exam (20%): Midterm exam will consist primarily of short answer questions, but may include multiple choice, and fill-in the blank questions as well. Exams will be conducted online. Exam will be open book and open note. Early or make-up exams will only be offered in case of emergencies or prior arrangement with instructor. Format for early and make-up exams will be left to the discretion of instructor.

Discussions (5%): Student may earn points by providing a posting to class discussion boards.

Sampling and Detection Strategy (10%): Students will prepare a 5-page report (including tables and figures, but not including references) detailing a sampling and detection strategy for a chosen microbiological hazard and environmental media. Reports should be single spaced and formatted in accordance with ASM journal guidelines. Students must get approval for hazard and media from TA.

Control Plan (20%): Graduate students will be expected to write and submit a detailed plan to control microbiological hazards in a specific scenario. Papers are expected to be as long as necessary to cover the topic, but should not exceed 10 pages of text single spaced (including tables and figures, but not including references). Formatting should be in accordance with ASM journal guidelines. Additionally, students will be expected to present their plans in a 5-minute recorded video and respond to questions during a panel discussion in the last week of class. Students must get approval of microbiological hazard and scenario from TA.

Final Exam (20%): Final Exam will be offered on ONLINE during finals week. Final exam will be comprehensive and will consist of short answer multiple choice, true/false-explain, and problem solving questions. Exam will be open book and open note.

Undergraduate student points will be available according to the following % breakdown:

Introduction Video (5%): Each student is required to submit a 1-2-minute long introduction video. The video should indicate the students name, what they like to be called, what degree program they are in, any experience they have that is relevant to the class, and what they hope to get out of the class. Students that do not have the capacity to record a video (though most should on their phones) may submit a 1-2 page-long statement describing the same information. Videos/Statements will be due by the beginning of the third class period.

Quizzes (20%): Students will have the opportunity to complete 4 quizzes. Quizzes will be due at 5 pm on the day indicated in the course outline. Late quizzes may be penalized 10% of point value for each class period that they are late.

Midterm Exam (25%): Midterm exam will consist primarily of short answer questions, but may include multiple choice, and fill-in the blank questions as well. Exams will be conducted online. Exam will be open book and open note. Early or make-up exams will only be offered in case of emergencies or prior arrangement with instructor. Format for early and make-up exams is left to the discretion of instructor.

In the News and Discussions (15%): Student may earn points by providing an "In the News" article and a posting to class discussion boards.

Graduate Student Questions (10%): Undergraduates may earn points by watching graduate student control plan presentations and submitting a question for at least 5 of the presentations.

Final Exam (25%): Final Exam will be offered on ONLINE during finals week. Final exam will be comprehensive and will consist of short answer multiple choice, true/false-explain, and problem solving questions. Exam will be open book and open note.

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 are 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 or 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 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.

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-accommodatio…). 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-requ…).

Safety

Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus's team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

SPH Land Acknowledgment

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

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. For more information, see the University of Washington Community Standards and Student Conduct website.

Equity, Diversity and Inclusion

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

1. 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.
2. 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.
3. 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.

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 for immediate follow up. Bias concerns can be anonymously and confidentially reported at this link https://sph.washington.edu/about/diversity/bias-concerns. 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.

COURSE OUTLINE:

	Date	Discussion Topic	Instructor	Recorded Lectures		Due
M	January 4th	Introduction/Sampling of Environmental Media	Meschke/Cangelosi			
		Module 1 - Sampling				
W	January 6th	In the News	Meschke	Sampling Plans	Meschke	
F	January 8th	Drop in Office Hours	Philo	Sampling of Food	Meschke	Introductory videos
M	January 11th	Sampling Purpose and Plans	Meschke	Sampling for Bioaerosols	Meschke	
W	January 13th	Sampling Method Performance and Controls	Meschke	Sampling of Surfaces	Meschke	
F	January 15th	Drop in Office Hours	Philo	Sampling of Waterborne Microbes	Meschke	Quiz 1
M	January 18th	Holiday-MLK Day-**NO CLASS**				
W	January 20th	Sampling Logistics	Meschke			
F	January 22nd	Drop in Office Hours	Philo			Hazard and Media
		Module 2 - Detection and Characterization				
M	January 25th	Immunological screening	Cangelosi	Microscopy/Immunoassays	Cangelosi	
W	January 27th	What is a microbial pathogen?	Cangelosi	Culture/Biochemical Assays	Cangelosi	
F	January 29th	Drop in Office Hours	Philo	Molecular Methods of Detection	Cangelosi	Quiz 2
M	February 1st	Guest Lecture: Sequence Analysis	Beck	High Throughput Sequencing Methods	Cangelosi	Sampling/Detection Plan
W	February 3rd	Community vs. nosocomial exposure	Cangelosi	Molecular/Genomic Epidemiology	Cangelosi	
F	February 5th	Drop in Office Hours	Philo			**Midterm Exam**
		Module 3 - Personal Controls				
M	February 8th	Covid-19 Vaccines	Cangelosi	Antimicrobial Use/Vaccination	Cangelosi	
W	February 10th	PPE Use scenarios	Cangelosi	Handwashing/Antisepsis/PPE	Cangelosi	
F	February 12th	Drop in Office Hours	Philo			Quiz 3
		Module 4 - Disinfection				
M	February 15th	Holiday-President's Day- **NO CLASS**	Meschke	Principle of Disinfection, sterilization and Preservation	Meschke	
W	February 17th	Disinfection Testing and Labeling	Meschke	Disinfection Classes (Chemical and Physical)	Meschke	
F	February 19th	Drop in Office Hours	Philo	Kinetics of Disinfection	Meschke	Hazard and Scenario
M	February 22nd	The "N-list"	Meschke	Decontamination of Infectious Wastes	Meschke	
		Module 5 - Media Specific Controls				
W	February 24th	Multibarrier Controls for Water		Water and Wastewater Treatment	Meschke	
F	February 26th	Drop in Office Hours	Philo	HVAC Controls/Filtration of Air/BSCs	Meschke	Quiz 4
M	March 1st	Snake Oil: Air Cleaners and Disinfectants	Meschke	Household and Public Surfaces	Meschke	
W	March 3rd	Disinfectants in our Food?	Meschke	Control and Prevention of Foodborne Disease	Meschke	
	March 5th	Drop in Office Hours	Philo	Clinical Hygiene/Institutional Infection Control	Meschke	Control Plan Videos
M	March 8th	Decontamination of Masks	Meschke	Laboratory Design/Biosafety Practices	Meschke	
W	March 10th	*Graduate Student Panel*	Meschke/Cangelosi			
F	March 12th	Drop in Office Hours/Course Review	Philo			Control Plan Reports
W	March 15th-19th	**Final Exam**				Final Exam