

ENV H 433: Environmental & Occupational Sampling and Analysis - Microbial Contaminants

Winter Quarter, 2018

MWF 8:30-10:20 AM Room T-369

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OFFICE HOURS: By Appointment

CANVAS SITE: <https://canvas.uw.edu/courses/1186921>

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COURSE DESCRIPTION

This course will review the sampling and analysis of microbiological contaminants in water, air, and on surfaces. Topics covered will include legal considerations, sampling and experimental design, routes of exposure, sources of exposure, standard methods, QA/QC, and data management. This course will be of use for public health professionals, microbiologists, civil and environmental engineers, and environmental scientists.

COURSE OBJECTIVES

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

- Recognize the various microbial contaminants in environmental and occupational settings
- Distinguish between the methods for sample collection and processing of microbial contaminants in different environmental and occupational exposure situations
- Categorize the methods for detection of microbial contaminants for different environmental and occupational exposure situations
- Formulate an appropriate experimental design for assessing environmental and occupational exposures to microbial contaminants
- Describe the advantages and disadvantages of using indicator organisms in environmental and occupational exposure assessment
- Identify the various indicator organisms in different environmental and occupational exposure situations
- Explain basic chemical and bio-safety laboratory precautions
- Describe quality assurance and quality control (QA/QC) procedures used in conducting environmental microbiology research
- Analyze, report, and manage scientific data related to environmental and occupational health sciences
- Recognize the importance of the legal and regulatory framework related to environmental and occupational exposures to microbial contaminants
- Critically evaluate papers in the scientific literature and identify strengths and weaknesses of the science article

TEXTS AND REFERENCES

There is no required text for this course. Assigned readings and course materials will be available on the course webpage. The following texts are recommended references for this course:

Multiple-Tube Fermentation Technique (9221)/Total Coliforms

<http://courses.washington.edu/envh433/Readings/coliform.PDF>

EPA Method 1604: Total Coliforms and *E. coli* in Water by Membrane Filtration Using a Simultaneous Detection Technique (MI Medium)

<https://nepis.epa.gov/Exe/ZyPDF.cgi/P1002D57.PDF?Dockey=P1002D57.PDF>

Difco™ & BBL™ Manual – online

http://www.bd.com/ds/technicalCenter/misc/difcobbmanual_2nded_lowres.pdf

EPA 2012 Recreational Water Quality Criteria Fact Sheet

<https://www.epa.gov/sites/production/files/2015-10/documents/rec-factsheet-2012.pdf>

COURSE DESIGN

The course will begin with lectures, which will be covered in an exam Jan 12, 2018. Then students will perform six laboratory experiments. Class will be held in T-369, MWF between 8:30-10:20am. Students must be in the classroom and ready to go before class starts at 8:30 AM. Each week, starting the week of January 22, students will look up research papers that use the method featured in that week's laboratory exercise. The paper must be written in English and published within the last 5 years. The paper needs to be posted to the Canvas site, and each student will briefly present their papers on Monday, Wednesday, or Friday morning. Major points should be written out, not read from the paper [See Below].

GRADING

First Exam Week 2 (20%): Students will be examined for their mastery of the material presented in the introductory lectures during weeks 1 and 2. The exam will consist of approximately 20 questions and the format will be multiple choice, short answer and true/false. Exam will be closed book.

Weekly Laboratory Reports (20%): Questions will be provided that need to be answered at the end of each week of class. This will be turned in weekly to the Canvas site. In general, the reports will be due before class on Monday.

Participation in class (20%): Answering questions in class and general participation will be noted as well as giving critical evaluations on papers in the scientific literature with identification of its strengths and weaknesses. Please note that each student will present 1 paper each week for 6 weeks. In addition, a minimum of 8 questions by each student about another student's presentation is required to receive 100% for participation. Papers need to be selected on Canvas by noon on the Thursday the week before the presentation. The first lab is January 22, meaning the paper for presentation needs to be on Canvas by noon January 18, 2018. Each student needs to select a unique paper that is written in English and peer reviewed. It must use the method used the week of lab and must be on bacteria.

Written report from one of your evaluations of a scientific paper (10%). By **January 22, 2018** students will need to get approval for which scientific paper they will critique in a 2-page review. The review will include a short introduction to the paper, the specific aims of the paper, what was found in the results, a critique of the results, and a critique of the discussion including whether the authors' conclusions are justified. The paper that was reviewed should be referenced using FEMS reference [examples below]
Paper is due March 5, 2018.

Examples of how the reference should be sited is below:

Chuang YY, Huang YC. Livestock-associated methicillin-resistant *Staphylococcus aureus* in Asia: an emerging issue? *Intern J of Antimicrob Agents* 2015;**45**:334–40.

Adhikari RP, Shrestha S, Barakoti A et al. Inducible clindamycin and methicillin resistant *Staphylococcus aureus* in a tertiary care hospital, Kathmandu Nepal. *BMC Infect Dis* 2017;**17**:483
DOI:10.1186/s12879-017-2584-5 [online only publication]

Final Exam End of Quarter (30%): Closed book in class. Given the last week of regular class [March 9, 2018].

IMPORTANT CLASS POLICIES

If you have your cell phone out, you will be asked to leave class and will lose points.

If you are late to class you will lose points for the day. If you are chronically late to class or have your cell phone out **more than 3 times**, you will not be able to pass the course. Missing the bus is not a valid excuse, nor is not making it back to Seattle before the start of class by 8:30 AM January 3, 2018.

If you miss the class for illness, you must contact Dr. Roberts or one of the TA's before class to let them know.

You cannot make up a class that you miss because it is a laboratory class.

After the first four classes that are lecture, students are not allowed to use computers, phones or tablets. If computers or tablets are seen, the student will lose points for the day, which can lead to not passing this required class.

DISABILITY RESOURCES FOR STUDENTS (DRS)

Disability Resources for Students (DRS) offers resources and coordinates reasonable accommodations for students with disabilities. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. If you have not yet established services through DRS, but have a temporary or permanent disability that requires accommodations (this can 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 or disability@uw.edu Requests for accommodations or services must be arranged in advance.

COURSE SCHEDULE

| Lecture | |
|------------|--------------------------------|
| Jan 3 | Introduction/overview |
| Jan 5 | Lab Safety |
| Jan 8 | Sampling & Experimental Design |
| Jan 10 | QA/QC and Regulations |
| Jan 12 | Exam – Closed Book/Notes |
| Laboratory | |
| Jan 15 | HOLIDAY |

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|-----------------------|---|
| Jan 17-19 | Laboratory preparation and talk about writing assignment |
| Jan 22, 24, 26 | MPN multiple tube fermentation, Colilert |
| Jan 29, 31, Feb 2 | IDEXX and membrane filtration to detect enterococci/ <i>E. coli</i> |
| Feb 5, 7, 9 | Surface sampling for vancomycin resistant enterococci |
| Feb 12, 14, 16 | Surface sampling for <i>S. aureus</i> and methicillin-resistant <i>S. aureus</i> (MRSA) |
| Feb 19 | HOLIDAY |
| Feb 21, 23, 26 | Airborne Microbial contaminants |
| Feb 28, March 2, 5, 7 | <i>Salmonella</i> in chicken |
| March 7 | Turn in homework, talk about papers detecting <i>Salmonella</i> in food and Review session with TAs |
| March 9 | Final exam Closed Book/Notes |

LABORATORY POLICIES

- Everyone must have laboratory coat, which will be provided.
- Everyone needs a bound laboratory notebook with lines by Jan 17, 2018. This is not provided by UW, but students must bring their own.
- No food, drink, gum, computers or tablets allowed in the lab spaces before or during class after Jan 10, 2018.
- No phones ever allowed in the lab spaces before or during class.
- No open-toe shoes and no shorts or short skirts (scrub pants are available for purchase). You may change shoes in the hallway before entering the lab space.
- Let TAs or Dr. Roberts know ahead of time if you cannot attend a session. There are no make-up sessions. Excuses for missing class are if student is very sick or at a scientific meeting.
- **Arrive on time and be ready to start right at 8:30 AM. This is critical. Walking in at 8:30 AM is not acceptable.**
- Turn in assignments on time. Late assignments will be marked down.
- Come to class prepared (keep up with reading).
- Be courteous (no newspapers, cell phones should be turned off, PDAs, no computers)
- All backpacks and personal items will be stored underneath the desks. **Do not leave in the hallway since there have been problems with items going missing.**
- Once you know what you are doing for the lab, you can start when you get in.
- You should be able to finish lab in the 2-hour time-period if you are prepared.
- Protocols for the week should be placed in your laboratory notebook before class.
- **ASK QUESTIONS!**