

Course Syllabus

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

Course Syllabus

Course Number: ENVH 444/544 (Fall 2021, 4 credits)

Course Title: Antibiotic Resistant Bacteria/Genes Impact on the Environment and Public Health

Course Times: T/Th 1:30 – 3:20

Course Location: RR134

Instructor:

Marilyn C. Roberts, PhD (she/her)
Professor, Department of Environmental & Occupational Health Sciences
Adjunct Professor, Department of Global Health and Pediatric Dentistry
Office: 4225 Roosevelt Way NE, Suite #100, Rm 2340
Email: marilynr@uw.edu
Phone: 206.543.8001

TA:

Claudia Nguyen (she/her)
Email: cn35@uw.edu

Office Hours: By arrangement

Course Website: <https://canvas.uw.edu/courses/1478664>

Course Description: Addressing issues of antibiotic resistant bacteria and genes through an interdisciplinary “One Health” approach that integrates human, animal and environmental health. This course explores how the global use and abuse of antibiotics has profound consequences on the health of humans, animals, and the environment.

Learning Objectives:

Upon completing the course, both undergraduate (444) and graduate (544) students will be able to:

1. Explain what antibiotic resistance genes (ARGs) and antibiotic resistant bacteria (ARB) are and the origins of ARGs (the resistome).
2. Describe the various mechanisms for resistance and important classes of resistance genes.
3. Compare and analyze diverse viewpoints on controversial issues related to sources of ARGs/ARBs in relationship to humans, animals, and the environment (One Health).
4. Summarize how several different human practices influence the evolution/ecology of ARGs/ARBs.
5. Explain how the evolution of resistance differs between developed and developing countries, how the two are interconnected, and how ARGs/ARB are transmitted around the world.
6. Discuss the role that agriculture, aquaculture, food animals and food play in the transmission of ARGs/ARB and give specific examples to illustrate this.
7. Describe how various modes of horizontal gene transfer occur and compare/contrast how they impact the evolution of ARGs/ARB.
8. Communicate effectively with both scientific and non-scientific audiences about the topic of ARGs/ARB using risk communication

9. Describe the role that sub-therapeutic use of antibiotics for “growth promotion” in agriculture plays in contaminating environments, municipal wastewaters, receiving water streams, recreational waters, etc.

In addition to the learning objectives above, graduate (544) students will be able to:

1. Critically evaluate papers in the scientific literature and identify strengths and weaknesses of the science presented.
2. Develop and compose a literature review on a topic related to ARGs/ARB.

Writing Resources (for courses with written assignments): All written assignments for this class must be high quality, well researched, well organized, and well written. Use plain language instead of jargon. The instructors will consider the clarity of writing when grading assignments. Writing is an important transferable skill for all career pathways. Establishing a strong foundation in writing skills will help students be successful throughout their future course work and career.

Therefore, this course includes written assignments with the goal to helping students identify areas of strength and improvement in writing. However, if a student feels that they could benefit from additional opportunities to improve their writing skills, a list of resources at the UW and others accessible online can be found on the SPH website

(<https://sph.washington.edu/sites/default/files/inline-files/Writing-Resources-4.3.19.pdf> (Links to an external site.)

↗ (<https://sph.washington.edu/sites/default/files/inline-files/Writing-Resources-4.3.19.pdf>.) and on the DEOHS intranet

(<https://portal.deohs.washington.edu/index.php/academic-support-writing-resources> (Links to an external site.) ↗

(<https://portal.deohs.washington.edu/index.php/academic-support-writing-resources>)).

Course Overview and Format: This course is designed to combine lectures by the instructor and invited guest lecturers with opportunities for students to engage in active, investigative learning through active learning. Students are expected to do the assigned readings prior to each class session and submit reflections from the reading through the course website. Three quizzes and one final exam will assess learning throughout the course.

Course Requirements

Textbook: There is no textbook for this course. Instead, a list of required readings will be provided on the course website for each class session. In addition, the following general readings for the course will provide good background knowledge on the topics we will be discussing:

- Antibiotic Resistant Threats in the United States, CDC 2019 (<https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf> (Links to an external site.) ↗ (<https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf>))
- National Antimicrobial Resistance Monitoring System for Enteric Bacteria (NARMS): Human Isolates Surveillance Report for 2015 (https://www.cdc.gov/narms/pdf/2015-NARMS-Annual-Report-cleared_508.pdf) (Links to an external site.) ↗ (https://www.cdc.gov/narms/pdf/2015-NARMS-Annual-Report-cleared_508.pdf)
- Global antimicrobial resistance surveillance system (GLASS) report: early implementation 2020 (<https://apps.who.int/iris/bitstream/handle/10665/332081/9789240005587-eng.pdf?ua=1>) (Links to an external site.) ↗ (<https://apps.who.int/iris/bitstream/handle/10665/332081/9789240005587-eng.pdf?ua=1>)

Preparing for Class: Reading and viewing assignments for each class session will be available through the course website. These will include readings, such as scientific articles, reports and articles from the popular press, as well as documentary videos. Students are expected to read/view the materials, then respond to questions on the reading assignments. Responses will be submitted via the course website prior to the applicable class session and will be reviewed and graded (complete/incomplete) by the instructor and/or the TA for the course. If you are ill please let us know.

Communication Exercise: There will be discussion throughout the course on what communication is and how it can be used to communicate science to specific stakeholders. The last few weeks in class each student will present their risk communication project. **The project is due Nov 18 by Noon.**

1. Each student will prepare a communication document or video which can include, but is not limited to, a fact sheet, an informational pamphlet, poster or a public service announcement. **Nov. 18, 2021.**

See

<https://youtu.be/kr0xaZPSG8w> [_ \(https://youtu.be/kr0xaZPSG8w\)](https://youtu.be/kr0xaZPSG8w)



[\(https://youtu.be/kr0xaZPSG8w\)](https://youtu.be/kr0xaZPSG8w)

From last year's communication project

1. Students need to identify a specific stakeholder and method of communication and submit these to the instructor for approval by **Oct 12, 2021.**
2. Completed assignments will be turned in online via Canvas website by noon **Nov. 18, 2021.** The assignment needs to be a pdf, Yoube video, or power point presentation (2007 format)

Research (Graduate/544 Students and 444/undergraduate honors): Graduate students enrolled in the 544 section and undergraduates in 444 that are doing honors for the course will research and write a literature review paper on a topic related to ARGs/ARB. The paper should be double-spaced, paginated, and no fewer than 6 and no more than 10 pages long, not including references. A minimum of 10 references must be included, up to three of which can be reputable websites (e.g., CDC, WHO, US State Department, etc.). The remaining works referenced should be from relevant, peer-reviewed scientific journals. **Paper topics must be submitted to the instructor for approval by Oct. 12, 2021 by noon and due by Nov. 23, 2021 by noon.**

Exams: There will be three quizzes and one final exam for this course. The quizzes will be in-class and the final will be last class of the quarter.

For undergraduate (444) students, grades will be based on the following:

- 20%** - Reflections on reading (will include questions about reading assignments each week on Canvas)
- 20%** - Communication Exercise (each student will create a risk communication brochure, fact sheet, or poster) for specific stakeholders and present the last week in class
- 20%** - Quizzes
- 5%** - Class Participation: Answers questions in class for active learning exercises and general questions during class
- 35%** - Final Exam

For graduate (544) students, grades will be based on the following:

- 10%** - Reflections on reading (will include questions about reading assignments each week on Canvas)
- 25%** - Communication Exercise (each student will create a risk communication brochure, fact sheet, or poster) for specific stakeholders
- 15%** - Quizzes
- 25%** - Final Exam
- 5%** - Class Participation: Answers questions in class for active learning exercises and general questions during class
- 20%** - Research Paper

Access and Accommodation

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 (<mailto:uwdrs@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 \(Links to an external site.\)](#) [\(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/\)](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 \(Links to an external site.\)](#) [\(https://registrar.washington.edu/students/religious-accommodations-request/\)](https://registrar.washington.edu/students/religious-accommodations-request/).

UW 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 \(Links to an external site.\)](#) [\(http://sph.washington.edu/students/academicintegrity/\)](http://sph.washington.edu/students/academicintegrity/). 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.

Classroom Climate

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. We encourage students with concerns about classroom climate to talk to your instructor, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director. vg@uw.edu (<mailto:vg@uw.edu>) is a resource for students with classroom climate concerns.

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 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 sphas@uw.edu (<mailto:sphas@uw.edu>).

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

[\(https://www.washington.edu/coronavirus/vaccination-requirement/\)](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](#) [↗] [\(https://www.washington.edu/coronavirus/2021/08/31/autumn-quarter-health-and-safety-measures-message-to-uw-personnel/\)](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!

Recording of Class Sessions

The in-person sessions will be recorded. They will be uploaded after class and are meant for students who could not make it to class due to illness. It is not meant to replace in-class lectures.

Learning Environment Concerns

The Department of Environmental and Occupational Health Sciences (DEOHS) strives to create welcoming and respectful learning environments that promote access and opportunity for all students, regardless of their experiences, perspectives, identities, and abilities. If you feel like this class is not living up to that commitment, there are several ways you can register your concern and seek resolution:

- If you feel comfortable doing so, begin by discussing your concern with the instructor and/or teaching assistant. Your instructor is expected to take your concerns seriously and work with you to identify a resolution.
- If you are not comfortable discussing the concern with the instructor, or you did so and the issue has still not been resolved, contact Trina Sterry, DEOHS Manager of Student and Academic Services (tsterry@uw.edu (<mailto:tsterry@uw.edu>)) to discuss your concern. She can also connect you to the appropriate member of DEOHS faculty leadership as needed.
- If you prefer to discuss your concern directly with someone from the School of Public Health (SPH) Dean's Office, you can review [the SPH Student Concern Policy](#) [↗] [\(https://sph.washington.edu/students/student-concern-policy/\)](https://sph.washington.edu/students/student-concern-policy/) and follow the procedures described there, including reaching out to the SPH Assistant Dean for Equity, Diversity and Inclusion, Dr. Victoria Gardner (vg@uw.edu (<mailto:vg@uw.edu>)). If you prefer to anonymously report your concern, you can email dcinfo@uw.edu (<mailto:dcinfo@uw.edu>) or use [the SPH Bias Incident Report Form](#) [↗] [\(https://sph.washington.edu/about/diversity/bias-concerns/\)](https://sph.washington.edu/about/diversity/bias-concerns/).
- If your concern is related to a bias incident, you can review [the UW's guidance on reporting bias incidents](#) [↗] [\(https://www.washington.edu/bias/\)](https://www.washington.edu/bias/), which includes a link to [the UW Bias Reporting Tool](#) [↗] [. \(https://report.bias.washington.edu/submit?_ga=2.18211193.1968382939.1619540714-515009282.1595522710\)](https://report.bias.washington.edu/submit?_ga=2.18211193.1968382939.1619540714-515009282.1595522710).
- If you have experienced sex or gender discrimination, including sexual assault, relationship or intimate partner violence, stalking, sexual harassment, or other sexual misconduct, you have the right to make a formal complaint and request an investigation under Title IX. Information about Title IX reporting options is available at <https://www.washington.edu/titleix/report/> [↗] [\(https://www.washington.edu/titleix/report/\)](https://www.washington.edu/titleix/report/).

Student Safety

If your immediate safety is at risk, you are witnessing violence or perceive imminent harm to yourself or others, please immediately dial 911. If your experience includes sexual assault, sexual harassment, stalking, and/or relationship violence, please contact UW SafeCampus at 206-685-7233 (available 24 hours, 7 days a week)

Course Outline

Week 1: Course Overview, Introduction to ARGs/ARBs

Readings:

- PBS Frontline episode, Hunting the Nightmare Bacteria. <http://www.pbs.org/wgbh/pages/frontline/hunting-the-nightmare-bacteria/> (Links to an external site.) ↗ (<http://www.pbs.org/wgbh/pages/frontline/hunting-the-nightmare-bacteria/>)
- Davies J, Davies D. 2010. Origins and evolution of antibiotic resistance. Microbiol. Mole Biol. Rev. 74:417-433 <http://mmlbr.asm.org/content/74/3/417.full.pdf+html> ↗ (<http://mmlbr.asm.org/content/74/3/417.full.pdf+html>)
- Levy SB, Marshall B. 2004. Antibacterial resistance worldwide: causes, challenges and responses. Nature Med. 10:S122-S139. <http://www.nature.com/nm/journal/v10/n12s/pdf/nm1145.pdf> (Links to an external site.)
- FACT SHEET: Obama Administration Takes Actions to Combat Antibiotic-Resistant Bacteria <http://www.whitehouse.gov/the-press-office/2014/09/18/fact-sheet-obama-administration-takes-actions-combat-antibiotic-resistan> (Links to an external site.) ↗ (<http://www.whitehouse.gov/the-press-office/2014/09/18/fact-sheet-obama-administration-takes-actions-combat-antibiotic-resistan>)

Sept. 30, 2021:

- Introductions and overview of student responsibilities and instructor expectations
- Group warm-up activity and zoom discussion {see how this will work}

Week 2: Overview of Antibiotic Resistance

Readings:

- Marinez JK, Baquero F. 2014. Emergence and spread of antibiotic resistance: setting parameter space. Upsala J Med Sciences. 119:68-77. <http://informahealthcare.com/doi/pdf/10.3109/03009734.2014.901444> (Links to an external site.) ↗ (<http://informahealthcare.com/doi/pdf/10.3109/03009734.2014.901444>)
- Heuer H., Smalla K. 2007. Horizontal gene transfer between bacteria. Environ Biosafety Res. 6:3-13. <http://dx.doi.org/10.1051/embr:2007034> (Links to an external site.) ↗ (<http://dx.doi.org/10.1051/embr:2007034>)
- Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations http://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf (Links to an external site.) ↗ (http://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf)

Assignments Due:

- Reflections on PBS Frontline and readings, Due by 1 pm on Tue Oct 5

Oct 5, 2021:

- History of antibiotic use since 1945
- Mobile elements [plasmids, transposons, integrons]
- Bacterial gene exchange [conjugation, transformation, transduction]

Oct 7, 2021:

- Basic overview of antibiotic resistance, differences between bacteria, viruses, fungi, parasites

Week 3: Antibiotic Classes and Mechanisms of Resistance**Readings:**

- Roberts MC, Schwarz S, Aarts H 2012. Acquired antibiotic resistance genes: an overview. *Frontier in Microbiol: Antimicrobials Resistance & Chemotherapy* 2012
http://www.frontiersin.org/Antimicrobials,_Resistance_and_Chemotherapy/10.3389/fmicb.2012.00384/full (Links to an external site.)
http://www.frontiersin.org/Antimicrobials,_Resistance_and_Chemotherapy/10.3389/fmicb.2012.00384/full
- Farias P et al., 2015. Natural hot spots for gain of multiple resistance:
<http://aem.asm.org/content/81/7/2534.full.pdf+html> (Links to an external site.)
<http://aem.asm.org/content/81/7/2534.full.pdf+html>

Assignments Due:

- Reflections on Reading: Due by 1 pm on Tuesday October 12th
- Paper topics approved by instructor (544 students and 444 honor students only) by noon Oct 13th (544 students and 444 honor students only)

Oct 12, 2021:

- Linkage between antibiotic/heavy metal resistance genes and virulence
- **Communication identification of stakeholder and type of document to be produced (all students) by 1 PM October 12th**

Oct 14, 2021:

- Antibiotic classes and how they are targeted specifically for bacterial pathways
- Mechanism of antibiotic resistance genes [ARGs] and antibiotics resistant bacteria [ARBs]
- **In-class quiz on content covered during the first 2 weeks of class**

Week 4: Antibiotic Resistome**Readings:**

- Dantas G, Sommer MOA. 2014. How to fight back against antibiotic resistance. *American Scientist* 102:42-51.
<http://www.americanscientist.org/issues/id.16136/issue.aspx> (Links to an external site.)
<http://www.americanscientist.org/issues/id.16136/issue.aspx>
- Mao D, Luo Y, Mathieu J et al. Persistence of extracellular DNA in river sediment facilitates antibiotic resistance gene propagation. *Environ Sci Technol.* 48:71-78. <http://pubs.acs.org/doi/pdf/10.1021/es404280v> (Links to an external site.)
<http://pubs.acs.org/doi/pdf/10.1021/es404280v>
- Forsberg K et al., 2012. The shared antibiotic resistome of soil bacteria and human pathogens. *Science.* 337:1107-1111. <http://www.sciencemag.org/content/337/6098/1107.full.pdf> (Links to an external site.)
<http://www.sciencemag.org/content/337/6098/1107.full.pdf>

Assignments Due:

- Reflections on Reading: Due by 1 pm on Tuesday October 19th

- Find 2 recent (last 2 years) articles in the popular press talking about antibiotic resistant bacteria. Post the urls to canvas site by 1 pm on Tuesday October 19th. Provide a 1 full paragraph finding on how this article could influence thinking in the general population and if it is this accurate or not.

Oct 19, 2021:

- What is the antibiotic resistome?

Oct 21, 2021:

- Sources of ARGs

Week 5: ARGs/ARBs the role of the popular press and ARG/ARB costs to society**Readings:**

- Roberts et al., 2009. Hospital and societal costs of AR infections in a Chicago teaching hospital: <http://cid.oxfordjournals.org/content/49/8/1175.full.pdf+html> (Links to an external site.) [↗](http://cid.oxfordjournals.org/content/49/8/1175.full.pdf+html)
(<http://cid.oxfordjournals.org/content/49/8/1175.full.pdf+html>)

Assignments Due:

- Be prepared to discuss one of your articles in class Oct 26, 28 (2 min presentation on who the audience was and what the main message of the article was. In-person presentation no slides)

Oct 26, 2021:

- How the popular press impacts the science
- Student presentations on popular press

Oct 28, 2021:

- ARGs/ARBs costs to society: Who pays?
- Student presentations on popular press

Week 6: One Health**Readings:**

- Berkner S, Konradi S, Schonfeld J. 2014. Antibiotic resistance and the environment-there and back again. EMBO reports <http://embor.embopress.org/content/embor/15/7/740.full.pdf> (Links to an external site.) [↗](http://embor.embopress.org/content/embor/15/7/740.full.pdf)
(<http://embor.embopress.org/content/embor/15/7/740.full.pdf>)
- McEwen SA, Collignon PJ. 2018. Antimicrobial resistance: a One Health Perspective. Microbiology Spectrum. Mar;6(2). doi: 10.1128/microbiolspec.ARBA-0009-2017
<http://www.asmscience.org/docserver/fulltext/microbiolspec/6/2/ARBA-0009-2017.pdf?expires=1532725393&id=id&accname=esid057303&checksum=F9925F043C3F3BC19B4841E43725D4E9> (Links to an external site.) [↗](http://www.asmscience.org/docserver/fulltext/microbiolspec/6/2/ARBA-0009-2017.pdf?expires=1532725393&id=id&accname=esid057303&checksum=F9925F043C3F3BC19B4841E43725D4E9) (<http://www.asmscience.org/docserver/fulltext/microbiolspec/6/2/ARBA-0009-2017.pdf?expires=1532725393&id=id&accname=esid057303&checksum=F9925F043C3F3BC19B4841E43725D4E9>)
- Nathalie Bleyzac, Sylvain Goutelle, Laurent Bourguignon [↗](https://www.ncbi.nlm.nih.gov/pubmed/?term=Bourguignon%20L%5BAuthor%5D&cauthor=true&cauthor_uid=32533455) (https://www.ncbi.nlm.nih.gov/pubmed/?term=Bourguignon%20L%5BAuthor%5D&cauthor=true&cauthor_uid=32533455), Michel Tod [↗](https://www.ncbi.nlm.nih.gov/pubmed/?term=Tod%20M%5BAuthor%5D&cauthor=true&cauthor_uid=32533455) (https://www.ncbi.nlm.nih.gov/pubmed/?term=Tod%20M%5BAuthor%5D&cauthor=true&cauthor_uid=32533455). Clin Drug Investig (Links to an external site.) [↗](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7290142/) (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7290142/>). 2020 Jun 12 : 1–4. Azithromycin for COVID-19: More Than Just an Antimicrobial?

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7290142/> (Links to an external site.) ↗
[\(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7290142/\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7290142/)

Reflections on Reading:

- Write a paragraph describing why it is important to look at antibiotic resistance in a One Health approach: Due by 1 pm on Tuesday Nov. 2 on canvas. Late submission will be marked down

Nov. 2, 2021:

- One Health and why it is a global issues
- **In class quiz covers the first 5 weeks of class**

Nov. 4, 2021:

- COVID-19 and antibiotic use
- Student presentations on popular press: short in-person presentation no slides

Week 7: Vaccines and behavior changes/Why are ARGs/ARBs a Global Issue?

Readings:

- Ferrero et al. 2015. Efficacy and safety of a decision rule for using antibiotics in children with pneumonia and vaccinated against pneumococcus. A randomized controlled trial. Arch Argent Pediatr. 113:397-403.
<http://www.sap.org.ar/docs/publicaciones/archivosarg/2015/v113n5a04e.pdf> (Links to an external site.) ↗
[_ \(http://www.sap.org.ar/docs/publicaciones/archivosarg/2015/v113n5a04e.pdf\)_](http://www.sap.org.ar/docs/publicaciones/archivosarg/2015/v113n5a04e.pdf)
- Riddle MS, Chen WH, Kirkwood CD et al. 2018. Update on vaccines for enteric pathogens. Clinical Microbiology and Infection Accepted doi: 10.1016/j.cmi.2018.06.023
<https://reader.elsevier.com/reader/sd/B7BDF4A2A40248A04D598132C5D51994B5A0C722AB> (Links to an external site.) ↗ [_ \(https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X\(18\)30488-9/abstract\)_](https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(18)30488-9/abstract)
[FFFBAB61B94EADB42F4971078B01982F04801D617E9253F6479AE4](https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(18)30488-9/abstract) (Links to an external site.) ↗
[_ \(https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X\(18\)30488-9/abstract\)_](https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(18)30488-9/abstract)
- Casey JA, Curriero FC, Cosgrove SE et al. 2013. High-density livestock operations, crop field application of manure, and risk of community-associated methicillin-resistant *Staphylococcus aureus* infection in Pennsylvania. JAMA Intern Med. 173:1980-1990. <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1738717> (Links to an external site.) ↗ [_ \(https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1738717\)](https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1738717)

Assignments Due:

- Reflections on Reading: Due by 1 pm on Tuesday November 9th

Nov 9, 2021:

- Vaccines, behavior changes

Nov 11, 2021: holiday no class

Week 8: Antibiotics and Agriculture; Alternative therapies to antibiotics

Readings:

- Casey JA, Curriero FC, Cosgrove SE et al. 2013. High-density livestock operations, crop field application of manure, and risk of community-associated methicillin-resistant *Staphylococcus aureus* infection in Pennsylvania. JAMA Intern

- Med. 173:1980-1990. <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1738717> (Links to an external site.) ↗ (<https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1738717>)
- Nakonieczna A, Cooper CJ, Gryko R. 2015 Bacteriophages and bacteriophage-derived endolysins as potential therapeutics to combat Gram-positive spore forming bacteria. J App Microbiol 110:620-631 <http://onlinelibrary.wiley.com/doi/10.1111/jam.12881/pdf> (Links to an external site.) ↗ (<http://onlinelibrary.wiley.com/doi/10.1111/jam.12881/pdf>)
 - Sybesma W, Rohde C, Bardy P. Et al., Silk route to the acceptance and re-implementation of bacteriophage therapy=Part II. Antibiotics 2018 7,35; doi.103390/antibiotics/7020035 <http://www.mdpi.com/2079-6382/7/2/35> (Links to an external site.) ↗ (<http://www.mdpi.com/2079-6382/7/2/35>)
 - McFarland LV. 2015: From yaks to yogurt: The history, development, and current use of probiotics. CID 60(suppl) S85-S90. <http://www.ncbi.nlm.nih.gov/pubmed/25922406> (Links to an external site.) ↗ (<http://www.ncbi.nlm.nih.gov/pubmed/25922406>)
 - Ho HJ. In press. Am J Infect Cont Alcohol handrubbing and chlorhexidine handwashing are equally effective in removing methicillin-resistant *Staphylococcus aureus* from health care workers' hands: A randomized controlled trial <http://www.sciencedirect.com/science/article/pii/S0196655315006653> (Links to an external site.) ↗ (<http://www.sciencedirect.com/science/article/pii/S0196655315006653>)

Assignments Due:

- Reflections on Reading: Due by 1 pm on Tuesday Nov. 16th, 2021
- **Risk Communication exercise turned in by everyone Nov. 18, 2021**

Nov 16, 2021:

- Alternative therapies, phage, probiotics
- **In class-quiz**

Nov 18, 2021:

- Agriculture and ARGs/ARB
- **Communication Project due by noon on canvas**

Week 9: The Role of Agriculture and Humans (in the Spread of ARGs/ARBs)/Global antibiotic resistant clones

Readings:

- Millman JM, Waits K, Grande et al., 2014. Prevalence of antibiotic-resistant E. coli in retail chicken: comparing conventional, organic, kosher, and raised without antibiotics. [v2] 2:15 <http://f1000research.com/articles/10.12688/f1000research.2-155.v2/doi> (Links to an external site.)
- Zurek, L, Ghosh A. 2014. Insects present a link between food animals, farms and the urban environment for antibiotic resistance traits. Appl Environ Microbiol. 80:3562-3567. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4054130/> (Links to an external site.)
- Melendez, D., **M.C. Roberts**, A.L. Greninger, et al., 2019 Whole genome analysis of extraintestinal pathogenic *E. coli* (ExPEC) multidrug resistant ST73 and ST127 isolated from endangered Southern Resident killer whales (*Orcinus orca*). J. Antimicrob. Chemother. 74:2176-2180. <https://academic.oup.com/jac/advance-article/doi/10.1093/jac/dkz159/5481182?guestAccessKey=aa942cae-9eba-413c-a041-d877e3e25645> (Links to an external site.) ↗ (<https://academic.oup.com/jac/advance-article/doi/10.1093/jac/dkz159/5481182?guestAccessKey=aa942cae-9eba-413c-a041-d877e3e25645>)
- Nilsson O. 2012. Vancomycin resistant enterococci in farm animals-occurrence and importance. Infect Ecol Epidem. 2:16969- <http://www.infectionecologyandepidemiology.net/index.php/iee/article/view/16959> (Links to an external site.)

- How do you protect yourself, family, and pets from ARB infections
- **Present risk communication project**

Dec. 2, 2021:

- ARGs/ARB: pandemic clones why do they exist?
- **Present risk communication project**

Week 11: Student Presentations/Summing up what has been learned in the quarter**Assignments Due:**

- Reflections on Reading: Due by 1pm on Tuesday December 8th





Dec 7, 2021:

- How do different human practices influence the evolution/ecology of ARGs/ARBs? Considering economics of antibiotic use
- Specific examples of antibiotic resistant bacteria
- The Example of VRE in US vs. EU
- Ciprofloxacin resistant Campylobacter
- **Present risk communication project (wrap up)**

Dec 9, 2021: Final















- **In class Final exam will be given during class from 1:30-3:20**















Course Summary:
















Date	Details	Due
Thu Oct 1, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285539&include_contexts=course_1478664	1:30pm to 3:30pm
Fri Oct 2, 2020	 DEOHS Student Online Learning Technology Survey https://canvas.uw.edu/courses/1478664/assignments/6615945	due by 1pm
Tue Oct 6, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285541&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Oct 8, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285542&include_contexts=course_1478664	1:30pm to 3:30pm
















Date	Details	Due
Tue Oct 13, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285543&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Oct 15, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285545&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Oct 20, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285547&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Oct 22, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285548&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Oct 27, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285549&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Oct 29, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285546&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Nov 3, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285544&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Nov 5, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285550&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Nov 10, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285551&include_contexts=course_1478664	1:30pm to 3:30pm

Date	Details	Due
Thu Nov 12, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285552&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Nov 17, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285553&include_contexts=course_1478664	1:30pm to 3:30pm
	 Quiz 3 https://canvas.uw.edu/courses/1478664/assignments/6615975	due by 3:20pm
Thu Nov 19, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285554&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Nov 24, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285555&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Nov 26, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285557&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Dec 1, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285558&include_contexts=course_1478664	1:30pm to 3:30pm
Thu Dec 3, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285556&include_contexts=course_1478664	1:30pm to 3:30pm
Tue Dec 8, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285559&include_contexts=course_1478664	1:30pm to 3:30pm

Date	Details	Due
Thu Dec 10, 2020	 ENV H 444 A Au 20: Antibiotic Resistant Bacteria/Genes Impact On The Environment And Public Health https://canvas.uw.edu/calendar?event_id=2285540&include_contexts=course_1478664	1:30pm to 3:30pm
	 Final Exam https://canvas.uw.edu/courses/1478664/assignments/6615933	due by 3:20pm
	 Final Exam https://canvas.uw.edu/courses/1478664/assignments/6615949	due by 3:20pm
Thu Sep 30, 2021	 Background Reading/Viewing for Week 1 https://canvas.uw.edu/courses/1478664/assignments/6615935	due by 1:30pm
Tue Oct 5, 2021	 Week 1/2 Reading Reflections https://canvas.uw.edu/courses/1478664/assignments/6615982	due by 1pm
	 Background Reading/Viewing for Week 2 https://canvas.uw.edu/courses/1478664/assignments/6615937	due by 1:30pm
Tue Oct 12, 2021	 Research paper topics https://canvas.uw.edu/courses/1478664/assignments/6615977	due by 12pm
	 Risk Communication Stakeholder and Type of Document https://canvas.uw.edu/courses/1478664/assignments/6615979	due by 12pm
	 Week 3 Reading Reflections https://canvas.uw.edu/courses/1478664/assignments/6615983	due by 1pm
	 Background Reading/Viewing for Week 3 https://canvas.uw.edu/courses/1478664/assignments/6615938	due by 1:30pm
Thu Oct 14, 2021	 Quiz 1 (Closed Book, No Notes) https://canvas.uw.edu/courses/1478664/assignments/6615973 (3 students)	due by 3:30pm
	 Quiz 1 (Closed Book, No Notes) https://canvas.uw.edu/courses/1478664/assignments/6615973 (ENV H 444 A)	due by 3:30pm
	 Quiz 1 (Closed Book, No Notes) https://canvas.uw.edu/courses/1478664/assignments/6615973	due by 3:30pm
Tue Oct 19, 2021	 Article Post about ARG/ARB in the popular press https://canvas.uw.edu/courses/1478664/assignments/6615934	due by 1pm

Date	Details	Due
	 Week 4 Reading Reflection https://canvas.uw.edu/courses/1478664/assignments/6615984	due by 1pm
	 Background Reading/Viewing for Week 4 https://canvas.uw.edu/courses/1478664/assignments/6615939	due by 1:30pm
Tue Oct 26, 2021	 Background Reading/Viewing for Week 5 https://canvas.uw.edu/courses/1478664/assignments/6615940	due by 1:30pm
	 Week 6 Reading Reflections https://canvas.uw.edu/courses/1478664/assignments/6615985	due by 1pm
	 Background Reading/Viewing for Week 6 https://canvas.uw.edu/courses/1478664/assignments/6615941	due by 1:30pm
Tue Nov 2, 2021	 Quiz 2 https://canvas.uw.edu/courses/1478664/assignments/6615974 (ENV H 444 A)	due by 3:20pm
	 Quiz 2 https://canvas.uw.edu/courses/1478664/assignments/6615974 (ENV H 544 A)	due by 3:20pm
	 Week 7 Reading Reflections https://canvas.uw.edu/courses/1478664/assignments/6615986	due by 1pm
Tue Nov 9, 2021	 Background Reading/Viewing for Week 7 https://canvas.uw.edu/courses/1478664/assignments/6615942	due by 1:30pm
	 Week 8 Reading Reflections https://canvas.uw.edu/courses/1478664/assignments/6615987	due by 1pm
Tue Nov 16, 2021	 Background Reading/Viewing for Week 8 https://canvas.uw.edu/courses/1478664/assignments/6615943	due by 1:30pm
	 Risk Communication Exercise https://canvas.uw.edu/courses/1478664/assignments/6615978	due by 12pm
Tue Nov 23, 2021	 Research Paper https://canvas.uw.edu/courses/1478664/assignments/6615976	due by 12pm
	 Week 9 Reflection https://canvas.uw.edu/courses/1478664/assignments/6615988	due by 1pm

Date	Details	Due
	 Background Reading/Viewing for Week 9 https://canvas.uw.edu/courses/1478664/assignments/6615944	due by 1:30pm
Tue Nov 30, 2021	 Background Reading/Viewing for Week 10 https://canvas.uw.edu/courses/1478664/assignments/6615936	due by 1:30pm
Wed Dec 8, 2021	 Week 10 Reading Reflection https://canvas.uw.edu/courses/1478664/assignments/6615981	due by 1pm
	 Discuss article - 2 min presentation https://canvas.uw.edu/courses/1478664/assignments/6615947	
	 Discuss article - 2 min presentation https://canvas.uw.edu/courses/1478664/assignments/6615948	
	 Discuss popular press article - 2 min presentation https://canvas.uw.edu/courses/1478664/assignments/6615946	
	 Lecture 1 https://canvas.uw.edu/courses/1478664/assignments/6615950	
	 Lecture 10 https://canvas.uw.edu/courses/1478664/assignments/6615951	
	 Lecture 11 https://canvas.uw.edu/courses/1478664/assignments/6615952	
	 Lecture 12 https://canvas.uw.edu/courses/1478664/assignments/6615953	
	 Lecture 13 https://canvas.uw.edu/courses/1478664/assignments/6615954	
	 Lecture 14 https://canvas.uw.edu/courses/1478664/assignments/6615955	
	 Lecture 15 https://canvas.uw.edu/courses/1478664/assignments/6615956	
	 Lecture 16 https://canvas.uw.edu/courses/1478664/assignments/6615957	
	 Lecture 17 https://canvas.uw.edu/courses/1478664/assignments/6615958	

Date	Details	Due
	 Lecture 18 (https://canvas.uw.edu/courses/1478664/assignments/6615959)	
	 Lecture 19 (https://canvas.uw.edu/courses/1478664/assignments/6615960)	
	 Lecture 2 (https://canvas.uw.edu/courses/1478664/assignments/6615961)	
	 Lecture 3 (https://canvas.uw.edu/courses/1478664/assignments/6615962)	
	 Lecture 4 (https://canvas.uw.edu/courses/1478664/assignments/6615963)	
	 Lecture 5 (https://canvas.uw.edu/courses/1478664/assignments/6615964)	
	 Lecture 6 (https://canvas.uw.edu/courses/1478664/assignments/6615965)	
	 Lecture 7 (https://canvas.uw.edu/courses/1478664/assignments/6615966)	
	 Lecture 8 (https://canvas.uw.edu/courses/1478664/assignments/6615967)	
	 Lecture 9 (https://canvas.uw.edu/courses/1478664/assignments/6615968)	
	 Present risk communication projects (https://canvas.uw.edu/courses/1478664/assignments/6615969)	
	 Present risk communication projects (https://canvas.uw.edu/courses/1478664/assignments/6615970)	
	 Present risk communication projects (https://canvas.uw.edu/courses/1478664/assignments/6615971)	
	 Present risk communication projects (https://canvas.uw.edu/courses/1478664/assignments/6615972)	
	 Syllabus Quiz (https://canvas.uw.edu/courses/1478664/assignments/6615980)	