

Antibiotics: Promise, Profits and Pitfalls

PIPa 1901

Fall, 2017

3 credits



Dr. Linda Kinkel

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Department of Plant Pathology
*College of Food, Agricultural
& Natural Resources Sciences*

Course Description

This course focuses on four main topics:

- History, biology, chemistry, and ecology of antibiotics.
- Global use of antibiotics in human and animal medicine and in agriculture.
- Consequences of antibiotic use and overuse, and the global public policy challenges of antibiotic resistance.
- Risks and opportunities in bringing new antibiotics to market, including discovery, scale-up, and intellectual property issues.

This course addresses the **Technology and Society theme** by *i)* integrating the science of antibiotics with the underlying social and political implications of medical and biotechnological advances; and *ii)* exploring contemporary issues surrounding intellectual property rights, genetic engineering, health care costs and medical ethics.

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Office Hours	We are available every day after class, or at other times by prior arrangement. Please email to set-up a time to meet.

Course Learning Outcomes

As a result of taking this course, you will be able to:

- Demonstrate a broad understanding of the science, history, ethics, and public policy issues related to antibiotic development, production, and use.
- Synthesize details learned about the basis of microbial chemical ecology and drug discovery approaches.
- Identify and describe major advances and limitations in antibiotic development, use, and patenting.

In addition to understanding these basic concepts, you will apply your knowledge in the following ways:

- Analyze research literature.
- Identify myths and facts in social media, online, and popular science news related to antibiotic use.
- Make connections across topics.
- Engage with peers, instructors, and guest speakers through active participation and cooperative interaction in classroom discussions and group activities.



Course Structure



The course will consist of 2, 75-minute class sessions each week. We will meet every Tuesday and Thursday from 1-2:15pm in **420A-Bruininks Hall**.

This is a **3-credit course** – and as such – it is expected that you demonstrate commitment and active participation. A detailed schedule is provided below. It is suggested that you add these important dates to your calendar.

Course Materials

There is no formal text for this course. Course materials are available through the course Moodle site and will include current literature available through the Moodle site or UMN Library website. If you have trouble accessing the website, please contact the instructors. Some course videos and podcasts will be available through YouTube or other sources.

Course Grading

Attendance:	10%
Participation: Complete readings and in class discussion:	25%
Homework and in-class assignments:	45%
Final Projects:	20%

Course Grading Standards

A: achievement that is outstanding relative to the level necessary to meet course requirements.

B: achievement that is significantly above the level necessary to meet course requirements.

C: achievement that meets the course requirements in every respect.

D: achievement that is worthy of credit even though it fails to meet fully the course requirements.

F: represents failure and signifies that the work was either 1) completed but at a level of achievement that is not worthy of credit; or 2) was not completed and there was no agreement between the instructors and the student that the student would be awarded an I.

I (incomplete): assigned **at the discretion of the instructors** when, due to extraordinary circumstances, e.g. hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between the instructors and the student.

For additional information, please refer to:

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

Your final grade will be based primarily on **in-class participation, homework assignments, and in-class presentations**. It is expected that you will attend ALL CLASS SESSIONS unless you are ill. As a freshman seminar course, this class places a high premium on active in-class participation. There is no substitute for showing up and engaging with the instructors and your student colleagues. Similarly, because there are NO EXAMS in this class, the modest out-of-class readings and written assignments, as well as the final group project, are critical components in both achieving mastery of course materials and in your final grade. Thus, we expect full participation in these elements of the course. Late assignments will be penalized ONE FULL GRADE per day unless you have spoken with the instructors PRIOR to the due date. There are no options for extra credit in this course.



Student Expectations	Instructor Expectations
<p>Students are expected to: Be <u>present</u> and <u>on-time</u> to class Be <u>respectful</u> of others in the class environment <u>Participate</u> in class activities Submit <u>original</u> and <u>high-quality</u> work <u>Review</u> required course materials Be <u>responsible</u> for their portion of work in group-projects Be <u>open</u> to new methods of learning and ideas that may contrast their own</p>	<p>Students should expect instructors to: Be <u>well prepared</u> for class <u>Respect</u> diversity and <u>value</u> the unique qualities of individuals Give thoughtful and timely <u>feedback</u> Provide <u>access</u> to relevant and constructive <u>learning materials</u> Provide safe and positive <u>learning atmosphere</u> Use <u>proven learning techniques</u> that allow students to succeed in <u>multiple ways</u></p>

Course Schedule

Theme/Unit	Topic	Dates
Course Introduction	Introductions. Course overview and mechanics Antibiotic brainstorming poster project	T 5 Sept
Theme 1: Microbes and infectious disease	- Life before antibiotics: diseases that changed history Diseases yesterday and today	Th 7 Sept
	- An introduction to MICROBES	T 12 Sept
Theme 2: Discovery and production of antibiotics	- A history of antibiotic discovery	Th 14 Sept
	- The ecology and evolutionary biology of antibiotics in soil	T 19 Sept
	- <i>Antibiotics and YOU (Activity)</i> - LAB EXERCISE I: Soil dilution plating - Popular Press reports	Th 21 Sept
	<u>Guest Lecture:</u> Discovery optimization and fermentation scale-up Dr. Christine Salomon, UMN Center for Drug Design	T 26 Sept
	<u>Field Trip:</u> BTI Pilot Plant Fermentation lab tour ----- meet in St. Paul, Gortner Lab ----- Dr. Fred Schendel, UMN Biotechnology Institute	Th 28 Sept
	- LAB EXERCISE 1 FOLLOWUP: assess soil dilution plates, discussion - Final popular press reports - <i>How are antibiotics made by bacteria? How do they work</i>	T 3 Oct
	<u>Guest Lecture:</u> Intellectual Property, Patenting, and Commercialization Dr. Anne Hall, UMN Office of Technology Commercialization	Th 5 Oct
Theme 3:	- Antibiotic resistance: mechanisms of resistance, acquisition and	T 10 Oct

Antibiotic resistance	horizontal transfer, processes of evolution and selection - <i>In class exercise and data review</i> - LAB EXERCISE 2: Antibiotic Disks experiment - Popular press reports	
	- Antibiotic resistance: local vs. global challenges: TB video in Russian prisons, reading - CLASS DISCUSSION	Th 12 Oct
	- LAB EXERCISE 2 FOLLOWUP, LAB EXERCISE 3: analysis and interpretation of scientific data - Assess antibiotic disks experiment - Assess isolate specificity experiment - CLASS DISCUSSION	T 17 Oct
Theme 4: Antibiotic stewardship and agricultural applications	<u>Guest Lecture:</u> Pharmacology and Antibiotic Stewardship Dr. John Rotschafer, UMN Department of Experimental and Clinical Pharmacy	Th 19 Oct
	- Kickoff survey project - <i>The crisis in antibiotic resistance: Frontline I</i>	T 24 Oct
	- Overview: Antibiotics in agriculture - <i>Frontline II</i> , CLASS DISCUSSION	Th 26 Oct
	<u>Guest Lecture:</u> Antibiotics in animal production Dr. Tim Johnson, UMN Department of Veterinary Biomedical Science	T 31 Oct
Theme 5: Antibiotics in the environment and in human health	<u>Research Cameo:</u> <i>Dr. JP Dundore-Arias</i> - <i>Group work time</i>	Th 2 Nov
	<u>Guest Lecture:</u> Antibiotics in the environment Dr. Tim LaPara, UMN Department of Civil, Environmental, and Geo-Engineering	T 7 Nov
	- <i>NARMS in-class exercise</i>	Th 9 Nov
	- <i>NARMS/antibiotic resistance initiative</i>	T 14 Nov
	<u>Guest Lecture:</u> Antibiotics and the human microbiome: solutions. Dr. Alex Khoruts, UMN Department of Medicine	Th 16 Nov
	- Food, microbes, and Thanksgiving.	T 21 Nov
Theme 6: Food, antibiotics, and policy	<i>THANKSGIVING NO CLASS</i>	Th 23 Nov
	Policy exercise: How to manage antibiotic misuse/overuse?/ How to unclog the antibiotic pipeline?	T 28 Nov
	<u>Guest Lecture:</u> Antibiotic resistance project and public policy. Dr. David Hyun, The Pew Charitable Trusts	Th 30 Nov
	IN-CLASS WORK SESSION	T 5 Dec
	IN-CLASS WORK SESSION	Th 7 Dec
	<i>CLASS PRESENTATIONS I</i>	T 12 Dec
	<i>CLASS PRESENTATIONS II</i>	Th 14 Dec

Campus Resources

<u>Student Writing Support</u>	Student writing support is available through the University of Minnesota Center for Writing and provides face-to-face and online collaborative consultations to help student develop productive writing habits and revision strategies. This is a free service to both undergraduate and graduate students.
<u>Moodle</u>	This course uses a Moodle site. Our Moodle site can be accessed through your myU “Courses” site. For assistance with Moodle visit You are responsible for checking the Moodle site regularly.
<u>Multilingual writers</u>	The <u>Minnesota English Language Program</u> , which helps international students prepare for academic work in an English-speaking college or university setting, offers <u>student English language support</u> for undergraduates. This is a free service.
<u>University Libraries</u>	The University has a number of resources available to you. They include the <u>SMART Learning Commons</u> , peer research consultants and a 24/7 chat with a librarian service. As critical thinkers, an understanding of how to obtain the vast wealth of information available through the libraries is a must. For those new to this system, the University offers various consultation services and workshops that could be beneficial.
<u>Counseling and Consulting Services</u>	The University of Minnesota provides a range of counseling services through the Counseling and Consulting Services. The UCCS assists students with concerns and offers an opportunity to talk with an experienced counselor who can help students select and achieve goals for personal and career development. The center offers three types of counseling: personal counseling, academic counseling and career counseling. <u>The Student Academic Success Services</u> office offers classes, workshops, and individual assistance aimed at helping students achieve academic goals.

Course Policies

<u>Disability Accommodations</u>	Participants requiring disability or other accommodations are strongly encouraged to talk to us as soon as possible to gain maximum access to course information. All discussions will remain confidential. University policy is to provide, on a flexible and individualized basis, reasonable accommodations to students who have documented disability conditions (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact Disability Services and us to discuss their individual needs for accommodations.
<u>Diversity</u>	The U of M is committed to achieving excellence through equity and diversity. A diverse student body enhances the academic and social environment for all students and prepares students to thrive in an increasingly diverse workforce and society. Equal educational access is critical to preparing students for the responsibilities of citizenship and civic leadership in a heterogeneous society.
<u>Excused Absences</u>	The U of M describes legitimate circumstances for absences as: illness of the student or his or her dependent, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances.
<u>Mental Health Services</u>	As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you.
<u>Sexual Harassment</u>	University policy prohibits sexual harassment as defined in the University Policy Statement (link to left). Complaints should be reported to the University Office of Equal Opportunity, 419 Morrill.
<u>Academic Integrity</u>	Students are expected to do their own assigned work. If it is determined that a student has engaged in any form of academic dishonesty, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University.
<u>Student Conduct</u>	In the unfortunate event that participant behavior disrupts class or endangers participants, instructors has the responsibility to ask that participant to moderate behaviors, and also has the right to ask uncooperative students to leave a class session. Students whose behavior suggests the need for counseling or other assistance may be referred to their college office or University Counseling and Consulting Services. Students whose behavior may violate the University Student Conduct Code may be referred to the Office of Student Conduct and Academic Integrity. Every attempt will be made to deal with any conflicts in the most timely, direct, educative, and respectful manner.