

Fermentation Microbiology

FST/MB 479/579

3 credits; CRN 52659

115 Wiegand, MWF 11:00-11:50 am

Spring 2019

Instructor

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Office Hours: Tu 3:30-5:00 pm and by appointment

Prerequisites

BI 212, MB 302, BB 350 or BB 450

Course Description

An introduction to industrial microbiology with a focus on the physiology of fermentation and use of microorganisms for the production of alcoholic beverages, food ingredients, and fermented foods.

Course Objectives

1. To learn the biological basis for microbial overproduction of valuable metabolites.
2. To learn how selected fermented foods and beverages are produced.

Expected Outcomes for All Students

1. Be able to correlate defects or alterations in microbial metabolism with overproduction of metabolites used as food ingredients.
2. With respect to specific fermented foods and beverages, be able to rationalize how and why the process of fermentation results in major changes to raw agricultural products.

Additional Expected Outcomes for Graduate Students

1. Write two critical evaluations of the claims of an assigned scientific article.
2. Teach class about a fermented food or beverage or food ingredient not covered by instructor in a 15-20 min oral group presentation.

Text

Lecture notes, power point presentations, and other required readings will be provided via Canvas prior to lecture. Specific readings will be assigned and announced via Canvas.

Assessment of Student Performance

All students: two midterm examinations (100 points each), a partly comprehensive **final** examination (100 points with ~70% covering material since the second midterm and ~30% covering material preceding the second midterm), and **30 points** in **extra credit** in the form of on-line quizzes and/or assignments.

How will the extra credit factor into your grade? Example for undergraduates: assume you got 70 on midterm 1, 73 on midterm 2, 81 on the final, and 24 out of 30 on quizzes/assignments. Your grade would be $[(70 + 73 + 81 + 24)/300] \times 100 = 82.7\% = B$. Without the extra credit, the grade would be $74.7\% = C$. **If you are taking the course as a graduate student, the number in the denominator will be 400** and the number in the numerator will include your scores on the 2 critiques and the oral presentation. **Note: Canvas does not distinguish the extra credit points from points earned on exams. This means that your running score in the Canvas gradebook will not be correct. Don't agonize. The correct final percentages and corresponding grades will be calculated at the end of the course.**

Exams will cover written material and powerpoint slides provided via Canvas **and unwritten material based on classroom discussion.** The **quizzes and assignments** will cover **material recently discussed in class.** The quizzes must be taken on-line within a 1-2 day period that will be specified in an announcement provided via Canvas. Answers will be made available on-line **after** the specified deadline, and therefore, **quizzes cannot be taken late.** While quizzes do not need to be taken in a single sitting and answers can be changed prior to submission, **only a single on-line submission of answers is allowed.** While talking with classmates or others about the quiz material is encouraged, you alone are responsible for submitting answers. Taking quizzes with others as a collaborative activity is a form of academic dishonesty.

Old exams and keys from past years will be made available on Canvas. **Important:** these exams reflect material presented in previous years--not necessarily this term. They are provided to show the types of questions asked. Exams given this term will reflect material presented this quarter.

Grading

The grade cut-offs below are guaranteed minimum grades. **(Scores will be rounded up in the following way: 87.5 will be marked as 88 and 86.5 will be marked as 87.**

	% of total points
A	≥93
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	<60

Additional work for graduate students only:

100 points for 1) two critical written evaluations (critiques) of two assigned scientific articles (30 points each), and 2) a group presentation (40 points) to teach the class about a fermented product/ingredient not covered by the instructor.

1) Two critical written evaluations--critiques (30 points each)

Graduate students will evaluate the claims made in two assigned scientific articles in the area of fermentation microbiology. What are “claims”? The “claims” are the important experimental findings as described in the abstract. You will evaluate the evidence used to support the claims. The first step in this two-part exercise is to determine what the claims are. Find them in the abstract, number them, and write them in your own words. Next, hunt for the specific experiments that provide the data used as evidence in support of the claims. Briefly, list and describe the evidence for each claim (i.e., fig 1a which shows trp uptake measurements, table 3 that lists strain genotypes, measurements of oxalate presented in text, p. 456, lines 12-15), **and** evaluate how good each is. Be systematic in documenting your reasoning. Papers must be typed and include the full title and citation of the evaluated paper. The first evaluation will be due **May 1** and the second **May 24**. **Two ~45 min meetings outside of class will be scheduled for graduate students for discussion of the papers and for organization of the group presentation scheduled for June 3 (below). Graduate students will meet with the instructor briefly at the end of the first day of class to schedule discussions.** The first will be scheduled in mid-Apr and the second will be held in mid-May.

The purpose of this assignment is to give you practice determining the strength of published observations as you will need to perform this same analysis for papers that set the stage for your own thesis work. Are you building on studies that are reasonable or questionable?

2) Group presentation (40 points)

Graduate students will make ~20-minute group presentations to teach the class about a fermented food, beverage, or microbially-produced food additive or processing aid not discussed in class. PowerPoint, overheads, chalk and blackboard, or any other suitable means may be used. Each student in the group must participate in the oral presentation. The group will be expected to provide the instructor with a pdf version of the presentation by **3 pm May 31** to allow posting and sharing on Canvas. **Clearly indicate in the handout which group member was responsible for what material.** Students are required to choose a product or product type that is new to them and to **obtain instructor approval for the topic no later than May 3. Presentations will be given June 3.** Presentations will be evaluated on the basis of clarity, mastery of the subject, and on how well questions are answered. Focus on making sure your audience understands the material you are presenting.

Date	Topic	Readings ¹	
Apr 1	Course overview, brief review, fermentation	Course notes A	
Apr 3	Alcoholic fermentation ecology		
Apr 5	<i>S. cerevisiae</i> fermentation physiology I		
Apr 8	<i>S. cerevisiae</i> fermentation physiology II		
Apr 10	<i>S. cerevisiae</i> fermentation physiology III		
Apr 12	<i>Saccharomyces</i> life-cycle & domestication I		
Apr 15	<i>Saccharomyces</i> life-cycle & domestication II		
Apr 17	<i>Saccharomyces</i> life-cycle & domestication III		
Apr 19	Midterm I in 115 Wiegand		
Apr 22	Non- <i>Saccharomyces</i> yeasts	Course notes B	
Apr 24	<i>Brettanomyces</i>		
Apr 26	Lactic acid bacteria		
Apr 29	Acetic acid bacteria		
May 1	Beer, wine, cider & sake I Grad student critique #1 due		
May 3	Beer, wine, cider & sake II Last day for grad students to choose presentation topic		
May 6	Beer, wine, cider & sake III		
May 8	Beer, wine, cider & sake IV		
May 10	Beer, wine, cider & sake V		
May 13	Review: microbiology of alcoholic fermentation		
May 15	Midterm II in 115 Wiegand		
May 17	Using microbes to make food ingredients I		Course notes C
May 20	Using microbes to make food ingredients II		
May 22	Fermented foods: Soybean products		
May 24	Fermented foods: Chocolate Grad student critique #2 due		
May 27	Memorial day holiday		
May 29	Fermented foods: Sourdough bread, kefir		
May 31	Fermented foods: Vinegar		
Jun 3	Graduate student group presentation(s)		
Jun 5	Fermented foods: Kombucha		
Jun 7	Review: food ingredients and fermented foods		
FINAL EXAM (DATE & TIME TBA) in 115 Wiegand			

¹ Course notes and other materials will be provided via Canvas prior to lectures.

Statement Regarding Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at <http://ds.oregonstate.edu>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Disruptive behavior and academic or scholarly dishonesty are prohibited

http://studentlife.oregonstate.edu/sites/studentlife.oregonstate.edu/files/student_conduct_code_1.pdf.

Academic or scholarly dishonesty is defined as an act of deception in which a student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the student's own efforts or the efforts of another.