ABG 298: Gastrointestinal Microbiology of Livestock
Spring 2024

Description
Microbiology of the gastrointestinal tract of ruminants and other livestock species; its relation to improving livestock production.

Credits: 3

Lecture
MTR 9:00 to 9:50 a.m.
Meyer 1135

Instructor
Timothy J. Hackmann
tjhackmann@ucdavis.edu
Office hours: By appointment

Text
Required: Russell JB. 2002. Rumen Microbiology and Its Role in Ruminant Nutrition. James B. Russell.
(available at http://www.ars.usda.gov/services/software/download.htm?softwareid=409)

Journal articles will also be discussed in addition to the required text. These are

1. Wylensek et al. 2020. A collection of bacterial isolates from the pig intestine reveals functional and taxonomic diversity. Nat Commun 11, 6389 (2020).
2. Schoelmerich et al. 2020. Energy conservation involving two respiratory circuits. Proc Natl Acad Sci. pii: 201914939. doi: 10.1073/pnas.1914939117
3. Stewart et al.. 2019. Compendium of 4,941 rumen metagenome-assembled genomes for rumen microbiome biology and enzyme discovery. Nat Biotechnol 37:953-961.
4. Lagier et al. 2016. Culture of previously uncultured members of the human gut microbiota by culturomics. Nat Microbiol 1:16203.

Grades and Grade Points
Ten written assignments will be given and will be worth 10 points each. Four exams will be given and will be worth 100 points each.

Four journal articles will be discussed. Each discussion will occupy one class, and participation will be worth 10 points for each article.

Grades will be based on the total points earned as a percentage of total points possible (540). Letter grades will be assigned as follows:

Percentage		Percentage	
93 to 100	A	73 to <77	C
90 to <93	A-	70 to <73	C-
87 to <90	B+	67 to <70	D+
83 to <87	B	60 to <67	D
80 to <83	B-	<60	E
77 to <80	C+		

Objectives

Students will learn how to

1) Identify groups, functions, and characteristics of microbes in the gastrointestinal tract of livestock, especially ruminants;
2) Apply microbiological principles to solve problems encountered during practical livestock feeding;
3) Critically evaluate journal articles in gastrointestinal microbiology.

Service Animals

The goal of the Department of Animal Science is to enable students to be safe and successful in the teaching laboratories. The Department has a formal policy regarding the presence of service animals in laboratories and at the animal facilities (http://animalscience.ucdavis.edu/resources/safety/pdf/ans-policy-on-service-animals-in-labs.pdf). Students are required to inform the instructor by the end of the first week of class about any situation that might involve a service animal being in a laboratory course. Please complete the form provided in the link for Department Chair or CAO approval.

Schedule

Topic	Due date for assignment
1. Introduction	
2. The GIT as a microbial habitat	
3. Microbes of the rumen: Overview and bacteria	1
4. Microbes of the rumen: Protozoa, fungi, methanogens, viruses	
5. Microbes of the human GIT	
6. Microbes of other mammal species	2
Journal article discussion 1	
Exam 1	
7. Quantification of populations	3
8. Development of populations	
9. Adaptation of populations	
10. Degradation of feed	4
11. Fermentation pathways	
12. Fermentation stoichiometry	
Journal article discussion 2	5
Exam 2	
13. Growth	
14. Nitrogen & lipid metabolism	6
15. Microbial interactions	
16. Diversity & genomics: Genome sequencing	
17. Diversity & genomics: Diversity	7
18. Diversity & genomics: Exercise in genome analysis	
Journal article discussion 3	
Exam 3	8
NO CLASS: Memorial Day	
19. Rumen disorders	
20. Manipulation of fermentation	9
21. Biological models	
22. Experimental techniques	
Journal article discussion 4	10
Exam 4	