

ABG 298: Gastrointestinal Microbiology of Livestock Spring 2020

Description

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

Credits: 3

Lecture

MTR 11:00 to 11:50 a.m.

1135 Meyer

Instructor

Timothy J. Hackmann

tjhackmann@ucdavis.edu, 530-754-1672

Office hours: By appointment, 2207 Meyer Hall

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. Ze X, Duncan SH, Louis P, Flint HJ. 2012. Ruminococcus bromii is a keystone species for the degradation of resistant starch in the human colon. ISME J 6:1535-43. doi: 10.1038/ismej.2012.4
2. Schoelmerich MC, Katsyv A, Dönig J, Hackmann TJ, Müller V. 2019. Energy conservation involving two respiratory circuits. Proc Natl Acad Sci. pii: 201914939. doi: 10.1073/pnas.1914939117
3. Stewart RD, Auffret MD, Warr A, Walker AW, Roehe R, Watson M. 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:

| <u>Percentage</u> | | <u>Percentage</u> | |
|-------------------|----|-------------------|----|
| 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

| Date | Topic | Due date for assignment |
|--------|---|-------------------------|
| 30-Mar | 1. Introduction | |
| 31-Mar | 2. The GIT as a microbial habitat | |
| 2-Apr | 3. Microbes of the rumen: Overview and bacteria | 1 |
| 6-Apr | 4. Microbes of the rumen: Protozoa, fungi, methanogens, viruses | |
| 7-Apr | 5. Microbes of the human GIT | |
| 9-Apr | 6. Microbes of other mammal species | 2 |
| 13-Apr | Journal article discussion 1 | |
| 14-Apr | Exam 1 | |
| 16-Apr | 7. Quantification of populations | 3 |
| 20-Apr | 8. Development of populations | |
| 21-Apr | 9. Adaptation of populations | |
| 23-Apr | 10. Degradation of feed | 4 |
| 27-Apr | 11. Fermentation pathways | |
| 28-Apr | 12. Fermentation stoichiometry | |
| 30-Apr | Journal article discussion 2 | 5 |
| 4-May | Exam 2 | |
| 5-May | 13. Growth | |
| 7-May | 14. Nitrogen & lipid metabolism | 6 |
| 11-May | 15. Microbial interactions | |
| 12-May | 16. Diversity & genomics: Genome sequencing | |
| 14-May | 17. Diversity & genomics: Diversity | 7 |
| 18-May | 18. Diversity & genomics: Exercise in genome analysis | |
| 19-May | Journal article discussion 3 | |
| 21-May | Journal article discussion 3 | 8 |
| 25-May | 19. Rumen disorders | |
| 26-May | NO CLASS: Memorial Day | |
| 28-May | 20. Manipulation of fermentation | 9 |
| 1-Jun | 21. Biological models | |
| 2-Jun | 22. Experimental techniques | |
| 4-Jun | Journal article discussion 4 | 10 |
| TBA | Exam 4 | |