

Biology 173 Research Based Sections: Fall 2015

Instructors

Professor Tom Schmidt (schmidt@med.umich.edu)

Dr. Arvind Venkataraman (arvindv@med.umich.edu)

Course Meeting Times

Lab: Thursday 9-12 AM Sections 201 - 2114 USB, Section 202 - 2115 USB
Thursday 2-5 PM Sections 203 - 2114 USB, Section 204 - 2115 USB

Recitation: 296 Weiser Hall Fridays 2-3 PM

Office Hours

Byron Smith, GSI (bjsm@umich.edu) - SLC Satellite (2165 Undergraduate Science Building)
Team Room D – Tuesdays: 1-2pm & Wednesdays: 10-11am

Alex Schmidt GSI (alexws@umich.edu) - SLC Satellite (2165 Undergraduate Science Building)
Team Room E – Mondays: 11am-12pm & Wednesdays: 11am-12pm

Dr. Schmidt – By Appointment

Dr. Venkataraman – By Appointment

Course Objectives and Philosophy

The community of microbes in our gut (microbiome) plays critical roles in regulating our health. In this course, you will research how the composition of your own gut microbiome can be managed for health benefits. Specifically, you will determine how the addition of one of three forms of fiber: resistant starch, inulin, or arabinoxylan to our diets impacts this community and impacts butyrate production. All the lab exercises have been designed to equip you with the concepts and skills necessary to answer this and related question. We will provide specific learning objectives in the write-up for each lab. Review them at the end of each lab and make sure to check in with your instructors if you think you did not meet any of these objectives. From a philosophical perspective, we encourage you to think about each lab exercise using a simple two-fold framework: i) why you are doing this experiment? And ii) what do the results mean? The questions at the end of each lab exercise are designed to foster this framework.

Course Websites

The lab manuals and associated reading material will be posted on CTools. Please access the main course website through CTools: <https://ctools.umich.edu/gateway/>. Through CTools, you will be able to access course announcements, lab information, grades, the Piazza discussion platform, and more.

Required Textbook

The Good Gut by Justin Sonnenburg and Erica Sonnenburg (2015)

Available on line and at local book stores.

[<http://www.amazon.com/The-Good-Gut-Control-Long-term-ebook/dp/B00OZ0TOV2>]

Before each lecture and lab, the instructors will post relevant chapters from this book as required reading material. You are expected to read these chapters before each lecture. We

will post be additional reading materials as needed. Lecture slides will be posted as well, which you may wish to print out before coming to class.

Course Logistics

Before each lab, we will post the protocol, and ask that you read it carefully prior to your lab session. The GSIs will provide a brief recap of the concepts underlying each lab and demonstrate the techniques needed for success in the laboratory.

Homework

There will be homework assignments for each lab that will be due exactly a week after. It will be your responsibility to submit your homework before the due date; no points will be awarded for late work. We encourage you to collaborate with one another and form study groups around the material, but the work that you submit must be in your own words.

Exams

In addition to these homework assignments, there will be two exams during lab sessions and two graded presentations, which will also contribute to grading (see below). If you miss an exam due to an unexpected emergency or illness, you should contact your instructors by 5:00pm on the day after the exam. We encourage you to approach your GSI and/or instructors about the material far enough in advance that we can help clarify difficult concepts.

Grading

There will be 100 possible points. The breakdown is as follows:

- **HOMEWORK**
60 points total (8 homework assignments 10 points each; we will drop the 2 homework assignments in which you scored least)
- **PRESENTATIONS AND FINAL PROJECT**
15 points total (1 presentation worth 10 points and a proposal for the final project worth 5 points)
- **QUIZZES**
20 points total (2 exams, 10 points each)
- **LAB NOTEBOOK MAINTENANCE**
5 points total (Before the labs, the GSIs will describe what should be recorded in the lab notebook for that day's exercise. Once you record these details, you are expected to get the GSI's initial before leaving the lab)

Grading Scale:

- A range: 90-100 points
- B range: 80-90 points
- C range: 70-80 points
- D range: 60-70 points
- E: <60 points

We reserve the option to adjust scores near these cutoffs upwards; the cutoffs will not be raised.

Students with Disabilities

If you would like to request special accommodation(s) for one or more disabilities, please contact one of the course instructors as soon as possible. Specifically, if you require special exam accommodations, please inform a course instructor at least two weeks prior to the first exam. If you have not already registered with the Office of Services for Students with Disabilities (G-664 Haven Hall; 763-3000), we encourage you to do so in order to obtain disability verification and determine appropriate accommodations. We will do everything possible to make arrangements for you, and your information will be kept strictly confidential.

Sexual Misconduct

We are committed to fostering a safe, productive learning environment and recognize that sexual misconduct can undermine students' academic success. We encourage anyone dealing with sexual misconduct to talk to someone about their experience, so that the situation can be addressed and the individual can get the support they need. Confidential support and academic advocacy can be found with the Sexual Assault Prevention and Awareness Center on their 24-hour crisis line, (734) 936-3333 and at sapac.umich.edu.

Disabilities

If you may need an accommodation for a disability, please let me know at the beginning of the term. Next, you should contact the Services for Students with Disabilities office. Once your eligibility for an accommodation has been determined, you will be issued a Verified Individual Services Accommodation form and we can arrange for your accommodation. Any information you provide is private and confidential and will be treated as such.

Academic Misconduct

University communities function best when their members treat one another with honesty, fairness, respect, and trust. The University of Michigan holds all members of the its community to high standards of scholarship, personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the College.

Lab Schedule

Date	Brief description
Sep 10	No Lab
Sep 17	Comparing the percentage of starch degraded by human amylase and the microbiome
Sep 24	Part 1 of Isolating organisms from gut microbiomes capable of degrading exotic polysaccharides (sea-weed, xanthan gum, carrageenan) - Inoculate into bacterial growth medium from rectal swab Learn to spread-plate and streak-plate bacterial cultures
Oct 1	Part 2 of Isolating organisms from gut microbiomes capable of degrading exotic polysaccharides (sea-weed, xanthan gum, carrageenan) – Inoculate from previous week’s culture into liquid media containing specific carbohydrates Part 1 of Determining if Hydrogen removal by methanogens influences short-chain fatty acid production by gut microbiomes – Set up microcosms with fecal pellets and/or pure cultures
Oct 8	Part 3 of Isolating organisms from gut microbiomes capable of degrading exotic polysaccharides (sea-weed, xanthan gum, carrageenan) – Streak plate from previous week’ culture into agar-based solid media Part 2 of Determining if Hydrogen removal by methanogens influences short-chain fatty acid (SCFA) production by gut microbiomes – Measure the amount of SCFAs in the microcosms from last week
Oct 15	Extracting DNA from mice fecal pellet
Oct 22	Part 1 of Classifying organisms that degrade the exotic polysaccharides (from Oct 8) – pick a colony, extract DNA, and set up a PCR to amplify the 16S-rRNA encoding gene
Oct 29	Part 2 of Classifying organisms that degrade the exotic polysaccharides – Gel electrophoresis to confirm PCR product from Oct 22, Clean up PCR product using ExoSAP IT
Nov 5	In-silico Lab 1 – Aligning DNA sequences, createing operational taxonomic units, start analyzing community composition
Nov 12	In silico Lab 2 – Comparing communities using diversity metrics
Nov 19	Anthropometry - Measuring BMI and compile dietary information
Dec 3	Presentations of final projects
Dec 10	Presentations of final projects