

**Food Science 324
Food Microbiology Lab
Fall 2014**

Course Description:

Food Science 324 is a laboratory course where students conduct exercises dealing with food preservation, spoilage, and food poisoning. Basic techniques for the isolation, identification and quantification of specific microbes occurring in foods are assayed. Also, some food fermentations mediated by bacteria and yeast will be conducted during the semester.

Meeting Times and Locations:

Laboratory	Monday Wednesday	1:20 – 4:20 pm	2145 Microbial Sciences Building
-------------------	---------------------	----------------	-------------------------------------

Instructor

Arnoldo Lopez-Hernandez
113A Babcock Hall
Office hours: by appointment
Email: alopezhernan@wisc.edu

Teaching Assistant

Elena Vinay-Lara
227 Babcock Hall
Office hours: by appointment
vinaylara@wisc.edu

General Course Information

Welcome to the Food Microbiology laboratory course at the University of Wisconsin – Madison. This laboratory will complement the information provided in the lecture course by giving “hands-on” experience working with food and microorganisms important in the food industry. There are several broad teaching goals of this course. First, we want to introduce you to the **basic techniques and tools used in the food industry**. The experiments conducted in this course will give you an understanding of the theory and basis for a wide range of approaches **from classical methods to the recently developed rapid methods for bacterial detection**. Secondly, you will be introduced to food-related, important organisms as well as try your hand at food production using microorganisms. The third and most important goal is to give you even more skills and experience you need to become a good scientist. This includes **keeping an accurate and complete lab notebook**, understanding the importance of proper controls and what makes a control appropriate, to become more comfortable in a lab setting, and overall to better learn the scientific process.

To accomplish these goals **you will perform a series of experiments, taking careful lab notes as you go along**. The experiments mimic industrial situations and when possible will not have predetermined, artificial results. There are a few simple things that you can do to assure success in this class. First, come to lab and do the experiments. To learn about experimental science you have to do it in-person. It is impossible to make-up missed lab periods and difficult to take quizzes later. Second, **read the experiments before you come to class**. Well-prepared students not only understand why they are doing what they are doing (which makes the lab more enriching) but they also finish in a more timely fashion (they get out of lab on time). Finally, take careful lab notes during the experiment. This will serve you well when it comes to writing the lab reports.

Lab Notebook

During the semester you will be expected to maintain a laboratory notebook and to keep it up-to-date. The following points should be kept in mind as you collect data:

1. Do not collect data on scraps of paper or paper toweling! It will still look like a scrap of paper or a towel and you may toss it into the garbage can in a moment of extreme tidiness!
2. **Date and identify all entries** in your data notebook.
3. Good data collection is a function of preparedness. If you set up an assay that needs daily monitoring, set up a chart that has spaces for each day's observation. This way the information is all in one place and if you have missed an observation period, it will be immediately obvious to you. A few minutes of preparation before coming to lab can save you hours of searching and frustration later!

You are expected to read the write-up in the lab manual and prepared your lab notebook before the experiments accordingly. For this course, we will require each of the following sections for every experiment in your lab notebook:

1. **Purpose of experiment** - A sentence or two briefly explaining the goal(s) of the experiment.
2. **General Outline** – Make a very general outline of the overall experiment. Make it very brief also!! This should be something like:
Day 1- Inoculate enrichment broth
Day 2 – Streak for isolation on PALCAM
etc.
3. Specific **Outline of the procedure** with room allotted for data collection — This defines the actual steps of the protocol, incubation times and temperatures, centrifuge speeds, reagents used, etc.
4. **Calculations and graphs** — This section should contain examples of your calculations, the results of all calculations made, any necessary graphs, etc. Include only example calculations, not all calculations.
5. **Conclusions** — The conclusion section is essential. A clear, concise summary of the results of the analyses is critical in conveying important scientific information. This should be no longer than a paragraph or two and needs to convey the scientific conclusions of the experiment.

Lab Reports

Lab reports will be due the week following the lab end of the lab exercise (more details will be provided during the semester). Lab reports will follow the format specified by the instructor and will not be accepted electronically. Unless specified, all lab reports must be typed.

Lab Safety

Microbiology is a fascinating science and many different procedures are used to study it. Often these protocols involve the use of hazardous equipment or dangerous chemicals. It is crucial for the success of experiments and the safety of the experimenter that certain rules be followed in the laboratory. Below is a list of general protocols, which will ensure your personal safety. Please read them and make sure you understand them completely.

Immunocompromised individuals

If you are immunocompromised for any reason (chemo, immunodeficiency diseases, pregnant or other reasons), please **inform the instructor immediately**. You will be discouraged from attending (without consequence) labs that would present even the slightest risk to you.

Biologically Contaminated Materials

A biologically contaminated material is **anything that comes in contact with a living culture** (slides, tubes, flasks, petri dishes). Treat these materials with special care to prevent transmission of microbes (a potential source of disease) to unsuspecting individuals.

1. **Treat all microorganisms and biologically contaminated materials as potential sources of disease.** We will be enriching for organisms from food, and they are pathogens, albeit weakened ones. Please be careful
2. Discard all biologically contaminated materials as outlined in the Lab Clean-Up section (see below).
3. **Never remove any cultures from the laboratory.**

Hazardous Chemical

Hazardous chemicals may sometimes be necessary for various experiments. These rules will help you handle them correctly.

Dress

1. **Lab coats** will be provided and required at all time; safety glasses will be required when deemed appropriate.
2. If you have long hair, take the necessary steps to prevent it from dangling near lit burners or cultures.
3. **Wear gloves when handling hazardous materials.** The instructor will inform you when necessary.

Chemicals

1. Know your chemicals. Understand their hazards (is it explosive? poisonous? caustic? blistering? etc.). This information will help you know how to treat them when handled or spilled.
2. There will be **no mouth pipetting**. Many of the chemicals we use in this lab are dangerous. Cultures and chemicals should never be mouth pipetted. will be ingested accidentally.
3. Keep volatile, flammable liquids (i.e. ethanol) away from flames.

4. If something is accidentally swallowed, follow these general guidelines. Identify the chemical ingested. If the person is unconscious do not administer liquids. If the person is conscious and the ingested chemical is known, perform the following treatment.
 - Acids - Do not induce vomiting, do not administer bicarbonate, administer milk of magnesia in large amounts followed by milk.
 - Bases - Do not induce vomiting; administer 1% acetic acid followed by milk.
 - Other liquids (except petroleum products) -Administer 2-4 glasses of water and then induce vomiting with finger or water containing 1 tsp. of NaCl per glass. Continue vomiting until vomit fluid is clear.
 - Gases - Remove the afflicted person from the area while avoiding inhaling the gas yourself. If the individual is not breathing, begin mouth-to-mouth resuscitation and continue until the victim is breathing normally or a physician orders a halt.
 - Burns - Immerse in cold H₂O for 15 minutes.

In all cases call a physician and tell them what the chemical is and what steps have been taken.

To get help

If you witness a trauma, go directly to any phone and dial 911. Make sure you know the seriousness of the situation and tell the dispatcher. If you say it is a life threatening situation, the ambulance will arrive in a few minutes, otherwise it could be 15 minutes. The nearest phone is a ways away; please use your/or somebody's cell phone.

Glassware

1. Treat all glassware as if it were fine china. Much of the equipment used in this laboratory is expensive. Please be careful!
2. Rinse out all non-biologically contaminated glassware with water and place in the appropriate discard area.
3. Treat pipettes with care when inserting them into a propipette.
4. If you break something, report it and then clean it up, taking into consideration any chemical that might have been spilled. There is no charge in this lab for glassware breakage, but please, no bowling for beakers or Erlenmeyer volleyball.
5. Know where the extinguishers, fire blankets and other fire fighting gear are in the laboratory. Also know the appropriate exit in case of fire in the building. Your instructor will give you the specifics on this during the introductory lab period.

Lab Clean-Up

Here are a few rules to follow to keep your lab bench clean and help prevent contamination problems.

Lab Bench

1. **Disinfect the work area** on the bench with disinfectant and a paper towel. Do this **before and after each lab period**.
2. Remove all materials from the lab bench when finished with an experiment. Leave the work area in the same state it was when the period began.
3. **Do not place backpacks, coats, purses, and other items on the bench. There are lockers in the hallway to store these items during lab.**

Microscopes

1. Put the 10X lens above the stage.
2. Center the stage on the microscope.
3. Clean oil off the lens using lens paper. Do not use xylol on any lens. Oil should only contact the 100X lens. Never use oil on non-oil immersion lenses. Do not even put these lenses in place on a slide containing oil.
4. Place the power cord and the microscope carefully in the cabinet under your lab bench.

Disposal of Biological Materials

1. In general, remove all tape and markings on the items and keep caps and plugs in place to prevent contamination of the environment.
2. Tubes containing cultures should be placed in the slanted metal trays on the lower level of the disposal cart.
3. Flasks are placed in the trays on the top of the disposal cart.
4. Petri plates and other plastic items should be placed into the small garbage cans near the disposal cart. Do not confuse these cans with the regular garbage cans.
5. Slides from wet mounts must be placed in the labeled container containing disinfectant at the front of the room. The slides can be retrieved in subsequent lab periods, cleaned and reused. Stained specimens on slides can be thrown in the regular glass trash-Red Buckets. Staining kills the bacteria.

Disposal of Non-Biologicals

Other items used in the lab that do not come in contact with cultures or dangerous chemicals can be rinsed out with water and placed on the disposal cart (if glassware or reusable) or thrown away (if disposable).

Pipettes

Used pipettes must be placed into the aluminum trays containing disinfectant on your lab bench. Do not place test tubes, plastic tips, propipettes, your lab partner or anything else into the trays.

Grading

Your grade in the course is based on lab notebook checks, exams, identification of an unknown from a case study, and on participation and technique in lab.

You are responsible for keeping track of your own progress in the course-check Learn@UW and notify us if there are discrepancies. The grades in this class loosely follow the standard curve as listed below, but keep in mind this is the “worst-case scenario”. (This way if everyone gets >92%, everyone will get As.) More likely, however, the curve will be tweaked to ensure that the average grade is no lower than a BC.

Score	Grade
92-100	A
90-91	AB
83-89	B
80-82	B/C
72-79	C
60-71	D
<60	F

Absences

Attendance in a laboratory course is absolutely essential to understanding the material. This does not, however, mean that you need to come to class when you are sick or have some other emergency for which you need to attend. Please contact the instructor (whenever possible) to let them know you will be absent. Any absence without a reasonable explanation will be considered un-excused. You alone are responsible for understanding the material you miss, as it is usually not possible to make up lab work. More than two un-excused absences is grounds to fail a student for the course.

Due Dates

Due dates for assignments are handed out at the beginning of the semester, and are very strict. All assignments must be handed in at the beginning of class on the date due. Late papers will be accepted for 50% of their earned value up to 3 days post due date (including weekends). Exceptions are made only for situations beyond the student's control and that have been cleared with the instructor.

Food Science 324
Food Microbiology Lab
FALL 2014

Laboratory: M, W: 1:30 – 4:30 p.m.

Location: 2145 Microbial Science Building

Lab Exercises

Section 1. Basic Microbiology Techniques

1. Microbiology Technique Checkup (Part 1: Aseptic Technique, Dilutions, Plating)
2. Microbiology Technique Checkup (Part 2: Gram Stain, Streaking for Isolation)
3. The effects of Heat on Microbes
4. Food Spoilage and Preservation
5. Shelf Life of Foods
6. Cleaning and Sanitation

Section 2. Food Safety

7. Antibiotic Residue Test
8. Detection of *Listeria*
9. Detection of *E. coli*
10. Detection of *Salmonella*
11. Detection of *Staphylococcus aureus*
12. Investigating a Food-Borne Disease Outbreak

Section 3. Food Production

13. Bacteriophage in Food
14. Kimchi
15. Yogurt

Tentative Schedule of Laboratory Exercises

Week	Dates	Begin	Continue	End
1	Sept 8, 10	1.1		
2	Sept 15, 17	2.1		1.2
3	Sept 22, 24	3.1, 4.1		
4	Sept 29, Oct 1	5.1	4.2	2.3, 3.2
5	Oct 6, 8	6.1	5.2	4.3
6	Oct 13, 15	7.1	5.3, 6.2	
7	Oct 20, 22	8.1, 9.1	6.3	5.4, 7.2
8	Oct 27, 29		8.2, 9.2	6.4
9	Nov 3, 5	10.1	8.3, 9.3	
10	Nov 10, 12	11.1, 12.1		8.4, 9.4, 10.2
11	Nov 17, 19	13.1, 15.1	12.2	11.2
12	Nov 24, 26	14.1, 14.2	15.2	13.2, 12.3
13	Dec 1, 3		14.3	15.3
14	Dec 8, 10			14.4

Midterm Exams (During Lab hours)

Exam 1: Week 5 (Oct 13, 15)

Exam 2: Week 9 (Nov 10, 12)

Final Exam:

12/19/14. 7:45AM - 9:45AM

Location: TBA