Guidelines for Independent Research Project

Most of your work in this lab has focused on clinical microbiology, yet only a small portion of the world's microbes are clinically important. Most microbes play essential roles in our internal and external environment. The last project for lab will be an independent research project examining a topic of interest to your group, preferably on an environmental topic, but outside our clinical emphasis in lab. This project is where you pull together all the skills you have mastered in lab. We challenge you to think critically and scientifically. There are several lab classes allocated for this project. Your actual schedule will vary depending on the time allotted by your instructor.

Your project must meet some minimum criteria...

- Each table will investigate a topic of your choice subject to your instructor's approval. We have included a list of suggested experiments. You may also propose a different experiment; however it must meet your instructor's discerning approval. It must be original, creative and NOT totally trivial. Do NOT think of this as a glorified high school science fair project. We are expecting you to conduct a college level experiment. Your instructor is not interested in bacterial sampling of bathroom knobs, anti-microbial soap, etc. You will ask one question of interest. You can not collect any samples from a hospital setting. You will design your experiment as a comparison. Each group of two at a table will do one part of the comparison.
- You must collect quantifiable data, preferably using serial dilutions. If your protocol does not use serial dilutions you must still know how to do them and be able to calculate them for your final lab practical.
- You will do replicate samples so that you can conduct a statistical analysis of you data to test your hypothesis. This requires of minimum of 3 samples for your test.
- You will work with your instructor and IA to design and come up with an appropriate experimental protocol. This is NOT EASY to do. You will really have to think and rethink this whole process through. You will undoubtedly revise your procedure several times before you have permission to proceed.
- Your experimental design will be limited by the constraints of the materials we have available in the lab and the time available to complete your experiment. The prep lab will provide all materials, within reason, necessary to complete your experiment. You do not need to purchase anything.

You will present your project to the class during a poster session. Each of you will be responsible for one or more parts of the poster. Click here for detailed information on the poster presentation format and requirements.

Most Probable Schedule:

Lab 1

- Discussion of experimental design
- Do statistical worksheet in class
- Discuss project ideas with your group

Lab 2

- Formulate a specific project - Come up with a question and a testable hypothesis.
- Present your ideas for instructor approval
- Write up your experimental design for instructor approval
- Submit materials request sheet before you leave lab
- Complete the project worksheet and submit to instructor before you leave lab

Labs 3-?

Actual experimental work

- Start project. You will proceed at your own rate.
- You are required to collect statistically analyzable data, these means at least three samples for your test and control groups with quantifiable date. . You may have to repeat some of your experiments to get usable data. Science rarely works the first time around

Lab before presentation

- Work on poster in class or collect final data

Presentation

- Poster Session

Suggested Project Ideas:

These are included as suggestions to help you get started. Please do not feel limited by them. Your experiment should be interesting to you and your instructor and not trivial.

- Plant aleopathy - many desert plants exude chemicals that inhibit the growth of other plants underneath them. This is an adaptive response to lack of water. Does this aleopathic chemical also affect the numbers and types of microorganisms in the soil underneath them?
- Antimicrobial properties of spices - much of the cuisine from hot or tropical areas is highly spiced. This has been considered a cultural adaptive response to prevent food spoilage. Design an experiment to test the antimicrobial properties of spices.
- Antimicrobial properties of herbs/natural products - Historically, poultices made of herbs were applied on wounds to reduce infection. Investigate some of these herbs and test for their antimicrobial properties
- Inhibition of growth of *Streptococcus mutans*. *S. mutans* has been implicated in the formation of dental caries. Investigate the antimicrobial properties of mouthwash or chewing gum products on bacterial growth.
- Comparison of bacterial population from different water sources. For example, collect samples of water from the source of the Truckee River and from a site in town. Please have a very interesting comparison otherwise this project won't even be interesting to you.
- Organic versus conventional food contamination. Compare some organically grown products with their conventional counterparts for their levels of bacterial contamination.
- Hamburger contamination. Some stores sell expensive and specially processed hamburger touting its lower bacterial contamination levels. Are their claims true?
- Is freezing an effective means of reducing bacterial contamination in food?
- Does repeated use of antimicrobial cleaning products select for resistant bacteria?
- How bacteriological clean are the fill-your-own water sources?
- Is ironing an effective method of killing bacterial contamination on mail?
- Is there a connection between gum chewing and a person's susceptibility to dental caries?
- Do native desert soils support the same level of nitrogen cycling as typical suburban garden soils?
- How effective are lactose-treated products in reducing the gas production of E. coli?