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7.13 Experimental Microbial Genetics

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Experimental Design and Interpretation, Technical Skill, Quality of Effort, Lab Notebook and Lab Citizenship

Half of your final grade will be based on how you perform in the laboratory. You do not necessarily have to complete your research project, but you do need to demonstrate a basic level of competence and put forth a genuine effort to extend the research as far as possible. In addition, we do not expect that all your experiments will be successful, but we do expect that you will have carried them out in a rigorous, well-controlled, and well-documented manner. Not everyone enters this course with the same level of laboratory research experience. The staff recognizes this and encourages you to "make the most" of your own skills. Your effort to expand your knowledge beyond the immediate need of the experimentation will be reflected favorably in this portion of the grade. Also, you are expected to demonstrate good "team effort" by not only working with your teammates to move the project forward but also by being a good lab citizen. This means that you should be vigilant about doing the lab jobs that will be assigned to you and about cleaning up after yourself when using common areas. Everyone is expected to carry his or her share of the burden.

You must keep a lab notebook. The notebook is very important as it is key to good experimental practice. Each lab partner should keep his or her own notebook, which will eventually contain all the data collected by the whole team. In this way each partner can consider the results independently.

The notebook should be a complete record of all the experiments as they were actually performed. A good notebook will enable someone to reconstruct, long after the fact, exactly what was done and why. In addition, you will derive both the Material and Methods section and the Results section of your final papers from the records kept in your notebook. Thus, it is essential to get in the habit of keeping a good record from the beginning.

Lab notebooks should be bound with numbered pages. In the notebook you should write down, as you go, what was actually done. Experimental results, tables, graphs, and photographs should be written directly in your notebook or taped to the pages for a permanent record. Your notebook should minimally include the information below and further, points 1-3 should be done before you begin your experiment:

1. Table of contents. Leave extra pages at the beginning of the notebook for a table of contents, which you'll add as you go along. The table of contents should have a short title of each experiment, numbered and dated.
2. A short summary of the reasoning for each experiment. Often a single sentence will suffice. It is also very important to include a summary of the method you will use and a detailed plan for how you expect the experiment to proceed. Sketches of the procedure may be very helpful in this regard as visualizing the physical steps required to complete the experiment ahead of time will help things proceed more smoothly during the experiment and help you get out of lab on time. Thorough preparation of this type is ***especially*** critical if this is the first time you will be performing a procedure.
3. All the relevant information about the preparation of the experiment. Much of this can be accomplished by suitable cross references to previous experiments. The first

time a solution is introduced, its origin should be noted. If a component or method is used for the first time, then it should be described in detail. The same applies to bacterial strains, plasmids, etc.

4. The actual series of events, as performed. Especially important here are the actual times of incubation (as opposed to what was planned), any changes in procedure, any unusual observations made, etc. Writing down what actually happened can make it possible to interpret an experiment even though many mistakes were made.
5. The results. Include raw data in the form in which it was collected. For example, record the actual number of colonies found, as well as the cell concentration calculated from this number. A brief summary of the results and interpretation will also be helpful when reviewing the data at a later date.

The main point is that it is unwise to rely solely on memory. After acquiring some experience, you may want to know something about an early experiment which did not seem important at the time. If you are in the habit of writing things as you go along, the chance of being able to learn from the early experiments is much greater. A good notebook will also help the instructors to help you troubleshoot experiments. The TAs will check the notebooks for completeness periodically. They must be current. You are responsible for having your previous day's entries completed every day.