BIO208 Yeast Lab
From Genes to Proteins to Behaviors

YEAST GENETICS

FORMAL LABORATORY REPORT GUIDELINES

Report Due: Tuesday, October 30th, 2012 (50 points)

Why should I write a Lab Report?
Effective communication is of vital importance for any collaborative enterprise, and it's particularly important in science where complex ideas must be well understood before they can be further tested. Imagine wasting years of time and millions of dollars on research that resulted from a miscommunication! Attempts are made to minimize such potential error by demanding reproducibility and oversight, but in the end, it comes down to individual scientists making careful observations and communicating them effectively.

The goal of this formal lab report is to give you practice in the critical interpretation of data and communication of research. The lab report will roughly take the form of a scientific publication, which follows a particular format and writing style. Science publications are used to convey results and interpretations to the scientific community. They are also used as a forum in which other scientists review and accept conclusions or provide alternative interpretations. Thus, as the author of your report, you must determine what question you are asking scientifically, how you test this question in your experiments, and how you collect and interpret your data.

How do I write a lab report?
Most of the background information and experimental rationale has been provided in the lab handouts and discussed in class. You've been collecting your own data over the last few weeks. Therefore, if you understand the handouts and have kept a record, then you should be able to generate a clear laboratory report. The sections included in a typical laboratory report are as follows:

1. Title Page
2. Abstract
3. Introduction (may include figures)
4. Materials and Methods
5. Results (must include figures and tables)
6. Discussion

Title:
The title should be no longer than 1 sentence, and it should describe the main finding of the report (i.e. "X-rays cause frameshift mutations in the yeast GUA1 gene that disrupt guanine biosynthesis, resulting in a rough colony phenotype"). Note: This is only an imaginary example title, and your title should accurately reflect your results). Follow the format below to include your name and the course number below the title.

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Title of Investigation
Names of students in the lab group (writer's name first)
Course name and number

Abstract:
The abstract is a short, succinct paragraph (~ 250 words or less) that provides an overview of the work that is discussed in the report. The abstract summarizes the scientific question being asked in the report as well as the purpose and significance of why you are doing the experiment. The abstract should be able to stand alone and include the major results and conclusions so the reader could get the main idea even without reading the rest of the report. It is often easiest to write this section last.

Introduction:
The introduction contains background information that is important for understanding the experimental research. This information gives the reader a basis to understand what is known in the research area and how the proposed experiments may add to the knowledge in the field. For example, an introduction to the yeast adenine biosynthesis pathway and the color of the biochemical intermediates is essential to understanding how a mutation in certain genes could result in a red phenotype. You may find that a figure is necessary to clearly explain this information. It's also important to provide the reader with a rationale for the experiments you've done and why the experiments are interesting. In your introduction, be sure to describe your hypothesis and justify it.

Materials and Methods:
The validity of a scientific result hinges upon it being reproducible. The materials and methods section is critical for this reproducibility and should contain enough information so that someone else could repeat your experiments. Do not simply copy procedures from lab handouts. Rather, summarize the materials and methods in your own words. It is often helpful to break down this section into sub-sections (i.e. UV mutagenesis, Nutritional requirement testing, Isolation of genomic DNA, Agarose gel electrophoresis, PCR, Sequence analysis, etc.). Describe the procedures you used in sufficient detail (e.g. include the temperature you grew your strains, length of incubations, PCR cycling parameters), but also be as succinct as possible. Use passive voice instead of active voice to write your methods. Example: "The experiment was performed at…" instead of "I performed the experiment at…"

Results:
The results section is the most important part of the report and is typically the easiest section to write first. This section provides a brief rationale for the experiments you did along with the actual data. Data is referenced in the text as figures and tables. For instance, you might say "In order to test the nutrient requirements of the red yeast strain, individual red colonies were streaked on minimal media and minimal media + adenine plates. The red strain failed to grow on minimal media, but it grew on minimal + adenine plates (Table 1). This adenine auxotrophy suggests that adenine biosynthesis is disrupted in the red strain." Data figures and tables must be thoroughly labeled where appropriate (e.g. title, x and y axis, gel lane contents, DNA ladder sizes, column and table headings) and include a figure legend so the data is clear to the reader. Figures and tables may be formatted directly within the text, or they may be included on separate pages at the end of the report. You should state your interpretation of the data, but refrain from discussing it in the larger context as that is an important part of your discussion section.

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Discussion:
This final section is where you explain how all of your data fits together to support your conclusion. At a minimum, you should address the following questions in your discussion (written in paragraph format as above):

1) Does your data support your initial hypothesis? If not, do you have an alternative hypothesis?
(Note: Scientists are hesitant to use the word "prove" in reference to a hypothesis. It's more accepted to use "these results support…" and "these results are consistent with…").

2) If there are differences between the DNA sequence of ADE1 or ADE2 in red vs. white yeast, what is the expected effect at the amino acid level? Does the mutation fit into a nonsense, missense, silent, or frameshift category? What is the expected effect of the mutation on the activity of the encoded protein?

3) How would an ade1 or ade2 mutation specifically alter the adenine biosynthesis pathway? Would any biochemical intermediates be expected to accumulate? If so, why?

4) What treatment in week 1 likely led to your DNA sequencing observations in the red strain?

5) Is your genetic data consistent with your nutritional growth data (i.e. growth phenotype on minimal media and minimal + adenine)?

6) Did you have any technical problems with the project, and if so, would you recommend any changes in the future?

7) Any ideas for additional experiments that might further clarify your results?