Final Lab Report Guidelines

11pt. font, Arial, 1 inch margins, single-spaced. 5 page maximum for main text and figures (abstract and references are not included in page limit) Figures with captions formatted within text.

Lab report document should be uploaded to CCLE in PDF format.

Due on Thursday the week of final exams. Upload an electronic copy to CCLE.

Your final lab report should be in the form of a short journal article. Each student should write their report separately. While you will have the same data as your lab mates, your writing should be distinctly different and done separately. There is a sample template below for your reports. Your report should be divided into sections typically used for scientific manuscripts: Abstract, Background and Introduction, Methods, Results and Discussion. More details on what should be included in each section can be found in the slides for Lecture 5.

The emphasis is not on how long your report is, but the content and quality of discussion. 5 pages is a maximum, not a minimum. Concise, professional scientific writing is an important skill that you should begin to cultivate now. It improves by reading scientific work and writing scientific reports.

If you need more guidance on writing a scientific manuscript, please refer to Whitesides 2004 and Plaxo 2010 handouts (posted on CCLE).

You will need to include the following:

1. At least 5 references. At most, 20% of these references can be reputable society, governmental, or foundation websites for data or statistics. Do NOT cite Wikipedia. You may use Wikipedia for a starting point to finding published journal articles or books for reference, but you must cite the original source. At least 3 of your references should be peer-reviewed journal articles.
2. Embed formatted figures with captions into the text (usually in the Results section). Captions should explain the figure so that the reader can understand the point without reading the document test. Do not include large picture files with excess information (you can compress as "best for printing" in Word or convert pdf to "reduced size" in Adobe. Use cropping tools and highlights or arrows to show important information from figures. Make sure the caption accurately and thoroughly describes the image and appears directly below the figure. Save space by shrinking figures to an adequate size and wrapping text around them. Figures do not have to be large, but should be legible when the document is printed.
3. Formulate a clear hypothesis, include it in the abstract in bolded text.
4. Make sure you discuss your results and why things did or did not work, including references for information that leads you to those conclusions.

HELA cells may need cupcakes to be happy

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(term and course) 167L Spring 2045
(assignment) Final lab report

Abstract:

Hypothesis: HELA cells laugh more when they eat cupcakes. This next sentence should state why it would be interesting or important to know the outcome of the hypothesis. Then you should say what kind of

experiment you did to figure this out in 1-2 sentences. Follow that with what kind of interesting data you got from those experiments. Finally summarize what kind of conclusions you were able to make from the data you collected. (sample: HELA cells are important for making living pastries so it is important to characterize what types of nutrients maximize their ability to perform their duties efficiently. We tested two different nutrients representing sweet and sour, cupcakes and pickles, to determine their impact on HELA cell happiness. We calculated the happiness quotient by recording the intensity of their laughter after 2 days of exposure to each nutrient. We saw that pickles do not affect HELA cells laughter compared to control of bland medium nutrients, while cupcakes increased their laughter decibels by 10% after 2 days. This data indicates that cupcakes could contribute significantly to happiness while pickles neither reduce nor improve happiness.)

Background and Introduction:

This section should include some background information on why it is important or interesting to test your hypothesis. You should do some research and include some references here. Explain as much detail about your experimental choices as possible. A short summary at the end should give, again, the reason for your hypothesis.

> sample: HELA cells have been involved in living pastry production for several years, contributing by products of their metabolism to the icing (ref 1). It has long been suspected that they metabolize different nutrients in different ways based on how much sugar or acid is present (ref 2). We suspect that the content of sugar and acid in the nutrients not only change the metabolism, but change the happiness of the HELA cells, which has a direct effect on the quality of the icing they produce.

> In order to test this hypothesis, foods of different sugar and acid content, cupcakes and pickles, were chosen to represent opposite sources of nutrients. Cupcakes have 10mg of sugar per 20g of cake while Pickles have 10 mg of acid with a pH of 2, per 50 g of pickle (ref 3). Thus they accurately represent the range of possible foods HELA cells eat.

> Happiness was calculated by recording laughter from the cultures and measuring the average loudness, or decibels, over 1 min intervals for 3 hours. Laughter loudness has been established as an accurate method for recording happiness by calculating the ratio of decibels from the experimental group to the control group (ref 4).

> If there is a correlation between sugar and acid content in HELA cell nutrients and their happiness, researchers making living pastries can use this information to better formulate meals for their HELA cells to maximize the efficiency and tastiness of their icing production.

Methods:

This section should have detailed explanation of your experimental design. Include the methods and protocols you used, and replicates and statistics you used. If somebody wanted to repeat your experiment, they should be able to read this section and do it. You do NOT need to include step-by-step protocols for standard procedures, such as passaging cells, changing medium, using a live-dead staining kit or MTT assay kit, which come with directions, unless you did something different. Use subsections here to partition the parts of your experiment.

> sample: *Cell culture:* HELA cells (ATCC) were cultured in MEM containing x% FBS, y% antibiotics, z% whatever, at 37℃ 100% humidity, 5% CO_2. They were passaged every 3 days at a ratio of 1:7. For the experiment they were plated at a density of 100,000 cells/cm^2 in 6-well plates.

Food formulation: vanilla cupcakes (Sigma) and dill pickles (Fisher) were pureedseparately in an Oster blender for 3 min per 100 g of food. 10 g of each food were added to 100 mL complete medium for HELA cells just prior to adding this medium to the wells. 3 conditions were maintained: control (no food added to complete medium), cupcakes (10 mg of cupcake puree added to 100 mL of complete medium), and pickles (10 mg of pickle puree added to 100 mL of complete medium). 6 wells of cells per condition were created. This set of experiments was performed by three different investigators in the lab simultaneously to create 3 sets of independent data.

Laugher measurements: After two days of treatment, a microphone connected to a Macintosh computer running Garage Band was used to record laughter. The microphone was held in a fixed position 1 cm from the surface of the medium directly above the center of each well for 1 min at the beginning of each hour for 3 hours. The computer software was used to calculate average decibels. A set of blinded investigators was asked to listen to each recording to determine if it was laughter or crying.

Statistics: There were 6 technical replicates averaged for each independent experiment and 3 independent experimental measures for each group. These data were averaged and a Student's T-test was performed to determine statistical differences between groups.

Results:

This section should summarize all your results. Include a brief description of the experiment that the results came from, describe the results, refer to figures. You do not need to include raw data unless it is important to understanding the discussion. If you're not sure whether to include it, ask your TA.

sample: The laughter measured from the three treatment groups, control, cupcakes, and pickles, revealed that pickles do not increase or decrease laughter from control, while cupcakes increase laughter by about 10% over the control (Table 1). The difference between cupcakes and pickles was relatively small but still statistically significant ($P < .05$, n=3).

group	% of control	stdev
cupcakes	110%	8%
pickles	100%	7%

Table: Ratio of treatment laughter compared to control.

Discussion:

This section should discuss what the results mean, how the hypothesis was answered or not answered. Anything unexpected and some analysis about why it was unexpected or why it might be true anyway. You should also discuss weaknesses or future work that can come from your experiment and how people can use your data and information to take a next step.

sample: Though one might have expected a stronger increase from cupcakes, it is important to note that vanilla cupcakes are somewhat bland, and there are stronger cupcakes and cupcakes with different types of sugar available. Researchers typically don't use these other cupcakes with HELA cells because it makes them more mobile and they fear that the cells will get distracted (ref 5). But perhaps it would be a valid change to investigate for the purpose of increasing efficiency.

If cells become more mobile they could potentially move faster and work faster without losing concentration.

Another unexpected outcome is that pickles do not decrease laughter. However, if one considers that pickles are a staple of some diets one might accept that HELA cells actually do not have a distaste for the acid and are not negatively affected by it. This is a characteristic of pickles that has not been studied with regard to HELA cells and an interesting finding.

While this study does correlate acid and sugar content to laughter, it does not correlate laughter with efficiency and quality of icing made by the HELA cells. This inference would need to be substantiated by further studies on the icing from these HELA cells before living pastry makers begin implementing cupcake feedings for their HELA cells. However, this information does add to the recipe possibilities for increasing efficiency and quality of HELA cell icing.

References:

Include all your references in the same format as that found in the journal Nature. Nature's guide for authors has formatting guidelines.