Lesson 4: Yeast and Caffeine Lab

**Introduction:**

By now you have learned about several different model organisms and how they have contributed to biomedical research. Now it is your turn to be a scientist! In this lab, you will be working with a commonly used model organism known as Baker’s Yeast (*Saccharomyces cerevisiae*). Yeast is a one-celled eukaryotic organism. Yeast cells and human cells behave similarly and we share many genes. This is why yeast has been used to study genetic disorders, cancer, and other diseases (source: [yourgenome.gov](https://www.yourgenome.org/stories/using-yeast-in-biology/)).

You and your lab group will investigate how yeast responds to caffeine, a substance that is found in many food and drink products that humans consume. You will need to develop a procedure based upon the Materials provided and Helpful Hints (see below). Answer the Pre-Lab Questions with your group and get teacher approval before continuing.

After conducting your experiment and collecting data, you will write a lab report based upon your findings (see the Lab Report Format attached to this document).

**Materials:**

| Yeast solution  (rehydrated yeast) | Test tube rack | Methylene blue stain |
| --- | --- | --- |
| Caffeine powder (lab-grade) | Digital scale | Blank microscope slides and cover slips |
| Distilled water | 10 ml graduated cylinder | Microscope |
| 10 ml test tubes and stoppers | Plastic pipettes | Gloves and safety goggles |

**Helpful Hints:**

* Caffeine powder must be dissolved in water to make a solution.
* Yeast needs to incubate overnight in order to grow (multiply).
* Adding methylene blue stain to a microscope slide containing yeast will help you determine how many cells are alive. Yeast cells that are alive will look clear, while dead cells will appear blue.

*Materials and Helpful Hints adapted from:*

*1. Goudsouzian, L.K., McLaughlin, J.S., and Slee, J.B. 2017. Using Yeast to Make Scientists: A six-week*

*student-driven research project for the Cell Biology laboratory. CourseSource.* [*https://doi.org/10.24918/cs.2017.4*](https://doi.org/10.24918/cs.2017.4)

*2. Garlock, Caitlyn. Yeast Population Lab.* [*http://msgarlock.weebly.com/uploads/2/8/1/7/28176599/ahs\_bio14\_ecology\_yeastlab.pdf*](http://msgarlock.weebly.com/uploads/2/8/1/7/28176599/ahs_bio14_ecology_yeastlab.pdf)

**Pre-Lab Questions:**

*(answer in your lab notebook)*

1. What is the experimental question for your experiment?
2. What is your hypothesis? Use an “if, … then … ” statement.
3. Explain the variables of your experiment:
   1. Independent variable (how will you change it?)-
   2. Dependent variable (how will you quantify/measure it?)-
   3. Control-
   4. Constants-
4. Describe the steps in your procedure.
5. Create a data table that you will use during your experiment.
6. How do you think your experiment can be related to human health?

**Teacher Approval? YES NO**

**Lab Report Format:**

You will write an individual, typed lab report. You will be allowed to submit a rough draft for feedback before submitting a final copy. Include the followings components:

* Title
  + *Based upon your Experimental Question*
* Hypothesis
  + *Use an “if, … then…” statement*
* Materials
  + *List any materials used, including quantities and sizes*
* Procedure
  + *Create a detailed list of the steps performed in the experiment*
* Data
  + *Include the completed data table*
  + *Include a labeled graph based upon the data table*
* Analysis
  + *Discuss the significance of the data you collected- what does it mean?*
  + *Connect back to model organisms, biomedical research, and human health*
  + *Include sources of error, limitations, and potential improvements*
* Conclusion
  + *Attempt to answer the Experimental Question based on your results*
  + *State if the hypothesis was supported or not*
  + *Use a “Since… , then…” statement*

**Lab Report Grading Rubric**

* Each component (listed above) is worth 3 points:
  + 0 = not present
  + 1 = needs improvement
  + 2 = satisfactory
  + 3 = exemplary
* Spelling, grammar, and punctuation combined is also worth 3 points
* **Total Point Possible: 24**