The Effects of Ultra Violet Radiation on *Saccharomyces cerevisiae*

**Background**
Without light, most living organisms would not be able to survive. On the electromagnetic spectrum, visible light has wavelengths between 400 nm and 780 nm. Ultraviolet light is not visible to the human eye and has wavelengths between 200 nm and 400 nm. UV light is separated into three types (UVA, UVB, and UVC). UVA causes aging damage to skin, UVB causes burning to skin, and UVC does not reach the Earth’s surface and is absorbed by the atmosphere. UV rays can damage DNA by creating lesions in the sequence of nitrogen bases on the DNA strands. Lesions appear as pyrimidine dimmers in which the thymine and cytosine nitrogen bases detach from their respective complimentary bonds on the opposing strand, and become covalently bonded to one another. This can prevent DNA polymerase from correctly “reading” the DNA strand. Specialized enzymes can detect and repair damaged DNA, however, overexposure to UV rays can overwhelm these repair mechanisms causing errors in the cell cycle which can lead to mutations and even cell death. Interestingly, when overly exposed to UV rays, unicellular organisms such as yeast and bacteria will try to mutate in order to prevent cell death.

Your task during this lab is to determine the effect of ultra violet light on survival of *Saccharomyces cerevisiae*. Using the scientific method, you will investigate factors that effect survival by developing a hypothesis based on your observations, designing and performing an experiment to test your hypothesis, and analyzing your results.

**Purpose:** To use the scientific method to design and conduct an experiment to investigate different factors that affect the survival of *S. cerevisiae* when exposed to UV radiation.

**Materials:**
- Overnight culture of *S. cerevisiae*
- Permanent marker
- YPD Plate
- Aluminum foil
- Pipets
- Scissors
- “Hockey stick” spreader

**IMPORTANT:** Be sure to WASH HANDS Before AND After working with *S. cerevisiae* AND to wear UV Protective goggles when working with the UV lights.
Part 1: Plating and UV irradiation

Using the aluminum foil cut out a circle template the size of the top of a petri dish. Fold the circle in half twice to create four equal quadrants. Cut out one of the quadrants. Obtain a YPD plate. On the bottom of the plate use a permanent marker to divide the plate into four quadrants. Toward the very outside of the plate, in small letters label your group’s initials, and the quadrants as 0 min, 5 mins, 10 mins, 15 mins, to represent the time intervals each section of your plate will be exposed to the UV light.

Make sure your template lines up with your quadrants.

Inoculate your YPD plate using the pipet dispense 100 µL of overnight culture of *S. cerevisiae* onto the center of the media of the YPD plate as demonstrated by your teacher.

Use the “hockey stick” to spread the culture across the media on the YPD. This will create lawn of your sample.

Bring your inoculated plate and template to the UV station. YOU MUST WEAR PROTECTIVE UV GOGGLES AND HAND PROTECTION while working at the UV station.

Place the template over the YPD place exposing only the 15 minute quadrant. At each of the timer intervals, fold over the quadrant to allow UV exposure for the indicated time interval, 15, 10, 5, and 0 minutes. The YPD plate will be under the UV light for a total of 15 minutes. The section labeled 0 minutes will be covered by the aluminum foil template for the duration of the UV exposure.

Bring your group’s plate to the front of the classroom for incubation.

Predictions: Predict what you think will happen to each quadrant on your lawn after 24–48 hours of incubation. Be sure to provide evidence to support your prediction.
Day 2: Observations & Questions:

Obtain your group's YPD plate which contains your culture of *S. cerevisiae*. Describe what you observe on the plate and write down any questions you may have.
Part 2: Student Experiment
Meet with your group members and share your hypothesis and experimental plans. As a group collaborate to develop a hypothesis and experimental plan that YOU will carryout to determine the effect of UV radiation on the survival of *S.cerevisiae*.

Hypothesis:

You may only have **ONE** independent variable. To help make this process easier list your variables **FIRST** then write your hypothesis.

Independent variable (what you change):

Dependent variable (what you measure):

Control variables (what you keep the same):

Hypothesis:
***** STOP here and obtain teacher approval before continuing.****

Procedure:

Write a procedure (step by step) for your experiment. Include how you will set it up, what materials you will use, and how many trials you will do.

Data Table:

Construct a data table, chart, or graph to organize the data you will collect.
**** STOP here and obtain teacher approval before continuing.****

**Day 3 & 4: Experiment**

Carry out your experiment and collect your data.

**Analysis/Conclusion:**

Each group member will write a paragraph concluding your lab. Include the following:

- Was your hypothesis supported by the data?
- How could you improve your experiment? (Were there any sources of error?)
- What new questions or ideas do you have?

Each GROUP will make and present a mini-poster which will include:

- Title
- Abstract
- Methodology (procedure)
- Discussion
- Results (tables, graphs, charts)
- Literature cited