

**EXPERIMENT 5:****THE EFFECT OF INCREASED UV LEVELS ON POPULATION GROWTH****DIFFICULTY: MODERATE TO ADVANCED (ADULT SUPERVISION IS RECOMMENDED.)****BACKGROUND**

The Earth's upper ozone layer acts like a sunscreen, or a shield that protects organisms on Earth from the dangerous ultraviolet radiation (UV rays) given off by the Sun. If certain chemicals such as aerosol propellants used in the 1960s and early 1970s were continually released into the atmosphere, they would deplete the upper ozone layer and less protection would remain to screen out harmful radiations.

UV light is known to degrade certain substances and to stimulate certain biochemical reactions. This activity will allow the student to investigate the impact of increased levels of UV radiation on the growth of various organism populations.

**LEARNING GOALS**

1. The student will understand the relationship between the ozone layer and increased UV levels.
2. The student will determine if there is a correlation between increased UV levels and the growth of various organism populations.

**MATERIALS**

1. UV light and clamp-type lamp
2. Culture of Paramecium, baker's yeast, brine shrimp or another safe microorganism
3. Magnifier or microscope as appropriate
4. Graph paper (may be used to assist counting populations by counting a sample population in a small area and then calculating to compute the entire population)

**(ADULT SUPERVISION AND SELECTION OF MICROORGANISM IS STRONGLY RECOMMENDED.)**

**PROCEDURE**

1. Determine what specified organism is to be used and prepare a culture of the organism according to the supplier's directions.
2. Prepare two sample cultures under identical conditions (control). Then expose one of the samples to continuous UV light so that it illuminates only the test sample (variable). Each day at the same time-say, at 12 hour intervals-make certain to stir the sample to be sure that it is uniformly mixed. Then, take a representative sample and count the living organisms you see in each sample:
  - a. Paramecium may usually be counted directly under a microscope without extensive staining.
  - b. Yeasts may require straining, and then counting under a microscope to see how many living yeast cells are in a given volume.
  - c. Brine shrimp can typically be counted under hand magnification.

**DISCUSSION**

1. What was your original hypothesis of how UV exposure affects population growth? Was there a correlation?
2. Do you think the UV exposure killed the organisms, or simply slowed down their ability to reproduce? Could there have been other factors responsible for causing any noted effects?
3. Make a line graph from the data collected, plotting the population on the vertical axis and the number of hours (or days) of UV exposure on the horizontal axis.
4. If increased UV exposure will affect population growth, then what might be the impact on life of a “hole” in the ozone layer?

**EXTENSIONS**

1. A similar investigation may be done using hydrilia or other similar aquatic plants (often available in aquarium supply stores). Place equal samples of the plant in identical water samples and seal them in transparent plastic storage bags or storage containers. Expose the containers and plants to different amounts of UV light in an otherwise ambient room light (or try it in the dark!), and test the water for dissolved oxygen (reflecting photosynthesis levels resulting from plant growth) using a Hack Dissolved Oxygen kit (this or similar kits are available from aquarium supply or swimming pool/water testing supply stores). Graph the percentage of dissolved oxygen on the vertical axis and the UV exposure time on the horizontal axis. Interpret as described above.