Germ Invasion

https://www.sciencebuddies.org/science-fair-projects/project-ideas/MicroBio_p007/microbiology/germ-invasion
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Experimental Procedure

Working with Biological Agents

For health and safety reasons, science fairs regulate what kinds of biological materials can be used in science fair projects. You should check with your science fair's Scientific Review Committee before starting this experiment to make sure your science fair project complies with all local rules. Many science fairs follow Intel® International Science and Engineering Fair (ISEF) regulations. For more information, visit these Science Buddies pages: Project Involving Potentially Hazardous Biological Agents (http://www.sciencebuddies.org/science-fair-projects/competitions/biological-agents-regulations) and Scientific Review Committee (http://www.sciencebuddies.org/science-fair-projects/competitions/scientific-review-committee-src). You can also visit the webpage ISEF Rules & Guidelines (https://www.societyforscience.org/isef/international-rules/) directly.

1. Identify 7 different locations where you would like to assess microbial biodiversity. Suggested sites could include the bathroom, kitchen, locations near heating vents, bedrooms, the refrigerator, the backyard, the garage, etc.
2. At each site, place 3 nutrient agar plates. Use the permanent marker to label the bottom of each plate with its location. Leave the plates open and exposed for 3 hours.
3. An additional 3 plates should be unopened and used as negative controls. In other words, you will study what grows on these plates even though you never expose them to the air. Hopefully, very little if anything will grow! Use the permanent marker to write "negative control" on the bottom of each of these plates.
4. At the end of 3 hours, collect all the plates. Seal each plate with heavy-duty tape or saran wrap.
5. Allow the plates to incubate by placing all of them in one single location that has a fairly constant room temperature (about 22 degrees Celsius) for 7-10 days, until distinct bacterial colonies can be observed. (Don't forget to put the 3, unopened control plates in this same location.)
6. Collect data over the course of the experiment. Every other day, write down the number of colonies, the color, and the size in your lab notebook.
7. After the end of the three week period, make various graphs of the data. Suggestions include, but are not limited to:
    a. Colony count on each plate.
    b. Colony count at each location (take an average of the 3 plates).
    c. Different types of microorganisms, based upon:
        i. Size
        ii. Color
        iii. Shape
8. Keep the microbial plates until your science project is completely done, and while you are writing up your display board or other assigned summary. You will want to make many observations.

Discussion Points to Consider When Writing up the Conclusions of your Science Project

1. Which environmental areas resulted in the most microbial growth?
    a. What environmental features unique to those locations might lead to microbial growth?
        - Moisture content?
        - Air circulation?
        - Cleanliness?
2. Based upon your background reading, can you identify any of the bacterial/microbial colonies based upon their morphological features? *Tip:* The Science Buddies guide to Interpreting Plates (http://www.sciencebuddies.org/science-fair-projects/references/interpreting-agar-plates) should be helpful.
    a. Color?
    b. Shape?

    c. Size?
3. If you had access to reagents in a biology laboratory, how could you use more sophisticated methods to type, classify, and characterize the individual colonies?
4. Based upon your background reading, what percentage of the microbial organisms that are present in your environment did you isolate and identify?

Bacterial Safety

Bacteria are all around us in our daily lives and the vast majority of them are not harmful. However, for maximum safety, all bacterial cultures should always be treated as potential hazards. This means that proper handling, cleanup, and disposal are necessary. Below are a few important safety reminders.

- Keep your nose and mouth away from tubes, pipettes, or other tools that come in contact with bacterial cultures, in order to avoid ingesting or inhaling any bacteria.
- Make sure to wash your hands thoroughly after handling bacteria.
- **Proper Disposal of Bacterial Cultures**
    - Bacterial cultures, plates, and disposables that are used to manipulate the bacteria should be soaked in a 10% bleach solution (1 part bleach to 9 parts water) for 1–2 hours.
    - Use caution when handling the bleach, as it can ruin your clothes if spilled, and any disinfectant can be harmful if splashed in your eyes.
    - After bleach treatment is completed, these items can be placed in your normal household garbage.
- **Cleaning Your Work Area**
    - At the end of your experiment, use a disinfectant, such as 70% ethanol, a 10% bleach solution, or a commercial antibacterial kitchen/bath cleaning solution, to thoroughly clean any surfaces you have used.
    - Be aware of the possible hazards of disinfectants and use them carefully.

Explore More!

Interested in the science behind viral outbreaks? Check out Coronavirus (http://www.sciencebuddies.org/science-fair-projects/Zika).