PLANTS GET SICK, TOO!

A Plant Pathogen Investigation

Student's Guide: Getting Ready

Premise: As living organisms, plants can get sick. Think of old trees that became diseased and had to be cut down, or shrubs planted outside where they live occasionally turn brown and die, but you probably have not been significantly impacted by the death of a plant. However, plant pathogens pose a major threat to global agriculture. Every year, plant diseases cause billions of dollars of losses to American farmers, and can lead to famine and war in the developing world. Diseases can affect plants at every stage of life, but post-harvest diseases often impact consumers when food rots before it can be eaten. Understanding where pathogens come from, how they can infect hosts, what environmental variables effect disease development, and how different hosts can defend against pathogens are important concepts in biology and the study of disease (of any organism, including animals like humans). Observing the progress of disease development on a familiar food product is a direct way to learn how hosts are impacted by pathogens. Furthermore, such knowledge is critical to understanding microbial pathogenicity and how microbes can endanger our food supply.
The *Plants Get Sick, Too!* module consists of an inquiry on the nature of plant disease in which you develop your own inoculations and undertake novel, hypotheses-driven experiments.
*Students should work in teams of 3–4 for this investigation.

Preparations: A minimum of one week is needed to complete an inoculation experiment, although many classes conduct the guided experiments to become familiar with the approach prior to the inquiry-based experiments. Both open and inquiry-based experiments require two weeks to undertake.

Materials and Supplies: The following are needed for each lab group:

- At least three potatoes (or other fruits or vegetables)
- Damp paper towels
- Sealable plastic bags
- Toothpicks
- Small beakers of bacterial inoculum
- A 10% bleach solution containing two drops of dish soap
- A large container for disinfesting the potatoes in 10% bleach
- Microscopy equipment (microscopes with 400X magnification, slides, coverslips, metal probes)
- Latex or nitrile gloves (soft rot bacteria are not infectious to humans, but do express a strong odor during infection).
    - Possible strategies to manage the strong odor: fan, candles, double-bag potatoes, fume hood, clothespins, handkerchiefs, etc.
- List the susceptibility of the fruits and vegetables you tested:

Very susceptible	Moderately	Not susceptible

Questions:

- What plant products exhibited the most symptoms? Why?
- What different environmental variables contributed to the most disease?
- What variables did you introduce into the experiment on accident that may have affected the results?
- Why do you think some plants got sick and some did not?

Communicating with Your Mentor:

You will be allowed time to communicate with your scientist mentor online. If not already acquainted with the mentor, introduce yourself and your teammates and ask some general questions. If you have already sent your mentor a message,

Additional Resources:

Dr. Lou Hirsch's website – contains access to the NABT paper (Hirsch, Miller, and Halterman, 2018) and tutorial videos: https://www.drlouhirsch.com/an-inquiry-based-investigation-of-b