

Biology Experiment

Microbes From a Hay Infusion

A hay infusion is an excellent way to provide microbes at a high density during any time of the year. This process allows you to follow the development of microbes as they become visible over time. You will use the ProScope Digital USB Microscope for taking time-lapsed pictures and for magnification viewing.

Objectives

In this experiment, you will:

- Produce microbes by making a hay infusion
- Observe, over time, microbes such as amoebas, protozoa, rotifers, insect larvae, algae, and bacteria

Materials

- Power Macintosh G3 or better
- ProScope Digital USB Microscope and software
- Jar, such as a mayonnaise or jam jar
- Hay
- Pond or creek water
- Corn syrup
- Microscope slides and slip covers
- Pipette
- Antibacterial soap for cleanup

Procedure

- 1** First make the hay infusion. Put the pond or creek water into a jar, such as a mayonnaise or jam jar, and add pieces of cut hay. Cover the jar loosely.
- 2** Using the ProScope USB microscope, take a picture of the contents of the jar every two days. Use the x0 lens on the microscope first, and then use the m50 lens each time thereafter.
- 3** Save the pictures in a folder entitled “Hay Infusion.” Make sure the date for each observation is also recorded.
- 4** After about a week, the hay infusion population will peak. Using a pipette, get small water samples from the top of the water, the bottom of the jar, and near the floating debris in the middle. Using samples from all of these areas will give you the best chance of getting different types of microbes for viewing.

- 5 Make a slide of several different water samples to compare. If the microbes move too quickly to take pictures of them, add a drop of corn syrup to each sample.
- 6 Take pictures of each slide using the various powers of magnification. Try to observe each sample both before and after adding the corn syrup.

Data

Draw and label any organisms you find in the water samples. Use reference materials to identify the organisms. Also use the photographs from the ProScope USB microscope to help identify each microbe. Compare and contrast the pictures to determine likenesses and differences in the various microbes. Describe any differences you observe over time.

Processing the data

1. What changes did you notice each day in the hay infusion project?
2. Which water sample produced the most microbes? Why do you think this sample produced the most microbes?
3. How many different microbes were you able to isolate and identify?
4. Which lens magnification made the microbes appear to be the clearest?

Extension

Continue to feed the hay infusion by adding more pond water and hay each week. Using the microscope, make new slides from the water samples every four to five days. Record any changes or additional microbes you detect.

Teacher information

- A hay infusion is a great way to produce a variety of microbes during any time of the year. The sugars in the dried grass provide food for the bacteria and other microbes. The bacteria serve as food for the protozoa. If the bacteria grow quickly, the protozoa will also grow quickly. The protozoa breathe oxygen so it is important to pump air into the hay infusion at least once a day. Use a pipette to accomplish this. Keep in mind that a hay infusion is very high in bacteria. Although most bacteria are harmless to humans, make sure that you and the students wash hands, equipment, and countertops with antibacterial soap to avoid contamination of any kind.
- During the first week of the hay infusion, a scum may form on the top of the water. This is completely normal. The scum may contain rod-shaped cells that may be a form of sulfur bacteria. After the first week, bacteria and protozoa should be visible under the microscope. These should be visible using the x200 lens. Photos should be taken and stored for later comparison.
- In weeks four and five, flagellates, ciliates, and diatoms should be present in the hay infusion. These should be visible using either the x200 or the x400 lens. Photos should be taken and stored in a folder for this date of observation.

- The hay infusion should produce amoebas and more flagellates in weeks nine and ten. Again, these should be visible through the x200 and x400 lenses. Spiral bacteria may also be visible at this stage. Bacteria may produce a somewhat unpleasant smell in the hay infusion that you will have to endure. The flagellates will be on the top of the water and the amoebas will probably be on the bottom of the hay infusion.

Sample results

The results of your work should include drawings and photographs of several different types of microbes. The photos taken over several weeks will provide you with stages of the microbes to compare and contrast. You should see both different microbes and microbes in different stages.

Answers to questions

1. You should see more debris each day in the hay infusion. You may also be able to see things moving in the hay infusion as the microbes start to appear. A scum or green slime may appear on the top of the water in the jar.
2. The water from the top of the jar, the bottom of the jar, and the middle of the jar should produce about the same number of microbes. This, of course, depends on the hay infusion sample. Each level should produce different types of microbes.
3. This will vary according to the hay infusion and the samples taken. In two to three weeks, there should be at least three or four different types of microbes present and viewable using the ProScope USB microscope.
4. Both the x200 and the x400 lenses should produce the best results when viewing the microbes. The x100 may also be effective after the movement of the microbes is slowed down by the addition of corn syrup to the water sample.

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