Name: _____ Date: _____ Student Labsheet

Carolina LabSheets®

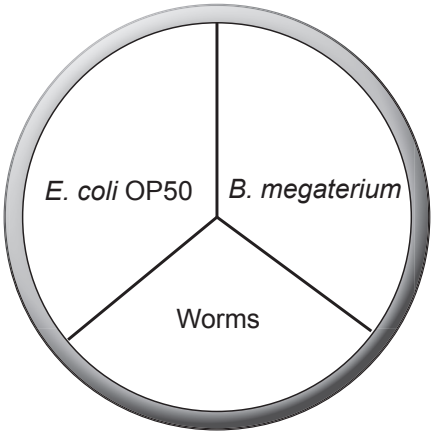
Introduction to Feeding Preferences in *Caenorhabditis elegans*

Living organisms have a natural ability to locate and assess the quality of potential food sources from a large range of materials available within their environment. The ability to analyze the quality of a food source dictates the organism's foraging, feeding, and roaming behaviors. These behaviors can be readily studied and quantified using *C. elegans*.

When hunting for high quality food, soil-dwelling nematodes such as *C. elegans* alternate between 2 modes of locomotion: dwelling and roaming. Dwelling worms make frequent stops and reversals, while roaming worms make straight, rapid movements. Special cells in the worms' sensory system extend roaming periods in response to low quality food sources in the environment, which allows them to continue foraging for higher quality food sources within their environment.

In this activity, you will inoculate ⅓ of a petri plate with an optimal food source and another ⅓ of the plate with a lower quality food source. Then you will count the number of observable instances of roaming and dwelling behaviors in the worm populations on the 2 different food sources. You will also count the number of worms found on each section of the plate.

Procedure



1. Use a permanent marker to draw divisions on the bottom of an empty petri plate as shown in the illustration. Your section labels may differ, depending on the species you are testing.
2. Pour nematode growth agar into each plate, cover with lid, and allow to cool to room temperature. If your plates have been pre-poured, skip this step.
3. Use a sterile cotton swab or inoculating loop to collect material from the surface of the *E. coli* OP50 culture. Apply the collected material to the NGM plate in a small circular space (approximately ½" diameter) in the section labeled "*E. coli* OP50." Do the same for the *B. megaterium* culture in its labeled section. Do not apply anything to the section labeled for the worms. Replace the lid on the petri dish.
4. Incubate the plates lid-up at room temperature for 24 to 36 hours.
5. To observe feeding preferences, it is easiest to transfer a chunk of worm-filled agar from a mature *C. elegans* starter plate to your test plates. Examine the mature *C. elegans* plate under a microscope to verify the plate is free of contaminants and the worms are alive and vigorous.
6. Sterilize a metal spatula. Dip the end in ethanol and briefly pass through a burner flame to ignite the alcohol. Use the sterilized spatula to cut about a 1-cm-square (about ⅜" square) chunk of agar with worms from the *C. elegans* wild-type starter plate.
7. Transfer the chunk to the section of your plate labeled "Worms" and place the chunk face down on the agar. Placing the chunk face down allows the worms to crawl quickly into the agar on the new plate.
8. Incubate the plate at room temperature for 24 hours. Choose a place to incubate where the plate will not be disturbed or exposed to direct sunlight. This will give the newly transferred worms time to migrate to the food source they prefer.
9. At the end of the 24-hour incubation period, carefully examine each plate. Count the number of observable instances of dwelling and roaming behaviors present in each section of the plate.
10. Additionally, count the number of worms observed in each section of the plate to examine feeding distribution. Note that this part of the activity may take place over several days.
11. Your instructor may assign additional time points for you to count worms and collect additional data.

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Data Table 1 for Section 1 (*E. coli* OP50)

Time	Instances of Dwelling Behavior	Instances of Roaming Behavior	Notes

Data Table 1 for Section 2 *(B. megaterium)*

Time	Instances of Dwelling Behavior	Instances of Roaming Behavior	Notes

Data Table 1 for Section 3 (Worms)

Time	Instances of Dwelling Behavior	Instances of Roaming Behavior	Notes

Data Table 2

Time (in hours)	Number of Worms in Section 1	Number of Worms in Section 2	Number of Worms in Section 3

Questions

1. Based on your observations, do the worms show a clear feeding preference for 1 bacterial species over the other?

2. What evidence were you able to collect to support your answer?

3. Complete a brief literature search on the species of bacteria offered as food sources. What morphological differences could account for any observable differences in feeding preferences?