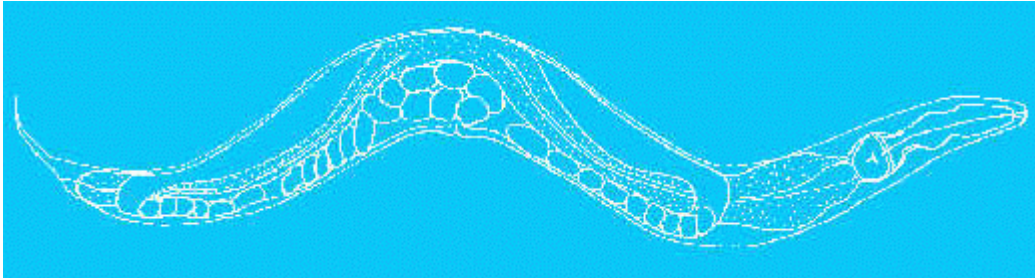


Caenorhabditis elegans: An Introduction



What is *Caenorhabditis elegans* and why work on it?

What is *C. elegans*?

C. elegans is a nematode - a member of the phylum Nematoda:

Nematoda. The roundworms and threadworms, a phylum of smooth-skinned, unsegmented worms with a long cylindrical body shape tapered at the ends; includes free-living and parasitic forms both aquatic and terrestrial.

(Academic press Dictionary of Science and Technology)

It is small, growing to about 1 mm in length, and lives in the soil - especially rotting vegetation - in many parts of the world, where it survives by feeding on microbes such as bacteria.

A brief description of *C. elegans*

C. elegans is a free-living nematode. There are two sexes: a self-fertilizing hermaphrodite and a male. The adult essentially comprises a tube, the exterior cuticle, containing two smaller tubes, the pharynx and gut, and the reproductive system. Most of the volume of the animal is taken up by the reproductive system. Of the 959 somatic cells of the hermaphrodite some 300 are neurons. Neural structures include a battery of sense organs in the head which mediate responses to taste, smell, temperature and touch - and although *C. elegans* has no eyes, it might respond slightly to light. Among other neural structures is an anterior nerve ring with a ventral nerve cord running back down the body. (There is also a smaller dorsal nerve cord.) There are 81 muscle cells. *C. elegans* moves by means of four longitudinal bands of muscle paired sub-dorsally and sub-ventrally. Alternative flexing and relaxation generates dorsal-ventral waves along the body, propelling the animal along. The development and function of this diploid organism is encoded by an estimated 17,800 distinct genes.

(above from the Riddle lab: <http://www.biotech.missouri.edu/Dauer-World/Wormintro.html>)

Caeno-WHAT? (Teacher Guide)

Goal: To demonstrate how the nervous system of the worm allows the animal to behave and respond to its environment.

Activity Time: 1 class period

What You Need:

Microscopes lit from underneath and able to magnify in the 20x-50x range

Adult N2 worms (normal animals)

E. coli growth agar dishes

Worm pickers (toothpicks)

Eye droppers

Different odorants to test: isoamyl alcohol (attracts), 1-nonanol (repels). Best at 10^{-2} strength

Plain, non E. coli containing agar plates (as a control)

Bucket or Styrofoam container for holding ice

Ice

Sodium Azide

Getting Ready:

It would be useful if your students have already had some experience using microscopes previously.

A day or two prior to this activity, have your students bring in a sample of dirt from their homes. Have them place the dirt onto half of 1 E. coli plated agar dish, label the dish with the students name, and leave overnight to see if any nematodes migrate out onto the agar.

Set up stations with a microscope, worm picker, and a dish of worms.

How to Start the Activity:

If you had the kids bring in soil samples, have each student look at their plate to see if anything has moved out onto the agar. There should be at least some kids who have some type of nematode in their sample. Talk about how this worm lives in the soil all over the world, and that it has become a very important model for understanding our how our nervous system works, and some of the genetics which control behavior.

Either project an image of some of the worms moving on a dish, or show the videotape (to be made) of their normal motion to give the students an idea of what they are looking for, or to fill out the worksheet together as a class.

What To Do:

Remind your students about the fact they'll be pooling data, so it is important for them to take careful notes while they are working. Have the students break up into groups to use the microscopes to explore the worm's behavior in reaction to different smells and light touches on their body. Assist your students in forming ideas about what they can test with the animals.

You may spot the sodium azide on the agar where students have placed “X”s to stop the worms from moving away.

TEST A WORM’S SENSE OF SMELL

Goal: To see if worms can smell. If they can smell, what smells do they like and dislike?

1). Get a plain petri dish and make an “X” on the top and the bottom of the dish, for the chemical to be tested and an “O” on both sides as a control.

(As in drawing below)



2). Put a worm or some worms in the center of the dish. (Use an eye dropper to transfer the worms)

3). Take a drop of a chemical and place it on the **top of the dish** where you placed the “X”.

4). Line up the “X” and the “O” on the top and the bottom of the dish.

(As in drawing below)



5). Wait at least 15 minutes for the worms to move around some.

6). Take a look at your dish. Where did the worms move?

7). Record your results.

TEST HOW THE WORM MOVES

GOAL: To see how the worms move and reacts to being touched.

Look at how the worms move on the dish.

Some worms look normal, but don't act normally when touched on the head or tail.

1). Take an eye-dropper or toothpick and use it to GENTLY touch a worm on the head. How did it respond?

2). How does the worm respond when touched on the tail?

3). Why might the worm move differently when touched?

Come back together as a group to discuss why the worm acts the way it does, and how what its nervous system needs to have in order the sense and react to the students' investigations.