Caterpillar Senses

How do hungry caterpillars find food?

BEST FOR GRADES
2-5

ESTIMATED TIME
30-45 Minutes

You Will Need

- ❏ Manduca caterpillars Can be purchased online from http://bit.ly/2CZ3L4b
- ❏ Solanaceous leaves *(tomatoes, potatoes, peppers, eggplant)*
- ❏ Non-solanaceous leaves *(grass, oak, pine needles, etc.)*
- ❏ Clear plastic jars or deli cups
- ❏ Fabric mesh *(such as tulle)*

Directions

1. Ask students to think about how the caterpillars might find their favorite foods. Have them consider their own senses and how they find their own favorite foods.
   - 1.1 Ask your scientist to create a testable question. Example: Do caterpillars use their sense of sight to decide which leaves to eat?
2. Introduce the caterpillars & review the Tomato Hornworms handout.
   - 2.1 Have students hold and observe their own caterpillar
   - 2.2 Have students observe how the caterpillar moves.
   - 2.3 Have students determine the age of their caterpillar(s) using the chart on the Tomato Hornworms handout.
   - 2.4 Record information on the Hungry Caterpillar Data Collection Sheet.
3. Have students pick leaves to feed the caterpillars (one solanaceous leaf, one non-solanaceous leaf)
4. Set up a choice test for caterpillars to choose between two leaves.
   - 4.1 Set the leaves 6-8 inches apart. Carefully place the caterpillar between them.
   - 4.2 Students should report which leaf their caterpillar chose and record the results on the Hungry Caterpillar Data Collection Sheet
   - 4.3 Students should determine which leaves are the caterpillars' favorite. Discuss with the student that some insects are generalists (they eat many types of plants) and some are specialists (they eat only a few specific types of plants.) These caterpillars are specialists and only eat certain kinds of plants.
5. Experiment to determine how the caterpillar knows it's the food they want. Ask your student how we could test each sense independently.
6. To test location, switch the position of the leaves.
   - 6.1 Did the caterpillars still find their favorite leaf? Record the results on the Hungry Caterpillar Data Collection Sheet.
7. To test vision, cover the leaves with a clear plastic container, so the leaves are visible, but caterpillars can't smell them.
   - 7.1 Did the caterpillars still find their favorite leaf? Record the results on the Hungry Caterpillar Data Collection Sheet.
8. To test smell, cover the leaves with fabric mesh, so that the caterpillars can smell them, but the leaves are not visible.
   - 8.1 Did the caterpillars still find their favorite leaf? Record the results on the Hungry Caterpillar Data Collection Sheet.
9. Based on their results, ask the students which sense the caterpillars use to find their favorite leaves.

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Caterpillar Senses

Discovery Questions & Keywords

Discovery Questions

Beginning the Experiment

Which senses do YOU use to identify your favorite foods?

Observe your caterpillars. How do caterpillars move?

During the Experiment

Which plants do the caterpillars like best?

How can we test each sense independently?

After the Experiment

Which senses do the caterpillars use to find their favorite food?

Keywords

Antennae

Sometimes referred to as "feelers," insects use these appendages for sensing

Larva

Also called caterpillar, it's the early life phase of a moth.

Mandibles

The sharp jaws of a larva used to chew leaves.

Ocelli

A scientific term for simple eyes.

Prolegs

Fake caterpillar legs! Used to hold onto leaves. (They do not count in the six true legs that characterize insects.)

Specialist

Insects that are picky eaters and only eat a few types of plants.

Generalist

Insects that eat many different kinds of plants.

Solanaceous

A plant family that includes tomatoes, potatoes, peppers, and eggplants.

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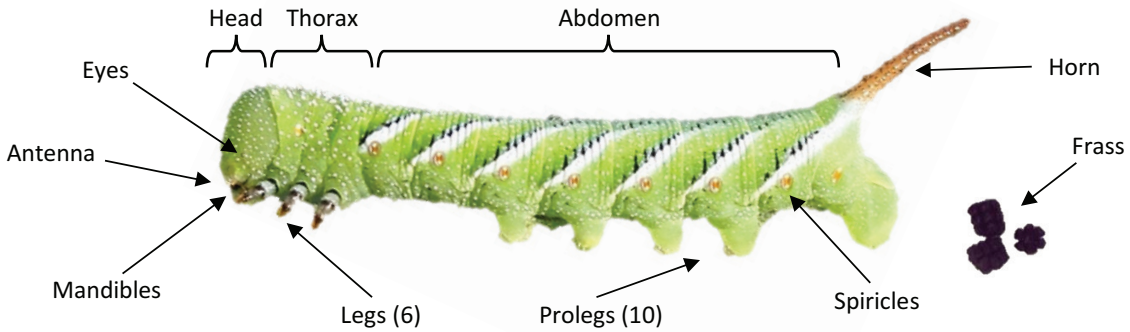
Caterpillar Senses

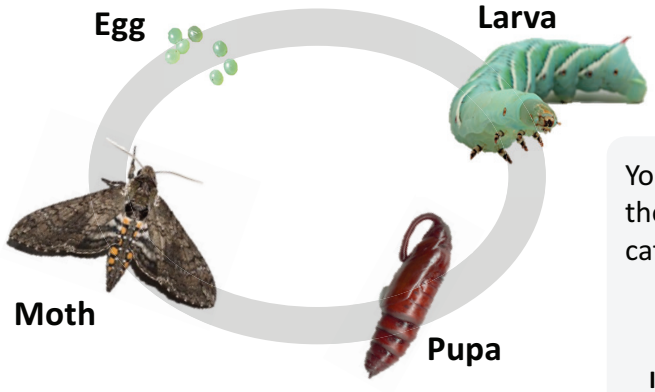
Tomato Hornworms *(Latin name: Manduca sexta)*

Anatomy of a Caterpillar



How old is my Hornworm?

Baby hornworms called larva hatch from eggs. As they eat leaves they grow bigger, just like humans! However, once they get big enough they form a special cocoon called a pupa. After a few weeks they emerge as adult moths and begin the cycle again when they lay their own eggs.



You can tell how old a caterpillar is by the size of their head! Match your caterpillar's head to the circles below:

Instar:	**1st**	**2nd**	**3rd**	**4th**	**5th**
Days:	1-4	5-7	8-11	12-15	16-20

What do hornworms eat?

Hornworms like similar vegetables that we like to eat! They specialize in eating the leaves of solanaceous plants. Which of these vegetables are your favorite?

Hornworms eat so many leaves that a 5th instar caterpillar can eat enough leaves to fill this area within this dotted line every day!

Created for Science-U @ Home. *Serpi, 2017.*

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Hungry Caterpillar Data Collection Sheet

Scientist Name: _____

How old is your caterpillar? (Use the chart on the Tomato Hornworms handout to find out!)

_____

Leaf choice:

Which leaf did your caterpillar choose?

- ❏ Solanaceous leaf (tomato, potato, pepper, or eggplant leaf)
- ❏ Non-solanaceous leaf (grass, pine needle, oak or maple leaf)

Choice 1. Location

Did the caterpillar choose this leaf?	Solanaceous Leaf	Non-solanaceous Leaf
Yes		
No		

Choice 2. Vision

Did the caterpillar choose this leaf?	Solanaceous Leaf	Non-solanaceous Leaf
Yes		
No		

Choice 3. Smell

Did the caterpillar choose this leaf?	Solanaceous Leaf	Non-solanaceous Leaf
Yes		
No		

Conclusion:

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The science of a how a caterpillar locates food.

How does it work?

Manduca, or Tomato Hornworms, are very hungry caterpillars. They can eat 64 square inches a day. That's about the size of a paper plate! All of that eating gives them enough energy to grow into adult Hawkmoths. But first they have to locate their favorite foods: solanaceous plants. Manduca love tomatoes, potatoes, peppers, and eggplants. Just like us!

So how do they do it? They smell them! Manduca have a better sense of smell than dogs. Turns out caterpillars have simple eyes (ocelli) which can only differentiate dark from light They cannot form an image.The tiny antennae, near the mouth parts, sense smells. Some sources describe their sense of smell as a combination of taste and smell.
The caterpillars will choose the solanaceous plants if they can smell them, telling us that they used their sense of smell to find their favorite food!

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Caterpillar Senses

Discovery question answer key for parents and teachers.

Beginning the Experiment

Which senses do YOU use to identify your favorite foods?

Depends on the scientist, but if you're like most people, you use a combination of your sense of sight, smell, and taste to determine which foods you think are yummy!

Observe your caterpillars. How do caterpillars move?

They crawl from back to front in waves using their belly - watch them closely, it's so cool!

During the Experiment

Which plants do the caterpillars like best?

These caterpillars love tomatoes, potatoes, peppers, and eggplants. Just like us!

How can we test each sense independently?

We can test this by changing the cues the caterpillars can detect. If we move the plants, we can see that the location of the plants doesn't matter. The caterpillars can still find the correct plants. If we cover the plants with a clear plastic jar, the caterpillar can see the plants without smelling the plants. Now the caterpillars can't find the correct plants. Finally, if we hide the plants with mesh fabric, the caterpillars can't see the plants, but they can still smell them.

After the Experiment

Which senses do the caterpillars use to find their favorite food?

Your experiment results should have resulted in the caterpillars using their sense of smell to locate the solanaceous leaves.

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