

Fruit Fly Fun

- Make flies or antenna out of pipe cleaners
- Feeding Fruit Flies
- Fighting Fruit Flies
- Geotaxis of Fruit Flies (tap them down, flies climb back up)
- Smells T-test Fruit Flies (they choose smells to test which one flies prefer)
- Courtship of flies (only if we have males and females separated)

Materials:

- pipecleaners, puff balls, kid scissors, glue, beads
- Feeding: Starved flies should be in a vial without food (with wet kimwipe) in the fridge, food, large petri dish, tape (see additional feeding worksheet for more info)
- Fighting: males set up in fighting chamber, food (see additional fighting worksheet for more info)
- Geotaxis: vestigial wings or smell less vs wildtype flies, 2 large pipetors to put flies in, cotton balls
- Smells: 2 water bottles T test (in tupperware under bench), smells from senses kit, Q-tips, cotton balls

Why are Fruit Flies important for mankind?

1. The fruit fly is a very useful model to study the genetic bases of feeding behaviors as vertebrate and invertebrate organisms show striking similarities in their chemosensory systems.
2. Feeding: eating behavior? mankind has a huge problem with our eating behaviors. Some people like to call it the obesity epidemic. how is it we decide to eat potato chips vs fruit? lets first understand how flies choose-look at different genes that might control it.
3. Fighting: what behaviors do we inherit vs learn? Males are picked as pupae so they never see another male fight yet they know certain moves. Humans fight too-some humans are more aggressive/mean and we're trying to find out why to see if we can help them live normal, non-aggressive lives.
4. Geotaxis: we all get back up when knocked down. if a person or fly doesn't, could be brain damage. Its how we test to make sure brain and neurons are functioning.
5. Smells: Do flies have preferences similar to humans? We understand how smell works but not preferences. why do we choose 1 smell over another?

Questions to ask visitors:

Why do we have flies here at the museum? what do we do with them as scientists?

Why do we study them? do they have brains?

What senses do flies have? can they hear? smell? taste? see? feel?

Activity specific questions: Which food do you think fruit flies like- high salt or low or none? What behaviors are babies born with-what do they just know how to do? do you think if we put 2 humans that have never seen another human before, in a room with 1 toy or 1 piece of food, that they would fight?

Which fly do you think will climb to the top faster? why? What do you do when someone knocks you down-do you just stay sitting on the ground? Which smell do you think the flies will like best? Why?

Experiment

First, give them a tube of flies where you can see all stages. Ask them what they see, what is the stuff at the bottom of the tube. do they see worms? they might see their black heads in the food. talk about the life cycle. have them gently tap the tubes so the flies fall down and ask what they think the flies will do next. Fact: Larvae move away from light and flies move towards light. Talk about how their brain changes as they change from larvae to fly.

Feeding and Fighting: see additional sheets

Geotaxis: First, put flies in the fridge then transfer wildtype to 1 pipet (be sure ends are closed well with tape, cotton balls, parafilm) then transfer either smell-less or vestigial winged. Smell-less are a brain damaged model and will climb slower. When we don't have smell-less at the museum, we compare vestigial vs wildtype to see who is a stronger climber. have them gently tap the flies down and watch what they do. Geotaxis assays are ways to test learning and memory in flies.

Smells: Have flies already in the T test water bottles.

Have smells out for kids to pick 2 to test. We have smells in the senses kit or different fruit juices in the fridge. Have them set out in cups on the bench. Kids pick, dip Q-tips and carefully move cotton balls aside to push in the Q-tip. Don't push the Q-tip in all the way because they're harder to remove.

They usually figure out that the flies just might like to go towards the light on their own but guide them to this incase they don't realize it. ask them how they'll solve that problem. ask them if they think they'd get the same result with Larvae

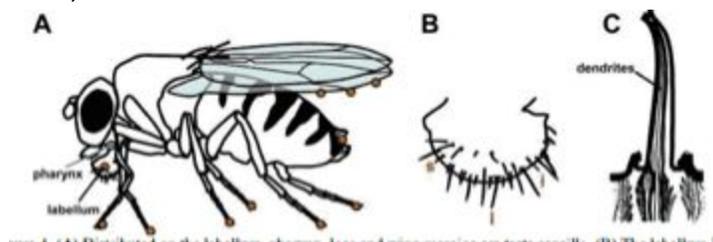
Research on your own how larvae detect light-do they have eyes?

Additional Scientific INFO about Drosophila!

TASTE

Drosophila depend on hair-like structure, called sensilla, located on multiple parts of their body including the proboscis, wing margins, legs and ovipositor (figure). Each of these receptors contains about 68 gustatory receptors (GRs) that help the *Drosophila* select nutrient food and select mates. These receptors are especially used to sense the difference between compound with high sugar content and those with high salt content (Montell, 2009).

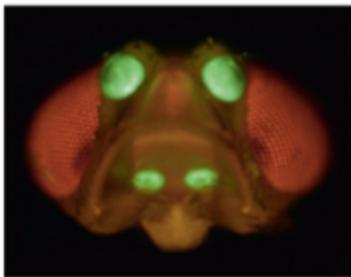
Figure 4. (A) Distributed on the labellum, pharynx, legs and wing margins are taste sensilla. (B) The labellum is shown indicating the various types of sensilla (l-, s- and i-type). (C) Structure of a single sensilla made up of four dendrites extending above the surface of the cuticle (Montell, 2009).



The proboscis comprises both internal and external sensilla. The external sensilla detect preferable food sources and the internal sensilla check the food before it is allowed into the digestive system. There are also the sensilla located on the ovipositor, which is used by the females to identify the best location to lay their eggs. Males on the other hand have more sensilla on their forelegs to allow them to sense pheromone levels when choosing a mate. The taste sensing neurons in the receptors are called bona fide neurons which are similar to the neuroepithelial neurons found in the taste buds of mammals.

SMELLING

Smelling takes place in an organ that takes the form of two conical knobs that sit between the comparatively enormous compound eyes. The term olfactory bulb couldn't be more appropriate. Somewhat lower down, just above the proboscis, sit two other small knobs, the maxillary palps, which are also used for smelling. Hundreds of fine olfactory hairs, the sensilla, sprout from the antennae and maxillary palps. An odorant molecule must make its way into these hairs to be recognized. "In principle, each olfactory hair functions like a miniature nose"



Observed while smelling: The illuminated points show active nerve cells in the fly brain, which glow neon green through the exoskeleton.