IB Lab #1: Isopod Activity

1. Aim: The aim of this experiment is to see if Pill bugs prefer salt, sugar, or tap water in a specific amount of potting soil.

2. Safety Information: Cation must be used when handling the scissors needed to do this experiment because they have a sharp point that could potential hurt someone. To avoid getting hurt by the scissors, never run with them and always carry them with the point pointing towards the ground. Also make sure that there are no fingers or hands in front of the scissors while they are being used.

3. Introduction/ Background: Do Pill bugs prefer saltwater, tap water, or sugar water saturated potting soil? Well, Pill bugs are invertebrates that can be found in a myriad of places throughout the world. They like to live in damp habitats (i.e under rocks, dead leaves, and logs). They survive on decaying vegetation. They are born from eggs, and sheds their outer shell, or exoskeleton, four to five times throughout their lives. Pill bugs have gills so their breathing can be affected by the level of moisture in different types of environments. They are also most active at night and prefer higher levels of soil, so the amount of soil they are living in could affect their activity. I collected my bugs from my family's garden in my backyard and from potting soil that I found around San Bruno park. I created the habitat I would keep them by, first, putting a moist paper two at the bottom of a plastic container. Then I put soil and a little bit of vegetation on top of that, and finally, I put the Pill bugs in their new habitat. Every day, after class, I would make sure to wet the dirt with a little tap water.

- **Hypothesis Statement:** I believe that the Pill bugs will prefer the potting soil that's saturated with tap water more than the soil that's saturated with salt or sugar water. This is because they are used to living in soil that's naturally unsaturated. Pill bugs, being crustaceans, have gills and need water to breathe. All living things desire to be in a area where they can live comfortably and thrive; thus, if the water the Pill bugs are ingesting is not what they are accustom to and/ or if they find breathing too difficult, they will want to move to a more habitable area. Since their normal habitat consists of naturally saturated soil, they will most likely stay in the area that is most like naturally saturated soil-- the potting soil saturated with tap water.

4. Methods/ Experimental Design:
- Independent Variable: the type of the water (sugar, salt, or tap)
- Dependent Variable: Pill bugs water preference (how many Pill bugs are in each type of saturated dirt)
- "0" Control: potting soil that's saturated with tap water only

- **Control of outside variables:** the amount of water, sugar, and salt in the potting soil, the type of potting soil

- **Materials:**
- 6 small petri-dishes
- 2 large petri-dishes
- 8 Pill bugs
- 3 graduated cylinders
- 3 graduated droppers
- 62 mL of tap water
- 5 mL of table sugar
- 5 mL of table salt

- 60 mL of potting soil
- timer
- 2 plastic cups
- masking tape
- 3 straws
- 1 pair of scissors

- **Diagram/ Set-up:**

- **Procedure:**

1. Cut an opening about 3/4 inch wide in three of the small petri-dishes, and three openings about 3/4 inch wide, each about an inch apart, in one the large petri-dishes. Take the smaller petri-dishes and align each of their openings with the openings in one of the large petri-dishes. This creates three passageways that the Pill bugs will walk through when the experiment is done. Using masking tape, make sure the petri-dishes stay together by putting a piece of tape on the bottom of each of them. Repeat the same process using the remaining petri-dishes. This creates two set-ups that the experiment will be performed in.
2. Using one graduated cylinder, measure ten milliliters of potting soil and pour it into one of the small petri-dishes. Repeat this process until each of the six, small petri-dishes have ten milliliters of soil in them. This provides comfortable habitats for the Pill bugs to roam in.
3. Rinse out the graduated cylinder that was used to measure the soil and fill it with twenty-five milliliters of water. Take one of the set-ups and, using a graduated dropper, put three milliliters of tap water, from the graduated cylinder containing twenty-five milliliters of water, in each of the three, small petri-dishes. Use the end of one of the straws to thoroughly mix the tap water into the soil. This set-up will be used for the control experiment, so that the Pill bugs can be observed in a habitat that is similar to what they are used to.
4. Take the other set-up, which will be used for the actual experiment, and, using a graduated dropper, put three milliliters of tap water, from the graduated cylinder containing twenty-two milliliters of water, in one of the three, small petri-dishes containing soil. Use the other end of the straw used in step three to thoroughly mix the tap water into the soil. This creates the habitat saturated with tap water that the Pill bugs can go to if they prefer tap water more than sugar or saltwater.
5. Take one of the graduated cylinders not containing water and use it to measure five milliliters of table salt. Pour that salt into one of the plastic cups. Next, refill the graduated cylinder containing tap water and pour twenty-five milliliters of tap water into the plastic cup containing the salt. Use one of the two clean straws to thoroughly mix the tap water and the salt. Once it is mixed, use a graduated dropper that hasn't been used to put three milliliters of the salt and tap water mixture into one of the two remaining smaller petri-dishes that doesn't already have tap water in it. Use the clean end of the straw that was just used to thoroughly mix the tap water and salt mixture into the soil. This creates the habitat saturated with saltwater that the Pill bugs can go to if they prefer saltwater more than sugar or tap water.
6. Create a tap water and sugar mixture by repeating step five using table sugar instead of salt. Make sure to use a clean graduated cylinder and plastic cup. Once the sugar and tap water mixture is mixed, use the only graduated dropper that hasn't been used yet to put three milliliters of the sugar and tap water mixture into the only small petri-dishes that doesn't already have tap water or the salt mixture in it. Use

the clean end of the straw that was just used to thoroughly mix the tap water and sugar mixture into the soil. This creates the habitat saturated with tap water that the Pill bugs can go to if they prefer sugar water more than tap or saltwater.

7. Place four of the Pill bugs into the large petri-dish of the control experiment set-up and the other four Pill bugs into the large petri-dish of the actual experiment set-up. This allows the Pill bugs to easily reach the habitat they prefer most.
8. Start the timer. After each minute, write down how many Pill bugs are in each of the small petri-dishes for both the control and the actual experiment set-up. Stop the timer when it reaches five minutes. This allows accurate data to be recorded and eventually put into a data chart.
9. Once the data has been collected, put it in to a data chart. This allows data to be seen more clearly and understood more easily.
10. Repeat steps 8-9 at least two more times, this allows more trials to be done and the experiment's results to be more accurate.

- **Data Collection:**

Table 1. Data collected during a trial to find out how Pill bugs act when they are in a tap water saturated environment. 9 mL of water were added to 30 mL of potting soil that was separated into three connected petri-dishes that were connected to an empty petri-dish. The bugs were allow to roam and the number of bugs in each petri-dish was recorded every minute. The results in the attached chart and graph demonstrate the experiment.

Table 2. Data collected during a trial to find out if Pill bugs prefer saltwater, tap water, or sugar water saturated potting soil. 3 mL of each type of water were added to 30 mL of potting soil that was separated into three connected petri-dishes that were connected to an empty petri-dish. The bugs were allow to roam and the number of bugs in each petri-dish was recorded every minute. The results in the attached chart and graph demonstrate the actual experiment.

5. Conclusion:

After conducting the experiment to see if Pill bugs prefer salt, sugar, or tap water in a specific amount of potting soil, the results showed that our hypothesis was incorrect. Unfortunately, the control group didn't really reveal anything; however, the experimental group revealed that the Pill bugs preferred sugar water more. With the control group, for the entire five minutes, the bugs ether wandered around or tried to get out of the petri-dishes. This could be because the control group's environment was much like the environment they are used to, so they acted similarly to the way they would in their natural habitat--roaming around at relatively fast speeds. Another reason for this could be that the Pill bugs that were in the control group were just naturally active, so they would prefer to move around instead of settling down in a specific area/ petri-dish. The experimental group showed different results. The Pill bugs spent the first two or so minutes moving around quickly and randomly, trying to get out, much like the control group, but after that seemed to calm down and spent the remaining time in the sugar water saturated dirt. There could be multiple reasons this occurred as well. One of those reasons could be that the Pill bugs want to experience something they've never experienced before, which would be the sweetness of the sugar water. Also, these particular bugs could be less active than the bugs in the control group and could have just decided to settle where they were when they got tired, which might just have been in the dirt saturated with sugar water. Another reason could be that Pill bugs like really most, high levels of dirt--there is a chance that the petri-dish containing the sugar water saturated dirt could've been more moist or had a tiny bit more dirt in it than the other two petri-dishes, which would draw the bugs to it. Lastly, compared to the salt and sugar water petri-dishes, the tap water petri-dish may have been too plain for the bugs; the salt water petri-dish could have been too strong and uncomfortable for the bugs to be in, leaving the sugar water petri-dish as their only other option.

- **Evaluations and Improvements:**

One weakness that occurred during the lab was that the bugs kept crawling out of the petri-dish set-up, so some time was wasted putting them back in. This could make our results a little less accurate. Another thing that could have helped further prove the results is if another test could have been done with only dirt saturated with sugar water to see if they really did like the sugar water and to prove that the bugs weren't just moving randomly. Lastly, another weakness that occurred was that the Pill bugs all came from different habitats and that could have affected the time of water they liked.

An improvement that could be made to the lab would be to figure out a way to keep the Pill bugs from crawling out of the petri-dish set-up. Also, it would be helpful to keep all of the bugs in the same habitat for a while so that they would, in a way, come from the same environment. The experiment could also be improved by being more accurate when measuring the openings in the petri-dishes and the amounts of the sugar, salt, soil, and water that are being used.