Tenebrio molitor as a Model Organism for the Impact of Different Metal Salts on Humans

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Abstract

We researched and investigated, what is the reaction of yellow mealworms (Tenebrio molitor) to different concentrations of metal salts? We did this experiment because we know that exposure to metal salt can be harmful to worms and we wanted to see what mealworms would do if we expose them to it. For our experiments we exposed yellow mealworms to different concentrations of metal salts (copper and iron chloride). We first did a stimulus test to see if the mealworms reacted to light, ethanol, and touch. After we did this we did a circle test. For this we encircled the mealworms in different concentrations of copper and iron chloride. The last test we did was a raceway test, in which we soil into a raceway then put different concentrations of copper and iron chloride on the soil. Then we would put the mealworms on the soil and see how far they crawled. Our most important result was that the worms reacted to 0.01 ppm concentrations of copper chloride which supported our most important conclusion which is that mealworms react more to copper chloride then iron chloride. This matters to human health exposure to copper in our bodies can harm us for example, we can get symptoms such as nausea, vomiting, diarrhea, liver damage, kidney damage, and death. (DOC, 2013)

Results

We first tested how much the tenebrio molitor would react to light, touch and ethanol to gather a large understanding of the species. We recorded how strong the reaction was and reporting it within our tables. Once we had tested their sensitivity to touch, we discovered that the tenebrio molitor demonstrated violent thrashing behavior when touched by our testing probe. While testing how they react when ethanol is poured upon them, we learned that 58.3% of the tenebrio molitor had a strong reaction. While 33.3% of the tenebrio molitor had no reaction at all. The tenebrio molitor showed little to no reaction to light or darkness. These findings were not surprising. Once we were done with our stimulus tests we began to begin our circle and raceway tests. Our circle tests showed that the tenebrio molitor would have strong to mild reactions when forced to come in contact with serial dilutions of copper and iron chloride. The dilutions of our metal salts were our independent variables. We also had a control in which we used dechlorinated tap water to use as our control. The worms reaction was our dependent variable change as we change our dilution of metal salt. We found that when using the different concentrations of iron mealworms still had multiple mild reactions during 10 PPM (33.3%). After that they gave no significant reactions throughout the tests. Whereas when testing copper we found that they react mildly down to 0.01 PPM. 33% of our sample set reacted mildly to the 0.01 PPM. When we measured how far the tenebrio molitor would crawl on soil with different dilutions of our metal salts poured on top. We then took these distances and compared them to how far the tenebrio molitor traveled with dechlorinated tap water poured atop instead. When we gathered our information on the copper chloride and were able to compare it to our control we found astonishing results. The worms crawling within Copper chloride 100 PPM. The average worm only crawled 2.25 inches more than an inch less than our control and when observed by our T-Test comparing the two it showed that they are in fact not similar. This represented t read existed through our entire test when we learned that they began to crawl less in a copper chloride concentration of 0.01 PPM. The worms here averaged at crawling 2 inches less than the control. Although the iron was the same the entire time when compared to the control thought a T-Test. As seen in our figures below:

Discussion

After completing our experiments we can conclude that Tenebrio molitor or mealworms are more sensitive to copper chloride than iron chloride. When the mealworms were in 100 PPM of copper chloride they were not affected, whereas when testing iron they were affected. After finding copper was a higher reaction. When we were doing the circle test to see the mealworm reaction we found that even in a concentration of 0.01 PPM, 33% of the mealworms had a mild reaction. The patterns that appeared throughout our data were that mealworms have a higher reaction to concentrations of copper chloride than iron chloride. The mealworms did not show a significant reaction in iron chloride but they did in copper chloride. This pattern shows how copper chloride is more dangerous to mealworms than iron chloride. Copper chloride is also dangerous to humans. The body needs certain amounts of copper to function properly, but too much exposure to copper can cause many health problems. For example, just breathing in copper can cause irritation to the nose and throat. Ingesting copper orally can cause nausea, vomiting, diarrhea, liver damage, kidney damage, and death (Dangers of Copper). Iron is also essential for our bodies to function but an overdose can also cause health problems. An overdose of iron can potentially cause iron poisoning which is usually from pure iron supplements. However children's supplements with iron only include so little iron that even a full jar won’t cause harm (Toxicity, Mechanism and Health Effects of Some Heavy Metals).

Works Cited

