Using Worms as a Model Organism to Study the Effects of Makeup Removers

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Abstract

Makeup in the U.S. has a revenue of 56.63 billion dollars every year. In addition, women on average spend 15,000 dollars on makeup in their lifetime. We were wondering just how safe makeup removers are, and how effective they can be. We researched how worms react when exposed to different concentrations of rinse and non rinse makeup removers. After testing our model organism (worms), we tested concentrations of makeup removers and how effective they are on makeup. The worm, being our model organism, creates a similar reaction to how we would react. Our soft tissue is very sensitive, especially to harsh chemicals. After many experiments and testing, we are able to conclude that makeup remover is safe and still effective when diluted.

Introduction

With a 56.63 billion dollar revenue (Bender, Joshua, 2014), the makeup industry is a growing market. Women spend 15,000 dollars in their lifetime on makeup. (Mychaskiw, Marianne,2015) We studied how worms react to different concentrations of rinse and non rinse makeup removers. This topic relates back to each member of our group because we are eager to discover if a rinse makeup remover is as safe as non rinse makeup remover. By conducting two separate experiments on the worms, we were able to get more accurate results. Our first experiment was titled the "Circle Test." Our data from this experiment is how the worms react to different concentrations of makeup remover. Our other experiment was titled the "Burrowing Test." In this test, we found how deep the worms will burrow into the soil. Our hypothesis was if we tested rinse and non rinse makeup removers, the rinse makeup remover would cause the worms to have a greater reaction because it needs to be rinsed away after use, meaning it could be harmful to worms when exposed to high concentrations of the solution. Our null hypothesis was that liquid makeup removers would create the same reaction as water (our control) because it is a water based substance.

Methods

We set up our circle test by using the different concentrations of diluted makeup remover to create a circle big enough for the worms to fit inside of. Then we recorded the reactions of the worms in a table. We also set the burrowing test up and put the diluted makeup remover on one side of the ant farm and dechlorinated water (our control) on the other side. Then measured how far the worms burrowed into the soil after a given amount of time, and recorded the depth. And then we put makeup on some people and used the diluted makeup removers to test which concentration took the least amount of wipes. We measured the reactions of the worms by categorizing the levels of reactions into 3 groups, strong, mild, and no reaction. We also measured the depth the worms burrowed into the soil with the treatment in it and compared it to the depth of which the worms burrowed into the soil with the control (water). And we measured our last dependent variable by counting the number of wipes it took to get makeup off of a person's face with the different concentrations of each makeup remover. We used a t-test to find whether our results in our experiments were significant or not. The p-values in the t-test were significant if the value was less than 0.05.

Results

For our experiment, we used worms as a model to see how they would react towards different concentrations of rinse and non rinse makeup removers. We used a sample size of 12 worms for each trial. The different trials included 100%, 50%, 25%, and 10% concentrations of both rinse and non rinse liquid makeup removers. The independent variables included all of the makeup removers and their concentrations. The dependent variables were the reactions of the worms and how far the worms burrowed. The role of the control (water) in our experiment was to compare the treated reaction results to the control reaction results.

For 100% and 50% concentrations of the non rinse makeup remover while burrowing (Figures 1 and 2), we found that both the treated and control results are the same. We noticed that the error bars overlapped on the graph. But for 25% non rinse makeup remover while burrowing (Figure 3), the results are not the same. We noticed this by examining the error bars and seeing that they do not overlap.

The other experiment we did was test the worms reactions towards different concentration of makeup remover by doing the circle test. While testing the concentrations of the non rinse makeup remover while doing the circle test, we found that at 100% (Figure 4) most of the results were strong reactions. For 50%, 25%, and 10% (Figure 4), most to all of the reactions were mild. While testing the concentrations of the rinse makeup remover while doing the circle test, we found that at 100%, 50%, and 25% (Figure 5); most to all reactions were strong.

At 10% concentration of the rinse makeup remover (Figure 5), our graph concluded that all of the reactions of the worms were mild.

Also, for 100%, 50%, and 25% concentrations of the rinse makeup remover while burrowing (Figures 6, 7, and 8), we concluded that both the treated and control results are the same. As stated before, we examined the graphs, finding that the error bars overlapped; showing that the results are the same.

Another way we used to show that our treated and control results were the same or different was analyzed our p-values. For 100% and 50% of non rinse makeup remover while burrowing, and 100%, 50%, and 25% of rinse makeup remover while burrowing; our t test values were over 0.05. Since the value was over 0.05, it showed that the treated and control results were the same. Whereas, 25% concentration of non rinse makeup remover while burrowing had a p-value less than 0.05. Since the p-value was less than 0.05 for 25% concentration of non rinse makeup remover, the treated and control results were different.

Figure 1: How Earthworms React to 100% Non-Rinse Makeup Remover While Burrowing

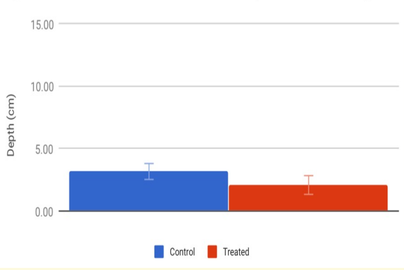


Figure 2: How Earthworms React to 50% Non-Rinse Makeup Remover While Burrowing

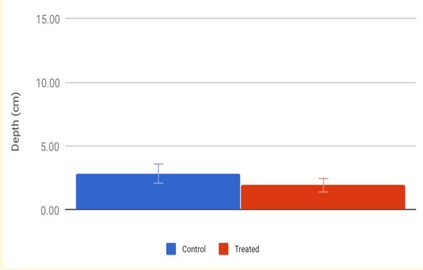


Figure 3: How Earthworms React to 25% Non-Rinse Makeup Remover While Burrowing

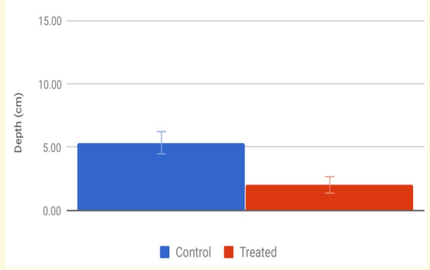


Figure 4: How Worms React to Circle Testing using Different Concentrations of Non-Rinse Make Up Remover

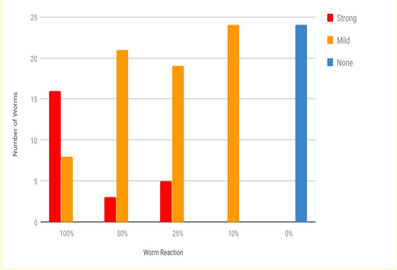


Figure 5: How Worms React To Circle Testing using Different Concentrations Of Rinse Makeup Remover

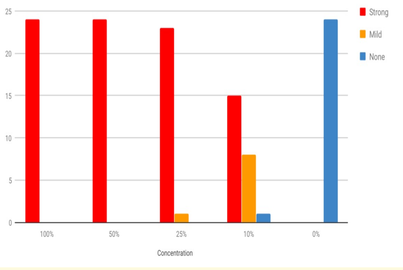


Figure 6: How Earthworms React to 100% Rinse Makeup Remover While Burrowing

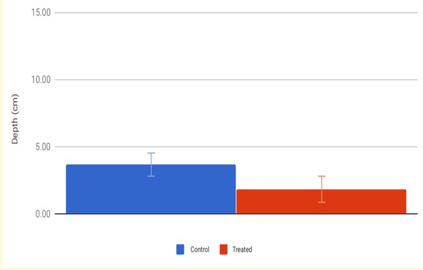


Figure 7:How Earthworms React to 50% of Rinse Makeup Remover While Burrowing

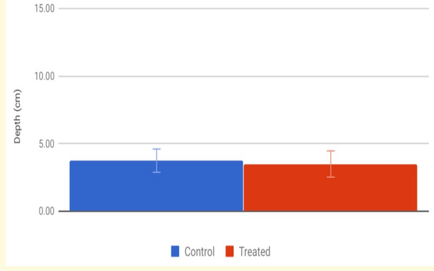
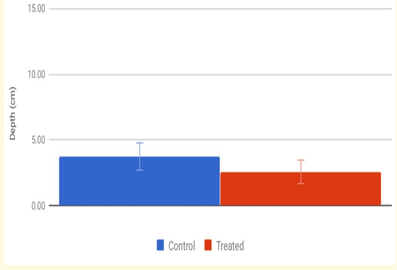


Figure 8: How Earthworms React to 25% Rinse Make Up Remover While Burrowing



Discussion

Based on our experiments and data we were able to conclude that rinse and non rinse makeup removers were equally safe to use to take off makeup. We know this because our p-values that we calculated showed that the data we collected between the rinse and non rinse makeup removers were the same because all the p-values were above 0.05. Our hypothesis was right in saying that the worms would have a stronger reaction with rinse makeup remover. However the worms did not have a strong reaction to the rinse makeup remover during the burrowing test but, they did in the circle test. This may have occurred because the makeup remover could have been absorbed in the soil during the burrowing test so the worms were not directly touching the makeup remover like they were during the circle test. Our data showed that the worms generally reacted the same for both makeup removers. Our null hypothesis was also incorrect because it stated that the worms will have no reaction difference between both makeup removers and dechlorinated water. In our experiment the worms did not have a reaction to water but they did have a reaction to the makeup removers. Time was a limitation for our group because if we had more time we would of been able to conduct more trials specifically on the "Burrowing Test" which may have given us more accurate result to interpret in our analysis. Overall our data helped us to conclude that rinse and non rinse makeup removers are safe to use to take off makeup. However, since the worms did have a stronger reaction to the rinse makeup remover in the circle test this means that when using rinse makeup remover you have to rinse it off to ensure that your sensitive skin tissue will not have a strong reaction. (Choi, Maureen,2016)

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