

How Do Disinfecting Wipes Affect an Earthworm's (*Lumbricus terrestris*) Burrowing Behavior?

Andrew Miler, Peter Shears, Jack Haessly

Christ King School

Wauwatosa, WI

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Abstract

Disinfecting wipes are an effective and easy solution to kill germs from different types of surfaces that people use every day. While wipes mostly contain water they also contain cleaning agents such as detergents and antimicrobials as well as chemicals such as alkyl dimethyl benzyl ammonium chloride. These wipes can affect the skin of a human by causing dried out, red, itchy, or peeling skin. To determine the effects of disinfecting wipes on worms, we put six worms on disinfecting wipes. After, we placed the worms in a dirt cup and timed how long it took for the worms to burrow and repeated the experiment with water-soaked paper towels. On average, the disinfecting wipes caused the worms to burrow 26 seconds slower than water. We should care about this experiment because it demonstrates how the chemicals dramatically affect worms. The harsh chemicals in disinfecting wipes are designed to be used with our bare hands, yet the worms are negatively affected by the liquid and become disoriented and greatly injured.

Introduction

We are testing the effect of disinfecting wipe liquid on earthworm burrowing behavior. Humans use disinfecting wipes every day in many ways. One way humans use disinfecting wipes is as a way to wipe down and kill bacteria/germs on certain surfaces, such as tables, counters, etc. Another way humans use these wipes is as an alternative to washing hands with soap and water. Because humans use disinfecting wipes every day, it is important to know how these wipes can affect human skin.

Disinfecting wipes are an effective and easy solution to kill germs from different types of surfaces without causing harm to the skin. While wipes mostly contain water they also contain cleaning agents such as detergents and antimicrobials. Alkyl dimethylbenzyl ammonium chloride and alkyl dimethylethylbenzyl ammonium chloride are examples of some of the dangerous sounding chemicals that are in disinfecting wipes. In high concentrations, these cationic liquids can cause chemical burns, but household disinfectants contain 0.01-0.1% of this chemical. (Soto, 2019) The chemicals in disinfecting wipes are mild because we typically use these wipes with our bare hands. Wipes have only a short history because they only became popular in the 2000's. Mr. Clean Up and Clorox wipes were introduced to the public on July 4th of 2000. Before the 2000's wipes were for only extreme situations, but now wipes are used to clean anything from a toilet to a stove. (*Cleaning Wipes*, 2019)

Disinfecting wipes could affect the skin of a human because the chemicals in the wipe could dry out skin. We are testing worms instead of humans because they have similar nervous systems and tissues. The earthworm shares many similarities to the human body when it digests food. The worm eats food through its mouth and goes through the pharynx and esophagus. Earthworms also have a cardiovascular system like humans do, they have blood vessels and heart like structures which pumps blood and nutrients around their body. Both worms and humans have a central nervous system which controls most of our bodies functions (Picture Of Worms Body). Instead of breathing with lungs earthworms breathe through their skin to get oxygen. Worms don't have brains like us, instead they use something similar to a spinal cord which controls the worm. Worms also don't have stomachs, they have a crop which connects to the gizzard.

The disinfecting wipe liquid gets into the soil through human pollution. After using a wipe, humans throw it into the trash, and gets deposited into a landfill, where the wipe decomposes and the chemicals soak into the ground. We should care about the soil's health for many reasons. One main reason to keep soil healthy is so we can continue to grow plants. Without many plants all living organisms will die (RecycleNation, 2015). It would be harmful to the environment if this chemical could get into the soil because it would kill all plants and all organisms in the soil.

Our group hypothesized that the wipes would make the worm burrow slower. The reason we thought the wipes would make the worm burrow slower is the wipes' chemicals. The chemicals would make it slower because the chemicals would hurt the worm. It would put the worm in shock, causing it to get a slower time.

Materials and Methods

First, we gathered our materials. We used worms, Great Value Disinfecting Wipes, paper towels, water, stopwatch, a beaker, and a cup with dirt. Next, we squeezed disinfecting wipe liquid into a beaker and soaked a paper towel in the disinfecting liquid and a paper towel in water. Then, we filled a cup with dirt. After, we placed a worm on the paper towel soaked with water for a minute, placed it in the cup with dirt, and started timing. When the worm burrowed its head, we stopped the timer. We repeated with two more trials and then repeated with five more worms. After, we repeated the same process but with the disinfecting liquid soaked paper towel. Then, we analyzed the data, created a graph, and formed a conclusion. Finally, we used the unpaired T-Test to determine if our data was significant and not based on outside factors.

Results

Trial 1			Trial 2			Trial 3		
Worm	Water	Disinfecting Wipe	Worm	Water	Disinfecting Wipe	Worm	Water	Disinfecting Wipe
1	13	25	1	8	20	1	11	40
2	10	55	2	18	10	2	21	37
3	6	16	3	5	26	3	14	24
4	8	24	4	10	43	4	9	45
5	3	60	5	6	34	5	8	34
6	10	40	6	5	55	6	13	65
Average	8.3333333333	36.6666666667	Average	8.6666666667	31.3333333333	Average	12.6666666667	40.8333333333

Data Table 2: Trials Averaged Out

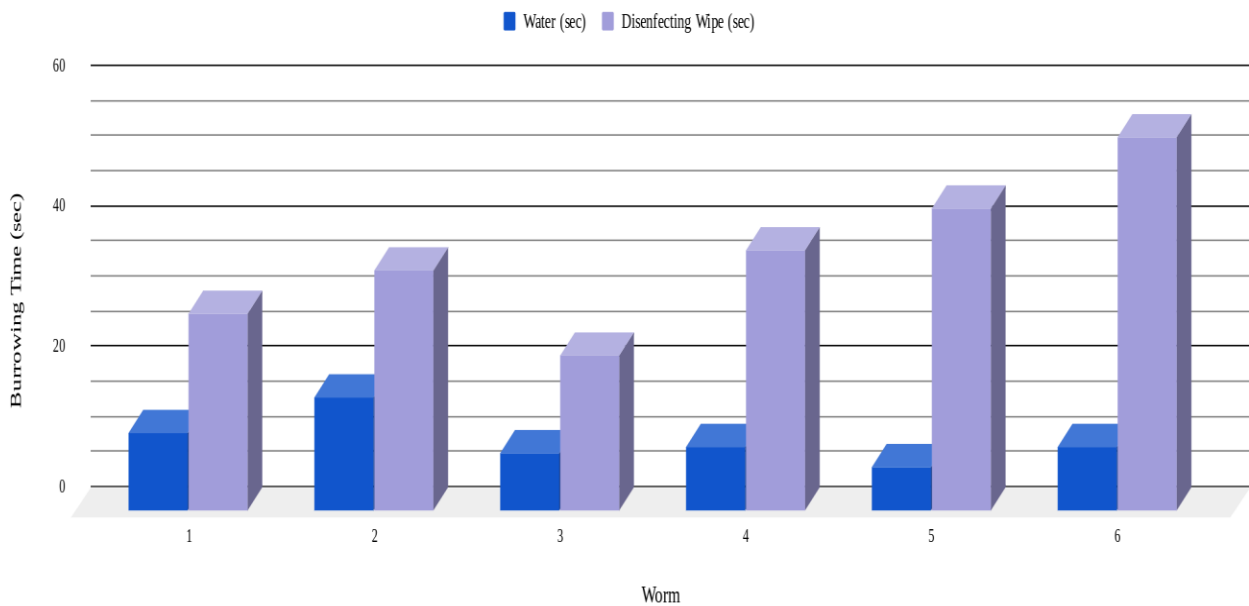
Worm	Water (sec)	Disinfecting Wipe (sec)
1	11	28
2	16	34
3	8	22
4	9	37
5	6	43
6	9	53
Average	9.833333333	36.16666667

In our experiment, we tested six worms with three trials each and averaged out the three trials. On average, the disinfecting wipes caused the worms to burrow 26 seconds slower than water. Our graph shows the average burrowing times of each of the worms and compares water vs. disinfecting wipes.

The independent variable in this experiment is the type of liquid our worm was placed in before the testing. The dependent variable was how long it took for the worm to bury its head under the soil. Variables we controlled were the brand of wipe we used, the amount of soil in the cup, the size of the water-soaked paper towel, and the time of day. The independent variable affected the burrowing time significantly between the two liquids.

In our T Test, we got 0.001580774806, meaning our results were indeed significant.

The Effect of Disinfecting Wipe Liquid on Earthworm Burrowing Times



Conclusion

The experiment had significant results. On average, the disinfecting wipes caused the worms to burrow over 26 seconds slower than water.

Our data does support our hypothesis that the wipes would make the worm burrow slower. The disinfecting wipe did indeed cause worms to burrow slower in dirt than water.

There are many trends in this experiment. One trend was the seconds in the water test. The worms almost all seemed to go into the dirt in late ones or earlier teens. The only one that was not in this trend was test 2 at 16 seconds. There was one other trend in this experiment and that was when our group tested the disinfecting wipes. The trend was that all worms took a longer time in digging into the dirt. They were also always confused during the disinfecting wipe testing.

One limitation in the experiment was how we could not have a big enough dirt tub. That was a limitation in our experiment because when we put the worm in the dirt it would sometimes run into the sides of the tub, most often when the worm was soaked in the wipe liquid. Another limitation was that we could not put the worm in the same place in the dirt every time.

We should care about this experiment because it demonstrates how the chemicals dramatically affect the worms burrowing time. The harsh chemicals in disinfecting wipes are designed to be used with our bare hands, yet the worms are negatively affected by the liquid and become disoriented. These experiments prove that disinfecting wipes can be dangerous and are only needed for extreme situations, and not for everyday uses.

A future research topic we could do is seeing how hand sanitizer affects worm burrowing time because it is another chemical solution that humans handle very often.

Works Cited

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