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Examining the Effects of Corrosive Household Chemicals on Bone and Tissue

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ABSTRACT

In popular media, criminals attempt to dispose of their victims by using various chemicals to dissolve the corpses. This research investigates the effects of household chemicals on the degradation of bone. Vertebrae from a domestic pig (*Sus scrofa domesticus*) will be immersed into five corrosive agents: drain-cleaner, lye, bleach, oven-cleaner, and cola. Tap water will serve as the control. Color, size, and weight of bones will be documented over time. I expect drain-cleaner, lye, and oven-cleaner to thoroughly degrade the bone, cola to cause mild degradation, and bleach and tap water to produce the least degradation.

INTRODUCTION

The ways in which perpetrators attempt to dispose of their victims range from carelessly leaving the corpse in a shallow grave to total annihilation of the body through fire or even chemical means. Mexican-American drug cartels have been known to dispose of their victim's bodies by placing the corpses in containers and adding strong chemicals such as acids or lye to attempt to completely dissolve the bodies (Palmer, 2009). Even in popular media, such as books, movies, and television, disposal of bodies via the use of strong chemicals is a prevalent method. For example, in the second episode of the show *Breaking Bad,* the main characters attempt to dispose of a body using a bathtub and hydrofluoric acid. Unfortunately for the characters, the acid is so strong, it destroys the corpse, as well as the bathtub, the floor supporting the tub, and the floor below that (Helmenstine, 2008).

With all this media supporting the use of chemicals as a means of body disposal, I wondered just how accurate the information was. I decided to research a variety of corrosive, easily accessible household chemicals and test how well each one would destroy bone and soft tissue in a short period of time (24 hours). I chose to work with carbonated soda, bleach, sodium hydroxide, potassium hydroxide, and sulfuric acid. I briefly considered testing hydrofluoric acid, but since even splashing a small amount onto your skin can become fatal, I decided to forgo that particular test. I hypothesize that the chemicals will offer a variety of results. The soda and bleach will likely have very little effect on soft tissue and bone degradation. The sodium hydroxide and potassium hydroxide will likely cause slight loss of mass to the soft tissue and bone. I believe that the sulfuric acid will cause the most significant degradation of all the chemicals.

Figure 1: Chemicals and buckets

Figure 2: Safety equipment, measuring tools & specimens

MATERIALS

Figure 1:

*(6) white gallon buckets: cleaned, dried, and labeled
*Tap water (control)
*Enforcer Crystal Heat® drain cleaner (Sodium Hydroxide)
*Clean Shot® drain opener (Sulfuric Acid)
*Coca Cola® carbonated soda
*Oven Brite® oven cleaner (Potassium Hydroxide)
*Bleach

Figure 2:

*(6) spinal sections of a pig (*Sus scrofa domesticus*): cut into fairly equal sizes (approximately 5-6”x 3-4”x 1-2”), flesh was left intact
*Food scale
*Plastic tongs
*Safety goggles
*Safety gloves
*Measuring tape

METHODS

In a review of the literature, studies indicated that hydrochloric acid is very effective in destroying soft tissue and bone. Sulfuric acid was considered the second most corrosive chemical (Hartnett, Fulginiti, and Di Modica, 2011). Sodium hydroxide and potassium hydroxide are often employed by assassins as means of body disposal. One criminal, Adolph Luetgert, disposed of his wife's body by placing it into a boiling vat of lye in 1897, and then burned what was left (Palmer, 2009).

Based on my findings and the availability to readily purchase the chemicals, I decided to conduct my experiment using the following: Carbonated soda, Bleach, Potassium Hydroxide, Sodium Hydroxide, Sulfuric Acid and Water (as a control).

I then conducted research on the MSDS (Material Safety Data Sheets) for each chemical to make sure I was taking the proper safety precautions (3E Company, 2012). I gathered supplies and materials, some of which I had at home and some I purchased.

I cut the pig vertebrae into pieces, trying to make them as similar in size as possible, leaving the flesh intact. Each specimen measured between 5-6” in length, 2.5-4” in width, and 1-2” inches in height.

I washed, rinsed, dried, and labeled the buckets.

I then measured each piece of vertebrae and recorded the height, length, width, and weight of each specimen. I also took pictures and noted visual appearance. I placed each specimen into a labeled bucket and, making a note of the time, I added each corresponding chemical and placed the buckets in separate safe locations outdoors. I photographed the specimens in the chemicals and covered the buckets with poly sheets.

After 12 hours I photographed, visually inspected, and recorded the results. I then placed the specimens back into their chemical solutions and returned them to their holding areas. After another 12 hours I photographed, visually inspected, and recorded the results. Thus, observations were made over a period of 24 hours.

RESULTS

Specimen 1: H2O (Control)

Figure 3: Beginning specimen
Initial measurements: 5.5”x3”x1.25”
Weight: 6 oz

Figure 4: H2O 12:22 pm

Figure 5: 1st observation 12:57 am
Measurements: 5.5”x3”x1”
Weight: 7 oz

Figure 6: H2O after 24 hours

Figure 7: Ending specimen 12:38 pm
Measurements: 5.5”x3”x1”
Weight: 7 oz

Figure 8: H2O weight results

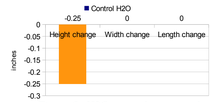

Figure 9: H2O mass change results

Specimen 2: Carbonated Soda

Figure 10: Beginning specimen
Initial measurements: 6.25”x3”x1.25”
Weight: 6 oz

Figure 11: Soda 12:25 pm

Figure 12: 1st observation 1:03 am
Measurements: 6”x3”x1.5”
Weight: 7 oz

Figure 13: Soda after 24 hours

Figure 14: Ending specimen 12:45 pm
Measurements: 6”x3”x1.5”
Weight: 7 oz

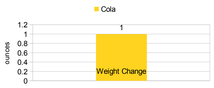

Figure 15: Soda weight results

Figure 16: Soda mass change results

Specimen 3: Bleach

Figure 17: Beginning specimen
Initial measurements: 6.25”x4”x1.5”
Weight: 8 oz

Figure 18: Bleach 12:43 pm

Figure 19: 1st observation 1:09 am
Measurements: 5.5”x4”x1.5”
Weight: 7.5 oz

Figure 20: Bleach after 24 hours

Figure 21: Ending specimen 12:51 pm
Measurements: 5.5”x4”x1.5”
Weight: 8 oz

Figure 22: Bleach weight change results

Figure 23: Bleach mass change results

Specimen 4: Potassium Hydroxide

Figure 24: Beginning specimen
Initial measurements: 5.5”x4”x2”
Weight: 8 oz

Figure 25:Potassium hydroxide 12:49 pm

Figure 26: 1st observation 1:12 am
Measurements: 4.5”x4”x2.5”
Weight: 9 oz

Figure 27: Potassium hydroxide after 24 hours

Figure 28: Ending specimen 12:58 pm
Measurements: 4.5”x4”x2”
Weight: 10 oz

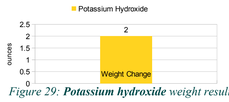

*Figure 29: **Potassium hydroxide** weight results*

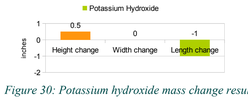

Figure 30: Potassium hydroxide mass change results

Specimen 5: Sodium Hydroxide

Figure 31: Beginning specimen
Initial measurements: 6”x2.5”x1.5”
Weight: 8 oz

Figure 32: Sodium hydroxide 12:57 pm

Figure 33: 1st observation 1:18 am
Measurements: 6”x2.5”x1.5”
Weight: 7 oz

Figure 34: Sodium hydroxide after 24 hours

Figure 35: Ending specimen 1:13 pm
Measurements:6”x2.5”x1.5”
Weight: 7 oz

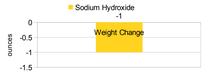

Figure 36 : Sodium hydroxide weight results

Figure 37: Sodium hydroxide mass change results

Specimen 6: Sulfuric Acid

Figure 38: Beginning specimen
Initial measurements: 5.25”x3.5”x1”
Weight: 7 oz

Figure 39: Sulfuric acid 1:03 pm

Figure 40: 1st observation 1:24 am
Measurements: 4”x3.25”x1”
Weight: 5 oz

Figure 41: Sulfuric acid after 24 hours

Figure 42: Ending specimen 1:21 pm
Measurements: 4”x3”x1”
Weight: 4 oz

Figure 43: Sulfuric acid weight change results

Figure 44: Sulfuric acid mass change results

CONCLUSIONS

Figure 45: Width change results: all specimens

Figure 46: Length change results: all specimens

Figure 47: Height change results: all specimens

Figure 48: Weight change results: all specimens

The overall results of this experiment verified my hypothesis. Specimen 1 in the H2O (the control) *(figures 3-9)* showed very little degradation, just some minor water weight gain. Specimen 2 in the soda *(figures 10-16)* and specimen 3 in bleach *(figures 17-23)* showed some discoloration, but no appreciable degradation of tissue or bone. Specimen 4 in potassium hydroxide *(figures 24-30)* increased in mass and showed a slight degradation of the tissue. Specimen 5 in sodium hydroxide *(figures 31-37)* showed a slight decrease in weight and had more obvious tissue degradation, but very little effect on the bones. Specimen 6 in sulfuric acid *(figures 38-44)* showed the most appreciable decrease in mass and weight and close to half of the specimen was visibly degraded. Given another 48 hours, I believe the entire specimen would have been completely eroded.

The results indicate that some chemicals may be used effectively by criminals to dispose of a body. The sulfuric acid is particularly potent. Because of its availability to the public, it is possible that criminals will continue to dispose of their victims with this easily attainable chemical. Law enforcement and legislative groups should consider requiring identification in order to purchase this dangerous substance to help track these dangerous criminals.

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