A111 The Effects of Household Corrosive Chemicals on Pig Bones and Human Tissue

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After attending this presentation, attendees will better understand: (1) how household corrosive chemicals cause decomposition on pig bones and human tissue; and, (2) if altered bones decompose faster than unaltered bones.

This presentation will impact the forensic science community by providing results from a two-part experiment that both attempts to validate previous research as well as adds a new element that has not previously been studied. This presentation will add to our databank of knowledge about the effects corrosive chemicals have on the body.

One of the most important goals in forensic anthropology is to provide information leading to the positive identification of a victim. Positive identification can be challenging because attempts to hide the identity of a victim are frequent. One way to hide a person's identity is the application of household chemicals to a body. These easily obtainable substances may be used to disfigure a body by dissolving the soft tissue and causing it to appear different than it did previously. In recent studies, the effects of corrosive chemicals have been tested on human teeth, bones, hair, and nails. In an experiment by Cope and Dupras, the effects of household corrosive chemicals on human dentition were examined.[1] For the present study, four corrosive chemicals were used: hydrochloric acid, sulfuric acid, phosphoric acid, and sodium hydroxide. The results of this experiment suggest that hydrochloric acid was the most destructive. Similar results are seen in the study by Hartnett et al.[2] The present study examined the effects of household corrosive chemicals on human teeth, hair, nails, and soft tissue. The chemicals included were hydrochloric acid, sulfuric acid, household lye, bleach, and the soft drink Coca-Cola™. The hydrochloric acid was the most destructive agent, fully consuming all tissue in less than 24 hours.

The objective of this research was to study the effects of everyday, household corrosive chemicals on pig bones, human hair, and human nails. The common chemical names and their main ingredients (in parentheses) used in all trials were: Acidic Toilet Bowl Cleaner® (hydrochloric acid), Lime-Away® (sulfamic acid), Septic Tank Cleaner® (hydrogen peroxide), Heavy Duty Stripper and Cleaner® (sodium hydroxide and diethylene glycol monobutyl ether), and Pequa Drain Cleaner® (potassium hydroxide). Water was used as the control. In order to meet the objective, this study consisted of two experiments. The first included recording the effects of the chemicals on the bones, hair, and nails for an extended period of time. The second included recording the effects of the chemicals on altered pig bones. Alterations included burnt, frozen, and chopped bone segments. After an initial pilot study, it was hypothesized that the altered bones would dissolve and change faster than the unaltered bones.

The most destructive chemical tested was the Pequa Drain Cleaner®, which contains potassium hydroxide. It caused the fastest dissolution rate on the burnt bone segment in Experiment #2, causing the bone to become bone residue in only 24 hours. Changes were also seen in both experiments by other chemicals such as the Acidic Toilet Bowl Cleaner®, where the most significant change was also seen in the burnt bone in Experiment #2. A rapid rate of mass loss was recorded from 6.8 grams to 5.9 grams in the first 24 hours. The altered bones dissolved or changed appearance at a faster rate than the unaltered bones, which supports the hypothesis.

Research on the effects of corrosive chemicals can help forensic anthropologists identify cases involving corrosive chemicals and can provide a foundation to direct future research. This research addressed the lack of data on the effects of chemicals on frozen, burned, or cut-up bones, and validated the research by Hartnett et al.[2] It can also be concluded that certain alterations to the bone play a significant role in dissolution rate and overall physical damage to the bone.

Reference(s):

1. Cope D., Dupras T. The dffects of household corrosive chemicals. *J Forensic Sci* 2009;54(6):1238-1246.
2. Hartnett K., Fulginiti L., Di Modica F. The effects of corrosive substances on human bone, teeth, hair, nails, and soft tissue. *J Forensic Sci* 2011;56(4):954-959.

Forensic Anthropology, Corrosive Chemicals, Decomposition

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