H90 Sealed For Your Protection II: The Effects of Corrosive Substances on Human Bone and Tissue

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The goal of this presentation is to understand the effects of various common corrosive substances on human bone, teeth, hair, and nails and identify the particular agent used in a recent homicide.

This presentation will impact the forensic community by demonstrating how certain common corrosive agents can affect bone. The forensic community can use the data provided to help identify if and what type of corrosive agents may have been used in an attempt to alter human remains.

In 2006, the remains of a woman and her two children were recovered from 55 gallon drums buried in a desert area west of Phoenix, Arizona. Based on the condition of the bodies, the use of an unknown corrosive agent to obfuscate identity was suspected. Multiple white plastic safety seals commonly used to secure containers of corrosive substances were found in conjunction with each of the three drums. The two children were almost completely consumed by the agent and the adult female had extensive marring of her soft tissue and skeleton consistent with some type of corrosive substance. Evidence of extensive leaching into the soil suggested a breach of the drum containing the adult female. The large number of safety seals suggested the use of a chemical agent that is easily acquirable. This study tests a variety of corrosive agents and their effect on human bone and tissue in an attempt to determine the possible agent used.

Six commonly available corrosive substances (muriatic acid, sulphuric acid, household lye, bleach, a 100% natural active bacteria and enzyme product, and a cola soft drink) and a control (tap water) were tested in undiluted form. Two inch round glass jars were filled with approximately one ounce of liquid or in the case of the dry chemicals, with a mixture of the powder and approximately one ounce of water.

A human male femur was purchased from a medical research company and was sectioned along the shaft. Soft tissue was removed from the femur. Cut hair and fingernail clippings were obtained from a salon and pulled teeth were donated from a forensic odontologist. Each of these specimens (except the fingernails) was weighed using a digital scale accurate to 1/10th of a gram. The specimens were described and photographed before being placed into the two inch round jars with the various liquids. Observations were made at specified intervals depending on the agent under consideration. For example, muriatic acid, which is also known as hydrochloric acid, consumed all human tissue types very rapidly so observations were made at half hour intervals until the specimens were no longer present. For those specimens that were not completely consumed, a designation of “no longer recognizable” was assigned. Initially, two runs of muriatic acid were completed to ensure that there was consistency in the observed changes. The results of these two tests were indistinguishable.

The results of the testing varied from consumption of human hair by household lye in three minutes to no observed change in all specimens placed into the natural organism product or water. Muriatic acid consumed all samples (except hair) in 24 hours or less. The rate of loss was steady over the course of the experiment. Sulphuric acid consumed the bone and the tissue over a period of several days while making the bone and tooth soft and viscous. Bleach consumed the hair in 20 minutes, the fingernails in several days and merely whitened the bone and tooth. The cola darkened the bone, nails and tooth but had no measurable effect on any of the specimens. The fingernails turned fluorescent yellow in the lye but the bone and tooth were unaffected.

While some of the substances were effective on individual specimens, the muriatic acid was the most effective across all of the tested material. The result of this experiment suggests that muriatic acid is the most likely agent used in the case described above. Future experiments will include more extensive testing of complete body parts as well as testing human blood and skin with the agents used in this study.

Corrosive Substances, Human Bone, Human Tissue

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