H30 The Effects of Household Corrosive Substances on Human Bone and Teeth

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After attending this presentation, attendees will gain an understanding of how various household corrosive products, chiefly those products used in masking the identity of a victim, effect human bone, and teeth. Application of this information can assist in the analysis of human remains and possibly provide an identification of the chemical.

At present, the forensic literature does not provide the needed information to determine how these household chemicals can affect the bone and teeth of the victim and how the identification process is hindered by the use of such chemicals. In an effort to provide such information, this presentation will impact the forensic community and/or humanity by assisting investigators in determining the affects of common household corrosive agents on bone and teeth.

Often times a murderer will attempt to destroy the body of their victim with the prospect of deterring the investigative process of determining the identity of the victim's remains. Forensic literature does address body disposal with the purpose of annihilating a victim's identification such as incineration or dismemberment of the limbs and head, but surprisingly there is a gap in the literature concerning the chemical effects that household products may produce on human bone and teeth. These highly corrosive household products are easily attainable by the general public and include such products like drain cleaners, toilet bowl cleaners, and muriatic (hydrochloric) acid.

A total of eight chemicals were utilized for this experiment. Of these chemicals, seven products were purchased at general stores and one chemical was prepared by dissolving sodium hydroxide pellets. Each product is categorized according to the pertinent amount of corrosive chemical found within the product. The corrosive acid/base categories include hydrochloric acid, sulfuric acid, phosphoric acid, and sodium hydroxide. Two products from each acid/base category were used to represent a higher and lower concentration of the corrosive acid/base found within the products.

Two human teeth, an incisor and molar, were allocated for experimentation in each chemical. To simulate the position of the teeth in the mandible/maxilla, a hole was drilled through the root of each tooth and a wire was fed through this hole. A wooden dowel was used to suspend the tooth, which allowed concentration of the chemical reaction to occur only on the occlusal surface of the molars and the incisal surface of the incisors. The teeth were suspended over a beaker holding 40ml of a chemical. Each sample was emerged in the chemical for 24 hours with documentation of changes after 1, 2, 3, 4, 5, 6, 12, and 24 hours.

For experimentation on human bone, a fresh human humerus was cut into eight segments, originating from the shaft of the bone. Only one segment was used for each chemical. The bone samples were submerged in a beaker holding 200ml of a chemical for a total duration of 24 hours. Documentation of changes was recorded after 1, 2, 3, 4, 5, 6, 12, and 24 hours.

Documentation of the chemical effects on the teeth and bone comprised of gathering quantitative and qualitative data. A fifteen minute interval was allotted for each measurement period. A spreading caliper was used to take measurements of the crown width and length of the tooth as well as the length and diameter of the bone segments. Weight measurements were taken with a digital scale. With the use of a digital camera microscope, pictures were shot of the teeth and bone during every measurement interval period.

The results of this experiment showed destruction of the teeth and bone with certain chemicals like hydrochloric acid, while other chemicals demonstrated an insignificant effect. In certain cases, within one hour the enamel portion of the teeth was completely obliterated while the bone segments demonstrated almost complete loss of tissue and afterwards a decrease in inorganic matter. Continuing changes of both the teeth and bone was witnessed in their basic morphology and quantitative aspects. The longer undisturbed exposure the samples had with the chemical, the greater the destructive effects.

Corrosive Agents, Human Bone, Human Teeth

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