A133 The Effects of Hydrochloric Acid on Fleshed Porcine Ribs

Amaretta J. Azevedo, MA, University of Califonria, Riverside, 900 University Avenue, Anthropology Dept, Riverside, CA 92521*

The goal of this study was to examine the effects of two concentrations of hydrochloric acid (14.50% and 31.45%) on fleshed porcine ribs and determine if environmental factors such as access to oxygen, agitation, availability of fresh acid, and ambient temperature affect the rate of dissolution.

This presentation will impact the forensic science community by providing a discussion of the importance of understanding the effects of hydrochloric acid and the factors that impact the dissolution of human remains to anticipate how the presence of corrosive chemicals will impact an investigation and to recognize the skeletal changes associated with exposure to hydrochloric acid as a taphonomic agent versus other potential postmortem agents.

Over the years, anthropologists and other forensic experts have been asked to assist with cases in which the perpetrator(s) used corrosive chemicals in an attempt to dissolve a body and other evidence of a crime. Previous studies indicate there are a number of corrosive chemicals capable of dissolving organic tissues, but hydrochloric acid is by far one of the most detrimental chemicals capable of dissolving organic tissue.[1-3] Although it is not a frequently used method, cases in which remains have either been severely damaged or completely destroyed by corrosive chemicals in an attempt to prevent the identification of the victim present unusual challenges for forensic experts.[1,4]

A total of 104 rib samples two to three inches long were placed in 100mL of acid for six days with controls in air and water. Eight samples were placed into an incubator that remained at an average temperature of 85°F throughout the experiment. Ambient and liquid temperatures were monitored and recorded in addition to observations at set intervals throughout the experiment, and the percentage of mass lost was calculated after six days.

The results from this study reveal that hydrochloric acid with a concentration of 31.45% was capable of dissolving macerated remains in less than 24 hours; however, in the case of the lower concentration of 14.50% hydrochloric acid, the acid was not capable of fully dissolving the macerated remains in less than 24 hours. When the remains were fleshed, this delayed bone dissolution by anywhere from 12 (31.45% HCl) to 24 (14.50% HCl) hours. Remains in a sealed container dissolved at a slower rate than those in an open container, indicating that access to oxygen affects the rate of dissolution. Agitating the sample quickened dissolution, and refilling the container with fresh acid delayed dissolution. In addition, it appears that temperature has the potential to impact the degree of dissolution, since samples that were placed in a heated environment were more decimated than those left at room temperature.

One thing is certain: the process of successfully dissolving a body in acid is a very complicated matter. It is important for anthropologists and other forensic experts to understand the effects of hydrochloric acid and the factors that impact the dissolution of human remains to anticipate how the presence of corrosive chemicals will impact their investigations. The effects of specific corrosive chemicals on bone need to be standardized using larger samples over longer durations in order to understand the skeletal changes associated with exposure to hydrochloric acid as a taphonomic agent versus other potential postmortem agents.[3] In addition, studying the differences between agitated and unagitated samples and the differences between refilled and unrefilled samples is important for reconstructing postmortem events and may help investigators understand the amount of effort a perpetrator(s) invested in concealing their crime. Future studies should involve a more thorough examination of the effects of temperature and involve the use of larger, completely fleshed body segments, if not complete pigs.

Reference(s):

1. Hartnett, Kristen M.; Laura C. Fulginiti; and Frank di Modica. 2011. The Effects of Corrosive Substances on Human Bone, Teeth, Hair, Nails, and Soft Tissue. *Journal of Forensic Sciences*. doi:10.1111/j.1556-4029.2011.01752.x.
2. Mazza, Alessandra; Giuseppe Merlati; Caterina Savio; Giovanni Fassina; Paolo Menghini; and Paolo Danesino. 2005. Observations on Dental Structures When Placed in Contact with Acids: Experimental Studies to Aid Identification Processes. *Journal of Forensic Sciences.* 50 (2).
3. Ubelaker, Douglas H; and Norman D Sperber. 1988. Alterations in Human Bones and Teeth as a Result of Restricted Sun Exposure and Contact with Corrosive Agents. *Journal of Forensic Sciences, JFSCA.* 33 (2): 540–48.
4. Nunno, Nunzio Di; Fulvio Costantinides; Michele Vacca; and Cosimo Di Nunno. 2006. Dismemberment: A Review of the Literature and Description of 3 Cases. *Am J Forensic Med Pathol.* 27: 307–12.

Taphonomy, Hydrochloric Acid, Muriatic Acid

*Presenting Author