



Physical Anthropology Section - 2012

H76 High Soil Acidity Associated With Near Complete Mineral Dissolution of Recently Buried Human Remains

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After attending this presentation, attendees will better understand how highly acidic soil can almost completely dissolve human bones within a short postmortem interval (8-10 years).

This presentation will impact the forensic science community by providing a well-documented postmortem interval for extreme microbiotic and chemical environments where the acidity is high. In addition, this research may help preliminary review and search teams in Colombia narrow down the list of graves to be excavated when similar conditions are present given the possibility of complete bone dissolution.

This research explores the potential causes of complete diagenetic bone mineral dissolution in graves of unidentified individuals buried between 2000 and 2002 in Colombia. The bodies of unidentified persons were documented and buried by an undertaker in a cemetery at the request and authorization from the local government agency of the municipality of La Macarena in the department of Meta, Colombia. The bodies were reportedly buried in coffins and wrapped in cloth or covered with plastic. A team of forensic scientists was sent by the government in February of 2010 to the cemetery in order to investigate reports of a possible mass grave in the area. However, they were able to determine that instead of a mass grave, there were approximately 450 single interments of unidentified individuals, each with its own grave marker. The investigation was initiated by complaints from community members looking for their loved ones.

The investigators were surprised to find that most of the skeletal material found was nearly completely eroded and destroyed by the action of unknown taphonomic agents. The location is described as an artificial terracing on a plain, surrounded by trees of medium height, grasses, and shrubs. The weather is mostly hot and humid year round in this location.

During the excavation, the anthropologists excavated an archaeological test trench in order to detect changes in the soil and determine the exact location of individual graves. The trench revealed partial grave outlines of four graves. Many of the grave outlines could only be distinguished by discoloration of the soil and coffin nails outlining the graves. Of the graves that the trench revealed, it was observed that clothing remained in some of the graves, but the bones were almost completely absent. Only one grave was completely excavated in order to detect the alteration suffered by the bones.

At the time of excavation, soil samples from different levels within the cemetery were collected and stored in plastic containers. The chain of custody was maintained as the samples were sent for testing at the Institute of Geography Agustín Codazzi, Department of Agrology - National Soil Laboratory in Bogotá, Colombia. The soil samples were tested for fungus, bacteria and chemical solvents. The samples do not exhibit a high level of flora that would indicate that the samples had dissolved as a result of the organic processes, especially phosphates that are normally active in this type of sample. The analysis did yield several genera of fungus: *Penicillium*, *Fusarium*, *Aspergillus*, and *Sclerotinia*. The most unique signature of this soil, however, was the extreme acidity. The abnormally low pH levels in the samples ranged from 4.2 to 4.5. According to the soil analysis from the laboratory, "highly acidic" soil ranges from 5.1 to 5.5. This acidity range is much lower than the "extremely acidic" range. As the pH scale ranges from 0 – acidic to 14 – alkaline, the samples here are even more acidic than what the laboratory reports as "highly acidic." Such a low pH can facilitate the degeneration of the bone mineral (hydroxyapatite) and facilitate the structural dissolution by opening the microscopic canals in bone and increasing the available surface area so it is subjected to greater taphonomic activity.

This research provides evidence of a taphonomic process of the near complete dissolution of human osseous material within a very short and well documented postmortem interval (8-10 years – burial to excavation).

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Taphonomy, Soil Acidity, Human Skeletal Remains