



Physical Anthropology Section – 2005

H1 Rodent Modification of Human Skeletal Remains: Brown Rat (*Rattus norvegicus*) vs. Gray Squirrel (*Sciurus carolinensis*)

Walter E. Klippel, PhD*, and Jennifer A. Synsteliem, MA, University of Tennessee, Department of Anthropology, 250 South Stadium Hall, Knoxville, TN 37996

The goal of this presentation is to demonstrate that members of the taxonomic order Rodentia have different incentives for gnawing bone, and that tooth marks on bones reflect species-specific motivations.

Postmortem scavenging by brown rats and gray squirrels appear to vary in time sequence due to different motivations for modifying bone. These observations will impact the forensic community and/or humanity by allowing for more informed estimates of time-since-death when accompanied by species-specific modifications to bone.

The most frequently reported scavengers of human skeletal remains are carnivores and rodents. Research detailing carnivore modification has established the scavenging sequence, sites of bone destruction, and the tooth marks most characteristic of this taxon. Canid behavior, in particular, has been well illustrated and sufficient evidence exists to show that modifications to long bone ends occur secondary to extracting grease and marrow from spongy portions of the bone. Attributes of rodent gnawing are often described as paired, broad, flat-bottomed grooves: a reflection of their chisel-shaped incisors. 'Rodents' are stated to modify the densest parts of the skeleton as they attempt to sharpen their teeth or extract calcium and other minerals from bone. The apparent motivations and gnawing attributes for any one species of this order has been presumed diagnostic of all members based on shared taxon and similar dental morphology. It is not uncommon, however, to read seemingly contradictory reports that claim rodents prefer fresh, spongy bone. In addition, published illustrations can be found that cite textbook motivations yet display rodent gnawing along regions deficit in compact bone.

Extended observations at the University of Tennessee's Anthropological Research Facility - a 2 ½ acre plot of land set aside for human decomposition research - demonstrates multiple case studies of rodent modification across the spectra of fresh ('greasy') bone to weathered ('dry') bone. Two cohabitants of the research facility will be used to illustrate this point: the brown rat (*Rattus norvegicus*) - a species responsible for bone modification that bares slight resemblance to conventional descriptions and illustrations of rodent damage to bone, and the gray squirrel (*Sciurus carolinensis*) - a species that manifests 'typical' rodent modification.

The brown rat is a commensal rodent that is heavily dependent on humans for food and protection; it feeds predominantly on cereal grains, but has developed a taste for nearly anything consumed by humans - including meat and fat. Cohabitation and dependency on humans has resulted in commensal species developing food preferences unlike most other rodents: yet even among 'commensal rodents' food preferences appear to vary - a fact well recognized by the food science industry.

To demonstrate the relationship between food predilection and site and type of bone modification, a singular experiment was conducted. Two unprovenanced human clavicles were obtained from the UTK Forensic Anthropology Center. The first clavicle was ivory in appearance and texture and had been previously snatched by 'rodents' during a bone scatter training simulation at the facility. This bone was later discovered wedged in the side of a tree stump with multiple, parallel flat-bottomed grooves traversing the compact bone at midshaft. The second clavicle was selected from an autopsy collection known to have been processed by hand-dipping in household chlorine bleach but was still sticky to the touch, manifested a dark golden-orange hue, and considered representative of a 'grease'-laden, or fresh clavicle. The two clavicles were individually secured to the top of a fallen tree trunk with approximately four feet separating the two specimens. This site was selected due to gray squirrels having been spotted in the area and its distant location from any known brown rat territories. It was hypothesized that gray squirrels would only show interest in the 'dry' bone. The clavicles were monitored periodically over several months for signs of disturbance. In conjunction, donated individuals placed at the facility near brown rat burrows and nesting locations were monitored for bone modification.

Photographic documentation of scavenging activity was obtained using passive infrared receivers to trigger camcorders and wildlife cameras. Tooth marks were documented by field notes and digital images acquired during site visits. To date, gray squirrels have only been photographed gnawing on the 'dry' clavicle and brown rats have only been captured modifying 'greasy' bone.

Rodents, Bone Modification, Postmortem Scavenging