H129 Osteon Area and Circularity: A Method for the Assessment for Human and Non-Human Fragmentary Remains

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After attending this presentation, attendees can expect to learn the method for the measurement of osteon area and the assessment of circularity of osteons based upon digital measurements taken from human remains, and how these measurements can help with the assessment of fragmentary remains.

This presentation will impact the forensic science community by demonstrating a method that allows for the assessment of whether remains are human or non-human when osseous fragments are too small for other methods of gross or genetic identification. This can benefit the forensic community by adding to the methodology available for the identification of highly fragmentary osseous remains as found in mass disasters, military conflicts or other situations which result in the fragmentation of individuals.

The impetus for this research is the lack of current methods within the forensic studies which can accurately assess human from non human remains when the remains are highly fragmentary in nature. Although many researchers have attempted to use histological methods to analyze these types of remains, there is still no conclusive way to determine whether a fragment of bone is human or non-human in nature when circular osteons are present at the microscopic level. This study, by using a large sample of osteons from all of the long bones of the human body, will identify an osteon area meas- urement range for humans based upon a modern sample. In addition to the osteon area measurements, this study also looks at the overall shape of human osteons and compares that to the shape of non-human osteons for use as an additional method to distinguish between human and non-human fragments of long bones.

To accomplish this, three thin sections were selected from each of the following long bones from 5 different individuals: humerus, radius, ulna, femur, tibia, and fibula. These thin sections represented a midshaft, proximal, and distal portion of each long bone shaft to account for osteonal size and density differences throughout the shaft of each long bone. A minimum of 30 osteons were measured from each thin section of bone using the Image Pro Plus 4.5 digital microscopic measurement program. A total of over 3400 osteons were measured from the aforementioned sections of the long bones. Of the measured osteons, all had digital area measurements recorded. Addi- tionally, the circumference and maximum diameter were taken for over 2300 of the 3400 osteons. All of the recorded measurements were exported to an Excel spread sheet. From there, the areas, circumferences and diameters were subjected to various statistics, including the range of areas within and between skeletal elements and determination of circularity based upon the equations used for a circle (). This research shows that the overall majority of human osteons are not circular in shape, but rather elliptical in nature, while non-human osteons tend to be very circular. The osteon area range for humans based upon this sample can help eliminate non-human osteons that fall outside of this area range.

Osteon Area, Osteon Circularity, Human vs. Non-Human Histology

 ** Presenting Author*