H1 A Histological Examination of *Odocoileus Virginianus* for Forensic Application

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After attending this presentation, attendees will understand the applications of bone histology in forensic settings as well as the importance of the histological character of non-human remains (Odocoileus virginianus) to successfully differentiate them from fragmentary human remains.

This presentation will impact the forensic community and/or humanity by demonstrating how the development of a histological database for nonhuman species will aid forensic investigations by providing a comparative standard to more accurately determine the identity of fragmentary remains as being human.

Few researchers have endeavored to approach the issue of bone histology in non-human specimens. In the forensic setting, the discovery of fragmentary remains poses the question of identity. Is it human or non- human? Determining the origin of such fragments is essential for defining an investigation, but if the remains do appear to be non-human, further analysis is not always of primary interest.

If the specimen does prove to be non-human, it is often useful and important to learn the identity of the animal species. Being able to successfully identify bone fragments by genus or species aids the physical anthropologist. A more clear understanding of what non-human species look like at the histological level would essentially strengthen the determination of identification.

The white-tailed deer (*Odocoileus virginianus*) is common to the Southeastern United States and in that region is sometimes found in forensic settings, commingled with or alongside of human remains. Developing a firm grasp of the histological character of the white-tailed deer is the first step of many in the establishment of a comprehensive method of using histology for the identification of osseous fragments.

To adequately assess *Odocoileus virginianus*, it is necessary to understand variation in histological character as a function of location on the diaphysis of a bone as well as differences between bones. The developmental stage of the deer may also have an affect on the appearance of any histological traits as bone remodels with increasing age.

To address these questions, this research focused on right long bones procured from five deer of varying ages: 0.75 years, 1.5 years, 2.5 years, 3 years, 4 years, and 6.5 years. The femur, humerus, radius, metacarpal, metatarsal, and tibia were separated out for thin-section preparation and histological analysis.

With the aid of a Buehler Isomet 1000 saw, two 0.08 mm sections were cut at three-centimeter intervals on each diaphysis of the bones. The bone samples were then mounted on slides using Permount solution and cover slips and left to dry. These thin-sections were examined under a Leica DMRX research light microscope at 100x magnification. The presence of all histological structures was described and noted for each slide. Digital images of the characteristic plexiform bone and primary canals were photographed using a Sony video uplink. When evidence of bone remodeling was recorded, area measurements were taken on secondary osteons and Haversian canals via Image Pro Express 4.0.

The observations and the collected measurement data from each femur and humerus of the deer samples were subjected to a repeated measures ANOVA to assess inter- and intra-bone variability among and between the deer. The statistical findings will provide a good basis to indicate if white-tailed deer can be positively identified by histological

analysis regardless of the loci of the bone fragment in question and regardless of age.

The statistical analysis results indicated no significant mean differences within shafts or across ages for osteon area in the femur or humerus. The results also indicated no significant mean differences within shafts or across ages for Haversian canal areas in the femur. A significance difference was noted between the Haversian canal areas in the nine-month deer and the 2.5-year-old deer humeri.

Based on the findings, a blind test was performed on five unidentified bones samples to discern deer from other ungulates based on osteon areas. The methodology and results of this research were successfully utilized to distinguish white-tailed deer bone from *Sus scrofa* (wild board), *Ovis Aries* (sheep), and *Capra hircus* (goat). The ability to do so speaks to the usefulness and reliability of bone histology in forensic anthropology and calls for more similar research endeavors in the future.

Histology, Fragmentary Remains, White-Tailed Deer

 ** Presenting Author*