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Variation of bone microarchitecture within and among contemporaneous species of fossil horses: Feasibility

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Abstract

Mesohippus, Miohippus, and Merychippus are extinct horse species that date back fifteen to thirty million years ago, which spanned over three time periods in North America. Each of the horses habituated different terrains from wet to dry. The third metacarpal became the prominent one-toe of horse evolution and is the specimen of this study. The aim is to determine if reorientation, segmentation, correcting size differences, and isolation are feasible. Horse fossils are extensive, documented, and are used as an analogous fossil lineage to humans for this study. Imaging of the third metacarpal was accomplished by micro-CT scanning with a focus on the distal end. Each specimen was standardized using methodical steps to show feasibility. Reorientation was used to align the same bone landmarks of each fossil. Segmentation was performed and separated bone from non-bone. Fossils were corrected for size differences for relative comparison. Isolating bone was accomplished by using arithmetic for the distal end. Evolution of the equine foot is important for equine health, sports, foot paleontology, and can analogously be converted to human orthopedics. As a feasible study for future bone microarchitecture, this analysis serves to present an enhanced understanding of standardizing the third metacarpal of horse fossil bones.