

Rhinoceros Horn Attachment: Anatomy and Histology of a Dermally Influenced Bone Rugosity

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Associations between rugosities on the skull and cutaneous appendages (e.g., horns) often seem obvious when examined in extant specimens in which the conformations of epidermal appendages remain intact. Inferences regarding the morphology of unpreserved cutaneous appendages from extinct animals, however, are not always so clear. Rhinoceros horn provides an example of an epidermal appendage in which the detailed morphology cannot be readily determined from its associated rugosity. The horn attachments of two adult white rhinoceros (*Ceratotherium simum*) were examined by dissection and histological sectioning. The horn proper is a keratinized epithelial structure affixed to the dense irregular connective tissue of the dermis. Rhinoceros dermis is 1.5–5 cm thick across the skin of the head, and retains much of its thickness beneath the horn, at 1–2 cm thick beneath the nasal horn and 2–3 cm thick beneath the frontal horn. The horn-dermis complex is affixed to bone by dense populations of extrinsic fibers derived from the reticular dermis. These fibers create an osteohistological structure similar to that of a fibrous tendon attachment. Irregular mineralization of the extrinsic fibers gives the cleaned bone surface its rugose appearance. A more thorough understanding of how this appendage affects the morphology of the underlying bone aids in differentiation between horn-induced rugosities and rugosities with other causal associations, such as tendon attachment or secondary dermal ossification.