

# BIAXIAL MECHANICS OF PORCINE PERIOSTEUM

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## **Abstract**

The periosteum is a key contributor of osteoprogenitor cells during bone growth and adaptation, trauma repair, and callotasis. The processes that call these cells into action are not understood fully, but it is generally accepted that mechanical loading plays a significant role by instigating recruitment, proliferation, and/or differentiation. Mechanical characterization of the periosteum, therefore, is a prudent step in deciphering these roles. Because the periosteum is three-dimensional and likely subjected to multiaxial loads in vivo, simple uniaxial tests are insufficient for a full mechanical characterization. Weve made use of the membrane theory in continuum mechanics to reduce periosteal mechanics to a two dimensional problem, and will present the first biaxial interrogation of (porcine) periosteal mechanics. Similar to other collagenous membranes, the periosteum undergoes finite deformation, is anisotropic, and exhibits a nearly bilinear stress-stretch response. Mechanical behavior is similar for periosteum removed from opposite legs of the same pig, and for samples removed from slightly different locations on the same ulna. Fung-type constitutive models fit the data well, but exhibit poor predictive capability.