

# The Innervation of the **Enthesis Organ** of the Rat Achilles Tendon: 2426: Board #158 9:30 AM - 10:30 AM

Shaw, H<sup>1</sup>; Milz, S<sup>2</sup>; Büettner, A<sup>3</sup>; Santer, R M.<sup>1</sup>; Watson, A<sup>1</sup>; Benjamin, M<sup>1</sup>; Best, Thomas FACSM

## Author Information

<sup>1</sup>Cardiff University, Cardiff, United Kingdom.

<sup>2</sup>AO Research Institute, Davos, Switzerland.

<sup>3</sup>Ludwig-Maximilians-Universität, Munich, Germany.

Email: shawhml@Cardiff.ac.uk

**PURPOSE:** The **enthesis** (bony insertion of a tendon or ligament) is a common site of overuse injuries in sport. Because enthesopathies can be painful, it is often assumed that the **enthesis** is highly innervated-but with little evidence to support the assumption. The Achilles tendon has one of the most complex of attachment sites, for together with adjacent tissues, the **enthesis** itself forms part of an '**enthesis organ**' which reduces stress concentration at the bony interface. These adjacent structures include a 'sesamoid fibrocartilage' in the tendon, a 'periosteal fibrocartilage' on the superior tuberosity of the calcaneus, and a fat pad which extends into the retrocalcaneal bursa during plantarflexion. The purpose of the present study is to investigate the innervation of the whole **enthesis organ** complex.

**METHODS:** The tendon attachment site was removed from one leg of 3 male Wistar rats at each of the following ages-neonates, 4 weeks, 12 weeks, and 24 months. The tissue was fixed in 4% paraformaldehyde, prepared for routine indirect immunohistochemistry and cryosectioned in the sagittal plane. Serial sections were immunolabelled with polyclonal antibodies to protein gene product 9.5, substance P, calcitonin gene related peptide and neurofilament 200. Histology reference sections were stained with toluidine blue.

**RESULTS:** No nerve fibers were detected at the **enthesis** itself or in the sesamoid and periosteal fibrocartilages in rats of any age. However, the fat pad was richly supplied by nerve fibers which immunolabelled with all of the antibodies used. It also contained abundant mast cells. The innervation of the fat pad was confirmed in 10 human Achilles tendons obtained from the Department of Forensic Medicine at the Ludwig-Maximilians-Universität, in accordance with the ethical regulations of Munich University. The nerve fibers again immunolabelled with all antibodies and formed an intricate network in which the fibers lay between individual fat cells.

**CONCLUSION:** We suggest that healthy entheses are not innervated because of the high levels of mechanical loading experienced at insertion sites. However, the striking innervation of the adjacent fat pad suggests that it may have an unheralded proprioceptive role monitoring changes in insertional angle between tendon and bone that occur as a result of foot movements.

©2006The American College of Sports Medicine

Med Sci Sports Exerc (2006) 38(5). 2426