

**SOFT TISSUE TEMPERATURE DISTRIBUTION IN HUMAN THIGH EXPOSED TO THERAPEUTIC ULTRASOUND.** CS Enwemeka<sup>1</sup>, KS Hetchman<sup>2</sup>, DC Cutaia<sup>1</sup>, KR Chambers<sup>1</sup> <sup>1</sup>Division of Physical Therapy & <sup>2</sup>Division of Sports Medicine, Department of Orthopaedics & Rehabilitation, University of Miami School of Medicine, Coral Gables, FL

Tissue temperature changes were studied in 10 healthy subjects, aged 20 to 26 years, in order to determine the thermal effects of three intensities of therapeutic ultrasound, namely, 0.5 W cm<sup>-2</sup>, 1.0 W cm<sup>-2</sup> and 1.5 W cm<sup>-2</sup>. To monitor tissue temperature at 1, 2 and 3 cm below the skin surface, a MT-23 ga needle thermosensor (Physiotemp Inc., Clifton, NJ) was inserted into the anterior aspect of the quadriceps femoris 15 cm proximal to the superior margin of the patella. Skin temperature was monitored via a skin thermometer placed adjacent to the needle thermosensor. X-rays were taken to ensure that the needle thermosensor was correctly positioned perpendicular to the skin surface. The needle and skin thermometers were then connected to a calibrated Multi-channel Temperature Monitor (Sensortek Inc., Clifton, NJ) via which the temperature at each depth was observed and recorded. A 1 MHz ultrasound unit (Duke Electronics, Anaheim, CA) was then used to sonicate a 154 cm<sup>2</sup> area defined by a 7 cm radius circle around the needle. Prior to ultrasound treatment, the baseline temperature at each depth was recorded. At each intensity, temperatures were recorded at 1 minute intervals during and after a 15 minute period of sonication until baseline values were attained. Contrary to the texts, the increase in tissue temperature recorded at each depth was less than 1°C. At 1, 2 and 3 cm below the skin, the highest changes in tissue temperature were 0.66°C, 0.82°C and 0.91°C, respectively, and were observed at 10 min after sonication at 1.0 W cm<sup>-2</sup>. ANOVA showed a significant effect of sonication intensity on tissue temperature at 1 cm (P = .003) and 2 cm (P < .02) below the skin. Temperature changes superficially and at 3 cm below the skin were not significantly different for the three sonication intensities (P > .05) during the 15 minute period of sonication. In contrast, after sonication, significant dose dependent temperature changes were observed superficially (P < .001), and at depths of 1 cm (P < .02), 2 cm (P < .001) and 3 cm (P < .03). These findings indicate that the thermal effects of therapeutic ultrasound are minimal in cutaneous and muscle tissues, suggesting that elevation of tissue temperature may not be the primary mode of action of therapeutic ultrasound.