INFLUENCE OF EXERCISE ON COLLAGEN SYNTHESIS AND ON OTHER ASPECTS OF MATRIX REMODELING

Kjaer M.

Institute of Sports Medicine, Bispebjerg Hospital, and Center for Healthy Aging, Faculty of Health and Medical Sciences, University of Copenhagen, Denmark

Human tendon and intramuscular connective tissue demonstrate a moderate collagen synthesis and degradation in the state of normal bodily activity, and mechanical loading of human tendon results in an up-regulation of collagen synthesis. The exercise stimulated increase in collagen formation remains elevated for about 3 days after exercise, and is associated with a stimulation of collagen degradation. Insulin-like growth factor I, transforming growth factor beta, interleukin 6 and estrogen can each be shown in humans to have a stimulating effect upon collagen synthesis. However, the basic core structure of tendon matrix remains unchanged in normal tendon in the adult life time, and much adaptation occurs during childhood and adolescence. In vitro experiments upon human tendon cells indicate that mechanical loading is crucial for an optimal stimulation of collagen synthesis. Anti-inflammatory medication is shown to limit the exercise related responses in collagen synthesis. It is suggested that the development of tendon overuse injury (tendinopathy) is related to a mismatch between anabolic and catabolic signaling upon collagen turnover.

Signaling for collagen synthesis and degradation is upregulated with tendinopathy, whereas only controlled loading (strength training) results in any manifest rise in collagen synthesis and a normalization of tendon fibril structure.