

## A Study of Influence of Freezing on Mechanical Properties of Tendon Fascicles

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**Abstract :** Tendons are the biological structures, which primary function is to transfer force generated by muscles to the bones. Unfortunately, damages of tendons are also one of the most common injuries of the human musculoskeletal system. For the most severe cases of tendon rupture, such as the tear of calcaneus tendon or anterior cruciate ligament of the knee, a surgical procedure is the only possible way of full recovery. Tendons used as biological grafts are usually subjected to the process of deep freezing and subsequent thawing. This, in particular for multiple freezing/thawing cycles, may result in changes of tendon internal structure causing deterioration of mechanical properties of the tissue. Therefore, studies on the influence of freezing on tendons biomechanics, including internal water content in soft tissue, seems to be greatly needed. An experimental study of the influence of freezing on mechanical properties of the tendon was performed on fascicles samples dissected from bovine flexor tendons. The preparation procedure was performed with the presence of 0.9% saline solution in order to prevent an excessive tissue drying. All prepared samples were subjected to the different number of freezing/thawing cycles. For freezing part of the protocol we used -80°C temperature while for slow thawing we used fridge temperature (4°C) combined with equalizing temperatures in the standard state (25°C). After final thawing, the mechanical properties of each sample was examined using cyclic loading test. Our results may contribute for better understanding of negative effects of soft tissues freezing, resulting from abnormal thermal expansion of water. This also may help to determine the limit of freezing/thawing cycles disqualifying tissue for surgical purposes and thus help optimize tissues storage conditions.

**Keywords :** freezing, soft tissue, tendon, bovine fascicles

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