Group #34

Biological Joint Biomechanics

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Abstract

Two sub-projects were developed to address the lack of a widely accepted research device capable of applying physiological loads to knee joint cartilage while enabling micro-CT imaging. The macroscale sub-project produced a mechanical loading device capable of applying up to 45 N of force on a rabbit knee joint across a range of angles, though force transmission was lower than expected due to friction and cable compliance. The microscale sub-project used a core compressor device to compress osteochondral cores at 10%, 20%, and 30% displacement under micro-CT imaging conditions, finding that Hexabrix concentration decreased with increasing compression, suggesting GAG redistribution within the cartilage. Future macroscale improvements include adding guide rods for better alignment and force transmission, with the ultimate goal of obtaining micro-CT analysis using the Bruker Poseidon X4. Next steps for the microscale sub-project involve testing the core compressor with PEEK chromatography frits as compression platens.