Loading Device to Enable Non-Surgical Study of Post-Traumatic Osteoarthritis in Rodents

Arthritis is the single leading cause of disability in the US, affecting more than 30 million people. In many of these patients, arthritis is initiated by injury to the joint, such as that which occurs during rupture of the anterior cruciate ligament (ACL). As such, surgical models of ACL rupture are commonly used to study the development of arthritis. The use of these surgical models is complicated by damage to other tissues in the joint that are transected in order to gain surgical access to the ACL. This effect is particularly important in small animals such as rodents.
A collaborative team including members of the Bonassar Lab (BME/MAE), the Fortier Lab (College of Veterinary Medicine), and the Rodeo Lab (Sports Medicine, Hospital for Special Surgery) have developed a non-surgical model of ACL rupture involving manual application of traumatic loads to the rodent stifle joint (i.e. knee). While effective, this manual method is difficult perform in a repeatable way. The goal of this project is to design and build a mechanical device that can control both the magnitude and direction of forces across the stifle to reliably produce the desired damage to the ACL.

Students who join the team will be tasked with: de novo design of a loading device; building and screening of prototypes, and benchmarking device performance relative to manual techniques on cadaveric rodent joints. Depending on the students' interest and background, additional opportunities may exist to deploy and assess this device during in vivo studies.

This project is well suited for 1-2 students who have a background in mechanical design, including CAD and fabrication. Familiarity with mechanical testing, Labview, and MatLab software is also desirable. Interested students should forward a copy of a resume and unofficial transcript to:

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