Multiscale Model of Facet Capsule Mechanobiology

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The facet capsular ligament (FCL), which connects two adjacent vertebral facets and surrounds the corresponding facet joint, is subjected to a wide range of loading conditions under normal and abnormal spinal motions. Injury to the ligament, which may arise due to chronic overload and/or due to traumatic injury, has been identified as a cause of both neck and low-back pain. The challenge in understanding FCL injury lies in its multiscale nature: the injurious load occurs at the scale of the whole body or, at smallest, a single vertebral motion segment, but the pain-causing injury occurs at the level of a single neuron. Our team is using a multiscale approach to attack this problem by translating joint-scale loads to the cellular level, complementing a multiscale modeling scheme with experiments on model systems and tissue.