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**Modeling spinal cord biomechanics**[1] CARLOS LUNA, Fischell Department of Bioengineering, University of Maryland, SAMEER SHAH, Departments of Orthopaedic Surgery and Bioengineering University of California, San Diego , AVIS COHEN, Department of Biology and Institute of Systems Research, University of Maryland, HELIM ARANDA-ESPINOZA, Fischell Department of Bioengineering, University of Maryland — Regeneration after spinal cord injury is a serious health issue and there is no treatment for ailing patients. To understand regeneration of the spinal cord we used a system where regeneration occurs naturally, such as the lamprey. In this work, we analyzed the stress response of the spinal cord to tensile loading and obtained the mechanical properties of the cord both in vitro and in vivo. Physiological measurements showed that the spinal cord is pre-stressed to a strain of 10%, and during sinusoidal swimming, there is a local strain of 5% concentrated evenly at the mid-body and caudal sections. We found that the mechanical properties are homogeneous along the body and independent of the meninges. The mechanical behavior of the spinal cord can be characterized by a non-linear viscoelastic model, described by a modulus of 20 KPa for strains up to 15% and a modulus of 0.5 MPa for strains above 15%, in agreement with experimental data. However, this model does not offer a full understanding of the behavior of the spinal cord fibers. Using polymer physics we developed a model that relates the stress response as a function of the number of fibers.

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