Measuring the Contribution of Specific Tissue Components to Tendon Strength and Resilience

Mechanical Engineering
University of Colorado Boulder

National Institutes of Health
Turning Discovery into Health

Hannah Larson

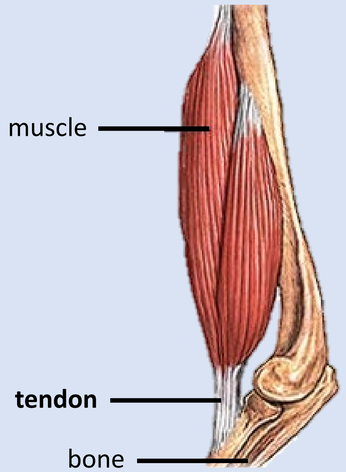
Department of Mechanical Engineering, University of Colorado Boulder

CONTACT:
hannah.larson-1@colorado.edu

Problem

- Tendons can become damaged and lead to:
  - Tendon injury, *i.e.* tendon rupture
  - Tendinopathy, a chronic pain condition that weakens the tendon
- Tendon and ligament injury occurs in:
  - 16 million people in the U.S. per year
  - 1/3 of all skiing-related injuries
- Tendinopathy affects:
  - 6% of adults
  - 24% of competitive athletes
- Risk of tendon injury increases with age due to changes in tendon composition and structure

Tendon injuries and diseases affect many people and are difficult to heal

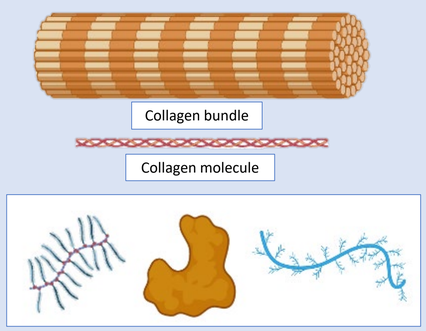


Tendons connect muscle to bone and must be strong to transmit forces from muscles to move the skeleton

Goals

Do certain components in tendons provide resilience to damage?

- Collagen makes up >60% of tendon mass, forming a strong rope-like structure
- Other proteins and molecules surround collagen fibers, possibly providing resistance to excess stretch that can damage tendons

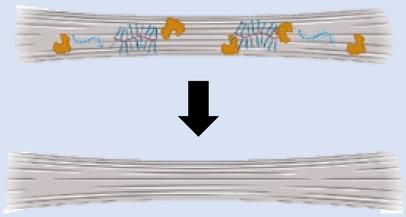


Tissue components that surround collagen in tendon (hyaluronic acid, decorin, etc.)

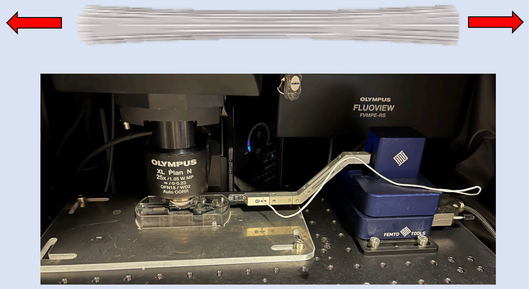
Goal: test the contribution of tissue components that surround collagen to tendon strength and damage resilience

Specific tissue components can be used to help develop tendon treatments and artificial tendon replacements

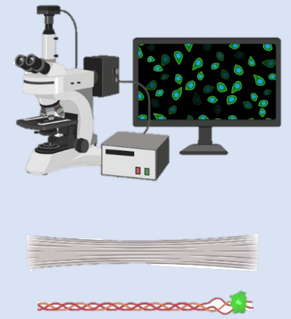
Approach



Remove specific tissue components from tendon using biochemistry



Repeatedly stretch tendons (like in the body) & measure force to track strength



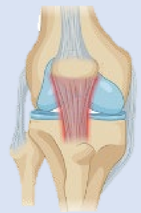
Quantify damage to collagen using fluorescent microscopy

Broader Impacts to Colorado and Beyond

Member, United States Olympic & Paralympic Committee

Insight into how to protect against and treat tendinopathy, which impacts some of the 15,000 athletes that train at the U.S. Olympic & Paralympic Training Center in Colorado Springs

Understanding tendon damage impacts Colorado economically, with 12 million skiers each year at risk for tendon/ligament injury



Studying tendon strength and response to damage will help address tendon diseases in an aging population

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