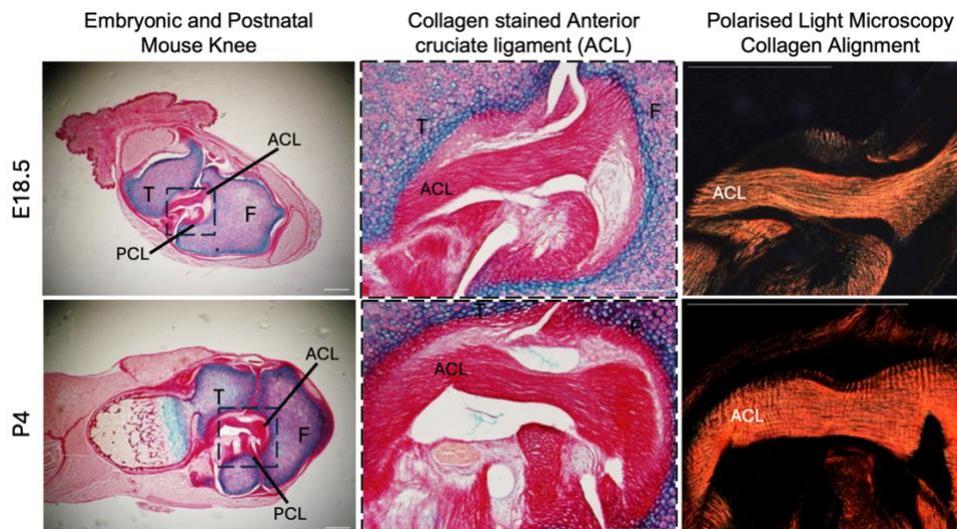




*Exploring sex-based differences in ligament development and maturation: Do they contribute to tissue vulnerability?*

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Sex-specific disparities in ligament injury risk are well recognised, yet the biological origins that underpin these remain unknown. This project seeks to address this critical and unexplored gap in musculoskeletal biology. While clinical data reveal that males experience a higher volume of ligament injuries, females are observed to be at a higher risk of injury, yet the anatomical and biological basis for this disparity remains unclear. This study aims to fill that gap through four interconnected objectives that include structural, molecular, biomechanical and mechanoregulatory investigations. The project will characterise the structural hallmarks of ligament maturation, such as collagen organisation during maturation (Figure below), aiming to uncover the molecular mechanisms driving ligament maturation and assess sex-based variation. Experiments will assess sex-based differences in ligament strength and investigate the role of embryonic motility in ligament maturation. It will use animal models of musculoskeletal development and maturation, examining morphological, mechanical and molecular changes. This project will add to knowledge of sexual dimorphisms in the musculoskeletal system.



Embryonic (E18.5) and postnatal day 4 (P4) mouse knees, sectioned and stained with Alcian Blue for cartilage and picosirius red for collagen. The Anterior cruciate ligament (ACL) morphology and collagen organisation is shown following polarised light microscopy. This technique will allow for the analysis of collagen fibre organisation during maturation of these ligaments, but also allow for comparisons across sex.