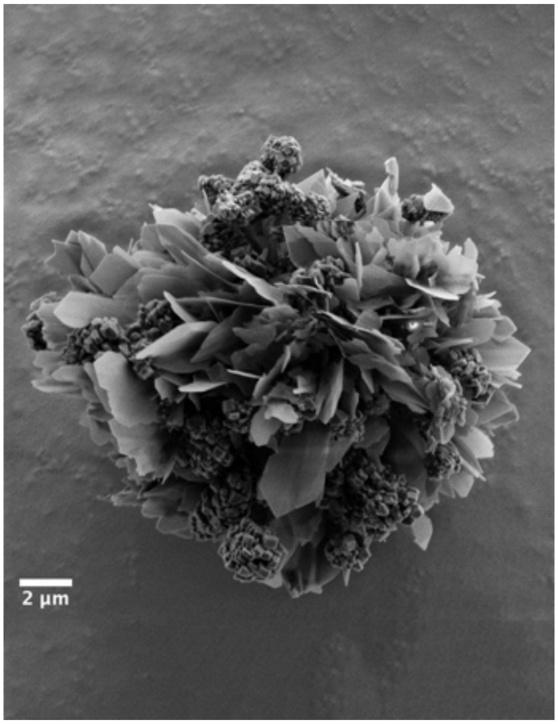


Laboratory synthesized Mg-carbonates from the amorphous phase under high temperature

This image shows an assemblage of Mg-carbonates in a microscale. The globular clustered minerals are magnesite, and the other ones with platy shapes are the hydrated form of magnesite – hydromagnesite. They crystallized from the same amorphous phase that was synthesized in the laboratory environment, and kept incubated at 75°C. The image represents a tiny fraction of my year-long project, about probing the amorphous-to-crystalline transition in the Ca-Mg-carbonate system, as a function of composition, time, and temperature. The research did not only focus on the morphology perspective, but also quantitatively study the change in mineralogy over the entire time span.

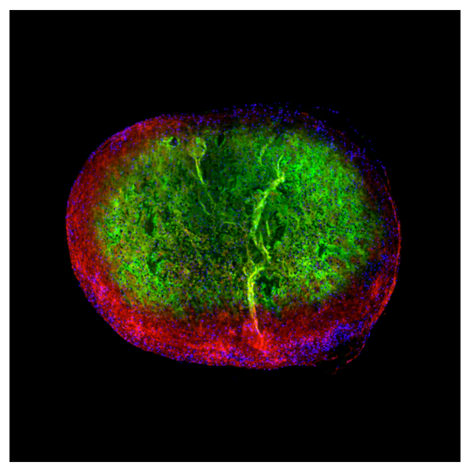
Created by: Jie Cheng
4th Year, BSc Honors in Environmental Earth Sciences

Tissue engineered human fibrocartilage

Cartilage is a mechanically crucial connective tissue with subtypes including hyaline cartilage, fibrocartilage, and elastic cartilage. Hyaline cartilage provides joints with frictional properties that rival the finest engineering materials known to man. Fibrocartilage has properties of both hyaline cartilage and fibrous tissue such as ligament. These allow it to transmit both tensile and compressive forces in structures such as the knee meniscus and the intervertebral disc of the spine while remaining soft and pliable. Elastic cartilage such as that of the ear are highly bendable.

Unfortunately, the evolution of cartilage's amazing properties came at a cost: it has no blood supply, which limits healing after injury. There are no known instances in nature where cartilage repairs itself to its original state in adults, not even in cartilaginous fish. Joint cartilage injuries lead to osteoarthritis, a painful and chronic joint disease with no existing cure.

You are looking at the cross-section of human meniscal fibrocartilage grown in just 3 weeks in the Adesida lab of the Department of Surgery, University of Alberta from nothing but human cells (blue) and a simple biomaterial scaffold made from bovine collagen. The cells came from a tiny piece of meniscus tissue from a 40-year-old man. Despite their adult origin, the cells regrew the main constituents of meniscal fibrocartilage under controlled conditions: human collagens I (red) and II (green). This technology may allow generation of meniscal fibrocartilage replacements using cells from a patient's damaged tissues, an innovation that could improve the lives of countless Canadians.



Created by:
David Li
and colleagues