BME174 Week 9: Dynamic Mechanical Analysis (DMA) Testing of Macroscale Cultured Fat Constructs

Introduction

Macroscale constructs of cultured fat tissue were formed in Week 8 by cell scraping the

differentiated fat cells, mixing them in identified concentrations of alginate, and crosslinking using a CaCl2 solution. Controls were created by crosslinking the alginate with CaCl2 without the addition of cells. This week, experimental fat and control samples will be subjected to

Dynamic Mechanical Analysis (DMA) testing as a proxy for food texture under the hypothesis that fat cell addition will alter the material’s mechanical properties.

Materials

* Alginate-based scaffolds seeded with (experimental condition) and without (control condition) differentiated fat cells
* Dynamic Mechanical Analyzer (RSA3; TA Instruments, New Castle, DE, USA)
* 6mm biopsy puncher
* Tweezers

Protocol

*Done previously by the instructors:*

1. Obtain macroscale fat and control samples from the 4C fridge and allow them to equilibrate to room temperature.

*To do in class:*

1. Take 6mm biopsy punches of each sample.
2. Place the sample between the two parallel plates of the DMA.
   1. Use the tweezers to carefully place the sample on the center of the base plate.
   2. Be careful not to poke the samples as this will alter their mechanical properties.
3. Perform a cyclic compression test to the sample (1 compression, 1 relaxation cycle).
4. Analyze results.

References

Yuen et al. (2022). Macroscale Adipose Tissue from Cellular Aggregates: A Simplified Method of Mass Producing Cell-Cultured Fat for Food Applications. bioRxiv. https://doi.org/10.1101/2022.06.08.495192