Rheology (gel stiffness of an elastic material) of PureCol® Collagen Product

Type I Collagen products provided by Advanced BioMatrix are widely used in a gel format for a variety of uses and applications including three dimensional structure for cellular experiments, extracellular matrix approximations in biophysical analysis and as scaffolds in tissue engineering.

*In vivo*, collagen undergoes self-assembly into fiber networks that are organized differently in different tissues. *In vitro*, collagen undergoes a very similar self-assembly process in which monomers assemble into fibrils that may bundle into fibers that assemble into a network. Different fibril microstructure and different overall network structure can be obtained by altering the pH, ionic strength, and temperature at which fibrillogenesis is initiated. Gel structure on both the fibril and network length scales is expected to impact the mechanical properties (and biological activity) of the resulting gels.

Collagen gels were prepared following the protocol provided on the PureCol® product webpage and in the Directions for Use (DFU). PureCol® gel formation is dependent on pH, temperature, ionic strength, nature of salt and collagen concentration. Eight (8) parts of PureCol® collagen were mixed with one (1) part of 10 X Phosphate Buffered Saline (PBS) while maintaining a temperature of 2 - 10°C. The pH was adjusted to 7.0 – 7.4 with 0.1 M sodium hydroxide (NaOH). The prepared collagen mixture was dispensed in small sample cups and then incubated at 37°C for >3 hours. Multiple lots of PureCol® collagen gels were prepared.

The collagen gel stiffness was measured using a Bohlin CVO rheometer. The rheometer measures multiple parameters including shear stress and strain of the collagen gel. To achieve tensile stress and strain approximating the Young’s Modulus (E) calculation of a typical saturated hydrogel, the following formula was employed: $E = \text{Stress} / \text{Strain} \times 3$ with the collagen gel stiffness being measured in Pascal units (Pa).

Four lots of PureCol® were tested for collagen gel stiffness. The collagen gel stiffness results are provided in Graph 1.