Development and Characterization of a Novel Instantaneous-Crosslinking Pectin-Based Hydrogel

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Hydrogels have received significant attention over the past 30 years due to their potential applications in drug delivery, blood vessel modeling, and as a cancer drug screening; however, they still have limitations: poor mechanical properties and the lack of tissue-regenerative ability and adhesiveness. The purpose of this study was to develop and characterize a new hydrogel system with improved microstructure, mechanical properties, and biocompatibility. The preparation method for the hydrogel was relatively simple: first, pectin, a natural plant derived polysaccharide, was animated in increasing concentrations of ethyl alcohol and air dried. Then, a 1% calcium chloride solution was created. Different concentrations of animated pectin solution were created and cross linked in the calcium chloride solution. The hydrogels were subjected to compressive, tensile, and swelling tests. The swelling tests were conducted in phosphate buffered saline for 1, 3, 6, 12, 24, 48, 72 and 168 hours. The freshly prepared hydrogel samples and their swelling tested counterparts were freeze-dried for scanning electron microscopy morphological examination and energy dispersive X-ray spectroscopy elemental analysis. Results showed that the increase in pectin concentration significantly increased compressive strength and the stability of the hydrogel system, but did not have any effect on stretchability. The hydrogel system created in this study was extremely flexible, meaning it could be cross linked into micro particles, macrospheres, dogbone-shaped and cylindrical-shaped samples. All in all, the newly developed hydrogel system showed great promise in various medical applications such as drug delivery, blood vessel modeling, and cancer drug screening.

Awards Won:

YM American Academy: First Award of $3,000