Shabnam Hemmati-Sadeghi, J Tissue Sci Eng 2017, 8:4(Suppl)
DOI: 10.4172/2157-7552-C1-039

The effect of polyglycerol sulfate-based hydrogels with tunable mechanical integrity on cartilage regeneration in osteoarthritis

Shabnam Hemmati-Sadeghi
Free University of Berlin, Germany

The current therapeutic approaches do not halt osteoarthritis (OA) progression or reverse joint damage caused by it. Furthermore, hyaluronic acid (HA), a standard visco-supplement, injected for pain management in OA patients, has a rapid clearance. Our group has synthesized non-degradable hydrogels from a heparin-analogous polymer dendritic polyglycerol sulfate (dPGS), which can be tuned with respect to its rheological properties and has anti-inflammatory effects. In this study, we further characterized this hydrogel in our OA *in vitro* model to test its effect on OA regeneration. Importantly, several concentrations from 3.6 to 4.8 wt% of dPGS and, as standard visco-supplement, blends of commercially available HAs were investigated to find out a suitable concentration for intra-articular injections which mimic HA in terms of viscoelastic and mechanical properties. To test the dPGS potential for OA-treatment, recombinant porcine tumor necrosis factor alpha (TNF-α) was used to induce OA-like changes. To document ECM formation, cartilage-typical-sulfated glycosaminoglycans (GAG) were stained with Safranin O and cartilage-specific type II collagen was detected immunohistochemically. The rheological measurements were performed with a temperature-controlled Bohlin Gemini 200 HR nano rheometer. From oscillatory measurement data, storage (G') and loss (G'') modulus were deduced as function of the oscillating frequency ω. Our results show that dPGS prevents TNF-α induced GAG loss and therefore can play a role in cartilage regeneration. To further investigate the mechanism behind this protective effect of dPGS, these samples are currently under analysis by microarrays. Furthermore, in our rheological experiments, we found that the 4.0 wt% dPGS had comparable viscoelastic properties to HA. These findings suggest that dPGS hydrogels have similar mechanical properties, but might have an advantage in control of inflammation and of being much less easily disappear from its injection place.

Biography

Shabnam Hemmati-Sadeghi has completed her Master's degree from Ferdowsi University, Mashhad, Iran and she is currently a PhD student at Free University of Berlin, Germany.

shabnam.hemmati.s@gmail.com

Notes: