Chondroitin Sulfate-based Two-component Adhesive and Hydrogel

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Technology description

In part, the present disclosure provides for a composition comprising at least one monomelic unit of a biologically compatible polymer functionalized with an imide to provide a tissue adhesive, a hydrogel or both. In another embodiment, at least one of the monomeric units of the biologically compatible polymer is conjugated to a second functional group, which can be an imide. The second functional group, if not an imide, can be any known functional group and can provide directionality to the polymer. Overall, when the polymer contains plural species of functional groups, the polymer can contain substantially equal molar amounts of the different functional groups, or the ratios can be varied as a design choice. Further, the functionalized biologically compatible polymer compositions may comprise at least a second biocompatible polymer that reacts with the first imidated biological polymer. Thus, the second polymer can contain functional groups reactive with an imide or another functional group on the first imidated polymer. Compositions of the present disclosure may further comprise a biologically active agent, such as a nutrient, a cell, such as a blood cell or a chondrocyte, or an undifferentiated cell, such as a stem cell, such as a hematopoietic stem cell or a mesenchymal stem cell.

Technical Details:
Polymers, matrices or gels are attractive for tissue engineering because those materials can encapsulate cells. Some polymers or gels have a high, tissue-like water content enabling nutrient and waste transport. Naturally derived biopolymers do not always have the structural or functional characteristics required for biomedical applications. Nevertheless, polymeric biomaterials are used in biomedical applications including medical device coatings, artificial implants, and drug delivery devices. Gels, networks, scaffolds, films and the like of interest made with the composition(s) of interest encourage cell, tissue and organ integration and growth. The optional presence of cells, such as stem cells, enhances cell, tissue and organ integration and growth. Researchers at Johns Hopkins have developed biologically compatible polymers which carry an imide and can be used as an adhesive, a hydrogel or both. A second biologically compatible polymer reactive with the imidated polymer can be used therewith to seal openings.

• Filling or finishing a defect in a tissue or organ, such as sealing an incision or wound

• Using patches and gels to prevent enzymatic synovial degradation during and after implantation in early osteoarthritic joints.
• Marrow stimulation without disrupting subchondral bone integrity in the eye, in the spine, in the musculoskeletal system, at sites carrying cartilage, etc.
• In situ polymerization techniques to form scaffolds and so on that can be molded to take the desired shape of the defect, promote tissue development by stimulating native cell repair, and can be potentially implanted by minimally invasive injection.

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