Materials for encapsulation of cartilaginous tissue cells

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Technology description

Summary

Cellulose-based hyrdogels for soft tissue regeneration

Description

Articular cartilage is a hydrated, soft connective tissue that functions to redistribute applied loads and to provide a low friction-bearing surface in moveable joints. Annually, over one million procedures involving cartilage replacement are performed in the United States as a result of debilitating ailments affecting articular cartilage. The most common of these pathological conditions is osteoarthritis (OA), a degenerative joint disease that afflicts between 32-38 million Americans. OA is characterized by a progressive loss of cartilage tissue due to excessive mechanical trauma or to continual loading over time, resulting in joint pain and stiffness. Unlike other connective tissues, cartilage has a limited reparative ability because it is relatively acellular and avascular. When repair does occur, it often results in the formation of fibrous scar tissue, which lacks the structural components and organization to withstand the mechanical demands of the natural tissue. The joints most commonly affected by OA are those of the hand, knee, hip and wrist. Degeneration of the fibrocartilaginous intervertebral disc (IVD) in the spinal column also gives rise to a variety of health problems, ranging from lower back pain to paraplegia. IVD degeneration occurs due to dehydration of the nucleus pulposus (NP), a gelatinous, semi-fluid structure in the central portion of the tissue that maintains disc height and provides resistance to compressive loads. Replacement of cartilaginous structures, such as the NP, represents an alternative approach to restoring joint function. In an effort to find a biocompatible material that can provide sustained structural integrity while allowing for extracellular matrix (ECM) production, researchers at the University of Pennsylvania have synthesized covalently crosslinkable cellulose-derived hydrogels that retain viability of encapsulated cartilage-forming cells while also giving way to ECM accumulation.

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