Fibrillated collagen

Fibrillated collagen is a type of collagen that has been mechanically processed to create a fibrous structure. This process involves breaking down native collagen fibers into smaller fibrils, which can then be reassembled into new structures.

Fibrillated collagen has several potential applications in the biomedical field, including:

Tissue engineering: Fibrillated collagen can be used as a scaffold for tissue regeneration. The fibrous structure of fibrillated collagen provides a three-dimensional environment for cells to grow and differentiate, mimicking the natural extracellular matrix of tissues.

Drug delivery: Fibrillated collagen can be used to encapsulate drugs and other therapeutics, allowing for controlled release over time.

Wound healing: Fibrillated collagen can be used as a wound dressing to promote healing and prevent infection. The fibrous structure of fibrillated collagen provides a scaffold for cells to migrate and regenerate tissue.

Cosmetics: Fibrillated collagen can be used in cosmetics to improve skin hydration and elasticity.

Food industry: Fibrillated collagen can be used as a natural food additive, such as in meat products to improve texture and water retention.

Fibrillated collagen is a versatile material with potential applications in a variety of fields. Ongoing research is focused on optimizing its properties for specific applications and developing new methods for synthesizing and processing fibrillated collagen.

Koo et al. used a rat tail nucleotomy model to develop mechanically stable collagen-cryogel and fibrillated collagen with shape-memory for use in minimally invasive surgery for effective treatment of IVDD. The collagen was loaded with hyaluronic acid (HA) into a rat tail nucleotomy model.

The shape-memory collagen structures exhibited outstanding chondrogenic activities, having completely similar physical properties to those of a typical shape-memory alginate construct in terms of water absorption, compressive properties, and shape-memorability behavior. The treatment of rat tail nucleotomy model with shape-memory collagen-cryogel/HA alleviated mechanical allodynia, maintained a higher concentration of water content, and preserved the disc structure by restoring the matrix proteins.

According to these results, the collagen-based structure could effectively repair and maintain the Intervertebral disc matrix better than the controls, including hyaluronic acid only and shape-memory alginate with hyaluronic acid [1)]

1)
Koo YW, Lim CS, Darai A, Lee J, Kim W, Han I, Kim GH. Shape-memory collagen scaffold combined with hyaluronic acid for repairing intervertebral disc. Biomater Res. 2023 Mar 29;27(1):26. doi: 10.1186/s40824-023-00368-9. PMID: 36991502.