A cryogel is a type of hydrogel that is synthesized at sub-zero temperatures, typically using a freezing process. Cryogels have a unique porous structure that allows for high water content and the potential for controlled release of drugs, proteins, and other biomolecules.

Cryogels have a variety of potential applications, including:

Tissue engineering: Cryogels can be used as scaffolds for tissue regeneration, providing a three-dimensional structure for cells to grow and differentiate.

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

Bioremediation: Cryogels can be used to remove pollutants and other contaminants from water and soil.

Biosensors: Cryogels can be used to create biosensors that detect the presence of specific biomolecules or chemicals.

Wound healing: Cryogels can be used as wound dressings to promote healing and prevent infection.

Cryogels are still a relatively new technology, and ongoing research is focused on optimizing their properties for specific applications. However, their unique structure and potential for controlled release make them a promising area of research for a wide range of biomedical and environmental applications.

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.