Hydrogel Replacement Disc Therapy

A novel method is being used to construct a mechanically stable hydrogel of highly biocompatible polymers that offer superior mechanical performance vs. existing rigid plastics used to treat degenerative disk disease. The hydrogel replicates the mechanical properties of a natural intervertebral disc and is resilient and capable of absorbing mechanical shock while maintaining flexibility.

Background:
Nearly 70 percent of all adults experience back pain as a result of spinal disk irregularities. To date, treatment of chronic back pain costs the U.S. economy more than $26 billion a year, or 2.5 percent of the nation’s total health-care expenditures. Individuals with severe forms of degenerative disk disease (DDD) may undergo surgery to correct the disorder if they not respond to physical therapy. There is a vast range of surgical procedures provided for DDD, but most are concentrated on the relief of symptoms and not the root of the problem. Alternative treatments developed for DDD, such as implantable synthetic replacement discs, are designed to mimic the vertebrae and maintain function. Three U.S. Food and Drug Administration-approved products exist, but they are made of metal and rigid plastic that do not properly simulate good vertebrae mobility or composition.

Technology Description:
Dr. Weilam Chen, Ph. D., R. Ph., associate professor in the Department of Biomedical Engineering at Stony Brook University, has created a superior alternative to the rigid plastics used to treat DDD. He is using a novel method to construct a mechanically stable hydrogel of highly biocompatible polymers. This novel hydrogel replicates the mechanical properties of a natural intervertebral disc, and is resilient and capable of absorbing mechanical shock while maintaining essential flexibilities. The mechanical properties of the disc are readily manipulated and may be tailored to a patient’s specific needs. Dr. Chen is focusing his research on the development of novel biomedical applications where hydrogels can replace existing polymers.

Advantages
This novel hydrogel technology:
• Provides mechanical support and cushioning to vertebral stress, while maintaining the required mobility of the spine.
• Offers a cost effective option and has mechanical properties that can be easily altered through changes in production.
• Represents a platform technology that can be applied to various areas that require the use of a rigid biocompatible surface or structure.

Applications
• Biomechanical implant
• Spinal disc injury
• Degenerative disc disease

Patents / Publications:
• Patent Pending
• Mechanically strong double network photocrosslinked hydrogels from N,N-dimethylacrylamide and glycidyl methacrylated hyaluronan.

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