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**TOLEDO**  
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## **System for *In Vitro* Formation of a Nucleus Pulposus**

The intervertebral disc (IVD) is a fibrocartilaginous tissue that separates the bony vertebral bodies of the spine. The central, jelly-like core region is known as the nucleus pulposus (NP). The structural and load bearing properties of the IVD largely result from the NP's ability to attract and retain water. Through an osmotic process, the NP absorbs water resulting in the creation of a swelling pressure that allows the IVD to support the compressive loads of the spinal column. The degeneration of the IVD is a leading source of chronic low back pain. Collectively, disc-degeneration related problems account for 80% of all elective surgeries on the spine and an annual healthcare cost of over \$30 billion. For those patients for whom nonoperative treatment fails, there are few effective treatment options. Current methods of surgically treating low back pain involve fusing the two vertebrae on either side of the IVD. However, the outcome of disc fusion is unpredictable and often leads to other serious problems. The innate ability of the IVD to repair itself is also quite low. Accordingly, there is great interest in regenerating the IVD and tissue engineered IVDs have the potential of being able to maintain and remodel themselves and, perhaps, sustain the biomechanical loads over long periods of time. Therefore, a bioreactor system has been developed for the large scale *in vitro* production of a bioartificial NP using human mesenchymal stem cells (hMSCs). The system regenerates the nucleus pulposus through the use of hMSCs, which are readily available from the patient's own bone marrow and have the innate ability to multiply in culture and differentiate into a wide variety of connective tissue types.

The University of Toledo is seeking a company interested in utilizing this bioreactor system for making nucleus pulposus-like cells for replacement of the nucleus pulposus in patients with intervertebral disc degeneration.

### **Applications:**

Patients with intervertebral disc disease

### **Advantages:**

1. hMSCs available from patient's own bone marrow
2. Techniques developed for isolating hMSCs
3. Bioartificial nucleus pulposus formed *in vitro*

**This invention is patent pending**

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