Tissue-Engineered Intervertebral Discs for the Treatment of Degenerative Disc Disease

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<th>Background &amp; Unmet Need</th>
<th>Technology Overview</th>
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<td>• Degenerative disc disease (DDD) is a condition in which the intravertebral discs (IVDs) in the spine degrade over time</td>
<td>• <strong>The Technology:</strong> Tissue-Engineered IVDs (TE-IVDs) combined with a bioresorbable stabilization system for improved treatment of DDD</td>
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<td>• This degradation leads to nerve compression and chronic back pain</td>
<td>• The bioresorbable support structure keeps the implant in place during the healing process but allows for segmental movement after the stabilization system dissolves</td>
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<td>• DDD is widespread, affecting &gt;90% of adults 50 years or older</td>
<td>• <strong>PoC Data:</strong> In a canine model, the TE-IVD implants engrafted successfully and persisted in the spine for 16 weeks</td>
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<td>• Surgical intervention for severe cases involves removing the entire IVD followed by fusion of the adjacent vertebrae or placement of a mechanical disc prosthesis to preserve motion</td>
<td>• The TE-IVDs were stable and maintained disc height up to 70% of adjacent normal discs</td>
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<td>• However, fusion and disc replacement are associated with increased risk of pseudarthrosis and adjacent segment disease</td>
<td>• The TE-IVD implants did not generate a chronic immune response, supporting the use of allogeneic cells</td>
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<td>• <strong>Unmet Need:</strong> An intervertebral disc implant that preserves a patient’s spinal movement without the risk of developing complications or comorbidities</td>
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**Inventors:**
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**Patents:**
US Patent 11,504,245
EP Application 3,583,213

**Publications:**

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Technology Applications
• Treatment of degenerative disc disease in patients with severe back pain that doesn’t respond to noninvasive approaches

Technology Advantages
• Replaces the entirety of the IVD utilizing viable tissues
• Restores disc height and spinal flexibility
• Inclusion of a bioresorbable support system reduces the risk of implant displacement

Supporting Data / Figures

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Figure 1: Quantitative analysis of disc height index and MRI. Compares the TE-IVD to the discectomy condition at different lengths in time. Data demonstrates that the TE-IVD had greater height index, a higher NP Voxel Count, and a higher NP T2 Relaxation Time which indicates the implant was well hydrated within the body.
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Supporting Data / Figures

**Figure 2:** X-ray and histology of adjacent motion segment, discectomy, and TE-IVD at 4 and 16 weeks. The TE-IVD implant showed clear vertebral separation and abundant staining with Safranin O, demonstrating proteoglycan-rich tissue with distinct morphological features of nucleus pulposus (NP) and annulus fibrosus (AF).

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