

AO Spine Research Network: Global Collaboration to Address Disc Degeneration and Regeneration

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Background and Rational:

Degeneration of the disc has been implicated as a principal factor in the onset of debilitating back pain and consequent limitations on daily activity. Surgical treatments to either fuse the affected segment, or to preserve motion through the use of mechanical implants, are not the ultimate solution to the problem. Attention has shifted to the biological restoration of the degenerated disc. The Spine Research Network (SRN) was established by AOSpine to draw together the multidisciplinary expertise of several leading research institutions to pursue a common scientific goal. The projects of the SRN are closely aligned with the AO clinical priority of "Degeneration and Regeneration of the Intervertebral Disc". The SRN's overall objective is to investigate the pathogenic mechanisms of disc degeneration and to develop long-term biological or non-biological treatments which preserve spinal motion and eliminate pain.

Program:

The current projects of the SRN emphasize the importance of the underlying biological mechanisms. The group is working on bioreactor design and tissue preparation methods for functional ex vivo studies of whole discs, for example, to improve the understanding of nutritional demands and limitations in the degenerating disc. In vitro studies and computer simulations are employed to characterize the

intradiscal transport mechanics of relevant nutrients, cytokines and therapeutic agents.

Projects are underway to better understand the processes of disc inflammation and pain development. The ingrowth of blood vessels and nerve fibers is being studied as a potential source of disc-related pain. The effect of age-related accumulation of specific proteins which play a role in the inflammatory cascade is being investigated.

To progress towards the production of engineered disc tissue for the biological restoration of disc function, the use of stem cells is being evaluated. Genes which are most suitable as markers of disc cell phenotype have been identified and will be evaluated to demonstrate the specificity of the cultured tissue. To provide an appropriate biological and mechanical environment for tissue engineering, a variety of scaffold materials are being studied.

The SRN draws together expertise crossing the boundaries of multiple disciplines to address the treatment of disc disorders by employing a strategy which focuses on the underlying biological processes which drive the degenerative processes, and which are required to support a regenerative treatment.

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