



Biology of intervertebral disc aging and degeneration: involvement of the extracellular matrix

Spine 2004;29:2691-9

Roughley PJ.

Genetics Unit, Shriners Hospital for Children, Montreal, Quebec, Canada.  
proughley@shriners.mcgill.ca

**STUDY DESIGN:** A review of current knowledge and opinions concerning the biologic changes that take place during development, maturation and degeneration of the intervertebral disc. **OBJECTIVE:** To provide an overview of the changes that occur in structure and composition of the extracellular matrix of the intervertebral disc and to explain the origin of such changes and their functional consequences. **SUMMARY OF BACKGROUND DATA:** The structure of the intervertebral disc, and, in particular, the composition of its extracellular matrix, changes throughout life, ultimately resulting in tissue degeneration in the adult. **METHODS:** A review of the published scientific literature. **RESULTS:** In the young disc, the outer anulus fibrosus and inner nucleus pulposus have clear physical and molecular properties, although these differences become less distinct in the adult. The age changes are due to variations in both the abundance and structure of the macromolecules, particularly aggrecan, and the structural variations may be due to changes in both synthesis and degradation. It is not clear how many of the changes are by design to adapt to the altered environment of the growing spine. However, it is commonly thought that the degradative changes are detrimental to disc function, a property that is exacerbated by the inability of the mature avascular disc to remove and replace accumulated degradation products. The rate at which these detrimental changes occur may vary between individuals because of genetic, biomechanical, and nutritional differences. Such changes are thought to form the basis of tissue loss associated with disc degeneration.

**CONCLUSION:** Changes in intervertebral disc structure throughout life ultimately result in tissue degeneration and the need for medical intervention. Current research is aimed at trying to restore the integrity of the degenerate disc matrix by biologic means, although at present it is not clear what the structure of the most appropriate repair tissue should be or how it can be achieved.

PMID: 15564918 [PubMed - indexed for MEDLINE]