Annulus fibrosus and nucleus pulposus tissue: cellular distribution and glycosaminoglycans content

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Currently there is a great interest in developing new therapies to address degeneration of the intervertebral disc due to the association of this degeneration with low back pain. Before being used in humans, any potential new therapies should be tested in model systems, either in vitro or in vivo. Bovine tail discs have been developed as a suitable model for many in vitro studies of the intervertebral disc, having similar physic-chemical properties to the human disc. Knowing that a degenerative disc disease causes a progressive dehydration and early loss of proteoglycans in the nucleus pulposus, in this work, we investigated 10 bovine intervertebral discs for the distribution and quantification of glycosaminoglycans sulfated by DMMB and electrophoresis methods. The hyaluronic acid content was determined by a fluorescence assay noncompetitive. The cell density was investigated by an ultrasensitive fluorescent nucleic acid stain for quantifying double-stranded DNA (dsDNA) using the PicoGreen® assay kit. Biochemical analysis demonstrated increased glycosaminoglycan and hyaluronic acid content on nucleus pulposus as compared to annulus fibrosus allowing influx of solutes into the intervertebral disc and hydration in different intervertebral disc areas in relation to proximity of vascular region and the terminal plate. The decrease in cell density observed in the region of the nucleus pulposus compared to the annulus fibrosus may be related to cellular nutrition that is dependent on blood supply, diffusion capacity of the matrix, cell density and viability of these regions.

Word Keys: Cellular density, glycosaminoglycans, hyaluronic acid, intervertebral discs.

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