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Author(s)	Chen, YF; Zhang, YZ; Wang, HQ; Liu, ZH; Zhang, WL; Wan, ZY; Sun, Z; Zhu, S; Samartzis, D; Wang, CM; Luo, ZJ
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NOVEL INSIGHTS INTO THE HALLMARKS OF HUMAN NUCLEUS PULPOSUS CELLS WITH PARTICULAR REFERENCE TO CELL VIABILITY, PHAGOCYTTIC POTENTIAL AND LONG PROCESS FORMATION

Yu-Fei Chen¹, Yong-Zhao Zhang¹, Hai-Qiang Wang¹, Zhi-Heng Liu¹, Wei-Lin Zhang¹, Zhong-Yuan Wan¹, Zhen Sun¹, Shu Zhu¹, Dino Samartzis², Chun-Mei Wang¹, Zhuo-Jing Luo¹

¹ Department of Orthopaedics, Xijing Hospital, Fourth Military Medical University, Xi'an, China;

² Department of Orthopaedics and Traumatology, University of Hong Kong, Pokfulam, Hong Kong, SAR China

INTRODUCTIONS: As a main cellular component within the disc, nucleus pulposus (NP) cells play important roles in disc physiology. However, little is known on the biologic hallmarks of human NP cells. Therefore, the present study aimed to address the features of human NP cells.

METHODS: Human NP samples were collected from normal donators, patients with scoliosis and disc degeneration as normal, disease control and degenerative NP, respectively. The NP samples were studied using transmission electron microscopy and TUNEL assay. Pre-digested NP samples were studied using flow cytometry with PI/Annexin V staining.

RESULTS: Both control and degenerative human NP consisted of mainly viable cells with a variety of morphology. Both necrosis and apoptosis were noted in human NP as forms of cell death with increased apoptosis in degenerative NP, which was further confirmed by the TUNEL assay. Phagocytic NP cells had the hallmarks of both stationary macrophages with lysosomes and NP cells with the endoplasmic reticulum. Annulus fibrosus cells have similar morphologic characteristics with NP cells in terms of cell nest, phagocytosis and intracellular organs. Moreover, NP cells with long processes existed in degenerative and scoliotic NP rather than normal NP. When cultured in glucose-free medium, NP cells developed long and thin processes.

DISCUSSION: Human degenerative NP consists of primarily viable cells. We present direct and in vivo evidence that both human annulus fibrosus and NP cells have phagocytic potential. Moreover, NP cells with long processes exist in both scoliotic and degenerative NP with lack of glucose as one of the possible underlying mechanisms.