Whether reactive oxygen species plays a critical role in intrinsic (mitochondrial) pathway-mediated apoptosis in notochordal cells under high glucose concentrations?

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Dear Editor,

We have read the article “Dose- and time-dependent effect of high glucose concentration on the viability of notochordal cells and expression of matrix degrading and fibrotic enzymes” by Park et al. with great interest [1]. First of all, we would like to congratulate the authors for an excellent study. However, one question from the mechanism by which diabetes mellitus affects intervertebral disc degeneration should be taken into account in our minds. We want to know whether the authors had measured the intracellular levels of reactive oxygen species (ROS) in notochordal cells under high glucose concentrations? Because ROS may be a new target for the prevention and treatment of diabetic patients with degenerative disc diseases.

First, high glucose (HG) is the underlying factor contributing to long-term complications of diabetes mellitus [2]. Recent studies show that biochemical pathways with elevated glucose concentrations can generate excessive levels of ROS. As the level of ROS was high in the hyperglycemia environment, oxidative stress may be increased. Mitochondria are the main source of ROS, and are the most sensitive position for the ROS' effects. ROS can lead to the oxidative stress towards mitochondria, and further induce the cell apoptosis. In the study, the authors found that diabetes mellitus enhances apoptosis of notochordal cells via the Fas type2-mediated intrinsic (mitochondrial) pathway, cytochrome c release from mitochondria, that triggers caspase activation. Although, Fas inhibitors were not investigated as a control group in the study and it is unknown whether ROS concentrations decrease or increase following exposure to high glucose conditions in

notochordal cells. Therefore, we are interested to know whether ROS plays a critical role in intrinsic (mitochondrial) pathway-mediated apoptosis in notochordal cells under high concentrations.

Second, recent studies suggest that ROS-induced oxidative stress plays an essential role in disc degeneration. Kim et al. [3] found that oxidative stress caused apoptosis of rat notochordal cells via both intrinsic and extrinsic pathways. Nasto et al. [4] found that mitochondrial-derived reactive oxygen species play a causal role in age-related intervertebral disc degeneration.

Third, antioxidants may be a novel treatment option for disc degeneration. Recent studies have shown that ferulic acid (FA) [5] and resveratrol possess excellent antioxidant and anti-inflammatory properties, can treat nucleus pulposus cells from the damage caused by oxidative stress and may have considerable promise in the treatment of disc degeneration. Meanwhile, many antioxidants such as N-acetylcysteine, α -lipoic acid and vitamin C are effective in reducing diabetic complications.

To summarise, it is important for us to define the relationship between ROS and the low viability of notochordal cells caused by high glucose concentrations. Antioxidants may be a novel treatment option for diabetic patients with degenerative disc diseases. Park Eun-Young and his colleagues please comment? Warm regards to the authors, and once again congratulations on their research.

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