

Rapamycin Removes Damaged Mitochondria and Protects Human Trabecular Meshwork (TM-1) Cells from Chronic Oxidative Stress

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Glaucoma is a chronic optic neuropathy that could lead to permanent vision loss. Primary open-angle glaucoma (POAG) is the most common type of glaucoma, with elevated intraocular pressure (IOP) as a major risk factor. IOP is mainly regulated by trabecular meshwork (TM), an important component of the conventional aqueous humor (AH) outflow pathway. TM cells are constantly subjected to oxidative stress. Long-term exposure to oxidative stress has been shown to cause elevation of AH outflow resistance, leading to higher IOP.

In this study, we induced chronic oxidative stress in human trabecular meshwork (TM-1) cells with 1 μ M rotenone and investigated the levels of reactive oxygen species (ROS), autophagy, and mitochondrial functions. Protective effects of rapamycin, an inducer of autophagy, were also investigated. Our data indicated that rotenone significantly increased oxidative stress, but not autophagy, in TM-1 cells. Rapamycin at 10 nM effectively suppressed the rotenone-induced cell apoptosis, as well as the ROS elevation. The protective effects of rapamycin could be associated to the induction of autophagy and removal of damaged mitochondria in TM-1 cells. Our results suggest autophagy has important roles in protecting TM-1 cells from oxidative stress, which could be further developed into a novel treatment to POAG.

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