DNA oxidation damage and expression of the DNA repair enzyme OGG1 in organ-cultured human conjunctival epithelial cells

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Background: Loss of corneal transparency, often resulting from overwhelming cellular and molecular stress, is a leading cause of blindness worldwide. Restoration of vision commonly relies on transplantation of full-thickness or lamellar donor corneal tissue. Prior to transplantation, donor tissue is preserved either under hypothermic conditions or in organ culture in eye banks. However, organ culture represents a non-physiological environment that may promote oxidative stress and associated DNA damage in ocular surface cells.

Aim: To investigate oxidative DNA damage and the expression of the DNA repair enzyme 8-oxoguanine DNA glycosylase-1 (OGG1) in organ-cultured human conjunctival epithelium.

Methods: Human corneoscleral tissue was obtained from residual rings following penetrating keratoplasty or automated Descemet's stripping endothelial keratoplasty and maintained in organ culture. Conjunctival samples were fixed, embedded, and analyzed by immunohistochemistry for 8-oxo-7,8-dihydroguanine (8-oxoG) and OGG1. *OGG1* gene expression was further assessed using RNA *in situ* hybridization (ISH). All procedures adhered to the Declaration of Helsinki and were approved by local ethics committees.

Results: Immunohistochemical analysis demonstrated detectable levels of 8-oxoG in conjunctival epithelial cells following organ culture, indicating the presence of oxidative DNA damage. OGG1 protein expression was observed throughout the epithelial layers.
Consistently, RNA ISH demonstrated *OGG1* gene expression throughout the conjunctival epithelium, confirming active transcription.

Conclusions: Organ culture conditions are associated with DNA oxidation damage in human conjunctival epithelial cells. Importantly, these cells retain the capacity to express the DNA repair enzyme OGG1 at both gene and protein levels. This suggests that conjunctival epithelium maintains an active defense mechanism against oxidative stress during storage, which may be relevant for tissue preservation and *ex vivo* epithelial cell expansion.

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