The Functional Significance of Baicalein in Regulating Aqueous Humor Secretion

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Background and Aims
Baicalein is a flavonoid derived from the root of Scutellaria baicalensis. It is frequently found in plants and has been widely used in Chinese herbal medicine. Recently, baicalein has been found to protect retinal ganglion cells from oxidative damage, suggesting its potential significance in glaucoma therapy. In addition, baicalein has been shown to regulate ion secretion in several epithelial cells. The aims of this study are to determine whether baicalein (1) affects the Cl⁻ and fluid transport across the excised ciliary epithelium and (2) inhibits the aqueous humor formation rate using arterially-perfused in-vitro eye.

Methods
Fresh porcine ciliary body/epithelium preparation was excised and mounted in a custom-made chamber for the simultaneous measurement of transepithelial electrical parameters and fluid movement. The measurement of aqueous humor formation rate was determined based upon the rate of fluorescein dilution in the anterior chamber of the arterially-perfused eyes.

Results
In excised ciliary epithelium, addition of 100µM baicalein to the aqueous surface caused a simultaneous inhibition of both Cl⁻ and fluid transport into the eye, potentially reducing the rate of aqueous humor secretion. Consistent with this hypothesis, baicalein significantly reduced the rate of aqueous humor formation when added to the anterior chamber of the perfused eye. The baicalein-induced effects were possibly mediated by the inhibition of Cl⁻ channels in non-pigmented ciliary epithelial cells.

Conclusions
Our results show that baicalein reduces the Cl⁻ and fluid secretion across the ciliary epithelium, thereby slowing the rate of aqueous inflow. This finding supports the potential role of baicalein in glaucoma treatment.

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