Editorial

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Published online: 13 April 2011
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I asked Suso Pintor about 12 years ago to come up with an explanation about why lens cells in the eye contain such high levels of adenosine 5'-triphosphate (ATP). He has at last come up with a hypothesis which I think is worth sharing with you in the following commentary.

The lens is particularly vulnerable to volume change and swelling (which probably results in the release of ATP), which causes opacification and cataract. Furthermore, an increase in intraocular pressure releases ATP into the anterior chamber of the eye, and it was suggested that the elevated ATP may contribute to the extreme pain experienced by patients with both closed- and open-angle glaucoma [1, 2]. Levels of ATP are decreased significantly in the lenses of the UPL rat, a cataract model, and it was suggested that the ATP decrease is associated with cataract development [3]. The embryonic lens has been shown to promote eye development and plays a central role in cave fish eye degeneration [4]. Perhaps released ATP is involved? Both P2X and P2Y receptor subtypes have been shown to be expressed on lens cells. P2Y₁ and P2Y₂ receptor mRNA was shown to be expressed on cortex fibre cells [5] and later also P2Y₄ and P2Y₆ receptor subtypes were identified on epithelial cells and peripheral fibre cells of the rat lens [6–8]. RT-PCR and Western blot analyses showed mRNA and protein for P2X1–7 receptors in the lens. Immunohistochemistry showed P2X1 and P2X7 receptor expression predominately in the cytoplasm of cortical fibre cells. P2X2 receptor expression was confined

to the apical–apical interface between epithelial and fibre cells. P2X3, P2X4, P2X5 and P2X6 receptors were expressed throughout the lens from the outer cortex through to the core and were membrane located [9]. It was speculated that the differential expression of P2X receptors on the ocular lens is involved in the maintenance of lens homeostasis. It has been shown that there is P2 receptor-mediated inhibition of connexin-43, a gap junction protein, which mediates cell communication between lens epithelial cells and this suggests that this mechanism of regulating connexin-43 may play a role in maintaining the microcirculation that is essential for the movement of water and solutes in the intact lens [10]. The presence of P2 receptors, which, when occupied, increases [Ca²⁺]_i, leading to modulation of growth of lens cells [11], perhaps representing a feedback mechanism for ATP release.

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