

Program#/Poster#: 1241/B52
Abstract Title: Acetazolamide, a carbonic anhydrase inhibitor, interferes with compensation to lens-induced defocus in chicks.
Presentation Start: Monday, Apr 26, 2004, 8:30 AM -10:30 AM
Location: Hall BC
Reviewing Code: 115 animal models: emmetropization – AP
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Keywords: 503 emmetropization,554 intraocular pressure,505 enzymes/enzyme inhibitors

Purpose: Emmetropization can be demonstrated experimentally using defocusing lenses; chick eyes show compensatory changes in both the choroid and sclera (axial length), opposite for positive and negative lenses. We investigated whether acetazolamide (ACZ), a nonselective carbonic anhydrase inhibitor, could inhibit one or more of these changes. These changes are mediated largely locally by the retina, with the retinal pigment epithelium (RPE) playing a critical role in signaling between retina and choroid/sclera. Carbonic anhydrase is involved in the regulation of pH gradients and fluid transport, influencing both IOP (via the ciliary epithelium, CA-II) and retina-choroid signaling (RPE; CA-IV).

Methods: Ten day-old chicks were fitted with either +15D or -15D lenses over one eye (T); the contralateral eye served as the control (C). Chicks received either 100mg/day ACZ or vehicle (dimethyl sulfoxide, DMSO) in two divided doses orally for 5 days. Treatment effects were measured at baseline and after 5 days of treatment using high frequency A-scan ultrasonography. Lens treatment effects were assessed in terms of interocular differences. Intraocular pressure (IOP) was measured using a Tonopen, day 5 measurements were made 3 hours after the last ACZ/DMSO dose. Data were analyzed by ANOVA followed by Tukey-Kramer post-hoc test and are reported below as Mean \pm SEM

Results: Lens-induced changes in internal axial length (IAL) and choroidal changes were significantly altered by ACZ (see table). ACZ treated-birds showed a significantly larger fall in IOP (baseline-day5) compared to DMSO-treated birds.

Treatment	N	Δ Choroid (mm, T-C)	Δ IAL(mm, T-C)	Δ IOP(mmHg, T)
DMSO/-15 D	10	0.048 \pm 0.062	0.192 \pm 0.059	-3.20 \pm 1.35
ACZ/-15 D	11	-0.031 \pm 0.033	0.157 \pm 0.052	0.48 \pm 0.61
DMSO/+15 D	8	0.406 \pm 0.044	-0.053 \pm 0.041	1.19 \pm 1.41
ACZ/+15 D	12	0.187 \pm 0.024	-0.216 \pm 0.032	3.65 \pm 0.82

Conclusions: ACZ interferes with the compensatory axial length and choroidal responses to lens-induced defocus. To distinguish between a RPE and ciliary epithelium location for these effects, further studies are underway using a CA-IV selective inhibitor.

Commercial Relationship: C.F. Wildsoet, None; P. Mathur, None; G.K. Wong, None.

Grant Identification: NEI Grant RO1 EY012392-04