

THE EFFECT OF ACETAZOLAMIDE ON INTRAOCULAR PRESSURE
AND AQUEOUS HUMOR COMPOSITION IN ALEWIVES (ALOSA PSEUDOHASENGUS)

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Past studies (Bull. MDIBL 25:12-13, 1985) have shown that acetazolamide at 1 and 5 mg/100 gm (IP) will lower intraocular pressure (IOP) in alewives. The purpose of this study was to determine the effect of acetazolamide on the chemical composition of aqueous humor. Alewives were taken from the Union River at Ellsworth, Maine, and were kept at the laboratory in running seawater. The weight of the alewives ranged from 110 to 246 gm. The alewives were MS-222 anesthetized and the IOP was measured with a pneumatograph with the actual IOP determined from a standard curve. Acetazolamide 5 g/100 gm was injected IP and after 24 hours the IOP was measured, blood was drawn from the tail vein, and the aqueous humor was removed from the anterior chamber.

Plasma and aqueous humor pH, TCO_2 , Na^+ , K^+ , Cl^- , and osmolality were determined. The measured values following acetazolamide treatment were compared to a control group of 0.9% NaCl injected fish. The results of these studies are listed in the Table and show that the IOP decreases from 15 to 9.58 mmHg following acetazolamide treatment.

Effect of Acetazolamide (5 mg/100 gm IP) on Plasma and Aqueous Humor
in Alewives (Alosa Pseudohasengus)
mean \pm SE

| | pH | Total CO_2 mM | PCO_2 * mmHg | AqH TCO_2 / Plasma TCO_2 | IOP mmHg | Na^+ mEq/l | K^+ mEq/l | Cl^- mEq/l | mOsm |
|-------------------------------------|--------------------------|---------------------------|--------------------------|---|-------------------------|------------------------|-----------------------|------------------------|----------------------|
| <u>Control</u> | | | | | | | | | |
| Plasma | 7.39 \pm .04** (14) | 9.57 \pm .49 (15) | 9.03 | 1.20 \pm .04 (10) | --- | 181 \pm 3.1 (6) | 5.01 \pm 0.3 (6) | 147 (2) | 378 \pm 6.1 (6) |
| Aq. Humor | 7.82 \pm .06 (7) | 11.71 \pm .74 (12) | 3.96 | | 15.0 \pm .23 (54) | 184 \pm 2.8 (6) | 3.14 \pm 0.1 (6) | 140 (2) | 352 \pm 1.2 (6) |
| <u>24 hours after acetazolamide</u> | | | | | | | | | |
| Plasma | 7.31 \pm .03 (10) | 16.57 \pm 1.33 (9) | 18.6 | 0.61 \pm .05 (7) | --- | 209 \pm 3.2 (8) | 4.9 \pm 0.5 (8) | 174 \pm 4.7 (8) | 398 \pm 3.2 (8) |
| Aq. Humor | 7.37 \pm .04 (6) | 10.13 \pm 1.16 (11) | 9.99 | | 9.58 \pm .99§ (16) | 230 \pm 5.8 (8) | 4.2 \pm 0.3 (8) | 186 \pm 4.4 (8) | 414 \pm 8.9 (8) |

* Determined from data for pK and solubilities for teleost blood from Boutilier et al., 1984 (Fish Physiol. Vol. X, Part 1).

** Indicates a stressed fish from handling.

§ Significantly different from control, $p < 0.001$.

() Number of fish.

Following acetazolamide, both the plasma and aqueous humor have a marked increase in the PCO_2 which is further reflected in the decreased ratio of aqueous humor TCO_2 to plasma TCO_2 . Also associated with the acetazolamide induced changes is an increase in both plasma and aqueous humor sodium, chloride, and osmolality. It is interesting to note that the drug effect causes changes in both fluids.

These studies suggest that carbonic anhydrase in the iris-ciliary body is inhibited by the above acetazolamide treatment and could account for the decreased IOP. That we could show no significant decrease in aqueous humor TCO_2 at 24 hours suggests that acetazolamide inhibits HCO_3^- and fluid secretion together and is reflected in the measured decrease in IOP. (This research was supported in part by NIH grants R01 EY00933 and P30 ES01985.)