EFFECTS OF METAL ION ON CORNEAL DEVELOPMENT IN THE EYE OF THE CLEARNOSE SKATE (RAJA EGLANTERIA)

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The cornea of vertebrates resembles a crystal in clarity and regular structure. Corneal transparency, a physically precise marker of tissue differentiation, arises from the macromolecular orderliness with which the extracellular matrix of the stroma is constructed during embryonic development. The paracrystalline regularity of the collagen and proteoglycan components of the stroma provides an opportunity to determine the effects of metabolic perturbants on extracellular matrix polymerization and tissue differentiation.

Previous work by Coulombre and Coulombre (1975. Develop. Biol.45:291-303) had indicated that transient perturbation of collagen or proteoglycan biosynthesis in ovo could be detected by the polymerization of one or more layers of randomly oriented extracellular matrix in the developing chick corneal stroma. Some metal ions, selenate in particular, have been shown to inhibit the sulfation of proteoglycans during their biosynthesis. In the present study, we sought to determine if exposure of a developing vertebrate embryo to selenate would result in detectable alteration in corneal development.

Embryos of the clearnose skate, Raja eglanteria, were incubated in seawater containing 1-2 mM selenate for one week at 20°C, then fixed, embedded and sectioned for immunohistochemistry and electron microscopy. Initial results indicate that, first, corneas of control and selenate-treated embryos are transparent. Second, the polysaccharide characteristic of vertebrate corneas, keratan sulfate type I, is present in both normal and selenate-treated corneas during the latter half of embryonic skate development and is present in the adult cornea of this skate species. Third, the corneas of both normal and selenate-treated embryos display stromas whose ultrastructure appears roughly normal in numbers of stromal plies of collagen fibrils. Fourth, however, present data indicate that selenate treatment causes deposition of at least one stromal ply of less than normal thickness. Further analyses of these corneas are in progress.

This research was supported by a grant to G.W.C. from NASA-BioServe (NAGW-1197) and by a grant to C.A.L. from Walt Disney Imagineering (88M-594), in connection with the Living Seas.