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Glycosaminoglycan fractions in the cornea of two fishes

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Four glycosaminoglycan fractions – chondroitin 4-sulphate, chondroitin 6-sulphate, keratan and dermatan sulphates were isolated from the cornea of fishes: *Cyprinus carpio* and *Stromateus argenteus*. Glycosaminoglycans are essential for the maintenance of corneal structure and function.

GLYCOSAMINOGLYCANS (GAG) and their various fractions have been reported in the cornea of some higher vertebrates¹. But studies on the various fractions of GAG and their significance in the cornea are yet to be reported though the corneal transparency and its consistency plays a significant role in photo-adaptation in aquatic medium. However, polysaccharide composition of corneal glycoprotein in a few fish has been reported and some interesting roles have been attributed to them^{2,3}. Here we report the occurrence of various fractions of GAG and their possible significance in the maintenance of corneal structure of common carp, *Cyprinus carpio* and pomfret, *Stromateus argenteus*. The fishes are from two habitats, the former is a freshwater fish while the latter is a marine one.

Histochemical preparations of cornea exhibited positive metachromatic reactions in both the cornea

when stained with toluidine blue and paraldehyde fuchsin⁴ but the reaction was a little weaker in the marine fish. The sections, when stained with PAS became purple. Alcian blue reaction indicated the presence of sulphated glycans⁴. GAG from each cornea was extracted for qualitative and quantitative estimation. Electrophoretic and chromatographic analysis of the extracted GAG confirmed the occurrence of the fractions – chondroitin 4-sulphate, chondroitin 6-sulphate, keratan sulphate and dermatan sulphate^{5,6}. Quantitative estimation indicated proportionately more GAG in pomfret cornea. Each extract was further hydrolysed and analysed chromatographically to detect various sugar components⁷. The sugars identified from their Rf values were glucose, galactose, mannose, fucose and xylose.

GAG, thus detected in the cornea may play a significant role in visual excitation since they act as selective ion barriers⁸. The transparency and elasticity of cornea is regulated by GAG¹. Further GAG fractions may be responsible for the determination of consistency of cornea, since the cornea of pomfret is much thicker than the carp cornea, that is, active thickness control is influenced by GAG by filling the corneal interfibrillar spaces and repelling water since cornea of pomfret shows relatively weak metachromasia. This is because metachromasia is dependent on hydration and pH^{9,10}. We have also observed this phenomenon in carp cornea. Thus it is obvious that pomfret cornea is strongly hydrophobic. In this context, it is worth mentioning that hydration and dehydration are limiting factors in aquatic medium, and the various GAG fractions probably play a crucial role in maintaining corneal structure and its osmolarity in aquatic domain.

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