

EFFECT OF HYPERKALEMIA ON $[K^+]$ OF VENTRICULAR AND EXTRADURAL FLUIDS

Animal	Time after beginning KCl infusion, hr	$[K^+]$, meg/kg H_2O		
		PL	Vf	EDF
#9	0	4.4		
	3	10.0	3.9	
#22	0	5.4		
	3	13.0	3.9	3.9
#18	0	3.7		
	2	8.2		
	4	8.0		
	8	5.4	3.5	4.5
#23	0	3.9		
	8	8.7	3.8	5.5

Hyperkalemia was produced in four fish by infusing 3% KCl into a caudal vessel. Results, shown in the table, demonstrate regulation of VF $[K^+]$ in the dogfish. Large increases in plasma $[K^+]$ produced only small increases in VF concentration. However, $[K^+]$ of EDF rose significantly after eight hours of hyperkalemia suggesting that $[K^+]$ of this fluid is not regulated. The delayed increase in EDF $[K^+]$ is consistent with results of other studies (Zubrod and Rall, J. Pharm. Exptl. Therap. 125:194-97, 1959) in indicating a slow rate of material exchange between plasma and EDF.

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1966 #13

FINE STRUCTURE AND SALT REGULATION

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A potassium antimoniate reagent has recently been introduced for electron microscopic localization of sodium. Despite theoretical limitations there is an enhanced precipitation at certain membrane sites following ouabain poisoning of tissues normally active in sodium transport.

A series of experiments has been carried out with Fundulus heteroclitus and Squalus acanthias to explore this reaction and tissues have been prepared for subsequent electron microscopic study.

Fundulus were carefully and slowly adapted to fresh water for comparison with sea water conditions in the gill. Specimens in both conditions were prepared as normal and ouabain poisoned specimens for examination of fine structure.

Squalus rectal gland was prepared as dissected from intact normal and ouabain poisoned fish and also as prepared from tissue slices which had been incubated in chilled, gassed Hogbans solution with and without added ouabain.

In each case control samples fixed in glutaraldehyde and osmium fixatives were taken for

comparison with material fixed in the antimoniate reagent.

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FINE STRUCTURE OF THE RECTAL GLAND OF Squalus acanthias AFTER INCUBATION OF TISSUE SLICES IN ISOTOMIC AND HYPEROSMOTIC SOLUTIONS

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Slices of the rectal gland of Squalus acanthias were incubated for periods up to 12 hours in chilled Hogben's solution and in solutions with added sucrose or sodium chloride. Experiments on indirect osmometry of the slices done in 1964 showed characteristic shrinkage curves in sucrose solutions and shrinkage followed by swelling in strong sodium chloride solutions. During 1965 similarly treated slices were fixed for electron microscopy after appropriate periods of incubation in chilled solutions gassed with 95% O₂ and 5% CO₂. Subsequent examination revealed that essentially intact fine structure was maintained for several hours with evidence of continuing secretory activity in the control Hogben's solution.

With addition of 0.6 M sucrose the slices shrank to 74% of initial volume after 24 hours. Despite prolonged incubation the fine structure remained intact. There was reduced cell volume and generally increased electron density but evidence of continuing vacuole formation at cell bases.

With addition of sodium chloride two morphologies result, one during shrinkage and another during swelling. During shrinkage there is dislocation and clumping of chromatin granules, clumped cytoplasmic organelles, shrunken and dense mitochondria and decreased cell volume. The lateral cell surfaces become attenuated and narrow and there are changes in the apical terminal web.

Slices immersed in 1.0 M sodium chloride begin to swell 2-5 hours after incubation with deterioration of fine structure. It is clear that previous reports by others of anomalous swelling in such solutions is not an osmotic response of viable cells.

In suitable media, slices of the rectal gland provide favorable material for correlation of fine structure with secretory activity maintaining structural integrity for long periods under a broad range of conditions.

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NEUROSECRETION IN Cucumaria

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Electron microscopic examination of the haemal vessels of this holothurian reveals the presence of nerve strands with axons containing large dense membrane-bounded granules. These are of particular interest since there is only fragmentary evidence of neurosecretion in echinoderms. The nerve strands pass between the cell processes of epithelial cells and are distributed