Electrolyte Transport in Aglomerular Tubules of the Goosefish, Lophius piscatorius.*

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Attention was directed to this biological system because it constitutes the simplest situation in which measurements can be made on the effectiveness of a unicellular membrane in elaborating a fluid from plasma which differs markedly from it in chemical composition.

Determinations of Na, K, Ca, Mg, Cl, SO_4, PO_4, protein, HCO_3, NH_3, pH, titratable acidity, freezing point depression, creatine and trimethylamine oxide were made in urine and plasma samples taken from fish immediately after capture and also during the course of "laboratory diuresis." The undifferentiated renal tubule of this marine teleost acts as a barrier to the movement of univalent ions while its cells actively transport Mg, Ca, SO_4, creatine and trimethylamine oxide. Urine normally is hypotonic to plasma to the extent of 0.1°C. Diuretic urine is isotonic with plasma, and as diuresis progresses there is a gradual rise in the total osmolarity of both plasma and urine, with marked shifts in the electrolyte composition of the latter. Cl immediately floods into urine in concentrations approaching those of the plasma, Na follows more slowly and never reaches 50 per cent of plasma values. K appears only in traces. The urine/plasma concentration ratios of Ca, Mg, and SO_4 remain high, even at the height of diuresis. Creatine and trimethylamine oxide, which in normal urine may contribute more than 50 percent of the total osmolarity, are present merely in traces in diuretic urine.

These results emphasize the fact that active transport across biological membranes cannot be explained in terms of known electrochemical phenomena. Future studies are planned to elucidate the biochemical energy sources which underlie divalent ion transport, and the mechanism accountable for the elimination of trimethylamine oxide and creatine.

In Vitro Studies on the Isolated Renal Tubule

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Preparations were made by placing fragments of the kidneys of the fresh water catfish (*Ameirus nebulosus*) in isotonic saline solutions containing phenol red, following the technique developed by Forster. In the present study individual renal tubules were teased out and an effort was made to trace the passage of the dye along the entire length of the individual tubule. The morphological differentiation of the renal tubule can read-

* This work was supported by a grant from the Rockefeller Foundation.

ily be noted in these preparations and this differentiation was confirmed with supravitally stained tubules and histological preparations.

As shown in previous studies phenol red is actively concentrated in the lumen of the proximal segment of the tubule. When the individual tubule is followed distally the red color seen in the proximal tubule disappears and the distal segment appears colorless, in most observations. Whether this loss of color is due to the acidification (change to yellow) of the dye needs further verification, but in a few instances a yellow tinge has been observed in the distal tubule. The presence of an apparent ciliary current in the tubule was observed; this current should be an aid in transporting the dye to the distal tubule.

These preliminary observations indicate that, when the proper conditions are achieved, a preparation can be made in which the acidification of the urine can be visualized directly in the individual renal tubule under controlled conditions. Such preparations can be utilized in studies on the mechanism of acidification with regard to the effects of salt concentrations, inhibitors, drugs, etc., on this mechanism.

Central Control of Autonomic Function in the Dogfish

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The classical response to stimulation of the mammalian central nervous system above the decussation of the pyramids is contraction of the contralateral muscles. There is a small area in the cerebral cortex with which some investigators have been able to obtain ipsilateral response.

The present investigations were undertaken to study central control of autonomic function in the dogfish. No valid findings were obtained on that point. However, it was noted that stimulation of the tectum produced the forced circling movements of the fish with dorsal fins and tail pointed toward the side of stimulation. This result was regularly obtained when the fish were stimulated with the tail already pointed towards the side of stimulation or with the fish lying in a tank of water perfectly straight. However, occasionally if the tail was already pointed away from the side of stimulation, there would be further contraction of the muscles of the contralateral side.

Similar results were obtained from the cerebellum. However, the threshold of stimulation was considerably lower than at the tectum.

Conclusions from the dogfish: The primary motor response is uncrossed. The highest center for motor control in the dogfish is the tectum. However, the cerebellum is also a motor area, with a lower threshold than the tectum.