1964 #5

FACTORS AFFECTING GILL-PERMEABILITY IN Squalus acanthias

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Using an in vivo gill perfusion technique, we studied urea loss at the dogfish gill: (1) at perfusate temperatures between 1 and 30°C, (4) after urea loading of 33 to 166 mm/kg, and (3) with Na-free and K-free perfusate.

The temperature effect is such that there is no consistent change in gill permeability to urea between 1 and 15°C. Twenty measurements in this temperature range gave a mean and S.D. of 12.2 + 3.04 mg/hr/kg body weight. Above 15°C gill permeability rises markedly. At 19°C the increase in urea loss from the gill is doubled, at 22°C it is 4X, at 25°C 7X, and 30° 10 -50X normal. Survival at 30°C was 25 min in two fish studied.

When blood urea level is elevated by intravenous urea loading urea loss at the gill is increased out of proportion to the increased gradient. Doubling the plasma urea resulted in a twentyfold increase in urea excretion at the gill. Interestingly, this was not accompanied by an increase in body weight. Expressed as gill clearance of urea the normal value of 0.4 cc/hr/kg was increased to 0.9, 1.6, and 4.7 cc/hr/kg by loads of 33, 83, and 116 mm urea/kg respectively.

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RENAL EXCRETION OF MERCURIALS IN THE AGLOMERULAR FISH, Lophius americanus

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Renal tubular handling of mercurial diuretics was studied in order to ascertain whether such compounds could be actively transported across renal tubular cells. Either chlormerodrin-Hg^{203} or mersalyl-Hg^{203} was injected intramuscularly into two separate sites rostral to the kidneys. In most experiments inulin and PAH were injected along with a mercurial. Concentration of mercury appearing in urine collected by means of catheters placed in the bladder or in the ureters was compared to concentration in plasma of caudal vein blood. In the case of chlormerodrin, UHg/PHg averaged 0.49 (Range: 0.30 to 1.07); in the case of mersalyl, UHg/PHg averaged 21.6 (Range: 8.5 to 37.0). The difference between these ratios was highly significant ($p < 0.01$). Only traces of Hg^{203} and inulin were found in urine excreted over a two hour period following injection of chlormerodrin, but PAH was present in large amounts. In three experiments, probenecid did not alter U/P of chlormerodrin-Hg^{203}; in contrast U/P of mersalyl-Hg^{203} was reduced after injection of probenecid from 31.5 to 1.5 in one experiment and from 20.2 to 0.4 in another. These data for mersalyl are reminiscent of those for PAH published by Forster and Hong (J. Gen. Physiol. 45: 811, 1962). Results indicate that the acidic mercurial, mersalyl, is handled by the acid secretory system; the non-acidic mercurial, chlormerodrin, is not transported by this system.