### SIMULTANEOUS XYLOSE AND INULIN CLEARANCES IN THE SCULPIN

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In a previous paper<sup>1</sup> the glomerular activity of a marine teleost, Myoxocephalus octodecimspinosus, was studied by the use of xylose. It has since become evident that in the elasmobranch, dog and man there is some reabsorption of this sugar by the renal tubules, raising doubt as to the validity of the xylose clearance as a measure of glomerular filtration in the teleost. Since evidence has been adduced that there is no secretion, and little if any reabsorption of the polysaccharide inulin in the dogfish,<sup>2</sup> dog<sup>3</sup> and man,<sup>4</sup> comparisons have here been made of the simultaneous xylose and inulin clearances in the sculpin.

The general method of experiment was the same as in our previous studies (1). The average slope of the plasma inulin curve after the intramuscular administration of this substance was determined on 15 fish; this curve was then used to determine the average plasma concentration of inulin by extrapolation from the particular plasma level observed at the end of the period of urine collection in each fish. The ratios of simultaneous xylose and inulin clearances in 8 sculpins were .70, .72, .78, .80, .81, .83, .88 and .95; averaging .81. While the scatter of the data is large, they are confirmatory of the view that a small portion (average 21 per cent) of the filtered xylose is reabsorbed by the tubules in this animal, as in the other animals listed above. No significance is attached to the absolute values of these clearances in this study, since no special care was exercised to maintain a normal urine flow.

#### EXPERIMENTAL PRODUCTION OF DIURESIS IN THE DOGFISH

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In contrast to the sculpin,1 the dogfish rarely exhibits any marked diuresis under ordinary experimental conditions. On the contrary, there is usually a moderate decrease in urine flow shortly after the urinary papilla is cannulated, and thereafter the rate of urine formation is constant until the terminal decline. The adequate

- <sup>1</sup> Clarke, R. W., 1934; J. Cell. Comp. Physiol., 5, p. 73.
  <sup>2</sup> Shannon, J. A., 1934; J. Cell. Comp. Physiol., 5, p. 301.
  <sup>3</sup> Shannon, J. A., 1935; Am. J. Physiol., 112, p. 405.
  <sup>4</sup> Shannon, J. A. and H. W. Smith, 1935; J. Clin. Invest., 14, p. 393.
  <sup>4</sup> Grafilin, A. L., 1931; Am. J. Physiol., 97, p. 602.

glomerular development in the dogfish implies a capacity for high rates of urine formation, and these have actually been observed by Smith<sup>2</sup> in fresh water elasmobranchs.

Injections of thephyldine and salyrgan, which are effective in producing diuresis in mammals under certain conditions, give no increase in urine flow in the dogfish. Phlorizin produces moderate diuresis, possibly in consequence of the osmotic activity of the glucose appearing in the urine. Adrenalin in large doses both induces diuresis and partially blocks the tubular reabsorption of urea, causing in one experiment a 55 fold increase in urea clearance and a change in urine flow from 16 to 75 cc. per kilo per day.

The effect of diluted sea water on renal activity was investigated in six fish, which were kept for 12 hours in 80 per cent sea water and then transferred to 70 per cent sea water. No significant changes were observed in 80 per cent sea water, but the succeeding urine collections in 70 per cent sea water showed a progressive increase in urine flow. The U/P ratio of inulin remained remarkably constant, the inulin clearance rising in proportion to the urine flow. One fish which in sea water had given a flow of 20 and a glomerular clearance of 90 cc. per kg. per day, showed in the second 12 hour period in 70 per cent sea water a urine flow of 61 and an inulin clearance of 272 cc. per kg. per day. The physiological means by which this increase in inulin clearance is effected is unknown.

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#### THE EXCRETION OF URINE IN THE SEAL

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Marine mammals, because they may spend their entire lives in the sea and never have access to fresh water, present an interesting problem in regard to urine formation. The harbor seal, *Phoca vitulina*, Linnaeus, has been examined with special reference to the rate of urine formation, the osmotic pressure and nitrogenous composition of the urine, the excretion of phosphate, chloride, sulphate and magnesium, and simultaneous renal clearances of inulin and creatinine. Urine was collected by catheterization of the female and blood samples were obtained by cardiac puncture.

In the fasted animal the rate of urine formation was relatively low, ranging from 0.06 to 0.1 cc. per minute, in an animal weighing 40 pounds. When a meal of approximately 1000 gr. of fresh herring was fed, the rate of urine formation increased, reaching a maximum of 1 cc. per minute between 4 and 7 hours after the ingestion of the food; during the next 12 to 24 hours the rate fell again to the fasting level. The preponderant nitrogenous constituent in the urine, in both

<sup>2</sup> Smith, H. W., 1931; Am. J. Physiol., 98, p. 279.