than in marine teleosts, while renal plasma flows in fresh water and marine forms are similar. As is true in the frog, low urine/plasma concentration ratios of inulin indicate that relatively little water is reabsorbed by the tubules. Urine flows of 34 animals in good physiological condition were found to vary from 32 to 342 ml per Kg. body weight per day, with an average value of 154 ml/kg/day. This compares with other observations reported in the literature on fresh water fishes as follows: Catostomus, 7-26; Ameiurus, 51-79; Pristis, 250; Salmo, 60-160; Pleuronectes, 24; Petromyzon, 362; Anguilla, 25 (reviewed by Wilkgren, 1953, Acta Zoologica Fennica 71:1). Glomerular filtration rates in the same 34 bullheads ranged from 83 to 582 ml. per Kg. per day with a mean value of 225. Maximal PAH clearances, which would estimate minimal renal plasma flows, were successfully obtained in 3 animals with values of 2630, 2733, and 46.36ml. per Kg. per day. Filtration fractions in these experiments were 0.13, 0.13 and 0.05 respectively. No comparable determinations of filtration rates and plasma flows on other fresh water fishes have been reported in the literature. Compared with mammals, the low glomerular filtration rates in Ameiurus relative to simultaneous renal plasma flows reflect, as in the frog, the non-availability of the renal portal circulation for glomerular perfusion (Forster, 1943, Amer. Jour. Physiol. 140:221). Renal plasma flows in marine and fresh water teleosts and in the frog are roughly comparable. High urine flows and glomerular filtration rates in freshwater teleosts and the frog, relative to non-diuretic marine teleosts, is perhaps an adaptation to the osmotic gradient imposed by the hypotonic environment of the former.

Carbonic Anhydrase Inhibition in the Elasmobranch: Effect on Aqueous Humor and Cerebrospinal Fluid CO₂

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In 12 dogfish (Sq. Acanthias) concentration of total CO₂ in plasma was 7.4 mM/L \pm S.E. of 0.07. Ratio (RAq) of CO₂ conc. in aqueous humor/plasma was 1.2 ± 0.1 Acetazolamide (100 mg. i.v. per fish) lowered RAq in all of 8 fish to 0.72 ± 0.05 . Effect was observed at 30 minutes and lasted at least 6 hours. CO₂ plasma conc. were constant for 2 hours, then rose (Hodler et al. Am. J. Physiol. 183, p.155), but changes in RAq were independent of alterations in plasma CO₂. Carbonic anhydrase was found in ciliary process, iris and retina (but not lens); activity was abolished by acetazolamide *in vivo*. Results suggest that, as in mammals, this enzyme plays a role in CO₂ transfer into aqueous. Similar experiments were done on CSF/plasma for CO₂ which for 6 untreated fish was $1.15 \pm$.05. Acetazolamide produced no observable effect in 30 minutes, but at 2 hours there was a striking *rise* in RCSF to 1.72 ± 0.09 , which persisted for at least 6 hours. Carbonic anhydrase was found in brain; its role may

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be removal of metabolic CO₂ from CNS a process slowed by acetazolamide. N⁵-t-butyl acetazolamide (J. Pharm. Exp. Therap. **117**, p. 385) was used as a control and produced none of the effects reported for acetazolamide. Supported by research grant B-1297 from Nat. Inst. Health.

Drug Transfer from Blood to Brain, Ventricular and Cerebrospinal Fluids of S. Acanthias

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Previous work on the blood-brain and blood-cerebrospinal fluid barriers in the dogfish led to the hypothesis that the fluid surrounding the brain was extradural in position and displayed drug transfer characteristics different from those of brain. To test this conclusion further a direct comparison was made of the rates of appearance and steady state ratios of several drugs in dogfish brain, ventricular and extradural fluids. Sulfadiazine, antipyrine and sulfanilic acid were injected intravenously and samples of blood, extradural fluid, ventricular fluid and brain obtained at intervals. In ventricular fluid sulfadiazine appeared rapidly and reached a fluid/plasma ratio of 0.8-1.10; sulfanilic acid a ratio of 0.13 and antipyrine a ratio of 1.0-1.2. In brain antipyrine was not measured but at 4 hours sulfadiazine reached a brain/plasma ratio of 0.53 and sulfanilic acid 0.17. In extradural fluid all three substances appeared slowly and the 4 hour fluid/plasma ratios were sulfadiazine 0.24, sulfanilic acid 0.26. If diamox was given before sulfadiazine, the final ratio to plasma became greater than 1.0 for ventricular fluid and brain, but was unchanged for extradural fluid. All the observations lead to the conclusion that the extradural fluid of the dogfish resembles a slowly formed dialysate of plasma, rather than true ventricular fluid in its drug transfer characteristics. This has also been shown in limited observation to be true for a cyclostome (P. marinus dosatus) and a marine teleost (G. callarias).

Renal Excretion of Tetraethylammonium in Lophius americanus

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With R. P. Forster and F. Berglund the excretion of an organic base, tetraethylammonium was studied in Lophius. The aglomerular fish rapidly excreted the injected tetraethylammonium in the urine to the extent of 35-66 per cent in 24 hours. In a few experiments the dogfish excreted 10-20 per cent in 17 hours. Simultaneous studies of endogenous creatine and