efflux times the total exchangeable sodium pool within the fish. The exchangeable sodium pool was assumed to be the apparent sodium space times the plasma sodium concentration. Since net sodium uptake was altered by the mercurials (Figure 1), unidirectional influx of sodium must be less in mercury treated animals. The influx of sodium is due in part to the expenditure of metabolic energy therefore it might be hypothesized that the mercurials decrease sodium uptake by interfering with active sodium transport rather than by structural damage to the gill epithelium.

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1972 #42

DYNAMICS OF VENTRICULAR FLUID ABSORPTION IN *Squalus acanthias*

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The existence of bulk absorption of CSF, as well as the dependence of the rate of absorption on CSF pressure, have been demonstrated in the rabbit (Brain 93: 665-678, 1970). It was the purpose of this study to explore the pressure-bulk relationship of ventricular fluid (CSF) absorption in *Squalus acanthias*.

Dogfish were anesthetized with 20 mg/kg of pentobarbital, their gills perfused with running seawater, and their bodies totally immersed in seawater in a small tank. A 20-gauge needle attached to polyethylene tubing was inserted percutaneously into the cerebellar ventricle and its intraventricular placement confirmed by testing with dilute trichloracetic acid for the presence (extradural fluid) or absence (ventricular fluid) of a protein precipitate in the fluid aspirated through the needle. If a bloody aspirate was obtained or if there was evidence of leakage around the puncture site on examination at the end of the experiment results were discarded. Four fish were judged to comply with these criteria. A pipette reservoir filled with dogfish Ringers and Evans blue which served as an indicator for leakage was arranged in such a way that it could be connected either to a calibrated pressure transducer or to the tubing leading into the cerebellar ventricle. The artificial CSF pressure was adjusted by varying the height of the pipette. The pressure transducer was used to determine either the effective artificial CSF pressure head in the reservoir or the intraventricular pressure. The pressures were recorded on a polygraph. At the beginning of each experiment all air was carefully removed from the tubing, the ventricular system was opened to atmospheric pressure to allow for equilibration, and the initial intraventricular pressure ($P_{initial}$) was measured. The artificial CSF was then allowed to run into the ventricular system at a previously determined pressure and the fluid loss from the pipette was measured by regular intervals. After an initial period of fluid flow adjustment the rate of infusion became steady and was assumed to represent the rate of bulk absorption of CSF at that pressure. Several short, preliminary measurements of the rate were made. If the flow was constant for the several preliminary tests, one long measurement of five to seven minutes duration was made and recorded as the bulk absorption rate. After the last period of measurement the infusion was stopped and the infusion pressure ($P_{terminal}$) again read. Each fish was subjected to seven to 13 of such runs. The ΔP's ($P_{terminal} - P_{initial}$) were varied in a random fashion from 4.5 to 26.5

cm H_2O during the entire course of an experiment. Graphs of ΔP versus steady state flow rate were made from the data obtained with each fish.

The bulk absorption capacity of the system is expressed in ml/min per cm H_2O pressure. Since the animals tested showed a linear relationship between ΔP and CSF absorption over the pressure range used in this study, the absorption capacity (or the inverse of the resistance) could be found from the slope of a line drawn by regression analysis through the various data points.

The values (ml/min/cm H_2O) plus the S.D. were: Fish 1 = .0049 $\pm$ .0002; Fish 2 = .0046 $\pm$ .0008; Fish 3 = .0044 $\pm$ .0009; Fish 4 = .0042 $\pm$ .0009: Average = .0042 $\pm$ .0009.

The resistance to bulk absorption of CSF in the dogfish is approximately the same as that reported for the rabbit (Brain 93: 665-678, 1970). This similarity in CSF absorption exists despite marked differences in anatomy between these two species. In mammalian systems CSF flows from the ventricular system into the subarachnoid space and is primarily reabsorbed into the venous blood of the cerebral sinuses through the arachnoid granulations. *S. acanthias* lacks both a subarachnoid space and arachnoid granulations, thus the bulk absorption of CSF in this species must take place via other channels. Postmortem observations of the dye distribution in the animals used in the present study suggest that the cranial nerves and possibly the central canal of the spinal cord serve as pathways for outflow and reabsorption of CSF from the ventricular system of the dogfish.

1972 #43

THE RATE OF CEREBROSPINAL FLUID PRODUCTION IN *Squalus acanthias*

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The rate of cerebrospinal fluid (CSF) production has been measured previously in *S. acanthias* by the steady state dilution of inulin perfused through the brain ventricular system (Comp. Biochem. Physiol. 12: 171-177, 1964). However recent work with mammals suggests that the rates calculated on the basis of the dilution of inulin are spuriously high and that larger, less diffusible markers, e.g., high molecular weight dextran, should be used for CSF production studies (Exp. Neurol. 29: 546-553, 1970). In addition it has been reported that CSF formation is markedly effected by temperature (Exp. Neurol. 27: 101-114, 1970) and blood-CSF osmotic gradients (Physiol. Rev. 51: 273-311, 1971). In the present study a reexamination of the rate of CSF production in *S. acanthias* was made using large molecular weight markers, osmotically balanced perfusion fluids, and tightly controlled temperature conditions.

Dogfish, weighing from two to three kg, were anesthetized with pentobarbital (20 mg/kg), loosely strapped into a trough-like holder, and completely submerged in a box filled with seawater. The gills were perfused by forcing seawater through the spiracles. The temperature of the water in the gill perfusate and the box was maintained at 13-15°C. The inflow and outflow lines, 22 gauge needles attached to polyethylene tubing, were percutaneously placed in one lateral (olfactory) and the cerebellar ventricles respectively. Proper placement of both needles was ascertained by testing