than 1 following injection into the cerebellar cavity of brain. In other words, when these test substances enter brain via blood their concentrations (quantity/gm brain) are higher in the outer slice than in tissue located nearer CSF; whereas, following injection into CSF, concentrations are higher in tissue near the ventricular surface. Unlike mannitol, sulfanilic acid, and inulin, distribution ratios for antipyrine and chloride are 1. Since antipyrine distributes in total brain water and chloride is probably largely extracellular, the data suggest that inner and outer slices of medulla are similar with respect to distribution of fluid between the extracellular and intracellular compartments. Thus, deviation of the observed distribution ratios for mannitol, sulfanilic acid and inulin from 1 can be ascribed to regional differences in the concentrations of these substances within brain fluids, rather than to regional differences in the volumes of fluid compartments of the brain. Concentration gradients have also been observed within dog brain, as test molecules diffused from CSF to brain (Rall et al., Life Sci. 1:43-48, 1962).

These results clearly demonstrate that CSF functions as a "sink" for mannitol, sulfanilic acid and inulin. When given systemically the concentration of each of these substances in brain ECF becomes greater than that in CSF (Table 1) and there is net diffusion from brain into CSF, as evidenced by the concentration gradient within the brain (Tables 1 and 2). In returning substances such as inulin to blood which have leaked across the blood-brain barrier from cerebral capillary blood to brain, CSF is functioning in a manner somewhat analogous to lymph in the peripheral tissue. It seems likely that CSF may also provide a means for transporting polar end products of neuronal and glial metabolism from brain to blood.

Our data also support the conclusion that the blood-brain barrier is not as well developed in lower vertebrates as in mature mammals (Cserr, Fed. Proc. 26:1024-25, 1967). Distribution ratios between brain and blood for sulfanilic acid, inulin and mannitol are considerably smaller in mature mammals than those reported here for the dogfish.

1967 #11

FINE STRUCTURE OF THE RECTAL SALT GLAND IN Squalus acanthias

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Slices of the rectal gland of dogfish were treated for one hour in appropriate incubation media at 5°-10° C and subsequently processed for electron microscopic examination. Previous work (Bulletin MDIBL 6:16, 1966) demonstrated that the procedures provide material favorable for correlation of fine structure with secretory activity and that structural integrity is maintained under a broad range of experimental conditions.

Osmotic and specific ionic conditions were varied during incubation and the slices were processed by histochemical methods for electron microscopy. Localization of the sodium precipitable by potassium antimonate, the localization and changes in ATP-ase activity and the morphology of the cytomembranes are of primary concern. The nature of the epicytoplasmic space (middle compartment of Curran and Kaye) will be explored on the basis of experiments with lanthanum and ruthenium red as particulate tracers applied following incubation. It is hoped that the results of these experiments will help resolve some of the controversy concerning the significance of the morphology of the lateral and basal cytomembranes in this and related organs involved in salt and water transport.

Additional materials prepared for subsequent electron microscopic examination include spiral valve, gall bladder and spleen of Squalus and the lower intestine of Fundulus.

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1967 #12

BULK FLOW BETWEEN THE CEREBELLUM AND THE CEREBELLAR VENTRICLE FLUID IN Squalus acanthias

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The brain ventricular system of Squalus acanthias consists of two lateral ventricles in the olfactory lobes, a third ventricle in the midbrain, a fourth ventricle in the medulla, a cerebellar ventricle, and an optic lobe ventricle. All ventricles are communicating, thus allowing a free flow of ventricular fluid between them. The lateral, third, and fourth ventricles contain choroid plexus tissue; the cerebellar and optic lobe ventricles are devoid of such tissue. If the cerebellar ventricle can be isolated from the ventricular fluid circulation by occluding its connection to the ventricular system, it would be possible to study the transport of material between the ventricular fluid of the cerebellum, the cerebellum, and the blood uncomplicated by the presence of the choroid plexus.

Several methods were tried to obstruct the flow of ventricular fluid into the cerebellar ventricle. All methods were checked for effectiveness by injecting small amounts of fluorescent dye into the lateral and/or fourth ventricles and examining the cerebellar ventricular fluid for fluorescence. The best blockage was obtained by injecting latex into the aqueduct between the third and fourth ventricles via an opening in the optic lobes.

By placing inflow and outflow cannulae into the cerebellar ventricle after blocking the opening with latex, a perfusion system was set up. Using a C^{14}-inulin dilution technique in this system, it is possible to detect and estimate bulk flow of fluid between the cerebellum and its ventricle. The results from one experiment (six determinations) indicated little or no volume flow from the cerebellum into the cerebellar ventricle (0.04 μl/min. ± 0.05 = mean flow rate ± standard error of the mean). Oppelt, Patlak, Zubrod, and Rall (Comp. Biochem. Physiol. 12:171-77, 1964) measured a total ventricular fluid production rate for Squalus of 4 μl/min. It appears that the principal site (or sites) of ventricular fluid production is (or are) not located in the cerebellum.

NITROGEN METABOLISM IN FISH: BLUTAMATE DEAMINATION AND AMINO ACID TRANSDEAMINATION BY EEL (Anguilla rostrata) LIVER MITOCHONDRIA

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Crude homogenates of eel liver were previously demonstrated to deaminate glutamate and transdeaminate alanine (McBean, Neppel, and Goldstein, Comp. Biochem. Physiol. 18:909, 1966). We extended these observations to isolated liver mitochondria in this study. Mitochondria were