

THE DISTRIBUTION OF GLUCOSE IN THE DOGFISH

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It has been suggested that glucose is significantly lower in cerebrospinal fluid than in plasma in dogs and man. The mechanisms of this difference are obscure. Therefore, the distribution of glucose between plasma, ventricular fluid (VF), extradural fluid (EDF) and pericardial fluid (PF) was studied in the dogfish, S. acanthias. Glucose was determined by a specific glucose oxidase method. In fasted fish, average plasma glucose concentration was 98 mg%, and there was 89 mg% in VF, 80 mg% in EDF and only a trace in PF. In freshly caught fish plasma glucose was 50-60 mg% with slightly lower levels in VF and EDF. Five grams of glucose were injected intravenously into 11 dogfish. After one hour plasma glucose ranged from 500-1000 mg%, and subsequently disappeared from the blood with a half-time of 7-8 hours. VF glucose rose slowly and after about six hours reached plasma concentration and continued to rise in face of falling plasma levels. EDF glucose approached plasma concentration at a much slower rate, and did not reach equilibrium after eight hours. No glucose was detected in PF of one fish six hours after glucose injections. It thus appears that under stable conditions plasma, VF and EDF glucose concentrations are similar, but that equilibration between plasma VF and EDF is delayed during changing plasma glucose concentrations.

THE RATE OF PRODUCTION OF VENTRICULAR FLUID IN THE DOGFISH

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Arachnoid villi, the major route of exit of cerebrospinal fluid in mammals are lacking in elasmobranchs. This suggests that either dogfish spinal fluid turns over at a very slow rate, if at all, or that other exit channels exist in these animals. Ventricular fluid (VF) turnover and production rates, therefore, were measured in the dogfish, S. acanthias. The anesthetized fish were fixed in a Horsley-Clark stereotaxic apparatus, and the frontal lobe of the brain was punctured so that injection into and withdrawal from the ventricular cavity could be accomplished without leakage. Radioiodinated serum albumin and inulin were injected, and their disappearance rates from the VF were measured and found to have half-times of 9-12 hours. In other fish both the frontal lobe and the cerebellum were punctured, and a balanced salt solution containing either inulin or inulin-C-14 was perfused at about 0.03 ml/minute. The difference in inulin concentration between the inflow and the outflow is a measure of production of new VF. VF formation rates thus calculated averaged 0.004 ml/minute. Assuming a VF volume of 4.3 ml, this represents a half-time for VF turnover of 9 hours. In three fish, acetazolamide, 30 mg/kg, was given intravenously after a suitable control period and caused a 30% reduction in VF production rates. These results, considering the temperature and size of these dogfish, indicate a brisk production rate and suggest that a search for VF exit channels should be fruitful.