muscle of the gut wall. Thus, an agent which dilates vascular smooth muscle may decrease intestinal wall compliance (increase tonus) and the transmural pressure across the blood vessel wall will remain unchanged, resulting in no change in blood flow or pressure and hence resistance. Since measurements of intestinal compliance were not made in this study, it is difficult to interpret the factors responsible for increased vascular resistance during epinephrine infusion. The studies of Hiatt et al. (Bull. MDIBL 6:22-34, 1966) and Moore and Hiatt (Bull. MDIBL 7:32-33, 1967) indicate that epinephrine has a stimulatory effect on gastrointestinal smooth muscle—but their data do not include the lower intestine. The possibility remains then, that increased resistance to blood flow through the dogfish intestine may result from either arteriolar constriction, increased wall tension, or both.

Acetylcholine, in doses below 2 μg/Kg appeared to produce a net decrease in resistance to blood flow. The results, however, were variable and the pooled data show no significant change. At higher doses, acetylcholine increased the resistance to blood flow. Acetylcholine has been found to have no effect on intestinal smooth muscle of the lower intestine (Moore, personal communication). If this is the case then one interpretation of these data is that higher concentrations of acetylcholine produce vascular vasoconstriction in this preparation. The fact that coeliac artery pressure increased even when systemic arterial pressure was decreased, would tentatively support this conclusion.

The data in these studies are not adequate to permit clear conclusions about those factors which increase or decrease vascular resistance to flow. Decreased intestinal wall tension increases vessel transmural pressure which would tend to increase vessel caliber and lower vascular resistance. The converse is also true. Such activity may mask the effect of substances that increase or decrease vessel caliber by acting on vascular smooth muscle. Further studies are needed to clarify the effects of acetylcholine and epinephrine on these interrelated factors in the lower intestine of Squalus acanthias.

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FINE STRUCTURE OF TRANSPORT EPITHELIA IN FUNDULUS AND SQUALUS

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Recent physiological studies on the transport of salt and water have led to theories which stress the role of intercellular space in epithelial structures. The "middle compartment" of the Curran model and the "standing osmotic gradient" theory of Diamond and Tormey have been proposed in explanation of results obtained in studies on intestine, gall bladder, kidney and salt glands. Morphological evidence supporting these hypotheses has been obtained in some studies under measured transport conditions. Although osmotic gradients across the epithelia have been controlled, little attention has been paid to the effects of hydrostatic pressure on the configuration and volume of this compartment.

The isolated intestine of Fundulus heteroclitus adapted to fresh water and to sea water has been prepared to electron microscopic examination in relation to the osmotic and hydrostatic pressures imposed across the epithelium. Isolated perfused preparations of the spiral valve of

Squalus acanthias have also been processed for electron microscopy. The gross structure of the spiral valve permits the application of hydrostatic pressure with minimal distension of absorptive surfaces.

Histochemical studies designed for localization of sodium in the intra-epithelial intercellular space have been continued using potassium antimonate in the perfused spiral valve and in slices of the rectal glands. The configuration of the intercellular space has been examined using the peroxidase method of Graham and Karnovsky. These preparations will be subjected to electron microscopic examination and the results reported subsequently.

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UREA TRANSPORT BETWEEN BLOOD, BRAIN, AND CEREBROSPINAL FLUID IN Squalus acanthias

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Urea is a small water soluble molecule which moves across most biological membranes quite rapidly; however, in mammals the transport of urea between blood and brain and between blood and cerebrospinal fluid (CSF) is curiously slow. In view of this and the importance urea plays in the osmotic balance of elasmobranchii, a preliminary study of the exchange of urea between blood, brain and CSF (also called ventricular fluid) in Squalus acanthias was begun.

Tracer amounts of ^{14}C-urea were injected intravenously into dogfish and plasma radioactivity was maintained relatively constant. The animals were sacrificed at various times and plasma, brain, choroid plexus, and CSF samples were taken. Employing a freezing microtome, the brain samples (medulla only) were rapidly frozen and sliced into sections parallel to the ventricular surface. Four such sections were obtained starting from the inner or ventricular surface and ending with the outer or dural surface. The results are presented in the table. It

Table 1

^{14}C-UREA SPACE ÷ WATER SPACE AT VARIOUS TIMES FOLLOWING IV INJECTION

	30 min	1 hr	2 hr	18 hr
CSF (100%)*	1.00	1.01	1.06	1.08
Choroid Plexus (90%)*	1.00		1.43	1.17
Medulla (79%)*				
inner	.49	.53	.86	1.02
	.34	.38	.75	1.00
	.23	.30	.71	1.00
outer	.16	.25	.63	1.00

*Water space.