work of 1966, renal clearance of MS222 was less than GFR; about 2% of drug appeared in urine in six hours.

MS222 does not produce anesthesia in fish following intravascular injection, in accord with low or absent concentration in brain (Table 2, Group I). When fish are immersed in sea water containing 100 μg/ml, they attain surgical anesthesia within five minutes. Table 2 shows the pharmacological basis for these observations. In the latter situation, drug reaches brain and CSF almost at once (Group II). Anesthesia lightens when the fish are returned to fresh sea water. The drug is then excreted through the gill causing venous, brain, and CSF concentration to decline (Group III). Not shown in Table 2 is the interesting sidelight that in the experiments of Group II, no drug was detected in the extradural fluid. Comparison of the concentrations of drug in CSF in Group III with those of Group II suggests that recovery from anesthesia occurs at somewhat higher concentration than onset of anesthesia. The same is true of alcohol intoxication (Mirsky et al., Quant. J. Stud. Alc. 2:35, 1941) and perhaps other anesthetics.

The ester linkage in MS222 appears to be critical for its diffusibility. The sodium salt of the acid homologue, m-aminobenzoic acid, was injected at 30 mg/kg; no drug was detected in the gill effluate and the plasma half-life was 37 hours. This is like other ionic lipid-insoluble drugs studied in 1966 (MDIBL 6:25). This experiment also shows that no major part of the ester of MS222 is hydrolyzed in vivo, since the analytical method (Bratton-Marshall) detects both arylamino compounds.

In summary, ethyl m-aminobenzoate (MS222) moves into or out of the fish via the gill, the direction of movement being toward that of the lower concentration. The movement in either direction is extremely rapid and would appear to be blood flow dependent. The half-life of this drug injected intravascularly is 56 minutes with a volume of distribution of about that of body water. The gill clearance is 10 ml/kg per min which represents about half of cardiac output. Cardiac output, as measured using the Fick principle, is the same as that previously reported for direct measurement and dye dilution methods.

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1967 #38

RENAL EXCRETION OF D- AND L-GLUCOSE IN THE GOOSEFISH

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The question of renal secretion of 3-0-methyl-glucose and L-sugars has been raised by Huang et al. as a result of studies in the dog (Proc. Soc. Exptl. Biol. Med. 124:20, 1967). These findings have prompted us to measure the excretion of L-glucose in comparison to D-glucose in the aglomerular teleost, Lophius americanus.

Experiments were performed 24 hours after capture, urine samples being taken from the cannulated ureters. The urine flow per minute and gram kidney was 7.7 μl ± 0.75 S.E. (n = 16). Measurements of the osmolarity showed no significant difference between plasma (333 m osmol/L ± 29.1 S.E.) and urine (306 m osmol/L ± 33.3 S.E.).

The average concentration of D-glucose (glucose oxidase method) in the urine was 6.06 mg% ± 2.3 S.E. (n = 14). The urine to plasma ratio was 0.11 ± 0.027 S.E. (n = 14).

After intravenous injection L-glucose was determined isotopically (labeled with C^{14}) and chemically as the difference between total reducing substance (Somogyi-Nelson) and glucose oxidase. The mean of the urine to plasma ratio was 0.32 ± 0.0046 S.E. (n = 14) with a plasma concentration of 11.0 mg% ± 2.0 S.E. In two of these animals PAH excretion was measured as an index of tubular functional activity. At plasma levels of 1 μg/ml the U/P ratios ranged from 14-30 in one instance and 90-120 in the other. (We would like to thank Dr. Robert Wolbach for these PAH determinations.)

Our finding of D-glucose in the urine of the aglomerular goosefish is in agreement with earlier studies (Malvin, Bull. Mt. Desert Island Biol. Lab. 5:12, 1965). The significant difference (P 0.001) of the U/P ratio in comparison to L-glucose implies that although diffusing into the tubular urine, L-glucose is not reabsorbed as D-glucose. The U/P ratio for L-glucose below 1.0 is evidence that there is no net secretion of this sugar and confirms data in the rat kidney (Stolte et al., The Physiologist 10:316, 1967).

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1967 #39

EFFECT OF PHLORIZIN AND EPINEPHRINE ON RENAL GLUCOSE REABSORPTION IN Squalus acanthias

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We studied the effect of graded doses of phlorizin on renal reabsorption of glucose in nine female dogfish, free-swimming in live cars. The procedure and analytical techniques used were those previously described (Bull. MDIBL. 6:2, 1966). After a control period, the phlorizin was

Table 1

EFFECT OF GRADED DOSES OF PHLORIZIN ON GLUCOSE REABSORPTION
(First line shows mean values for all control periods)

BW kg	KW g	Phlorizin mg/kg	$\dot{V}$ ml/hr	GFR ml/hr	Glucose load mg/hr	T_G mg/hr	R_G %
--	--	0	1.5	11.4	9.4	9.1	96
3.8	8.3	2.6	0.7	3.0	2.3	1.1	43
4.7	13.2	2.1	4.5	14.5	13.4	5.6	41
4.1	10.0	12.2	0.3	0.7	0.2	0.1	31
3.5	11.0	14.3	0.6	2.8	1.2	0.5	41
4.0	12.3	12.5	2.6	4.1	2.2	0.9	43
5.7	19.5	17.5	5.0	15.6	20.0	3.0	15
3.9	8.8	25.6	1.7	5.1	4.0	0.8	19
3.7	11.3	27.0	1.1	4.4	3.6	0.1	2
3.7	8.5	54.0	2.7	7.6	5.0	0	0