1963 #15

EQUALITY OF H^+ AND CL^- TRANSPORT BY GASTRIC MUCOSA OF Squalus acanthius

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A distinctive feature of the isolated gastric mucosa of the dogfish is the absence of a significant transmucosal electrical potential difference. Previous study had demonstrated that the Cl^- ion is actively transported during H^+ secretion but the possibility of another abherent ion transport canceling a transport of Cl^- ion in excess of H^+ had not been excluded. For paired gastric mucosae from 12 fish values in μEq. cm^{-2}. hr^{-1} were obtained: Cl^- flux serosa to mucosa 5.8 ± 0.4, mucosa to serosa 4.5 ± 0.2 and H^+ secretion 1.3 ± 0.1. Consequently the dogfish does differ from teleosts and other vertibrates in failing to actively transport Cl^- in excess of H^+ and thus generate a short-circuit current which would give rise to an epithelial potential.

Elasmobranchs differ from other vertebrates; in having a higher interstitial $[Cl^-]$ concentration and have in common with other fish a low arterial pCO_2 + higher pH. Exposure of 8 mucosae to solutions with either a $[Cl^-]$ of 82 mEq/1 (but made iso-osmotic with sucrose) or 1% CO_2 (with 30 mEq/1 HCO_3^-) had no significant influence on the mucosal potential.

Substitution of Cl^- by SO_4^- or the isethionate ion did not induce a "reversed" potential. In confirmation of previous work, the mucosa secreted H^+ against an adverse potential difference of 75 ml and the spontaneous potential was not materially changed by carbachol stimulation or SCN inhibition.

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ISOLATED DOGFISH RECTAL GLAND: ELECTRICAL PARAMETERS, SODIUM AND CHLORIDE FLUX

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Because of the secretion of a remarkably concentrated solution of sodium chloride by the rectal gland of Squalus acanthius in vivo, the following observations on the isolated gland are reported even though secretion was not elicited in vitro.

The fish received 10 ml of 6% NaCl subcutaneously 2 hours before the experiment. After being split longitudinally, each of two 0.5 cm^2 portions of the gland were mounted between chambers with both surfaces exposed to 4 ml of saline (Na 252, K 10, Ca 10, Mg 4, Cl 240, HCO_3 30, HPO_4 2, SO_4 4 and glucose 25 mEq/1; 5% CO_2, 95% O_2) at 21.1 ± 1.4°C. Wet weight 0.35 gms cm^{-2}. Values are given as means and standard errors of paired observations on blands obtained from 6 fish.

The spontaneous transmural potential difference was insignificant; 0.27 ± .44 mV. with the mucosal surface positive to serosal surface. The D.C. electrical conductance was 1.56 + .23 millimhos . cm^{-2} and increased 30% over 5 hours.

By double-labelling experiments with Na^{22} and Cl^{33}, flux was determined, after 4 hours to attain an isotopic steady state, over 4 hourly periods. One portion of the gland was used for the serosa to mucosa and the other for the mucosa to serosa flux. The fluxes in uEq.cm^{-2}.hr^{-1} were for Na 0.53 ± .07, 0.53 ± .31 and for Cl 0.68 ± .15, 0.70 ± .12 serosa to mucosa and mucosa to