the corresponding Cl^- solutions, and increasing the O_2 and CO_2 doubles the rate in either solution. A serosal-negative PD is observed in SO_4^{--} solutions, as expected. The rise in resistance upon changing from SO_4^{--} to Cl^- solutions under hypoxic conditions is significant; the other differences in R, while dramatic in individual cases, are not significant with this number of experiments.

The persistence of J_H with no exogenous Cl^- can be explained by an electrogenic H^+ pump, with no requirement for simultaneous Cl^- transport. Chloride might enhance pump activity without itself being transported, as seems to be true for the bullfrog gastric mucosa (Shanbour and Rehm, PSEBM 136:1236, 1971, Kidder and Montgomery, J. Balto. Col. Dent. Surg. 29:52, 1974). In this case, one would expect J_H to be measured by I_{sc}, which can be approximated by PD/R. For the 10 measurements in SO_4^{--} solutions, the relationship $I_{sc} = 6.46 + 0.46\ J_H$ (in μA) provided the best fit, and the slope is thus far from unity. These experiments are not ideally suited to this analysis (the tissue was not actually short circuited, for instance), but to the extent that they are valid, they suggest active transport of some other ions than H^+ and Cl^- in this tissue, a conslusion likewise supported by other data (Kidder, Bull. MDIBL, This issue).

In any event, the demonstration of active H^+ transport in the absence of exogenous Cl^- is a result which is not expected from a tightly-coupled neutral HCl pump, but quite consistent with an electrogenic mechanism.

THE "REHM EFFECT" IN DOGFISH GASTRIC MUCOSA WITH SUFFICIENT OXYGEN

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The passage of electrical current through gastric mucosae has been found to affect the rate of H^+ secretion in dog (Rehm, AJP 144:115, 1945) and frog (Crane et al., Biochem. J. 43:21, 1948) in a manner consistent with an electrogenic H^+ secretory mechanism; this has been termed the Rehm effect. Hogben (Bull. MDIBL 15:45, 1975) has recently reported that this effect is absent in dogfish gastric mucosa. He also failed to find a long time-constant transient (LTCT) in the voltage response to current which is found in the frog. These observations are consistent with an explanation for the Rehm effect based on ion concentration changes in the cells during current passing (Hogben, in Sachs et al. "Gastric Secretion," Acad. P. 1972), since these concentration changes are the basis for one model for the LTCT (Kidder and Rehm, Biophys. J. 10:215, 1970).

However, Hogben's experiments were conducted using pO_2 = 1 atm, which is hypoxic for this tissue _in vitro_ (Kidder, AJP 231:1240, 1976). It was therefore desirable to repeat these experiments with elevated pO_2. Mucosae from 6 dogfish were mounted under hyperbaric conditions (Kidder, op. cit.) at pO_2 = 1.9 atm, pCO_2 = 0.1 atm, and their secretory rate measured with the pH-stat apparatus during a 1.5 hour equilibration period. Sufficient current was then passed (via Ag/AgCl electrodes remote from the tissue) to bring the transepithelial potential difference (PD) to -60 mV (reference mucosal solution) for 1 hour. The current was then reversed to -60 mV for one hour, followed by an hour of open circuit control. A typical experiment is shown as Figure 1. Negative PD is seen to inhibit secretion, while positive PD slightly enhances secretion, and for all changes, the time course of the response is slow; i.e., this is not a current-induced artifact of the chamber and electrodes. In 2 cases, the order of current sending was reversed.

The secretory rate was noted for the last 20 minutes of each period, when the tissue has apparently reached a steady state, and the results used to construct Table 1. Acid secretion was always inhibited by -60 mV as compared to either control period (or their average), and this inhibition is significant. While +60 mV usually stimulated secretion, the increase is not statistically significant. It thus appears that the Rehm effect can be demonstrated in dogfish gastric mucosa which are not hypoxic.

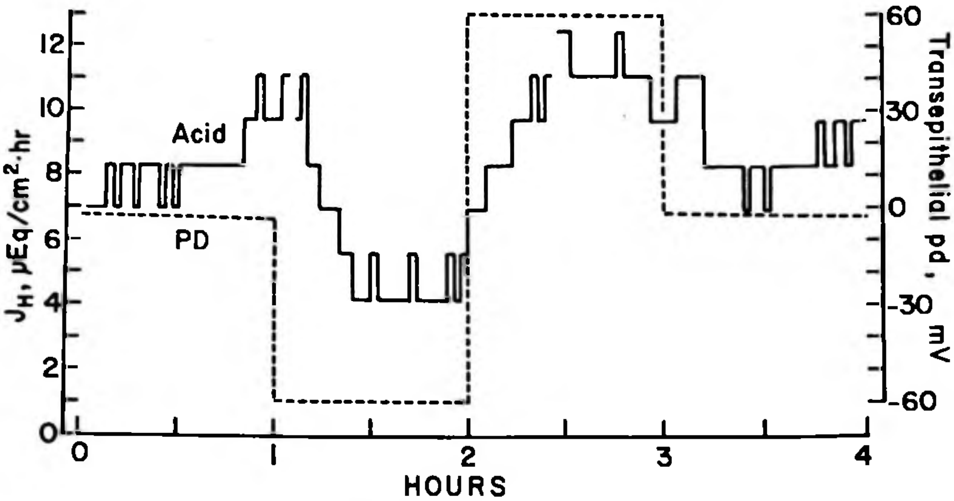

Figure 1. An example of the Rehm effect in dogfish gastric mucosa. Inhibition by -60 mV (current M → S) and stimulation by -60 mV are seen.

TABLE 1

Voltage clamping on dogfish gastric mucosa
Acid secretion, μEq/cm^2·hr (% of average control)

Date	Control #1	+60 mV		-60 mV		Control #2
8/19/77	5.41	7.91	(139.6)	3.36	(64.1)	5.92
8/22/77	11.54	11.74	(113.5)	6.39	(61.8)	9.15
8/25/77	9.14	10.94	(120.6)	4.74	(51.9)	9.00
8/26/77	7.48	10.53	(116.9)	6.79	(75.4)	10.53
8/29/77	5.40	4.92	(91.1)	4.21	(78.0)	5.40
8/30/77	8.10	6.26	(100.8)	2.92	(47.0)	4.32
Average	7.85	8.72	(113.8	4.78	(63.0	7.39
S.E.M.	±1.05	±1.24	±7.5)	±0.69	±5.5)	±1.12

The inhibition of secretion by -60 mV (to 63 ± 5.5% of control) and the difference between +60 and -60 mV are significant at the 1% level by Student's t-test; no other differences are significant at the 5% level. Comparing the current period to the nearest (in time) control does not change the conclusions.

One might therefore predict that a LTCT would be observed under these conditions, according to the of Hogben. Figure 2 shows that this is not the case, implying that the resistance ratios of anions to cations are equal at the apical and basal faces of the cells in this tissue, and that no appreciable con- centration differences are produced by current. It thus appears that Rehm's explanation of the effect current as a direct action on an electrogenic H^+ mechanism adequately accounts for the data.

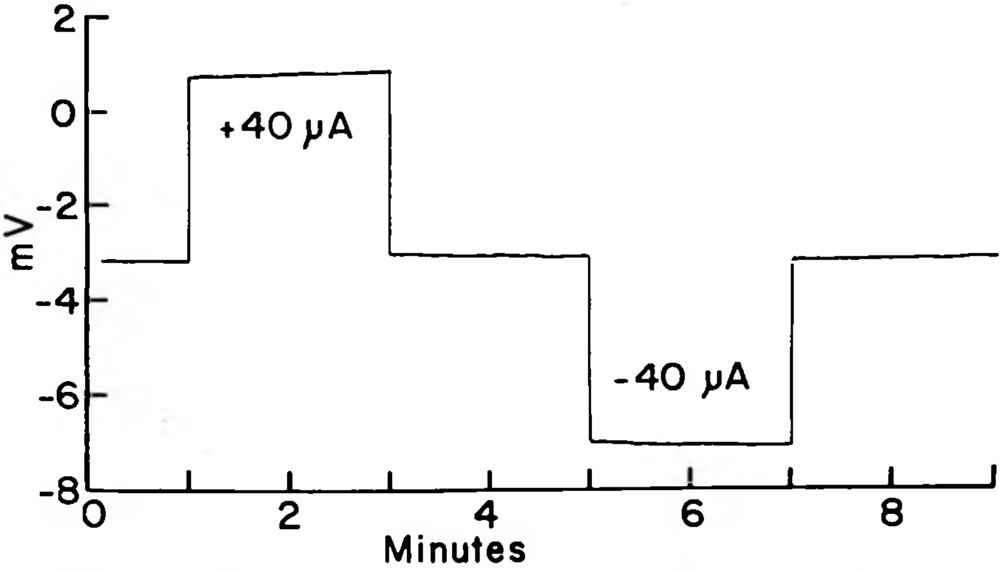

Figure 2. The effect of passing a square current pulse across dogfish gastric mucosa. No long time-constant transient responses (τ ≈ 30 sec.) can be found. Current density 40 μA for 3.14 cm^2 tissue.

COUPLED NaCl INFLUX ACROSS THE MUCOSAL MEMBRANE OF *Pseudopleuronectes americanus* INTESTINE: EFFECTS OF FUROSEMIDE AND CYCLIC AMP

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Previous studies of ion transport by flounder small intestine under short-circuit conditions suggested an obligatory interaction between the absorptive fluxes of Na and Cl (Field, Karnaky, Smith, Bolton and Kinter J. Membrane Biol. in press). Support for this notion rests on the observations that replacement of either Na or Cl in the bathing media with nontransported ions abolishes both electrolyte absorption and the spontaneous (serosa-negative) transepithelial electrical potential difference (PD). In addition, ouabain reduces active Cl absorption and the PD to zero when added to the serosal bathing solution. Thus, coupling between Na and Cl absorption appears to result from a direct interaction of both ions with cellular transport mechanism(s).

To reconcile these findings with the fact that the rate of active Cl absorption exceeds that of Na under short-circuit conditions, Field et al. (J. Membrane Biol. in press) proposed that one-for-one transcellular NaCl transport might be obscured by the perm-selective properties of the paracellular pathway. In essence, much of the Na transported into the lateral intercellular spaces could recycle to the mucosal solution via Na-selective tight junctions, thereby reducing transepithelial Na transport to a fraction of that for Cl. According to this model, the processes responsible for coupled, transcellular NaCl transport would be similar to those of rabbit gallbladder (Frizzell, et al. J. Gen. Physiol. 65:769, 1975) and small intestine