

ROLE OF THE Na,K-ATPase IN THE MERCURIAL-INDUCED SWELLING OF DOGFISH (*SQUALUS ACANTHIAS*) RECTAL GLAND CELLS

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We have suggested (Kleinzeller et al., Bull. 28,80,1989) that the mercurial-induced swelling of rectal gland cells results from a concurrence of two actions of the mercurial: a) an inhibition of cell Na,K-ATPase activity by interaction with enzyme -SH groups, and b) a reorganization of F-actin lining the basolateral cell membrane (Mills et al., Bull 28,84,1989). This view was now tested further.

The time-course of 1 mM p-chloromercuribenzenesulfonate (pCMBS) action on cell ATPase, measured by the "zero-time" uptake (4 min) of ⁸⁶Rb by gland slices, showed a gradual decrease in pump activity, reaching a 50% inhibition in 2 h. Mersalyl (1 mM) produced the same inhibition (47% in 2 h). These results are consistent with the time-course of mercurial action on tissue electrolytes (Bull. 26,163,1986). An inhibition of the sodium pump is per se insufficient to produce cell swelling: 1 mM ouabain or N-ethylmaleimide (NEM) inhibited ⁸⁶Rb uptake faster (85-90% and 75% inhibition in 2 h, resp.) than pCMBS, but did not produce major cell swelling (Kleinzeller, loc. cit).

The putative role of the Na,K-ATPase in the mercurial-induced cell swelling permits the prediction that other inhibitors of the sodium pump should enhance the pCMBS swelling effect. Fig. 1 shows that 1 mM ouabain, which alone does not produce cell swelling, and also does not affect the distribution of cell F-actin (Kleinzeller & Mills, Biochim. Biophys. Acta, in Press) markedly accelerates pCMBS-induced swelling of rectal gland cells. The same effect was seen when the Na,K-ATPase was blocked by the absence of Na (Li-saline) or by NEM.

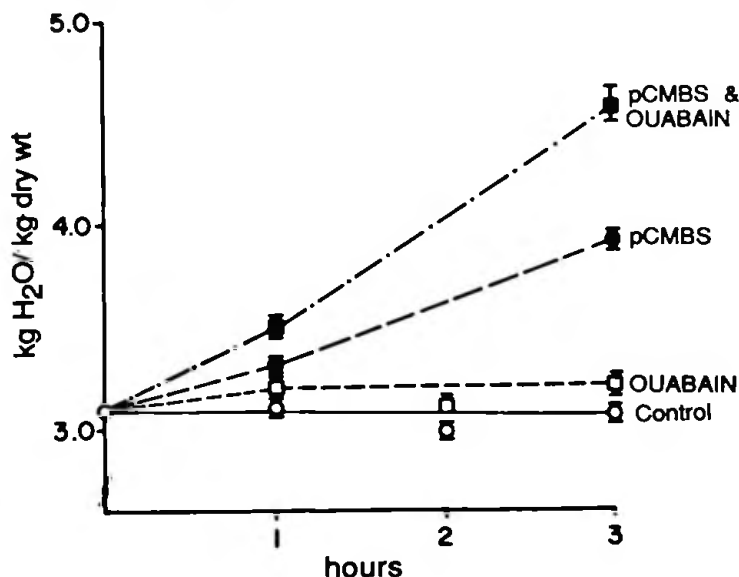


Fig. 1. Effect of 1 mM ouabain on the pCMBS-induced swelling of rectal gland cells. Mean values of tissue H₂O (4 determinations, \pm SE)

The data are consistent with point a) of the above hypothesis on the mechanism of the mercurial-induced swelling of rectal gland cells.

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