SOMATOSTATIN INHIBITS CNP-INDUCED STIMULATION OF SHARK RECTAL GLAND.

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The stimulatory action of vasoactive intestinal peptide (VIP) on chloride secretion by shark rectal gland is inhibited by somatostatin, which acts on at least two sites proximal and distal to adenylate cyclase (Silva, P. et al. Am. J. Physiol. 249:R329-R334, 1985). The discovery that shark cardiac natriuretic peptide (CNP) activates rectal gland secretion via a different pathway that does not involve adenylate cyclase (Silva, P. et al. Am. J. Physiol. 277:R1725-32, 1999) prompted the question of whether direct stimulation of the rectal gland by CNP could be inhibited by somatostatin.

These experiments were designed to examine the effect of CNP in the presence and absence of somatostatin. Isolated rectal glands of *S. acanthias* were perfused through their single artery by gravity at 16.C and 40 mmHg pressure with oxygenated shark Ringer's solution (pH 7.6) containing 5 mM glucose and 10^{-2}M procaine (to block release of VIP from rectal gland nerves) in a single-pass perfusion. Venous effluent and duct fluid were collected separately from PE-90 catheters placed in the rectal gland vein and duct. After a control period of perfusion consisting of three 10-min collections, during which a stable basal secretory rate was established, a bolus of 5 x 10^{-7} M C-type natriuretic peptide (N-8768, Sigma Chemical Co.) was given over 1 min, without altering the rate of gland perfusion. Collections were continued at 1-min intervals until the rate of secretion returned to baseline levels. Somatostatin (10^{-6} M) in oxygenated shark Ringer's solution was then infused for the ensuing 20 min. Ten minutes after the beginning of the somatostatin infusion another bolus of CNP was injected, and 10 minutes later the infusion of somatostatin was stopped and replaced by shark Ringer's solution. After the secretory rate had again stabilized, a third 1-minute bolus of the stimulating agent was given, and the effect again observed during successive 1-min clearance periods.

The results of 10 experiments are summarized in the figure. Somatostatin (10^{-6}M) suppressed CNP stimulation almost completely. The inhibitory effect quickly dissipated when somatostatin was removed from the perfusate, so that the peak stimulation achieved by the third bolus of CNP (in the absence of somatostatin) was not significantly different from that observed when CNP was first injected, before somatostatin was added.

These data suggest that somatostatin can inhibit rectal gland secretion stimulated by a variety of first and second-messengers, probably by acting on a site at or close to the final common pathway of chloride exit from the epithelial cell.

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Effect of somatostatin on chloride secretion by shark rectal gland stimulated by CNP. Cardiac natriuretic peptide (CNP, 5 x 10^{-7}M final concentration) was infused over 1 minute at the times indicated by arrows. Chloride secretion (mEq/h/g) is indicated on the ordinate. Somatostatin (10^{-6}M) inhibited CNP-induced chloride secretion almost completely.