

THE EFFECTS OF GLYCINE AND METHACHOLINE ON MUCUS OUTPUT IN THE RAT ILEUM

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The small intestine represents the major absorptive site for the products of food digestion. Goblet cells distributed throughout the intestine secrete a viscoelastic mucus gel which overlies the epithelial surface. The effects of food components on the secretion rate of mucus are not well established. *In vitro* experiments have shown that acetylcholine and cholinomimetic agents act as goblet cell secretagogues (Neutra et al 1984). This, however, only applies in the early stages of cell maturation and upon migration to the villus or mucosal surface the sensitivity ceases and it is suggested that this is associated with the loss of acetylcholine receptors on migration. This present study endeavoured to examine the effects of methacholine on the levels of mucus output in the isolated rat ileum. In addition, attempts have been made to investigate the effect of glycine, a common constituent in nutrient media and food, on the rate of mucus secretion in intestinal goblet cells.

Using a chronically isolated ileal loop in the rat (Poelma & Tukker 1987), the mucus output was investigated in response to the intraluminal perfusion of isotonic saline containing glycine (80 mM) or methacholine (10 and 100 $\mu\text{g mL}^{-1}$). The loop was initially perfused for two hours with isotonic saline, at a flow rate of 40 mL hr^{-1} , to obtain a baseline level for mucus output. Subsequently either glycine (80 mM) was perfused, at the same flow rate, over a period of four hours, or methacholine, for one hour at a concentration of 10 $\mu\text{g mL}^{-1}$, immediately followed by a second hour's perfusion at 100 $\mu\text{g mL}^{-1}$. The loop was finally perfused for a further 2h with saline only. The perfusates were analysed for mucin content using a direct fluorimetric assay (Crowther and Westmore 1987). Results were tested for significance using a Mann Whitney U-test.

FIGURE 1.

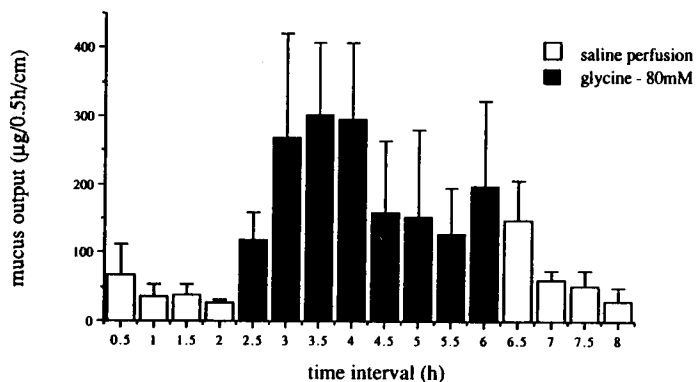


Fig 1. The effect of glycine on mucus output (n=4) mean \pm sd

FIGURE 2.

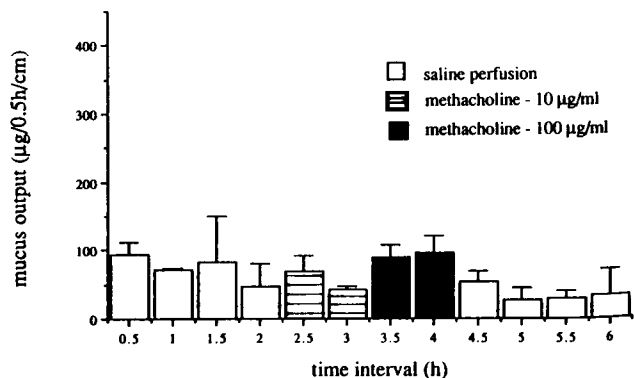


Fig 2. The effect of methacholine on mucus output. (n=4) mean \pm sd

Intraluminal perfusion of glycine produced a significant ($p < 0.05$), although transient, increase in mucus output up to a maximum of 838% of baseline level. Perfusion with methacholine at either concentration, however, had no significant effect on the amount of mucus produced.

This study, therefore, has shown that methacholine does not stimulate mucus secretion in the rat ileum and hence it is likely that acetylcholine receptors are absent from the mature goblet cell. The observation that glycine produced such a substantial increase in mucus secretion is quite unexpected and inexplicable as other workers have offered no evidence for the local action of individual amino acids or peptides on the gut before absorption across the mucosa (Gardner 1985).

Neutra, M.R. et al (1984) Ciba Foundation symposium: 20-39

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Crowther, R.S., Westmore, R.F. (1987) Anal. Biochem. 163: 170-174

Gardner M.L.G. (1985) in: Hunter J.O., Alun Jones, V (eds) Food and the Gut. Bailliere Tindall, pp 131-134