

EFFECTS OF BOMBESIN ON GASTRIN RELEASE AND ELECTROMYOGRAPHIC ACTIVITY OF THE GASTROINTESTINAL TRACT IN SHEEP

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Introduction

Bombesin-like immunoreactivity has been detected in neural tissues of the ovine stomach and intestine (Wathuta, 1986). During attempts to extract and characterise this activity the effects of a standard synthetic bombesin on gastrin release and electromyographic activity of the gastrointestinal tract in sheep was investigated.

Materials and Methods

Five sheep weighing 30-40 kg maintained on chaffed meadow hay and pelleted concentrates were surgically prepared with stainless steel electrodes implanted in the reticulum, cranial dorsal rumen, abomasal antrum and cranial duodenum and integrated electromyographic (EMG) activity was used as an index of motility (McLeay et al., 1982). Activity was recorded for 240 min during intravenous infusions of 154 mM NaCl which were either continuous or interrupted in the 60-90 min period by 30 min infusions of bombesin (14aa, Sigma) at rates of 7.5, 15 and 30 pmol·kg⁻¹·min⁻¹. Infusions were made in animals fasted 12 h via a jugular vein and blood sampled via this or the other jugular vein at 45, 75, 90, 150 and 240 min. Blood samples were collected into tubes, allowed to clot and the resulting serum stored at -20°C before estimation of gastrin concentration by radioimmunoassay using Hansky's antibody Ab74 which recognises all major forms of human gastrin and cross-reacts with synthetic ovine gastrin. Results were tested for significance by ANOVA.

Results

Bombesin at 15 pmol·kg⁻¹·min⁻¹ failed to stimulate gastrin release in two experiments in two

animals but in three other animals increased gastrin levels 30 min after infusions commenced (table 1). Responses to 7.5 and 30 pmol·kg⁻¹·min⁻¹ were variable and not significantly different from control (table 1).

TABLE 1. MEAN GASTRIN CONCENTRATIONS WITH INFUSION OF NaCl OR BOMBESIN (pmol·kg⁻¹·min⁻¹)

Infusion	Time			
	75 min	90 min	150 min	240 min
154 mM NaCl	119	116	112	127
Bombesin 7.5	75	97	106	100
Bombesin 15	93	200*	125	137
Bombesin 30	75	128	118	105
SED	28	26	31	26

Results from 3 animals and the values are expressed as a % of that value at 45 min; *p < 0.05.

Bombesin significantly increased the frequency of reticulum contractions and reduced the amplitude of the A sequence rumen EMG in the hour of its infusion (table 2). The basal integrated rumen EMG between A sequences was increased by bombesin and a marked stimulation of the EMG was confirmed by direct recording.

Bombesin in doses of 7.5-30 pmol·kg⁻¹·min⁻¹ stimulated duodenal EMG activity in all 16 experiments on 5 animals. The increased activity was characteristically 10-20 min bursts of continuous regular cycles at a frequency of 7 min⁻¹ commencing with the infusion. Antral EMG activity was reduced in association with the increased duodenal activity, but increased towards the end of infusions when duodenal stimulation had subsided.

TABLE 2. MEAN FREQUENCY OF RETICULUM CONTRACTIONS AND AMPLITUDE OF INTEGRATED RUMEN EMG WITH INFUSIONS OF NaCl OR BOMBESIN ($\mu\text{mol} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)

Infusion	Reticulum frequency		Rumen amplitude	
	h during	h after	h during	h after
154 mM NaCl	90	86	99	95
Bombesin 7.5	98	103	—	—
Bombesin 15	103	100	59	99
Bombesin 30	105	100		
SED	4.4	5.5	4.0	10.2

Results from 5 animals: the values for frequency are mean hourly and for amplitude the averages for the last 10 contractions of each hour, both expressed as a % of those values for the hour before.

Discussion

In contrast to another ruminant species (Bloom et al., 1983) bombesin stimulated gastrin release in sheep although responses were variable. Bombesin had consistent excitatory effects on EMG

activity of the reticulum, rumen, and duodenum and both inhibitory and excitatory effects on the abomasal antrum. Such responses occurred in the absence of changes in peripheral levels of gastrin. The diverse actions of bombesin on EMG activity of the gastrointestinal tract of the sheep and its role in gastrin release in this species warrant further study.

(Key Words: Bombesin, Gastrin, Electromyogram, Sheep)

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