GUSTATORY EFFECTS ON INTESTINAL MOTILITY OF DOGS

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Summary : Trained, unanaesthetised dogs with jejunal fistula and adapted to 2 h meal-time showed transient taste-correlated changes in pressure (mm H_2O) but not in frequency of intestinal motility. Intestinal pressure was increased on bitter taste both before meal-time (4.7 ± 0.2 mm) and after it (13.1 ± 0.9 mm) over respective basal pressure (before meal 3.2 ± 0.4 mm, after meal 10.6 ± 1.4 mm), whereas it was decreased on sweetness of saccharin (before meal 1.1 ± 0.1 mm, after meal 4.8 ± 0.5 mm), and after glucose (before meal 1.7 ± 0.2 mm; after meal 8.8 ± 0.9 mm). Taste-induced motility changes were more pronounced on starvation than on fed state.

Key words : intestinal motility taste

INTRODUCTION

The gastro-intestinal secretions and motility both of which are essential for digestion, absorption and movement of food in the gastro-intestinal tract, are known to be increased in the presencc of food in the stomach (1). Further it is also known that before food actually enters the stomach, its fast-acting sensory properties (sight, smell, taste etc.) enhance salivary, gastric (7) and pancreatic secretions (5) thus acting as primers to secretions after the arrival of food. But such anticipatory effects of sensory cues on clinically more important intestinal motility (3) are virtually unknown and hence the present report.

MATERIAL AND METHODS

Trained young (6-8 months old) 2 h meal-time (1300-1500 h) adapted and conscious dogs (n=6) were used for the investigation. Their intestinal motility responses to taste both before and after meal-time were recorded kymographically using conventional ballon method (2) and water manometer as described by us earlier (10). From a pipette with a fairly long (3 cm) nozzle 2-3 *ml* of any one of gustatory test solutions (18% glucose, 0.8% saccharin and 0.006% quinine in distilled water at room temperature of 24-26°C) on anyone test day was dropped (from 1.0-1.5 cm height) on tongue *in situ* of the dog lying quietly on a table and gently restrained.

RESULTS

Taste effects on the on-going (basal) intestinal motility were seen 20-40 sec after placement of test solution and for a period of 30-100 sec, both before and after food (Fig.1). The visually observed smacking, tongue-rolling and swallowing movements

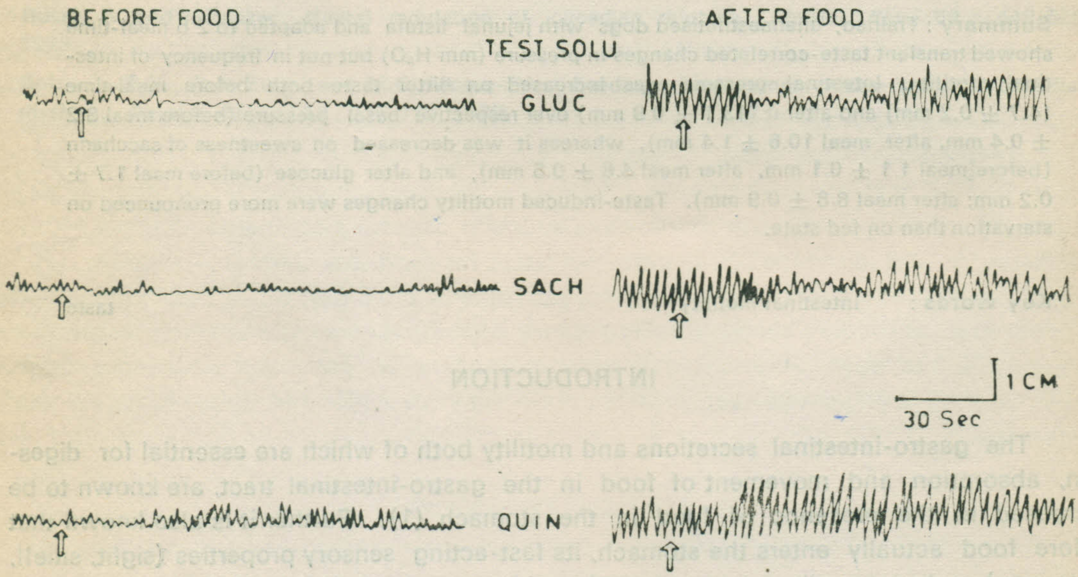

Fig. 1 : Effects of gustation on intestinal motility of fed (after food) and starved (before food) dogs. Arrow (↑) mark indicates the point in time at which test solution was placed on tongue.

which started almost immediatelly (5-10 sec) and lasted for nearly 1 min period, following test solution contact with tongue, had no influence on intestinal motility. The sweet taste of a substance whether containing calories (glucose) or not (saccharin) decreased the intra-luminal pressure (mm H_2O) of on-going basal intestinal activity whereas bitter taste (quinine) increased it. The taste (either sweet or bitter) did not affect the frequency (waves/min) of motility, and in that respect is smiliar to effects after food intake which also did not alter frequency though it caused significant increase in intra-luminal pressure (Table I). The effects of taste on low-amplitude starvation (before food) - correlated, basal motility were more pronounced, both in force and duration (Fig. 2), than on after-food-induced high amplitude basal motility.

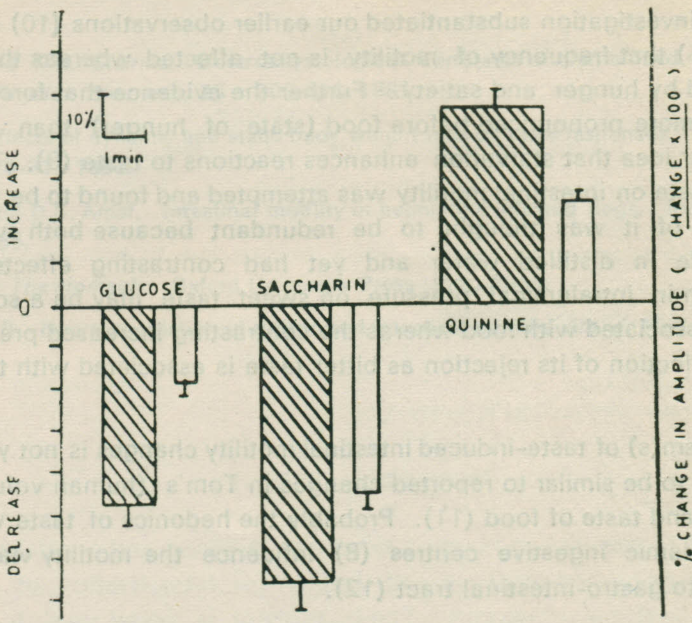

Fig. 2 : Effects of gustation on amplitude (vertical height of bar), duration (horizontal length) and direction (increase or decrease) of dogs before (■) and after (□) food.

TABLE I : Effects of gustation on intestinal motility. (mean ± SE) of dog.

	BASAL	GLUCOSE	SACCHARIN	QUININE
1. *Before food*				
Pressure (mm H_2O)	3.2±0.4	1.7±0.2*	1.1±0.1*	4.7±0.2*
Freq. (Waves/min)	25.8±1.1	23.8±0.9	21.8±1.2	27.3±1.1
2. *After food*				
Pressure (mm H_2O)	10.6±1.4	8.8±0.9	4.8±0.5*	13.1±0.9*
Freq. (Waves/min)	33.4±1.7	31.5±1.5	30.4±1.8	34.8±1.2

*P < 0.05 compared to basal

DISCUSSION

The present investigation substantiated our earlier observations (10) and the observations of others (1) that frequency of motility is not affected whereas the intra-luminal pressure is altered by hunger and satiety. Further the evidence that force and duration of taste effects are more pronounced before food (state of hunger) than after food (fed state) reinforced our idea that starvation enhances reactions to taste (9). Though effects of distilled water taste on intestinal motility was attempted and found to be not significant, a specific mention of it was thought to be redundant because both sweet and bitter solutions were made in distilled water and yet had contrasting effects on intestinal motility. Reduction in intraluminal pressure on sweet taste may be a sort of receptive relaxation as it is associated with food wheras the contrasting increased pressure on bitter taste could be a reflection of its rejection as bitter taste is associated with toxicity (4).

The mechanism(s) of taste-induced intestinal motility changes is not yet worked out. However it appears to be similar to reported changes in Tom's (human volunteer) gastric motility on the talk and taste of food (11). Probably the hedonics of taste with its known effects on hypothalamic ingestive centres (8) influence the motility via hypothalamic neural connections to gastro-intestinal tract (12).

The present report indicates that taste, like the peptide motilin, exerting its "primary effect on gastro-intestinal motility can have a profound effect on metabolism" (6) through the effects on intestinal transit time and absorption.

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