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'SHAM FEEDING' WITH THE PECTIN MEAL

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The pectin meal which has been used in the Serial Test Meal to determine the secretory and motor activity of the human stomach (Hunt & Spurrell, 1951) was designed to exert minimal stimulation of the cephalic phase of gastric secretion. It is a bland mixture of rather neutral characteristics, for which subjects do not express any strong feelings of like or dislike. It has been shown that the pattern of gastric response to the meal is the same whether the meal be taken by the mouth or administered by stomach-tube (Hunt & Macdonald, 1951). However, direct evidence as to its effect on cephalic secretion has had to await an occasion when a subject could be 'sham fed', the response of the stomach being recorded without the actual entry of the meal. This opportunity has now arisen, and the gastric secretory response to the pectin meal has been compared with the secretion in response to a meal of the subject's choice and with the basal gastric secretion.

Pavlov (1902) was the first to use 'sham feeding' as a means of investigating the cephalic phase of gastric secretion, though Richet (1878) had earlier shown that in man there was a gastric response to the sight, taste, smell or thought of food. Beaumont (1833) and later Wolf & Wolff (1943) showed that the cephalic phase of gastric digestion was associated with a juice rich in acid, and Carlson (1919), Ivy (1941) and Janowitz, Hollander, Orringer, Levy, Winkelstein, Kaufman & Margolin (1950) have published quantitative data about this secretion.

THE SUBJECT

The subject, Mrs D., was a woman of 42 who, following her first pregnancy, had developed an achalasia of the cardia. This remained amenable to treatment with a mercury bougie until the latter part of a subsequent pregnancy when the difficulty in swallowing increased until dilatation with the bougie became impossible. In view of this complete oesophageal obstruction a gastrostomy

was performed and the patient was fed by this route till the baby was born a week later and for a further month by which time swallowing function was restored. These experiments were performed 16-20 days post-partum before any relaxation of the cardia could be detected.

PROCEDURE

A tube was passed through the gastrostomy and the gastric juice was withdrawn during the whole of the experimental period and divided into 15 min samples. The volume of each sample was measured and the H^+ concentration, Cl^- concentration, and pepsin concentration (Hunt, 1948) were determined. After collecting the basal gastric secretion for 45 min, the meal was given and the gastric juice collected for a further period. On the first day the meal consisted of 200 ml. of pectin meal, on the second day the meal was that chosen by the subject and consisted of fried bacon, egg, tomato and bread with tea, toast and marmalade, and on the third day the basal secretion was collected for 2 hr. The subject was unaware of the meal she was to receive until it was produced at the end of the 45 min period of collecting the basal secretion. Taking a meal consisted in its introduction into the mouth, mastication and then ejection, the whole process lasting some 20 min.

RESULTS

Table 1 shows the data of the basal gastric secretion, and Tables 2 and 3 show the data relating to the secretion of gastric juice produced by 'sham feeding' with the pectin meal and with the meal of the subject's choice.

TABLE 1. Basal gastric secretion

Time (min)	Volume recovered (ml.)	[H^+] (m.equiv/l.)	[Cl^-] (m.equiv/l.)	[Pepsin] (units/l.)	Amount H^+ (m.equiv)	Amount Cl^- (m.equiv)	Amount pepsin (units)
0-15	28.5	63.3	89.8	47	1.80	2.56	1340
15-30	13.0	107.6	141.1	36	1.40	1.83	468
30-45	16.5	106.4	123.1	34	1.76	2.03	561
45-60	23.5	121.9	143.6	38.5	2.86	3.37	905
60-75	14.5	126.7	159.0	45.5	1.84	2.31	660
75-90	26.0	129.3	166.7	33.5	3.36	4.33	871
90-105	22.0	119.5	148.8	45	2.63	3.27	990
105-120	24.0	113.0	138.5	37	2.71	3.32	888

TABLE 2. Gastric secretory response to 'sham feeding' a pectin test meal

Time (min)	Volume recovered (ml.)	[H^+] (m.equiv/l.)	[Cl^-] (m.equiv/l.)	[Pepsin] (units/l.)	Amount H^+ (m.equiv)	Amount Cl^- (m.equiv)	Amount pepsin (units)
0-15	14.0	95.6	129.5	70	1.34	1.81	980
15-30	18.0	123.1	150.1	34	2.22	2.70	612
30-45	18.0	124.3	156.7	41	2.24	2.82	738
200 ml. pectin 'sham fed'							
45-60	23.0	127.4	157.7	48.5	2.93	3.63	1116
60-75	23.0	127.9	156.5	25	2.94	3.60	575
75-90	26.0	129.1	159.0	38	3.36	4.13	988
90-105	21.0	129.1	159.0	45	2.71	3.34	945
105-120	28.0	127.1	152.6	42	3.56	4.27	1176
120-135	24.0	124.8	150.1	45	3.00	3.60	1080

TABLE 3. Gastric secretory response to 'sham feeding' a meal of the subject's choice

Time (min)	Volume recovered (ml.)	[H ⁺] (m.equiv/l.)	[Cl ⁻] (m.equiv/l.)	Pepsin (units/l.)	Amount H ⁺ (m.equiv)	Amount Cl ⁻ (m.equiv)	Amount pepsin (units)
0-15	22.5	126.7	152.6	38	2.85	3.43	855
15-30	27.5	130.3	151.6	40	3.58	4.17	1100
30-45	24.5	130.3	162.9	38.5	3.19	3.99	943
Chosen meal 'sham fed'							
45-60	40.0	127.9	156.5	83	5.12	6.26	3320
60-75	79.0	111.1	111.6	43.5	8.78	8.82	3437
75-90	37.7	124.5	139.8	23.5	4.69	5.27	886
90-105	12.0	130.3	148.8	30	1.56	1.79	360
105-120	11.0	116.6	142.4	34	1.28	1.57	374
120-135	14.0	101.8	134.7	57	1.43	1.89	798

DISCUSSION

The amounts of acid, chloride and pepsin secreted in response to 'sham feeding' with the pectin meal, and with a palatable breakfast are shown in Figs. 1-3. It is clear that there is no increase in the amount of these substances produced in response to the pectin test meal, but the meal of choice caused a marked increase in the amount of acid, chloride and pepsin secreted. This finding confirms the belief that the pectin meal does not produce any significant stimulation of appetite juice in a subject who can secrete vigorously when allowed to select a palatable meal.

Although following the meal of choice there is a rise in the volume of juice secreted and the amount of H ion therein, the concentration of H ions shows no significant alteration (Fig. 4). This means that as far as acid secretion is concerned the basal secretion and 'appetite juice' are similar in composition but, as Pavlov pointed out, appetite is expressed in an increased production of juice. The pepsin concentration, as seen in Table 3, rises during the first 15 min of feeding with the palatable meal.

The increase in amount of pepsin produced as a result of a pleasant meal rises almost to its maximum during the first 15 min of the 'sham feeding' (Fig. 3), whereas with acid and chloride the maximum secretion is not attained until the second 15 min period after the commencement of 'sham feeding'. This plateau-like curve of the pepsin secretion, together with increased concentration of pepsin in this period, could be accounted for by a preliminary washing-out of preformed pepsin as Babkin (1944) has suggested.

The increased volume of the gastric juice produced in response to a meal of the subject's choice was a striking feature in the 'sham feeding' experiments (Fig. 5), and this increase in gastric secretion was noticed within 3 min of the commencement of 'sham feeding'. The rapidity of this response is in agreement with the findings of Janowitz *et al.* (1950), and is typical of nervous control.

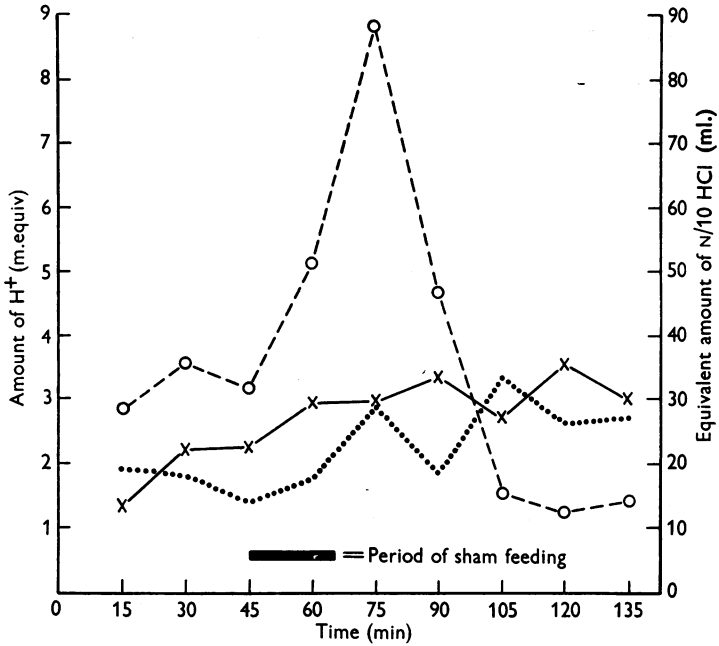


Fig. 1. Amount of H⁺ secreted in response to 'sham feeding' a meal of subject's choice (O---O) and a pectin meal (x---x). Basal secretion,

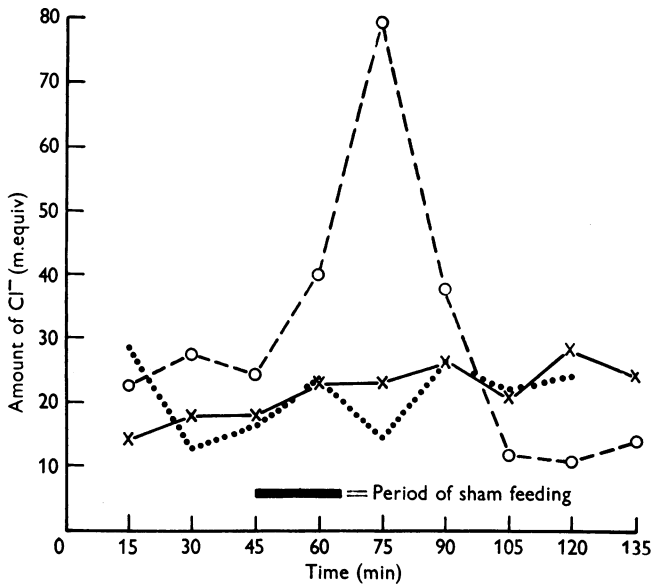


Fig. 2. Amount of Cl⁻ secreted in response to 'sham feeding' a meal of subject's choice (O---O) and a pectin meal (x---x). Basal secretion,

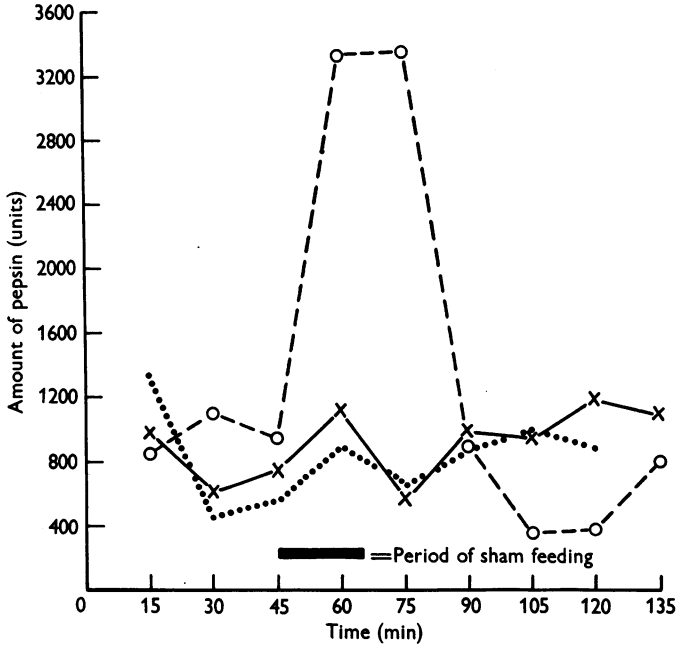


Fig. 3. Amount of pepsin secreted in response to 'sham feeding' a meal of subject's choice (O---O) and a pectin meal (x---x). Basal secretion,

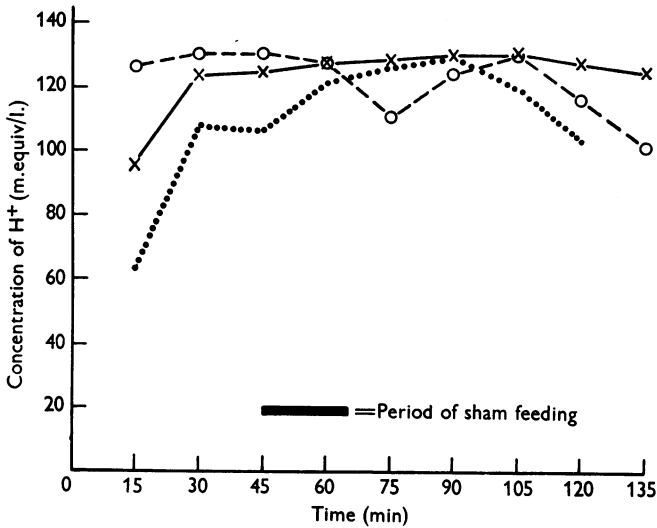


Fig. 4. Concentration of H⁺ in gastric contents in response to 'sham feeding' a meal of subject's choice (O---O) and a pectin meal (x---x). Basal secretion,

The secretory activity of the stomach had returned to its resting level an hour after the commencement or 40 min after cessation of 'sham feeding' with the exception of pepsin which returned to its basal rate 15 min earlier.

In complete contrast to the gastric activity under the influence of a powerful cephalic stimulus, the pectin test meal did not elicit a gastric response in any way different from the basal secretion.

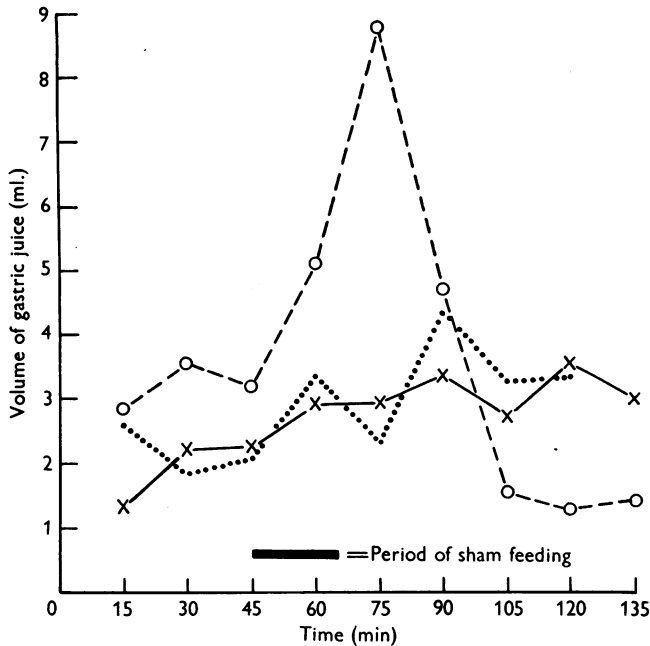


Fig. 5. Volume of gastric juice produced in response to 'sham feeding' a meal of subject's choice (O---O) and a pectin meal (x---x). Basal secretion,

SUMMARY

1. A subject with a gastrostomy for complete achalasia of the cardia was 'sham fed' with a pectin meal, and the gastric response compared with the basal secretion and with the secretion in response to a meal of the subject's choice.

2. The pectin meal did not cause any cephalic secretion of gastric juice, whereas a meal of choice produced a marked cephalic response.

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