

PERIODIC SECRETION OF THE INTESTINAL GLANDS IN DOGS DURING EMOTIONAL EXCITATION

N. V. Maevskaya and Yu. V. Linevskii

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It was previously been shown [2, 3] that an increase in the secretion of the intestinal glands of dogs in response to local mechanical stimulation of the mucous membrane takes place during prolonged emotional excitation. The intestinal glands were found to be more inert than the gastric glands in similar conditions: the intestinal secretion was not affected in every case, and if changed it returned to normal often after only 2-4 days.

Clinical observers [1] have reported the inhibition of secretion in patients in a depressed state. However, this problem has not been studied experimentally.

The object of the present investigation was to study the effect of emotional excitation on the periodic secretion of the fluid part of the intestinal juice and the enzymes.

EXPERIMENTAL METHOD

The investigation was carried out on 3 dogs with Thiry or Thira-Vella isolated loops of the proximal part of the jejunum. The volume of juice periodically secreted in a fasting state was measured every 15 min for 4 h. The activity of enterokinase [5] and alkaline phosphatase [4] was determined in a homogenate of the juice and expressed in conventional units per gram homogenate; the amount of enzyme liberated during the experiment was calculated as mean values per hour and per gram of the solid part of the juice.

Emotional excitation, in the form of a sustained aggressive reaction lasting 60 min and 4 h was evoked by exposing a cat to the dog during the second hour of the experiment or throughout the experiment.

EXPERIMENTAL RESULTS

In a normal state, individual differences were observed between the dogs in the secretion of intestinal enzymes, although the secretion of the fluid part of the juice showed approximately identical variations. For instance, in the dogs Renat and Murat the enterokinase activity was 90-506 units /g homogenate, while in the dog Chernysh it was 20-80 units. The phosphatase content varied in Renat from 1730 to 7230 units, in Murat from 7590 to 25 000 units, and in Chernysh from 900 to 7204 units. The secretion of enzymes per time, i.e., per hour, was more stable.

The effect of an aggressive reaction lasting 60 min on secretion was investigated in the dogs Chernysh and Murat, and the effect of a reaction lasting 4 h was studied in Renat. A more prolonged period of emotional excitation was evoked in the dog Renat because the secretion of intestinal juice in response to mechanical stimulation had previously been investigated in this animal during excitation for 60 min, and observations have shown that the effect of emotional excitation on intestinal secretion often diminishes in repeated experiments.

In both Renat (Fig. 1) and Chernysh (Fig. 2), a marked increase in secretion was observed as the result of emotional excitation. In Chernysh the secretion was also increased during the period of the after-effect, and the increase was particularly marked two days after emotional excitation.

The secretion of enzymes in Renat was increased as the result of a sharp increase in their concentration in the juice (Fig. 1). The total volume of secretion was within the limits of the control values, but the secretion of the solid part of the juice showed a slight increase, the total quantity of which in the period of 4 h was 0.93 g, compared with from 0.08 to 0.47 g in the control experiments. The content of enzymes per gram of the solid part of the juice was about doubled.

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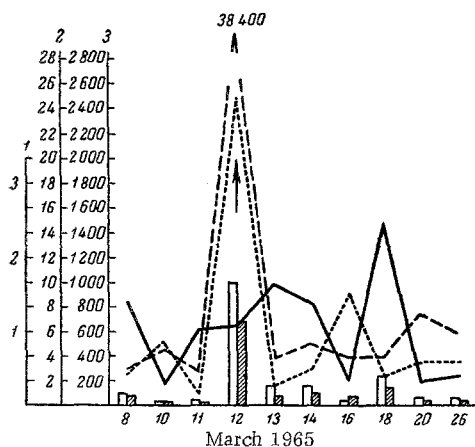


Fig. 1. Effect of emotional excitation on periodic secretion of the intestinal glands in the dog Renat. Abscissa—dates of experiments; ordinate: 1) volume of juice (in ml); 2) phosphatase (in thousands of units); 3) enterokinase (in units). Continuous line—secretion of intestinal juice, broken line—concentration of phosphatase in homogenate of juice, broken line—concentration of enterokinase. Columns—amount of enzymes secreted per hour of the experiment: unshaded—phosphatase, shaded—enterokinase. Arrow—aggressive reaction lasting 4 h.

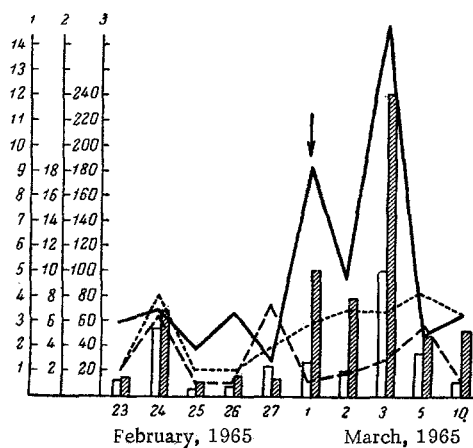


Fig. 2. Effect of emotional excitation on the periodic secretion of the intestinal glands in the dog Chernysh. Arrow—aggressive reaction lasting 60 min during the second hour of the experiment. Rest of legend as in Fig. 1.

In Chernysh the increase in the secretion of enzymes after emotional excitation was not accompanied by any significant changes in their concentration, for the volume of the fluid part of the intestinal juice increased considerably at the same time (Fig. 2).

The secretion of enterokinase and phosphatase usually changed parallel to each other.

The periodic secretion, just as was found in the case of secretion in response to local stimulation, is highly resistant to the prolonged action of extraordinary stimuli, as shown by the absence of changes in the secretion in one of the dogs, although the reaction of aggressiveness was strong in this case also.

Like the secretion in response to local mechanical stimulation, the period of compensation of the changes in periodic secretion of juice may continue for several days.

It may be concluded from the results of these experiments that during emotional excitation changes occur in the functional state of the glands of the small intestine, and these are expressed as changes in the secretion of enzymes. The secretion of enzymes in this case is a highly sensitive index, because it may change not only on account of variations in the volume of secretion or in the ratio between the liquid and solid parts of the intestinal juice, but also when the volume of secretion remains constant, as the result of changes in the concentration of enzymes in the juice.

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