

CHANGES IN PROTEIN CONTENT OF GASTRIC JUICE DURING SECRETION

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UDC 612.321.015.348:612.39

Depending on the method of excitation of gastric secretion, characteristic quantitative and qualitative changes in the protein composition of the gastric juices are observed. In the course of gastric secretion rapid changes in protein composition of the juice may occur.

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Much attention has recently been paid to the study of the protein composition of the gastric juice. This problem is of particular interest to clinicians, for the composition of the gastric juice proteins has been shown to change significantly in diseases of the organs of the gastrointestinal tract, and analysis of the protein composition of the gastric juice may therefore be of diagnostic importance [2-14].

The protein composition of normal gastric juice and, in particular, changes in its composition have received much less study. However, a knowledge of these parameters is essential for a fuller understanding of normal gastric function [11].

The object of this investigation was to study changes in the protein composition of the gastric juice in normal physiological conditions.

EXPERIMENTAL METHOD

Chronic experiments were performed on 8 dogs undergoing operations (an esophagotomized dog, dogs with a gastric fistula and with isolation of the pylorus), and also on dogs with Pavlov pouches.

Tests were made on the gastric juice obtained in response to various stimuli: feeding and sham feeding with meat, feeding with mixed food, stimulation of gastric secretion by histamine, and stimulation of the second phase of gastric secretion in the fundal part of the stomach by introducing 5% peptone solution into the isolated pylorus. The protein composition of the gastric juice was determined by the diffuse melting out method [1]. This method was chosen because it can be used to analyze the protein composition of gastric juice in a more adequate medium (at pH 3.5) than electrophoresis, when the analysis made in an alkaline solution. Altogether 87 tests were performed.

EXPERIMENTAL RESULTS

The initial reaction of the gastric juice during the experiments was alkaline. The latent period of secretion and the volume of juice secreted, its acidity, and its protein composition were studied. Both the protein concentration and the total protein content in the actual volume of juice secreted were determined.

The protein composition of juice secreted by the major portion of the stomach in response to various stimuli differed significantly. For instance, the protein concentration in the gastric juice secreted in the first phase rose considerably in the zone of 20-30% saturation of salt. The maximal quantity of protein was salted out at 50-60% saturation (Fig. 1). The protein concentration in the juice secreted in response to sham feeding was 98 ± 4.8 mg%. The total quantity of protein secreted in 10-min samples averaged 18.3 ± 1.3 mg.

The second phase of gastric secretion was studied in dogs with innervated and denervated isolated pyloric portions of the stomach. The protein composition of the juice obtained from these dogs was closely similar. In the second phase of gastric secretion a considerable increase in concentration of proteins salted

Laboratory of Physiology of Digestion, A. A. Bogomolets' Institute of Physiology, Academy of Sciences of the Ukrainian SSR, Kiev (Presented by Active Member of the Academy of Medical Sciences of the USSR N. N. Sirotin). Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 65, No. 2, pp. 14-16, February, 1968. Original article submitted June 15, 1966.

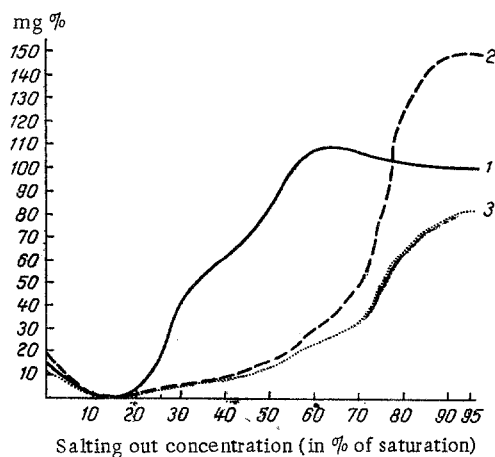


Fig. 1

Fig. 1. Protein composition of gastric juice obtained from the major portion of the stomach. 1) Juice during sham feeding with meat (first phase of secretion); 2) juice obtained during stimulation of second phase of gastric secretion by introducing peptone into the isolated pylorus; 3) juice obtained by stimulation of secretion by subcutaneous injection of histamine.

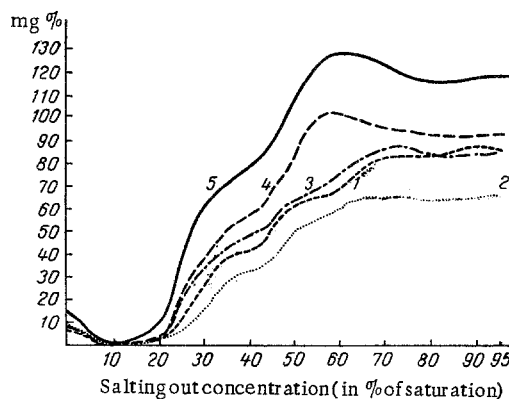


Fig. 2

Fig. 2. Changes in protein composition of gastric juice in 20-min samples in the same experiment. Juice obtained in response to sham feeding with meat. Numbers denote series number of samples in order of collection.

out at 60–70% saturation was observed; the maximal concentration of proteins was salted out at high percentages of saturation. The protein concentration in juice of the denervated pylorus during the second phase of gastric secretion was 162 ± 11.6 mg%. The total protein content in the 10-min samples was 7.1 ± 1.2 mg. After stimulation of gastric secretion in the innervated pylorus the protein concentration in the juice was 165 ± 18.4 mg%, and the total content of protein secreted in the 10-min samples was 13.1 ± 1.5 mg.

The protein concentration in juice secreted from the main part of the stomach in response to histamine injection was 90 ± 9.4 mg %, and the total protein secreted in the 10-min samples was 13.1 ± 1.5 mg.

The protein concentration in the juice obtained from the isolated gastric pouch of dogs receiving mixed food rose steadily with an increase in salting out concentration. In juice obtained in response to feeding with meat, an increase in protein concentration was observed at 40–50% saturation, and was much greater.

Observations on changes in the protein composition of the juice in the course of secretion during the same experiment showed that quantitative and qualitative changes took place rapidly in the protein composition. Analyses of the protein composition of the juice in samples collected in 20-min intervals in the reflex phase of gastric secretion are shown in Fig. 2. In this particular experiment, the following changes in protein concentration were observed in five successive samples: 95.7, 69.5, 95.2, 104, and 123 mg%. The quantity of proteins salted out in these same samples was 21, 20, 23.7, 28, and 24.6 mg respectively.

Rapid changes in the protein composition of the juice were also found during analysis of samples collected in 10-min intervals after stimulation of gastric secretion by subcutaneous injection of histamine.

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