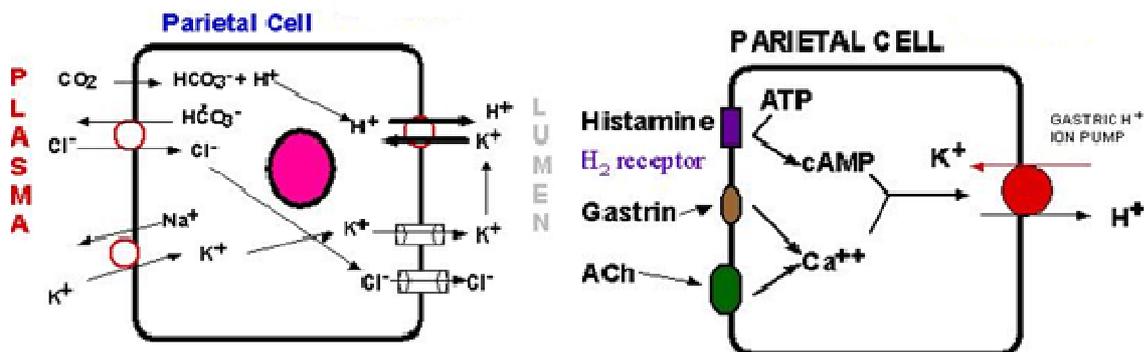


ASSESSMENT OF GASTRIC SECRETION

INTRODUCTION

The stomach mucosa has two important types of tubular glands: oxyntic glands (also called gastric glands) and pyloric glands. The oxyntic (acid-forming) glands secrete hydrochloric acid, pepsinogen, intrinsic factor and mucus. The pyloric glands secrete mainly mucus for protection of the pyloric mucosa from the stomach acid. They also secrete the hormone gastrin.

When stimulated, the parietal cells secrete an acid solution that contains about 160 millimoles of hydrochloric acid per liter, which is almost exactly isotonic with the body fluids. The pH of this acid is about 0.8, demonstrating its extreme acidity. At this pH, the hydrogen ion concentration is about 3 million times that of the arterial blood. To concentrate the hydrogen ions this tremendous amount requires more than 1500 calories of energy per liter of gastric juice. A parietal cell (also called oxyntic cell) contains large branching intracellular canaliculi. The hydrochloric acid is formed at the villus-like projections inside these canaliculi and is then conducted through the canaliculi to the secretory end of the cell. Different suggestions for the chemical mechanism of hydrochloric acid formation have been offered.



In human beings, gastric juice is achieved by gastric probe. Gastric juice is drawn after the introduction into stomach of a thin probe, called Eihorn tube/probe. Eihorn probe is a soft rubber tube 1.4 m long and 3-4 mm in diameter graduated, on one end cap has a perforated metal olive. This probe is sterilized before use and the subject is invited to swallow. At 50-70 cm from the dental arch probe reached the stomach, and the subject is lying in lateral left decubitus. At the free end of the probe gastric juice is aspirated with a syringe from 15 to 15 minutes.

Exploration of gastric secretion is performed in the morning, when the gastric juice is aspirated, at every 15 minutes. The acidity and volume of each sample are measured. After that, gastric secretion is stimulated with histamin or gastrin and again the acidity and volume of each sample of gastric juice are established. Today it has no practical use.

Assessment of free and total acidity

Materials: gastric juice obtained before and after the stimulation of gastric secretion (5 samples); NaOH solution 0.1N; pipettes; burette; Topfer-Linosier reagent (contains dimethylaminoazobenzen and phenolphthalein); Berzelius beakers

Procedure:

10 ml of gastric juice are put into a beaker and 3-4 drops of Topfer- Linosier are added. In the presence of free hydrochloric acid (HCl), the gastric juice turns to red. Titration of free HCl is made with NaOH 0,1N from burette, which is introduced drop by drop into gastric juice, until the red colour turns to yellow-orange (the reagent dimethylaminoazobenzen has the turning point at pH=3,1- 4,4). The volume of NaOH 0,1N used for neutralization of free acidity is noted.

The titration is continued with NaOH until the fluid becomes pink, due to the phenolphthalein, which has the turning point, from colorless to red at 8,2 – 10. The volume of NaOH 0,1N used corresponds to the total acidity of gastric juice.

This operation is repeated with the gastric juice of each sample. Free and total acidity can be expressed in clinical Jaworsky units or in g‰. The number of ml of NaOH 0,1N which neutralized the free and total acidity from 100 ml of gastric juice represents the clinical Jaworsky unit.

Normal values: **free acidity= 20 – 40 clinical units**

Total acidity = 40 – 60 clinical units

Total acidity represents the sum of free acidity and combined acidity (acidities (H ions) bound with proteins and mucin. The values in g‰ are obtained multiplying by 100 the number of ml of NaOH 0,1N used for neutralization of 10 ml of gastric juice and with 0,00365, which is the equivalent of HCl (1 ml of NaOH 0,1N neutralizes 0,00365g of HCl). This calculation is made for free and total acidity.

Normal values: **free acidity= 0,7 – 1,4 g‰**

total acidity= 1,8 – 2,5 g ‰.

Assessment of gastric acidity in mEq HCl

For expressing of gastric acidity in mEq HCl is necessary to know the concentration of free H at the pH of 7. Therefore, the titration of gastric juice must be performed in the presence of an indicator which turns at the pH of 7. Such an indicator is red phenol, having the turning point between 6,4 – 8,0.

Materials: samples of gastric juice; NaOH 0,1N; Berzelius beakers, burette; pipettes; Red phenol 0,02%

Technique: the titration of acidity of each sample is achieved in the same manner as before, following the turning of red phenol from yellow to red. One obtains only one value.

The acidity of each sample can be calculated according to the formula:

$$\text{mEq HCl} = \frac{\text{vol. of gastric juice (ml)} \times \text{number of ml of NaOH used for neutralization}}{1000}$$

Adding the values of acidity calculated in mEq from four samples of gastric juice, one can find out the flow of acid from gastric juice in mEq/hour.

Normal values: **1,5 – 2 mEq HCl/hour** (when gastric secretion is not stimulated – the volume of gastric juice is 60 – 80 ml/h)

-15 – 22 mEq/h (after the injection of histamine, volume = 200 – 250 ml/h)

Pathological variations :

- hypersecretion(hyperacidity): gastro-duodenal ulcers, acute gastritis, pancreatic adenoma with gastrin hypersecretion (Zollinger-Ellison syndrome);
- hyposecretion(hypoacidity): chronic gastritis;
- achlorhydria (no HCl secretion): in gastric carcinoma.

OTHER TESTS

1. Gastrin plasma concentration. Hypergastrinemia associated with normal or decreased acid secretion: atrophic gastritis, gastric cancer and Biermer anemia. Hypergastrinemia associated with increased acid secretion: Zollinger-Ellison syndrome.

2. Intrinsic Factor is evaluated by Schilling test (radioactive Cobalt marked B12 vitamin administration and measurement of its 24 hours urinary secretion). Allows the diagnosis of atrophic gastritis and Biermer anemia.