

Gastric Function Tests

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- ⊙ **Stomach is a reservoir of ingested foodstuffs.**
- ⊙ **It has a great churning ability which promotes digestion.**
- ⊙ **Stomach elaborates HCl & proteases (pepsin) which are responsible for the initiation of digestive process.**
- ⊙ **The products obtained in the stomach (peptides, amino acids) stimulate the release of pancreatic juice & bile.**

Secretion of gastric HCL

- ⊙ The parietal (oxyntic) cells of gastric glands produce HCL.
- ⊙ The pH in the gastric lumen is as low as 0.8 (against the blood pH 7.4).
- ⊙ The protons are transported against concentration gradient by an active process.
- ⊙ The enzyme K^+ activated ATPase-present in the parietal cells is connected with the mechanism of HCL secretion.

- ⊙ It involves an exchange of H^+ ions (of the parietal cells) for K^+ ions (of the lumen).
- ⊙ This is coupled with the consumption of energy/ supplied by ATP.
- ⊙ The H^+ are continuously generated in the parietal cells by the dissociation of carbonic acid which, in turn, is produced from CO_2

- ⊙ **The bicarbonate ions (HCO_3^-), liberated from the carbonic acid (H_2CO_3) dissociation, enter the blood in exchange for Cl^- ions.**
- ⊙ **The latter diffuse into the gastric lumen to form HCL.**
- ⊙ **Gastrin-a peptide hormone of gastrointestinal tract-stimulates HCL secretion.**

Fractional test meal (FTM)

- ⊙ Fractional test meal involves the collection of stomach contents by Ryle's tube in fasting.
- ⊙ This is followed by a gastric stimulation, giving a test meal (rice gruel, black coffee etc.).
- ⊙ The stomach contents are aspirated by Ryle's tube at different time periods (every 15 min for 2 hrs.)
- ⊙ The samples are analyzed for free & total acidity.
- ⊙ The results are normally represented by a graph.

Alcohol test meal

- ◉ **In this case, the test meal in the form of 100 ml of 7% alcohol is administered.**
- ◉ **The response to alcohol test meal is more rapid & test time can be reduced to 1½ hour.**
- ◉ **Clear specimens can be collected by this test & the free acidity levels are relatively higher compared to FTM.**

Pentagastrin stimulation test

- ⊙ **Pentagastrin is a synthetic peptide.**
- ⊙ **It stimulates the gastric secretion in a manner similar to the natural gastrin.**
- ⊙ **The stomach contents are aspirated by Ryle's tube in a fasting condition.**
- ⊙ **This is referred to as residual juice.**
- ⊙ **The gastric juice elaborated for the next one hour is collected and pooled which represents the basal secretion.**

- ⊙ **Pentagastrin (5mg/kg body weigh) is now given to stimulate gastric secretion.**
- ⊙ **The gastric juice is collected at 15 minute intervals for one hour.**
- ⊙ **This represents the maximum secretion.**
- ⊙ **Each sample of the gastric secretion collected is measured for acidity by titrating the samples with N/10 NaOH to pH 7.4.**
- ⊙ **The end point may be detected by an indicator (phenol red) or a pH meter**

- ⊙ **Basal acid output (BAO)** refers to the acid output (millimol per hour) under the basal conditions i.e. basal secretion.
- ⊙ **Maximal acid output (MAO)** represents the acid output (millimol per hour) after the gastric stimulation by pentagastrin i.e. maximum secretion.
- ⊙ **In normal individuals, the BAO is 4-10 mmol/hr while the MAO is 20-50 mmol/hr.**

Augmented histamine test meal

- ⊙ **Histamine is a powerful stimulant of gastric secretion.**
- ⊙ **The basal gastric secretion is collected for 1 hr.**
- ⊙ **Histamine (0.04 mg/kg body weight) is administered subcutaneously & the gastric contents are aspirated for the next one hour (at 15 minute intervals).**
- ⊙ **The acid content is measured in all these samples.**

Insulin test meal

- ⊙ This is also known as Hollander's test.
- ⊙ It is mainly done to assess the completeness of vagotomy (vagal resection).
- ⊙ Insulin (0.1 unit/kg body weight) is administered intravenously, which causes hypoglycemia, usually within 30 minutes, in normal persons.

- ⊙ If the **vagotomy operation is successful**,
insulin administration does not cause any
increase in the acid output, compared to the
basal level.
- ⊙ **This test has to be carefully performed, since**
hypoglycemia is dangerous.

Tubeless gastric analysis

- ⊙ **The tubeless gastric analysis involves administration of a cation exchange resin that gets quantitatively exchanged with H^+ ions of the gastric juice.**

- ⊙ **The resin is then excreted into urine which can be estimated for an indirect measure of gastric acidity (concentration of H^+ ions).**
- ⊙ **Diagnex blue containing azure-A-resin is employed in the tubeless gastric analysis.**

Abnormalities of gastric function

- ⊙ **Increased gastric HCl secretion is found in**
- ⊙ **Zollinger-Ellison syndrome (a tumor of gastrin secreting cells of the pancreas),**
- ⊙ **Chronic duodenal ulcer,**
- ⊙ **Gastric cell hyperplasia,**
- ⊙ **Excessive histamine production etc.**

- ⊙ **A decrease in gastric HCl is observed in**
- ⊙ **Gastritis**
- ⊙ **Gastric carcinoma**
- ⊙ **Pernicious anemia**
- ⊙ **Partial gastrectomy**
- ⊙ **Chronic iron deficiency anemia.**

References

- ⊙ **Text book of Biochemistry – DM Vasudevan**
- ⊙ **Text book of Biochemistry – U Satyanarayana**
- ⊙ **Text book of Biochemistry – MN Chatterjea**

Thank you