

Looking at a Normal Person's Gastric Acid Production – Is it Continuous?

Below found at: <http://medical-dictionary.thefreedictionary.com/Gastric+Acid+Determination>

Gastric Acid Determination

Definition

***Note that the “basal gastric secretion” is what the stomach is secreting while fasting and not being stimulated in any way to produce gastric acid.**

Gastric acid determination, also known as stomach acid determination, gastric analysis, or basal gastric secretion, is a procedure to evaluate gastric (stomach) function. The test specifically determines the presence of gastric acid, as well as the amount of gastric acid secreted. It is often done in conjunction with the gastric acid stimulation test, a procedure that measures gastric acid output after injection of a drug to stimulate gastric acid secretion.

Purpose

The purpose of the gastric acid determination is to evaluate gastric function by measuring the amount of acid as suctioned directly from the stomach. The complete gastric acid determination includes the basal gastric secretion test, which measures acid secretion while the patient is in a [fasting](#) state (nothing to eat or drink), followed by the gastric acid stimulation test, which measures the secretion of gastric acid for one hour after injection of pentagastrin or a similar drug that stimulates gastric acid output. The Gastric acid stimulation test is done when the basal secretion test suggests abnormalities in gastric secretion. It is normally performed immediately afterward.

The basal gastric secretion test is indicated for patients with obscure gastric [pain](#), loss of appetite, and weight loss. It is also utilized for suspected peptic (related to the stomach) ulcer, severe stomach inflammation ([gastritis](#)), and Zollinger-Ellison (Z-E) syndrome (a condition in which a pancreatic tumor, called a [gastrinoma](#), stimulates the stomach to secrete excessive amounts of acid, resulting in peptic ulcers). Because external factors like the sight or odor of food, as well as psychological [stress](#), can stimulate gastric secretion, accurate testing requires that the patient be relaxed and isolated from all sources of sensory stimulation. Abnormal basal secretion can suggest various gastric and duodenal disorders, so further evaluation requires the gastric acid stimulation test.

The gastric acid stimulation test is indicated when abnormalities are found during the basal secretion test. These abnormalities can be caused by a number of disorders, including duodenal ulcer, [pernicious anemia](#), and gastric [cancer](#). The test will detect abnormalities, but x rays and other studies are necessary for a definitive diagnosis.

Precautions

Because both the basal gastric secretion test and the gastric acid stimulation test require insertion of a gastric tube (intubation) through the mouth or nasal passage, neither test is recommended for patients with esophageal problems, [aortic aneurysm](#), severe gastric hemorrhage, or congestive [heart failure](#). The gastric acid stimulation test is also not recommended in patients who are sensitive to pentagastrin (the drug used to stimulate gastric acid output).

Description

This test, whether performed for basal gastric acid secretion, gastric acid stimulation, or both, requires the passage of a lubricated rubber tube, either by mouth or through the nasal passage, while the patient is in a sitting or reclining position on the left side. The tube is situated in the stomach, with proper positioning confirmed by fluoroscopy or x ray.

Basal gastric acid secretion

After a wait of approximately 10-15 minutes for the patient to adjust to the presence of the tube, and with the patient in a sitting position, specimens are obtained every 15 minutes for a period of 90 minutes. The first two specimens are discarded to eliminate gastric contents that might be affected by the stress of the intubation process. The patient is allowed no liquids during the test, and saliva must be ejected to avoid diluting the stomach contents.

The four specimens collected during the test constitute the *basal acid output*. If analysis suggests abnormally low gastric secretion, the gastric acid stimulation test is performed immediately afterward.

Gastric acid stimulation test

After the basal samples have been collected, the tube remains in place for the gastric acid stimulation test. Pentagastrin, or a similar drug that stimulates gastric acid output, is injected under the skin (subcutaneously). After 15 minutes, a specimen is collected every 15 minutes for one hour. These specimens are called the *poststimulation specimens*. As is the case with the basal gastric secretion test, the patient can have no liquids during this test, and must eject saliva to avoid diluting the stomach contents.

Preparation

The patient should be fasting (nothing to eat or drink after the evening meal) on the day prior to the test, but may have water up to one hour before the test. [Antacids](#), anticholinergics, cholinergics, alcohol, H₂-receptor antagonists (Tagamet, Pepcid, Axid, Zantac), reserpine, adrenergic blockers, and adrenocorticosteroids should be withheld for one to three days before the test, as the physician requests. If pentagastrin is to be administered for the gastric acid secretion test, medical supervision should be maintained, as possible side effects may occur.

Aftercare

Complications such as nausea, vomiting, and abdominal distention or pain are possible following removal of the gastric tube. If the patient has a [sore throat](#), soothing lozenges may be given. The patient may also resume the usual diet and any medications that were withheld for the test(s).

Risks

There is a slight risk that the gastric tube may be inserted improperly, entering the windpipe (trachea) and not the esophagus. If this happens, the patient may have a difficult time breathing or may experience a coughing spell until the tube is removed and reinserted properly. Also, because the tube can be difficult to swallow, if a patient has an overactive gag reflex, there may be a transient rise in blood pressure due to [anxiety](#).

Normal results

Reference values for the *basal gastric secretion test* vary by laboratory, but are usually within the following ranges:

- men: 1-5 mEq/h
- women: 0.2-3.8 mEq/h

Reference values for the *gastric acid stimulation test* vary by laboratory, but are usually within the following ranges:

- men: 18-28 mEq/h
- women: 11-21 mEq/h

Abnormal results

Abnormal findings in the *basal gastric secretion test* are considered nonspecific and must be evaluated in conjunction with the results of a gastric acid stimulation test. Elevated secretion may suggest different types of ulcers; when markedly elevated, Zollinger-Ellison syndrome is suspected. Depressed secretion can indicate gastric cancer, **while complete absence of secretion (achlorhydria) may suggest pernicious anemia.** Elevated gastric secretion levels in the *gastric acid stimulation test* may be indicative of duodenal ulcer; high levels of secretion again suggest Zollinger-Ellison syndrome.

Resources

Books

Pagana, Kathleen Deska. *Mosby's Manual of Diagnostic and Laboratory Tests*. St. Louis: Mosby, Inc., 1998.

Key terms

Achlorhydria — An **abnormal condition** in which hydrochloric acid is absent from the secretions of the gastric glands in the stomach.

Pernicious anemia — One of the main types of anemia, caused by inadequate absorption of vitamin B₁₂. Symptoms include tingling in the hands, legs, and feet, spastic movements, weight loss, confusion, depression, and decreased intellectual function.

Zollinger-Ellison syndrome — A rare condition characterized by severe and recurrent peptic ulcers in the stomach, duodenum, and upper small intestine, caused by a tumor, or tumors, usually found in the pancreas. The tumor secretes the hormone gastrin, which stimulates the stomach and duodenum to produce large quantities of acid, leading to ulceration. Most often cancerous, the tumor must be removed surgically; otherwise total surgical removal of the stomach is necessary.
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MEASUREMENT OF GASTRIC ACID SECRETION

INDICATIONS FOR SECRETORY TESTING

Gastric secretory testing assesses the basal and maximal capacity of the stomach to produce acid. Clinically, its utility has diminished but it may assist in the diagnosis and management of patients with hypergastrinemia (e.g., gastrinoma) and in the diagnosis of incomplete vagotomy in patients with postoperative recurrent ulcer. Demonstrating fasting acid secretion or an acidic fasting gastric pH excludes achlorhydria as a cause of elevated fasting serum gastrin concentration. Patients with gastrinoma (Zollinger-Ellison syndrome; ZES) demonstrate hypergastrinemia with elevated basal acid output (see [Chapter 32](#)).

METHODS FOR MEASURING ACID SECRETION

Aspiration of gastric juice is the most widely used method for measuring acid secretion in humans. Traditionally, this is performed by positioning a nasogastric tube into the most dependent portion of the stomach of a fasted individual. Proper positioning may be verified fluoroscopically or by recovery of more than 90 mL after injection of 100 mL water. Gastric juice is collected by suction. When the tube is properly positioned, only 5% to 10% of gastric juice escapes collection and enters the duodenum. Neutralization by bicarbonate and diffusion of tiny amounts of acid back into the mucosa result in a small underestimation of the true rate of secretion. More recently, an endoscopic technique has been described to measure acid secretion in patients with gastrinoma. In this technique, all gastric contents are aspirated and discarded and then a single 15-minute sample of gastric juice is collected under direct endoscopic visualization.^[183]

The H^+ concentration in a sample of gastric juice can be determined by one of two methods. First, the specimen can be titrated in vitro with a base (e.g., NaOH). The millimoles (mmol) of base needed to titrate a volume of gastric juice to an arbitrary pH endpoint (e.g., 7) represents the “titratable” acidity in mmol per liter of the sample. The other method is to measure the pH of the sample with an electrode. Because pH electrodes measure H^+ activity and not concentration, it is necessary to convert activity to concentration using a table of activity coefficients for H^+ in gastric juice.^[184] Once the H^+ concentration of the sample in mmol per liter is determined by either of these methods, it is multiplied by the volume of the sample in liters to determine the acid output during the collection period (e.g., mmol per hour or mmol per kilogram of body weight per hour).

BASAL ACID OUTPUT

Basal acid output (BAO) estimates resting acid secretion in the absence of intentional and avoidable stimulation. It is expressed as the sum of the measured acid output, expressed as mmol H^+ per hour, for four consecutive 15-minute periods. The upper limit of normal for BAO is about 10 mmol H^+ per hour in men and 5 mmol H^+ per hour in women ([Table 49-1](#)).^[185] BAO fluctuates from hour to hour in the same person. The lowest BAO occurs between 6 and 11 am and the highest occurs between 2 and 11 pm. Variation is also related to cyclic gastric motor activity with increased BAO in late gastric phase III (migrating motor complex).^[186]

Table 49-1 -- Typical Results of Gastric Secretory Testing in Health and Disease

	Basal Acid Output (mmol H ⁺ /hr)		Maximal Acid Output (mmol H ⁺ /hr)	
	AVERAGE	RANGE	AVERAGE	RANGE
Normal subjects				
Men	2.5	0-10	25	7-50
Women	1.5	0-5	15	5-30
Duodenal ulcer				
Men	5.0	0-15	40	15-60
Women	3.0	0-15	30	10-45
Gastric ulcer				
Men	1.5	0-8	20	5-40
Women	1.0	0-5	12	3-25
Gastrinoma				
Both sexes	40	10-90	65	30-120

MAXIMAL ACID OUTPUT AND PEAK ACID OUTPUT

Maximal acid output (MAO) and peak acid output (PAO) estimate the acid secretory response to an exogenous secretagogue, usually pentagastrin (6 µg/kg subcutaneous or intramuscular or 6 µg/kg/hr continuous intravenous infusion). Pentagastrin is a manufactured analog of gastrin that contains its biologically active C-terminus sequence. Possible side effects include flushing, nausea, abdominal pain, dizziness, and palpitations. MAO is the sum of acid output of four consecutive 15-minute collection periods, and PAO is calculated by multiplying by two the sum of the two highest outputs recorded in the four test periods. The expected range for MAO is 5 to 50 mmol H⁺ per hour and for PAO is 10 to 60 mmol H⁺ per hour. MAO and PAO are higher in men and in smokers; they correlate with parietal cell mass (i.e., the total number of parietal cells). Typical results for MAO in healthy subjects and in disease are shown in [Table 49-1](#).

The below found at: <http://www.nlm.nih.gov/medlineplus/ency/article/003883.htm>

Stomach acid test

The stomach acid test is used to measure the amount of acid in the stomach. It also measures the level of acidity in stomach contents.

How the Test is Performed

The test is done after a period of not eating so that fluid is all that remains in the stomach. Stomach fluid is removed through a tube that is inserted into the stomach through the esophagus (food pipe).

To test the ability of the cells in the stomach to release acid, a hormone called [gastrin](#) may be injected into your body. The stomach contents are then removed and analyzed.

How to Prepare for the Test

You will be asked not to eat or drink for 4 - 6 hours before the test.

How the Test Will Feel

You may have some discomfort or a gagging feeling as the tube is passed through your nose or mouth, and down your esophagus.

Why the Test is Performed

Your doctor may recommend this test for the following reasons:

- To check if anti-ulcer medications are working
- To check if material is coming back up from the small intestine
- To test for the cause of [ulcers](#)

Normal Results

Normally the volume of the stomach fluid is **20 to 100 mL and the pH is acidic (1.5 to 3.5)**. These numbers are converted to actual acid production in units of milliequivalents per hour in some cases.

Note: Normal value ranges may vary slightly depending on the lab doing the test. Talk to your doctor about the meaning of your specific test results.

What Abnormal Results Mean

- Increased levels of gastrin can cause increased release of acid and may lead to ulcers ([Zollinger-Ellison syndrome](#)).
- The presence of [bile](#) in the stomach indicates material is backing up from the small intestine ([duodenum](#)). This may be normal. It may also happen after part of the stomach is removed with surgery.

Risks

There is a slight risk of the tube being placed through the windpipe and into the lungs instead of through the esophagus and into the stomach.

Alternative Names

Gastric acid secretion test

References

Scubert ML, Kaunitz JD. Gastric secretion. In: Feldman M, Friedman LS, Brandt LJ, eds. *Sleisenger and Fordtran's Gastrointestinal and Liver Disease*. 9th ed. Philadelphia, Pa: Saunders Elsevier; 2010:chap 49.

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