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## **GAS & BLOATING**

**WHAT EXACTLY IS "GAS"?** — Gas within the digestive or gastrointestinal (GI) system—which includes the esophagus, stomach, small intestine, and large intestine—primarily consists of odorless vapors, such as oxygen, nitrogen, carbon dioxide, hydrogen, and methane. These comprise more than 99 percent of eliminated intestinal gas. Minor components of "flatus"—or gas expelled through the anus—that may be associated with unpleasant odor include trace amounts of sulfur-containing gases released by bacteria that are normally present within the large intestine.

**SOURCES OF GAS** — There are two primary sources of intestinal gas: gas that is ingested (mostly swallowed air) and gas produced by bacteria that normally reside in the colon (a process called fermentation).

**Bacterial production** — The normal colon provides a home for billions of harmless bacteria, some of which may actually promote the health of the bowel. The bacteria survive by consuming foods that are not digested in the upper portions of the intestine. Their preferred foods are carbohydrates (a general term that refers to sugar, starches, and fiber in foods). Carbohydrates are normally digested by the action of enzymes in the small intestine. However, certain carbohydrates are incompletely digested, leaving them available for the bacteria in the colon to digest. The by-products of bacterial digestion include carbon dioxide, hydrogen, and methane.

Some carbohydrates, such as raffinose, are not well digested, and therefore produce increased amounts of gas. Raffinose is contained in a number of vegetables such as cabbage, Brussels sprouts, asparagus, broccoli, and some whole grains. As a result, these foods tend to cause increased amounts of gas and flatulence in most people. Another factor is variation among individuals in their ability to digest carbohydrates. A classic example is lactose, the major sugar contained in dairy products. Much of the world's adult population has a limited ability to digest lactose. Thus, consumption of large amounts of lactose by such people will lead to the production of gas often accompanied by cramping and diarrhea. Certain diseases can also lead to excessive bloating and gas. For example, patients with diabetes mellitus or scleroderma may, over time, develop sluggishness in the peristaltic activity of their small intestine. This may lead to bacterial overgrowth within the bowel, with poor digestion of carbohydrates and other nutrients. Excessive gas due to bacterial fermentation of the unabsorbed food can produce gaseousness.

**WHAT ARE THE SYMPTOMS OF GAS?** — As mentioned above, people who complain about gas usually mean that they pass excessive amounts of gas from below or burp too frequently. Other frequent complaints attributed to gas are abdominal distension and crampy abdominal pain. Such pain may be perceived in areas that the gas may become trapped, such as bends in the colon, which occur naturally in the area under the liver (upper to mid right part of the abdomen), and in the area under the spleen (upper to mid left part of the abdomen).

**Irritable bowel syndrome** — One of the most common examples is a disorder known as irritable bowel syndrome (IBS). Its cardinal symptoms are abdominal pain and altered bowel habits, but these symptoms have no identifiable cause. Many patients also complain of visible abdominal distension although they do not have increased amounts of gas in the intestine. Many researchers believe that some of the symptoms of IBS, especially the sensation of bloating, may be caused by heightened sensitivity of the intestines to normal events that occur within them. This theory proposes that nerves carrying sensory messages from the bowel are overactive in people with IBS, so that normal amounts of gas or movement in the gastrointestinal tract are perceived as excessive and painful. In support of this theory is the observation that some patients with severe IBS feel better when treated with medications (such as low doses of imipramine or nortriptyline) that decrease the sensations coming from the intestine. There is also evidence that some IBS patients are unable to move gas along in their intestines, and that fatty meals retard the evacuation of gas.

**Functional dyspepsia** — Dyspepsia describes recurrent or persistent pain or discomfort that is primarily located in the upper abdomen. It is experienced by approximately 25 percent of the population in the United States and other western countries. Dyspepsia can arise from various underlying conditions. However, the most common type of dyspepsia seen by physicians is known as "functional" (or "nonulcer") dyspepsia. This refers to dyspepsia that occurs without an identifiable cause. People with functional dyspepsia tend to have increased sensitivity to distension in the upper intestines.

**Foods that cause gas** — As discussed above, several foods contain the carbohydrate raffinose, which is poorly digested and leads to gas production by the action of colonic bacteria. Common foods containing raffinose include beans, cabbage, cauliflower, Brussels sprouts, broccoli, and asparagus. Starch and soluble fiber are other forms of carbohydrates that can contribute to gas formation. Potatoes, corn, noodles, and wheat produce gas while rice does not. Soluble fiber (found in oat bran, peas and other legumes, beans, and most fruit) also cause gas. Some laxatives contain soluble fiber and may cause gas, particularly during the first few weeks of use.

**Lactose intolerance** — Intolerance to lactose-containing foods (primarily dairy products) is a common problem. In Europe and the United States, lactose intolerance affects 7 to 20 percent in Caucasians (being lowest in those of northern European extraction), 80 to 95 percent among Native Americans, 65 to 75 percent of Africans and African Americans, and 50 percent of Hispanics. More than 90 percent of the population is affected in some regions in eastern Asia. Lactose intolerance is caused by an impaired ability to digest lactose, the principle sugar in dairy products. Clinical symptoms of lactose intolerance include diarrhea, abdominal pain, and flatulence after ingestion of milk or milk-containing products. Lactose intolerance can be diagnosed by a lactose breath test, in which a measured amount of lactose is consumed, and the amount of hydrogen in breath samples is measured. Treatment involves avoidance of dairy products that contain lactose and/or supplementation with the enzyme lactase, which is available in over-the-counter products. People who avoid dairy products should take calcium supplements, since dairy products are a valuable source of calcium.

**DIAGNOSIS** — The first steps in evaluating patients who complain of gas are obtaining a thorough medical history and performing a physical examination. Additional testing depends upon the specifics in each individual. Those with "alarm" symptoms such as diarrhea, weight loss, abdominal pain, anemia, blood in the stool, lack of appetite (anorexia), fever, or vomiting usually require specific testing. For patients without alarm symptoms, such diagnostic assessment rarely detects a specific underlying problem. For those who require testing, specific tests may include:

- Examination of stool to detect the presence of blood, abnormally increased levels of fat (steatorrhea), or the presence of *Giardia lamblia*.
- A lactose tolerance test, during which patients are provided with a test dose of lactose by mouth. After receiving the test dose, those with lactose intolerance may soon develop abdominal discomfort, diarrhea, and excessive flatulence. Breath or blood samples are obtained during the test to confirm the presence of lactose intolerance.
- X-ray examination of the small intestine.
- Upper endoscopy, sigmoidoscopy, or colonoscopy (in which the inside of the stomach, upper intestines or colon are examined via a tube with a camera at the end).
- Antibody tests for celiac disease.

**TREATMENT** — Doctors may recommend several measures to help reduce bothersome gas and associated discomfort or distress. The approach depends upon the individual, the type of symptoms, and the cause. Specific recommendations may include:

- Avoidance of foods that appear to aggravate symptoms. These may include milk and dairy products, certain fruits or vegetables, whole grains, artificial sweeteners, and/or carbonated beverages. Physicians may recommend that patients keep a diary of the foods and beverages they consume over a certain time period and suggest systematically eliminating one food or group of food at a time to help determine which may be most responsible for symptoms.
- Over-the-counter products that contain simethicone, such as certain antacids (eg, Maalox® Anti-Gas, Mylanta® Gas, Gas-X®, Phazyme®), or activated charcoal (eg, CharcoCaps®, CharcoAid®), which is a powerful absorbent. Simethicone, which causes gas bubbles to break and join together, is widely used to help alleviate gas, even though its value is questionable. Evidence concerning the benefit of activated charcoal is contradictory: its effect in alleviating symptoms of intestinal gas has been supported by some studies yet refuted by others. As a result, physicians may recommend that patients consider trying activated charcoal to see whether its use may result in some symptom relief in their case.
- Beano™, an over-the-counter preparation that contains an enzyme (alpha-galactosidase) involved in metabolizing certain complex carbohydrates. This agent may be effective in reducing gas production and frequency in people who have increased gas due to eating beans or other vegetables containing the carbohydrate raffinose.
- Bismuth subsalicylate (eg, Pepto-Bismol®) can reduce the odor of unpleasant smelling gas due to the presence of hydrogen sulfide, a sulfur-containing compound.
- Antibiotic therapy in patients who have been diagnosed with bacterial overgrowth.
- Restricting lactose in the diet, and using certain lactose-digestive aids, such as lactose-reduced milk, or over-the-counter "lactase" supplements (eg, LactAid® tablets or liquid) in patients who have been diagnosed with lactose intolerance. As mentioned above, those who avoid dairy products should take calcium supplements.