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## The Digestive System

### Overview

Unless your weekend hobby is doing improv, you probably feel uneasy discussing your digestive system in polite company. We all love to eat, of course, but we don't care to think about what happens to that chicken chalupa once it disappears down the hatch. We impose a sort of "don't ask, don't tell" policy on our own bodies. This strategy works well enough, until your gallbladder refuses to stay mum or your gut decides to show a little insubordination. Then, suddenly, you want to know what's going on down there in the dark.

Digestion is the physiological conversion of food into energy. The process can be a bit—well . . . untidy. But let's stifle our squeamishness and talk frankly about the digestive system—what it is, how it works, what can go wrong, and how you can keep yours as healthy as possible.

The digestive system is also called the *gastrointestinal (GI) system* (*gastro-* comes from the Greek word for stomach). It consists of the digestive tract and its accessory organs:

- **Digestive tract.** The digestive tract, or GI tract, is the path through which food travels as it's transformed into fuel for the body. It begins—where else?—at the lips, and includes the oral cavity, throat, esophagus, stomach, small intestine, and large intestine, ending at the anal canal.
- **Accessory organs.** Accessory organs are not part of the digestive tract itself, but they act as a support regiment, of sorts. These organs and structures include the tongue, teeth, liver, gallbladder, and pancreas. The appendix has no role in digestion but is nevertheless considered to be an accessory organ.

### Getting to know your digestive system

A diagram of the GI tract resembles a Rube Goldberg–like mouse trap—a complicated apparatus that performs a deceptively simple function. It's a finely tuned network that interacts in complex ways with other body systems to perform the straightforward task of turning food into fuel.

That chicken chalupa, for instance, can't move directly from your stomach into the body's cells, which require fuel in order to carry out their normal functions. The food particles must first be broken down to extract their proteins, fats, vitamins, and other nutrients.

In addition to digestion, the GI tract carries out essential related duties:

- **Motility.** How is a meal conveyed from your mouth to your stomach and then through your intestinal tract? It must first descend through the esophagus, the hollow muscular tube that begins at the back of the throat and terminates at the top of the stomach. It does so with the help of gravity and voluntary muscle contractions controlled by swallowing. In the lower half of the esophagus and in the stomach and intestinal tract, food is propelled by slow, involuntary contractions of smooth muscle, a process called *peristalsis*. Alternating contractions of rings of longitudinal muscle, called *segmental contractions*, knead and mash the food and churn it with digestive juices. Together, peristalsis and segmental contractions make up the mechanism known as *motility* (from the Latin word *motus*, meaning motion).

- **Secretion.** Your digestive system must call on accessory organs such as the liver to break down the food molecules in, say, a hunk of chicken as it scoots through the GI tract. These organs secrete enzymes, acids, and other substances that modify the chemical composition of food so that nutrients can be absorbed. Your salivary glands jump-start the process by secreting fluid and mucus to lubricate and bind food as you chew. They also secrete an enzyme that begins to dissolve starches. Then other accessory organs report for duty. The liver and gallbladder, for example, work in tandem to secrete, store, and release bile, which helps the body absorb fats. The pancreas secretes several essential digestive enzymes and bicarbonate, a substance that neutralizes acidic stomach juices.
- **Absorption.** Food is reduced primarily to glucose molecules. The end products of digestion also include amino acids (proteins) and fats. Absorption is the passage of these molecules across the mucous membranes of the cells that line the GI tract. Most absorption occurs within the compactly arranged coil of the small intestine. Its lining looks something like a corrugated cardboard tube, with ridges that increase the surface area for absorption. These ridges are lined with furrowed cells specially designed for the task. The glucose molecules then pass into the circulatory system, which transports and distributes them throughout your body.
- **Elimination.** Well, now we've reached the messy part. Like any other extraction process, digestion produces waste, such as insoluble fiber, sloughed-off cells, and digestive secretions. These waste products form feces, or stool. It consolidates in the colon (part of the large intestine), where water is removed so that the mass of stool can be easily expelled from the body through the anus. Too little water causes constipation, and too much leads to diarrhea. The stool is stored in the rectum until voluntary defecation (fecal evacuation) occurs. This mechanism is controlled by a set of drawstring-like sphincter muscles regulated by both voluntary and involuntary muscle contractions.

## Understanding what can go wrong

The components of the digestive system and its accessory organs are diverse, ranging from the mucous membranes lining your cheeks to the smooth muscle of your gut and the spongy glandular tissue of your pancreas. Most of the time, acting as a unit, these tissues carry out their mission with astonishing efficiency. However, a wide variety of problems can occur within this assortment of glands, muscles, nerves, connective tissue, and other structures. Some problems, such as autoimmune conditions, arise spontaneously, from unknown causes, and can be managed but not cured. Other diseases, such as hepatitis and cancers of the mouth, esophagus, and pancreas, develop gradually and are often linked to poor lifestyle choices, such as unsafe sexual practices, alcohol misuse, smoking, and smokeless tobacco use.

It's helpful to classify diseases and conditions of the digestive system according to their type or cause, as shown below [table of diseases omitted]. Such pigeonholing is never precise, of course, and the categories in this list sometimes overlap. Appendicitis, for instance, might be classified as either an acute infectious condition or an inflammatory disorder. Similarly, chronic infections—those that recur often or progress slowly—might at first cause acute (sudden, severe) illness. Finally, some entries, such as cirrhosis of the liver, may be considered either diseases in their own right or symptoms of other disorders.

## **Keeping your digestive system shipshape**

Proper digestive functioning begins with having good general health. The GI tract and accessory organs depend, for example, on having a robust immune system to fight infectious diseases. They rely on the heart and lungs to provide a vigorous blood supply. Any disease that compromises other body systems—high blood pressure or diabetes, for instance—puts the digestive system in jeopardy.

Of course, just as the most decorated soldier remains vulnerable to attack on the battlefield, even the most conscientious person may develop a digestive system disorder without warning. Many diseases are triggered by an invisible genetic trip wire set before birth. About 20% of Crohn's disease cases, for example, are thought to have a familial origin.

You can improve your odds of staying well or ease your symptoms if you do fall ill by following general recommendations for a healthy lifestyle: eat a high-fiber, low-fat diet, stay physically active, don't use tobacco products, abstain from alcohol or moderate your intake, and know your individual risk factors for digestive disease.

## **Preventing digestive system disorders**

Wouldn't it be great if a particular new blend of yogurt or a potent new antioxidant juice could, like some edible kryptonite, shield us against digestive system malfeasance? Unfortunately, such cure-alls are pure fantasy.

But the reality is encouraging: The lifestyle choices that foster a fit heart, strong bones, and a trim gluteus maximus are the same ones that shore up your digestive health. You don't need to do anything special to coddle your colon. Let's take a look at the health experts' advice:

### ***Stop smoking***

Everyone knows that smoking causes heart disease, high blood pressure, and lung cancer, but what does it have to do with the digestive system? According to the U.S. Centers for Disease Control and Prevention (CDC), of the top 10 cancers among men, three affect the digestive system or its accessory organs: colon and rectal cancer (54%), cancers of the oral cavity and pharynx (15%), and cancer of the pancreas (13%). All three have been linked to tobacco use. Two of them are also among the top 10 cancers that strike women: colon and rectal cancer (41%) and cancer of the pancreas (10%).

Smoking harms your digestive system in other ways, too:

- Increases the risk of Crohn's disease and ulcers
- Blunts immune system response
- Lengthens the time it takes the body to heal from an ulcer
- Impairs functioning of the liver and pancreas
- Contributes to GERD (gastroesophageal reflux disease, or heartburn) by weakening the sphincter muscle that keeps stomach acid from entering the esophagus

### ***Maintain a healthy weight***

Obesity, particularly if you carry your extra weight in the abdominal area, is associated with a higher risk of digestive system cancers, especially esophageal cancer and colorectal cancer. It also increases your risk of GERD, gallstones, liver disease, and other problems. If that weren't enough, obesity is associated with type 2 diabetes mellitus, which damages the nerves that regulate digestive function. This nerve destruction can lead to gastroparesis

(delayed emptying of stomach contents into the small intestine), constipation or diarrhea, and trouble swallowing.

### ***Stay physically active***

Studies show that physical activity reduces the risk of developing ulcers and GI cancers, and lowers the risk of bleeding disorders of the digestive tract in older adults. Start small if you need to. Walk your schnauzer around the neighborhood a few days a week. Swim in the community pool, rake leaves, or hop on an exercise bike while you're watching Dr. Phil—just do things you enjoy that keep you moving.

### ***Follow a low-fat, high-fiber diet***

Why is a low-fat, high-fiber diet—a so-called heart healthy diet—good for the digestive system? Let's start with fiber. Fiber is the coarse, undigestible material in plants—for instance, apple peels, potato skins, bean husks, citrus pulp, and celery strings. Fiber bulks up the stool, reducing the likelihood you'll become constipated or have hemorrhoids from straining during bowel movements. Fiber is also thought to help usher food quickly through the GI tract, reducing the amount of time potential toxins remain in contact with the intestinal lining, which lowers the risk of digestive tract and other cancers.

A low-fat diet promotes weight management, helps prevent GERD, and eases symptoms in people with gallbladder disease, hiatal hernia, celiac disease, chronic pancreatitis, and inflammatory bowel disease.

### **Recognizing the warning signs**

When does an embarrassing or annoying symptom become a red flag? Listen to your body. Abdominal pain, depending on its location, may indicate appendicitis, hernia, intestinal obstruction, or another serious condition. A rigid and tender abdomen is a grave sign that immediate surgical intervention may be needed. Keep in mind that abdominal pain might actually be a symptom of a heart attack, especially if it's accompanied by pain in your chest, arm, shoulder, neck, or jaw. GI tract bleeding, relentless heartburn, or unplanned weight loss should always be investigated by your doctor. Seek medical attention right away if you have any of the following symptoms:

- Severe abdominal pain
- Vomiting blood
- Black stool or bright red blood in the stool
- Change in bowel habits, especially an inability to have a bowel movement
- Unintentional weight loss
- Persistent heartburn

### **Management**

Even if you take care of yourself, your digestive system will mutiny now and then. Nothing like a few tainted oysters to remind you how quietly the humble GI system *usually* goes about its business. According to the CDC, 42 million Americans visit their healthcare providers with digestive complaints each year. Of course, those who overindulge and underexert can expect to have more frequent uprisings.

Your doctor may recommend lifestyle modifications, order diagnostic assessments, or prescribe treatment. Some common tests and procedures are listed below:

***Common digestive system procedures***

- Barium swallow
- Cholecystectomy (gallbladder removal)
- Colectomy
- Colonoscopy
- Colostomy
- Defecography
- Digital examination
- Endoscopic retrograde cholangiopancreatography (ERCP)
- Endoscopy
- Enteroscopy
- Esophagealgastroduodenoscopy (EGD)
- Ileostomy
- Jejunostomy (J-tube)
- Laparoscopy
- Manometry
- Nasogastric (NG) tube insertion
- Ultrasound (US)
- Upper gastrointestinal (GI) series

Some of these procedures are no more stressful than getting a spray tan. Others require lengthy preparation to evacuate the bowel. Be sure to listen carefully, ask questions, and read the handouts your provider gives you. You'll need to know, for instance, whether you're allowed to eat and drink the morning of the procedure and whether someone will have to drive you home afterward.

Complying with your doctor's instructions is important. Take your medications as prescribed. Return as scheduled for follow-up appointments. Don't conceal embarrassing symptoms or withhold information about your lifestyle habits, such as excessive drinking. After all, if "don't ask, don't tell" is a bargain you can't strike with your own digestive system, it won't fly with your doctor, either.