

# THE SCIENCE OF DIGESTION

Think your smartphone is a feat of engineering? Well, it's got nothing on your gut. Read on for the inner workings of this complex system, with tips, tricks and watch-outs for a happier, healthier tummy

BY LIZ KRIEGER

## THE BASICS

Mmm...garlic. Or maybe butter and sugar. As soon as the smell of something yummy wafts from the kitchen, your digestive system kicks into gear. Starting with your tongue and ending with your colon, "it's an amazingly complex system," says Chris South, M.D., a gastroenterologist at the Ohio Gastroenterology & Liver Institute. "The digestive system has so many zones and organs, all united in the same goal: to turn food into fuel by extracting the nutrients we need."

With so many players, doing their own things, your personal food processing plant is like a symphony orchestra: When all of them perform well, the result is beautiful music that simply flows. Should one or two musicians space out or be unable to play their parts, all of a sudden the group can sound more like middle school band practice. In bodily terms, that means bloating, pain, constipation and all manner of digestive disasters. Turn the page to learn more about this amazing ensemble, some of the causes of missed notes and how to get your body back in tune.

# From fork to flush YOUR BODY ON FOOD

**EYES**

Behold, a gooey wedge of Death by Chocolate! Instantly you visually take note of the texture, color and shape. All of a sudden, you want it, even if you weren't craving cake before.

**MOUTH**

The saliva pooling in there contains the enzyme amylase, which starts digesting the food as soon as it makes it onto your tongue. The liquid also helps lubricate the food and mold it to slide into the pharynx (your throat).

**ESOPHAGUS**

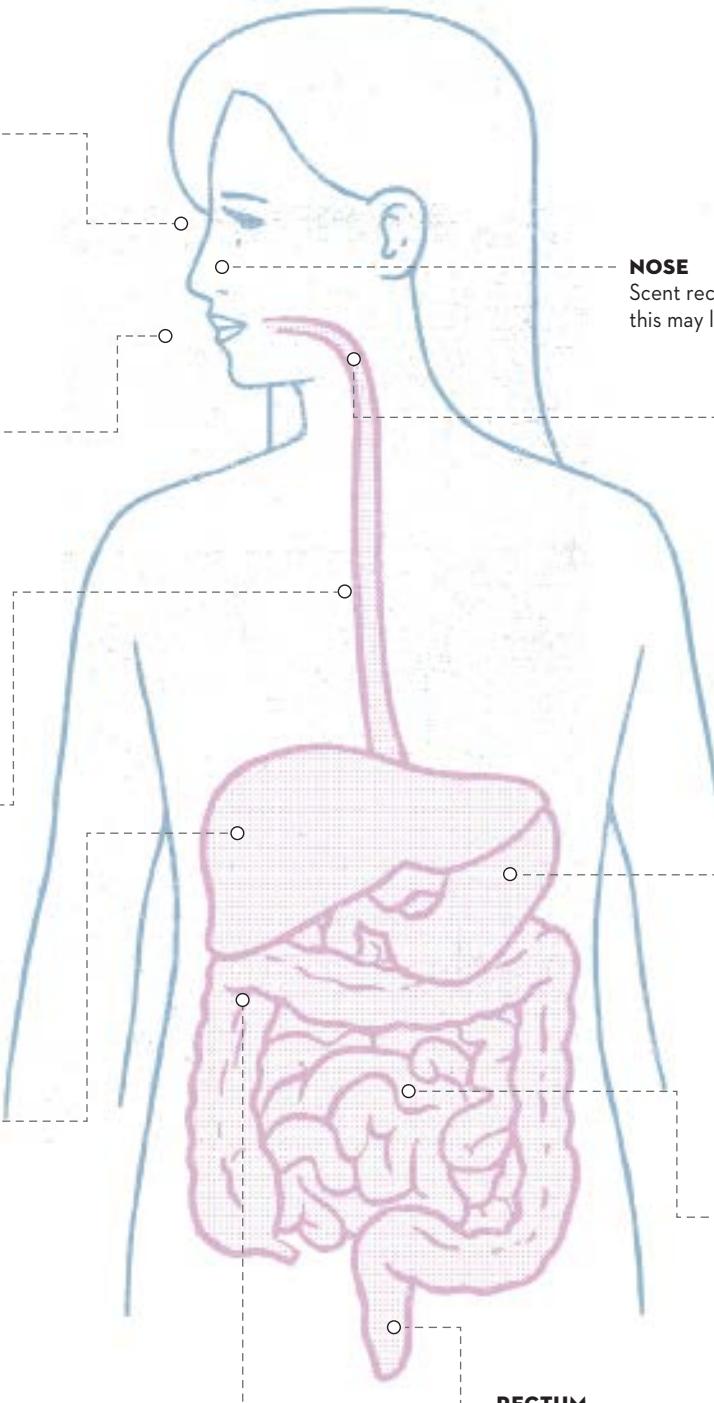
Involuntary muscle contractions called peristalsis keep the food moving along. Then the sphincter at the bottom of your esophagus opens up to accept the food into your stomach.

**PANCREAS + LIVER**

The pancreas shoots juices containing enzymes to break down carbs, fat and protein into the small intestine. The liver sends bile, via the gallbladder and bile ducts, to digest fat.

**LARGE INTESTINE**

It's at least three feet long, and absorbs water from food, turning whatever's left into poop. It's also where trillions of (mostly good) bacteria help finish digestion and make certain vitamins.

**RECTUM**

The final stretch is where waste waits before being released. This area has a lot of nerves (especially near your anus) alerts you when it's full and when you need to find a bathroom.

**DID YOU KNOW?**

These bugs also play a vital but not fully understood role in the way your immune system functions.

**NOSE**

Scent receptors register aroma, and this may lead you to begin to salivate.

**EPIGLOTTIS**

When you swallow, it covers your trachea, keeping that cake from going down the "wrong pipe" and toward your lungs (cough!). When all goes well, the food heads through the upper esophageal sphincter, a ring-shaped muscle, then into the esophagus.

**STOMACH** Welcome to the hydrochloric acid bathtub! Here, muscle contractions grind everything up even more and ready it to travel to the small intestine. For most people, the majority of the food is out of the stomach within a few hours.

**SMALL INTESTINE**

This freakishly long (20 feet!) tubular organ is where most of your body's nutrient absorption happens via fingerlike projections (villi) that cover the coils along the inside.

## 13-21

## TIMES A DAY

That's how often most people pass gas. Avoiding sneaky sugar alcohols (like malitol or sorbitol) and bubbly drinks can help.

*Tummy trouble*

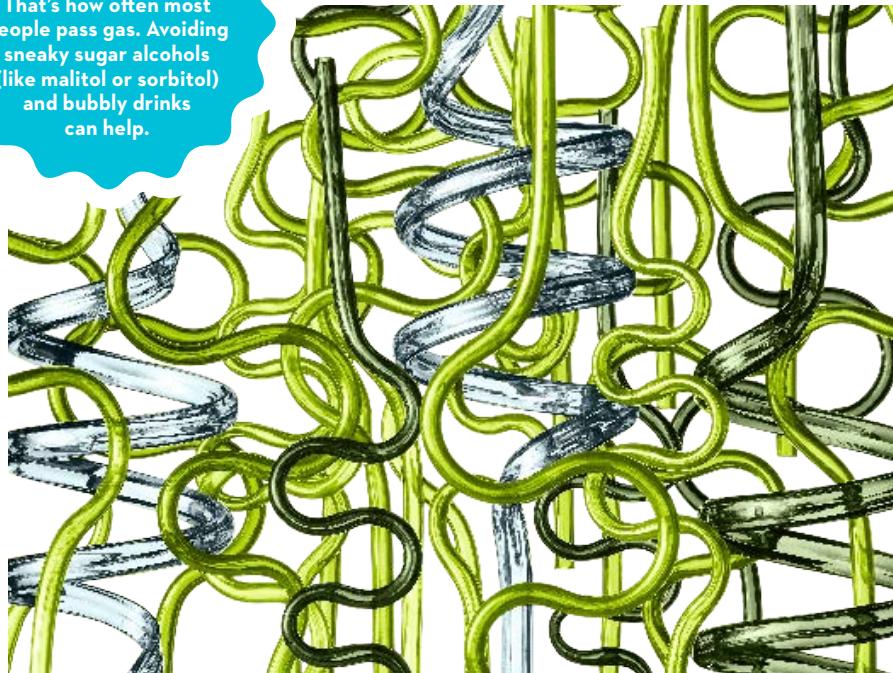
## 5 CAUSES OF DIGESTIVE DRAMA

Check out these surprising reasons for GI distress

### 1 YOUR MIND

Know how your stomach can act up when you're nervous? "Like a direct Internet connection from your head to your gut, the vagus nerve runs from the brain through the abdomen," says Shanti Eswaran, M.D., an associate professor of gastroenterology at the University of Michigan. "So if something is going on in your head, that nerve is affected," causing diarrhea (when liquid fills your intestine) or constipation, generally defined as "going" fewer than three times a week. You may also feel more abdominal pain.

**The fix:** Do what lowers stress, like meditation or exercise; if emotions are a big cause of the problem, cognitive behavior therapy or antidepressants can help.



### 3 TRAVEL

Racing to get to the gate, new-to-you foods, not taking in enough liquids, a change in routine and the sedentary nature of travel slow down your GI tract. The result can be constipation and/or diarrhea.

**The fix:** Move as much as possible, drink lots of water and go easy on alcohol, which can be dehydrating. To ease symptoms, take 200 to 400 mg of magnesium citrate a day, says Vincent Pedre, M.D., author of *Happy Gut*. It attracts water to the colon, keeping things moving.

### 4 ANTIBIOTICS

The medicine you take to fend off one infection can sometimes leave your gut depleted of the "good" bacteria it once had, rendering you susceptible to "bad" bacteria creeping in, says Dr. South. This can lead to diarrhea.

**The fix:** Eat prebiotic (i.e., high-fiber) foods, which the healthy bacteria in your gut feed on; this can help them flourish. While many pop a probiotic as soon as they get a Z-Pak, there's not a ton of science to back up the idea that probiotic supplements help, says Dr. South.

### 5 YOUR CYCLE

If you tend to get diarrhea when you have your period, it's no coincidence. Prostaglandin hormones can trigger muscular activity in your intestines, says Mary Jane Minkin, M.D., a professor of obstetrics and gynecology at the Yale School of Medicine.

**The fix:** If it's a big problem, ask your doc about taking birth control pills, which prevent ovulation. You can also try ibuprofen, which blocks the production of more prostaglandins, says Dr. Minkin.

### 2 MORNING COFFEE

If you start the day with coffee, the stimulant acts in two ways—and quickly. It speeds up the GI tract overall, says Dr. Eswaran. But it also causes rectal hypersensitivity, leading to contractions and to the search for a restroom.

**The fix:** Time your coffee right, and be aware that for some people, any very hot or very cold beverage can cause the contractions, she says.

### PUT YOUR GUT IN A GOOD MOOD

About 90% of your body's serotonin—a mood-regulating hormone—is made in your digestive tract, says GH Nutrition Director Jaclyn London, M.S., R.D., and though the science is still emerging, people with major depression have actually been found to have different bacteria in their feces than healthy folks. Breed more of the "good," serotonin-making buggers in your gut by eating fermented foods like yogurt and kimchi and more prebiotics, says London. Top choices include apples, bananas, asparagus and artichokes plus legumes, nuts and seeds.

# Eat for a happy GI tract

## FOODS YOUR TUMMY WILL LOVE

Eat these for a happy belly, says Jaclyn London, M.S., R.D., GH's nutrition director.



### GINGER

If you're queasy, compounds in ginger—fresh, candied or in tea—can halt the stimulation of GI tract receptors that make you feel icky. Research has linked regular consumption to less morning sickness and chemo-induced nausea.



### OATMEAL

This grain is loaded with soluble and insoluble fiber, which can absorb water and bulk up your stool, which helps keep things moving through your GI tract. By keeping you regular, the fiber also eases gas pressure.



### POTATOES

Both white and sweet spuds can be calming for your belly when it's upset because they're binding—meaning they absorb excess water in your intestines and help you keep your, well, poop together.



### YOGURT

Recovering from a stomach bug? Add plain low-fat Greek yogurt to your reentry into the world of food. It contains live and active cultures, which can help boost production of gut bacteria that will help get your GI tract back to normal.



## EXERCISE REGULARLY, BE MORE REGULAR

There's no polite way to say this: Moving your body helps you move your bowels. The muscles in your digestive system are positively affected even by something as simple as brisk walking and staying active throughout the day, says Sandra Fryhofer, M.D., an internist in Atlanta. Plus, when you get your heart rate up, it stimulates the natural squeezing of muscles in your gut, a.k.a. peristalsis, which aids in moving everything through. In a study of 62,000 women, those who reported daily physical activity were about half as likely to experience constipation as those who worked out less than once a week.

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## KEEP A SYMPTOMS DIARY

Many patients are too grossed out or embarrassed to go into detail about their digestive issues with their doctors, so make a list! Jot down your symptoms—bloating, pain, constipation, funky-colored stools—how long you've had them and what you've tried, then simply hand it to your doc. While you can solve many of these problems through changes in your diet or exercise routine and even by taking over-the-counter fiber supplements, there are also Rx options for IBS, Crohn's disease and other digestive dramas that may bring you some relief.

call the doc if you have...

### UNEXPLAINED BLOATING OR PELVIC PAIN

In rare cases, these could signal ovarian cancer, especially if you feel full after eating very little, says Dr. Minkin. Bloating with frequent tummy pain and diarrhea might be an inflammatory bowel disease (IBD) such as ulcerative colitis.

### BLOODY STOOLS

It's likely a hemorrhoid, says Dr. South, but always bring this up with your MD. Blood could be a sign of IBD or be caused by a growth or tumor.

### PALE POOP

In general, your stool should have some green, yellow or brown in it, says Dr. South. If it's grayish or super-light, there could be a liver problem or bile duct blockage.

### UNEXPLAINED WEIGHT LOSS

This could signify a range of things, including celiac disease, says Brigid Boland, M.D., an IBD expert at the University of California at San Diego. Other potential causes: Crohn's disease, ulcerative colitis or, rarely, cancer of the colon, pancreas or gallbladder.

### PAIN IN YOUR LEFT TUMMY

Severe discomfort with a fever could mean diverticulitis, an infection in the large intestine. You'll be given antibiotics, says Dr. Boland, and then start a diet rich in fiber.