3.5: Gastrointestinal Tract and Your Health

Skills to Develop

- Interpret why certain disorders and diseases, such as gastroesophageal reflux disease (GERD), celiac disease, and irritable bowel syndrome compromise overall health.

When nutrients and energy are in short supply, cells, tissues, organs, and organ systems do not function properly. Unbalanced diets can cause diseases and, conversely, certain illnesses and diseases can cause an inadequate intake and absorption of nutrients, simulating the health consequences of an unbalanced diet. Overeating high-fat foods and nutrient-poor foods can lead to obesity and exacerbate the symptoms of gastroesophageal reflux disease (GERD) and irritable bowel syndrome (IBS). Many diseases and illnesses, such as celiac disease, interfere with the body getting its nutritional requirements. A host of other conditions and illnesses, such as food allergies, cancer, stomach ulcers, Crohn’s disease, and kidney and liver disease, also can impair the process of digestion and/or negatively affect nutrient balance and decrease overall health.

Gastroesophageal Reflux Disease

Gastroesophageal reflux disease (GERD) is a persistent form of acid reflux that occurs more than two times per week. Acid reflux occurs when the acidic contents of the stomach leak backward into the esophagus and cause irritation. It is estimated that GERD affects 25 to 35 percent of the US population. An analysis of several studies published in the August 2005 issue of *Annals of Internal Medicine* concludes that GERD is much more prevalent in people who are obese. Hampel, H. MD, PhD, N. S. Abraham, MD, MSc(Epi) and H. B. El-Serag, MD, MPH. “Meta-Analysis: Obesity and the Risk of Gastroesophageal Reflux Disease and Its Complications.” *Ann Intern Med* 143, no. 3 (2005): 199–211. [http://www.ncbi.nlm.nih.gov/pubmed/16061918](http://www.ncbi.nlm.nih.gov/pubmed/16061918) While the links between obesity and GERD are not completely known, they likely include that excess body fat puts pressure on the stomach, overeating increases pressure in the stomach,
and fatty foods are triggers for GERD symptoms. The most common GERD symptom is heartburn, but people with GERD may also experience regurgitation (flow of the stomach’s acidic contents into the mouth), frequent coughing, and trouble swallowing. Approximately 35 percent of children born in the United States have GERD. In babies, the symptoms are more difficult to distinguish from what babies do normally. The symptoms are spitting up more than normal, incessant crying, refusal to eat, burping, and coughing. Most babies outgrow GERD before their first birthday but a small percentage do not.

**Figure 2.6.1: Heartburn is a burning sensation that radiates throughout the chest. © Shutterstock**

**Additional Facts about GERD**

There are other causative factors of GERD that may be separate from or intertwined with obesity. The sphincter that separates the stomach’s internal contents from the esophagus often does not function properly and acidic gastric contents seep upward. Sometimes the peristaltic contractions of the esophagus are also sluggish and compromise the clearance of acidic contents. In addition to having an unbalanced, high-fat diet, some people with GERD are sensitive to particular foods—chocolate, garlic, spicy foods, fried foods, and tomato-based foods—which worsen symptoms. Drinks containing alcohol or caffeine may also worsen GERD symptoms. GERD is diagnosed most often by a history of the frequency of recurring symptoms. A more proper diagnosis can be made when a doctor inserts a small device into the lower esophagus that measures the acidity of the contents during one’s daily activities. Sometimes a doctor may use an
endoscope, which is a long tube with a camera at the end, to view the tissue in the esophagus. About 50 percent of people with GERD have inflamed tissues in the esophagus. A condition known as Barrett’s esophagus may develop over time in some people who have GERD. Barrett’s esophagus refers to a structural difference in the tissue of the esophagus, which is caused by recurrent tissue damage. It occurs in 5 to 15 percent of patients diagnosed with GERD and less than 1 percent of these patients may develop cancer of the esophagus, a highly lethal cancer.

The first approach to GERD treatment is dietary and lifestyle modifications. Suggestions are to reduce weight if you are overweight or obese, avoid foods that worsen GERD symptoms, eat smaller meals, stop smoking, and remain upright for at least three hours after a meal. There is some evidence that sleeping on a bed with the head raised at least six inches helps lessen the symptoms of GERD. People with GERD may not take in the nutrients they need because of the pain and discomfort associated with eating. As a result, GERD can be caused by an unbalanced diet and its symptoms can lead to a worsening of nutrient inadequacy, a vicious cycle that further compromises health. Many medications are available to treat GERD, including antacids, histamine2 (H2) blockers, and proton-pump inhibitors. Some evidence from scientific studies indicates that medications used to treat GERD may accentuate certain nutrient deficiencies, namely zinc and magnesium. When these treatment approaches do not work surgery is an option. The most common surgery involves reinforcing the sphincter that serves as a barrier between the stomach and esophagus.

**Ulcers**

Ulcers occur when the top layer of the cells in the stomach, duodenum, and/or colon erode and expose the lower cell layer to the luminal contents. The number one cause of ulcers is the bacteria, *Helicobacter pylori* (*H. pylori*), which degrades the protective layer. Chronic use of anti-inflammatories can also erode the protective layer of the stomach and or small intestine, and cause ulcers. Ulcers are not caused by stress or smoking but these can make an ulcer worse. Avoiding coffee, caffeinated beverages like coffee, drinking alcohol, and foods that exacerbate the condition can help improve ulcers. Prescribed medicine is the best treatment.

**Diverticulitis**

Sometimes small pouches form in the colon wall at weakened spots. These are called diverticula and become inflamed from bacteria and irritants. There is a low incidence of diverticulitis in people who eat more fiber.

**Inflammatory Bowel Disease (IBD)**

The cause of inflammatory bowel disease is unknown. Crohn’s disease and chronic ulcerative colitis are the most common types of IBD.

**Irritable Bowel Syndrome (IBS)**

Irritable bowel syndrome (IBS) is characterized by muscle spasms in the colon that result in abdominal pain, bloating, constipation, and/or diarrhea. Interestingly, IBS produces no permanent structural damage to the large intestine as often happens to patients who have Crohn’s disease or inflammatory bowel disease. It is estimated that one in five Americans displays symptoms of IBS. The disorder is more prevalent in women than men. Two primary factors that contribute to
IBS are an unbalanced diet and stress. There is no specific test to diagnose IBS, but other conditions that have similar symptoms (such as celiac disease) must be ruled out. This involves stool tests, blood tests, and having a colonoscopy (which involves the insertion of a flexible tube with a tiny camera on the end through the anus so the doctor can see the colon tissues).

Symptoms of IBS significantly decrease a person’s quality of life as they are present for at least twelve consecutive or nonconsecutive weeks in a year. Large meals and foods high in fat and added sugars, or those that contain wheat, rye, barley, peppermint, and chocolate intensify or bring about symptoms of IBS. Additionally, beverages containing caffeine or alcohol may worsen IBS. Stress and depression compound the severity and frequency of IBS symptoms. As with GERD, the first treatment approaches for IBS are diet and lifestyle modifications. People with IBS are often told to keep a daily food journal to help identify and eliminate foods that cause the most problems. Other recommendations are to eat slower, add more fiber to the diet, drink more water, and to exercise. There are some medications (many of which can be purchased over-the-counter) to treat IBS and the resulting diarrhea or constipation. Sometimes antidepressants and drugs to relax the colon are prescribed.

Celiac Disease

Celiac disease is an autoimmune disorder affecting between 0.5 and 1.0 percent of Americans—that is, one in every one- to two-hundred people. It is caused by an abnormal immune reaction of small intestine cells to a type of protein, called gluten. Gluten forms in the presence of water and is composed of two protein parts, glutenin and gliadin. Glutenin and gliadin are found in grains that are commonly used to make bread, such as wheat, rye, and barley. When bread is made, yeast eats the flour and makes a waste product, carbon dioxide, which forms bubbles in the dough. As the dough is kneaded, gluten forms and stretches. The carbon dioxide gas bubbles infiltrate the stretchy gluten, giving bread its porosity and tenderness. For those who are sensitive to gluten, it is good to know that corn, millet, buckwheat, and oats do not contain the proteins that make gluten. However, some people who have celiac disease also may have a response to products containing oats. This is most likely the result of cross-contamination of grains during harvest, storage, packaging, and processing.
Celiac disease is most common in people of European descent and is rare in people of African American, Japanese, and Chinese descent. It is much more prevalent in women and in people with Type 1 diabetes, autoimmune thyroid disease, and Down and Turner syndromes. Symptoms can range from mild to severe and can include pale, fatty, loose stools, gastrointestinal upset, abdominal pain, weight loss and, in children, a failure to grow and thrive. The symptoms can appear in infancy or much later in life, even by age seventy. Celiac disease is not always diagnosed because the symptoms may be mild. A large number of people have what is referred to as “silent” or “latent” celiac disease (Figure 3.6.1).

Celiac disease diagnosis requires a blood test and a biopsy of the small intestine. Because celiac disease is an autoimmune disease, antibodies produced by white blood cells circulate in the body and can be detected in the blood. When gluten-containing foods are consumed the antibodies attack cells lining the small intestine leading to a destruction of the small villi projections. This tissue damage can be detected with a biopsy, a procedure that removes a portion of tissue from the damaged organ. Villi destruction is what causes many of the symptoms of celiac disease. The destruction of the absorptive surface of the small intestine also results in the malabsorption of nutrients, so that while people with this disease may eat enough, nutrients do not make it to the bloodstream because absorption is reduced. The effects of nutrient malabsorption are most apparent in children and the elderly as they are especially susceptible to nutrient deficiencies. Over time these nutrient deficiencies can cause health problems. Poor absorption of iron and folic acid can cause anemia, which is a decrease in red blood cells. Anemia impairs oxygen transport to all cells in the body. Calcium and vitamin D deficiencies can lead to osteoporosis, a disease in which bones become brittle.

If you think you or someone close to you may have celiac disease, do not despair; it is a very treatable disease. Once diagnosed, a person follows a gluten-free diet for life. This requires dedication and careful detective work to seek out foods with hidden gluten, but some stores carry gluten-free foods. After eliminating gluten from the diet, the tissues of the small intestine rapidly repair themselves and heal in less than six months.

Gallstones

The gallbladder is a where bile is stored and bile is important for the digestion of fat. Sometimes pieces of solid matter form in the gallbladder and this material is called gallstones. Gallstones are mainly formed from cholesterol. If these "stones" block the ball duct or prevent the flow of bile into the small intestine, fat in your diet will not be absorbed.

Lactose Intolerance

Lactose intolerance is common and is estimated to occur in 70% of the population. It occurs when the enzyme lactase is missing, low, or ineffective at digesting the carbohydrate lactose. Bacteria then ferment the lactose causing bloating and discomfort. Lactose intolerance increases with age and people who experience this condition must avoid foods that contain lactose. Such foods would be milk and milk-based products. Several dairy products treated with lactase to remove lactose are available on the market as well as a variety of fermented products like yogurt and kefir. Each person is different so you will have to experiment to see which products you can tolerate and how much of that product.
Constipation

Constipation occurs when your bowel movements are infrequent and difficult, and there are many reasons why it occurs. These include but are not limited to some medications, changes in your usual diet or activities, eating a lot of dairy products, eating disorders, irritable bowel syndrome, not being active, not enough water or fiber in your diet, overuse of laxatives, stress, and atonic colon (weakened muscles). Treatment involves listening to defecation signals, high fluid, high fiber diet (as long as the cause is not spastic colon), and exercise. Including more whole grains, fruits and vegetables in your diet is a good way to prevent constipation. When adding more fiber to your diet, add more water too.

Hemorrhoids

Hemorrhoids occur when the veins in your lower rectum and/or anus become swollen. This condition occurs when you don't eat enough fiber, push too hard during defecation, stand or sit too long, labor during childbirth, lift too heavy a weight, or are overweight or obese. Avoiding the cause of the hemorrhoid is the best way to prevent their reoccurrence.

Diarrhea

Diarrhea is watery stools caused by reduced water absorption or reversed water transport, and shortened transit time through the gut. It is common and generally will resolve in a few days but one should be careful not to become dehydrated. There are many reasons why diarrhea occurs including food poisoning, infections, IBS, lactose intolerance, and allergies to cow's milk. The best treatment is bowel rest coupled with fluid and electrolyte replacement.

Food Allergies

Paying attention to the way individuals react to various foods is essential in determining what foods may specifically affect a person adversely. Food allergies are one of the many ways in which different body make-ups affect nutritional concerns. Although an estimated twelve million Americans have food allergies, there are likely many more people who say they have food allergies than actually do. This is because food sensitization is different from a medically-determined food allergy. When someone has a food allergy, the immune system mistakenly attacks a certain kind of food (usually the protein component of a food), such as peanuts, as if it were a threat and IgE antibodies are produced. Doctors sometimes test for food allergies by using skin-prick tests or blood tests to look for the presence of IgE antibodies. However, these types of tests are not always reliable as they can sometimes yield a false positive result. By far, the most valuable tests for determining a food allergy is the Double Blind Placebo Controlled Food Challenge (DBPCFC), which involves administering the food orally and then denoting the signs and symptoms of the allergic response.

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Food allergy symptoms usually develop within a few minutes to two hours after a person has eaten a food to which they are allergic. These symptoms can range from the annoying to the potentially fatal, and include:

- A tingling mouth
- Swelling tongue and/or throat
- Difficulty breathing
- Hives
- Stomach cramps
- Diarrhea
- Vomiting
- Drop in blood pressure
- Loss of consciousness
- Death

There are no clear treatments for food allergies. Epinephrine is sometimes used to control severe reactions, and individuals with known and dangerous allergies may get prescriptions for self-injectable devices. The only certain way to avoid allergic reactions to food is to avoid the foods that cause them. Beyond avoidance, this can mean reading food labels carefully, or even calling manufacturers for product information.

Ninety percent of food allergies are caused by these eight foods:

1. Milk
2. Eggs
3. Peanuts
4. Tree nuts
5. Fish
6. Shellfish
7. Wheat
Soy

The prevalence of food allergies is a complex and growing problem. In response to this situation, the National Institute of Allergy and Infectious Diseases (NIAID) collaborated with thirty-four professional organizations, federal agencies, and patient-advocacy groups to develop a comprehensive guide to diagnosing and managing food allergies and treating acute food allergy reactions. The guide defines various food allergies, allergens, and reactions, provides comprehensive information on the prevalence of different food allergies, tracks the history of food allergies, and reviews medical management techniques for people with food allergies.

### Gut Microbiota

Our body is covered with small microorganisms we cannot see. Within our gut, it is estimated that there are 100 trillion bacteria, which 10 times more cells than we have in our body. Most bacteria do not cause us harm and, in fact, have a symbiotic relationship that keeps us healthy; for example, they produce vitamin B₆, vitamin B₁₂, biotin, vitamin K, and short chain fatty acids. Recent studies have suggested a link between several chronic diseases (cancer, obesity, heart disease, depression, and autism, to name a few) and the microbes that reside in our gut. Diet plays a role in prominent role in determining the specific microbial communities found in our intestinal track. Prebiotic foods contain undigested material, like fiber, that our gut microbes digest while probiotic foods contain live bacteria.

https://www.youtube.com/watch?v=QE9QWFg-XNs

**Figure 2.6.4:** Cartoon of different types of bacteria.

### Key Takeaways

- Unbalanced diets can cause diseases and, conversely, certain disorders and diseases can cause an inadequate intake and absorption of nutrients simulating the health consequences of an unbalanced diet.
- Unbalanced, high-fat diets can exacerbate the symptoms of GERD and IBS.
- Celiac disease and anorexia can lead to nutritional deficiencies, which compromise the functioning of the organ systems and decrease health.
- Food allergies affect roughly twelve million Americans, with symptoms that range from mild to deadly. Proper diagnosis leads to better management of food allergies and sensitivities.
Discussion Starter

1. The next time you visit the grocery store, be a “gluten detective” and use the ingredients list to identify all the foods you might normally purchase that contain gluten. Discuss how you can use food labels to avoid products containing gluten.