



Gut Health Series, part 1

In One End and Out the Other

The Whats of the Guts



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In One End and Out the Other

- What a Process
- Tongue in Cheek
- Hard to Swallow
- Butterflies in Your Stomach
- Underestimating the Pancreas
- Big Jobs of the Small Intestine
- Love Your Liver...and Gallbladder
- Living Large in the Intestine
- Get to Know Your Bug Community





What a Process

Understanding the digestive system and the process



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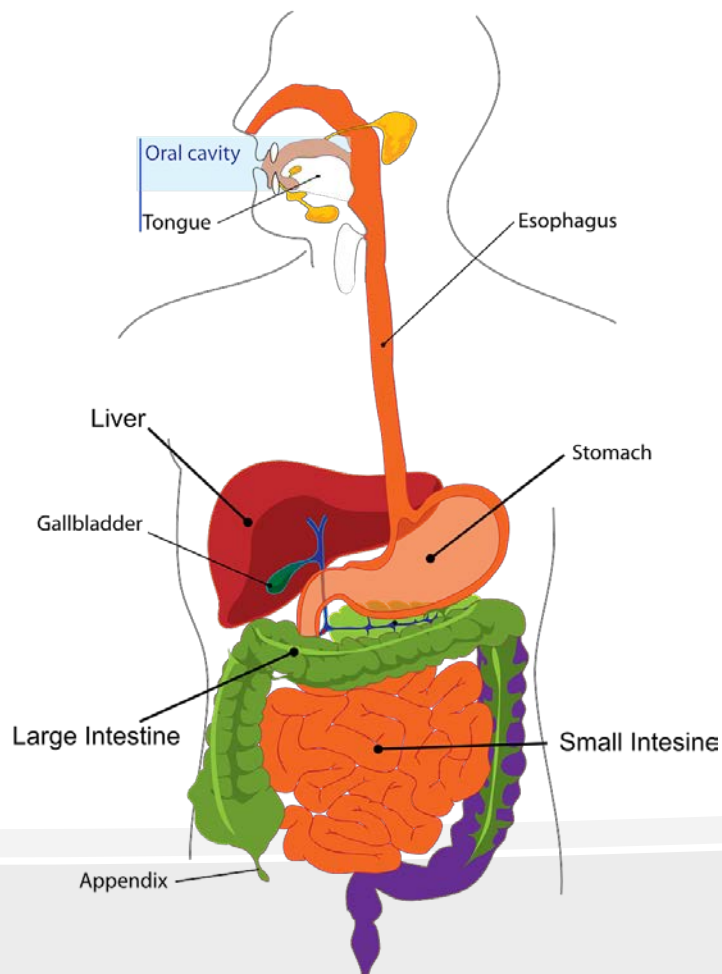
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The Digestive System

A Complex Interconnected Web of Systems and Functions

Body Systems

- **Muscular** – Its structure is muscles.
- **Immune** – Most of the immune system is in the digestive tract.
- **Neurological** – The enteric nervous system creates a direct link between brain and gut.
- **Endocrine** – There are several hormones related to digestion.
- **Cardiovascular** – Probiotic bacteria help regulate cholesterol and triglyceride levels.
- **Metabolic** – Commensal bacteria play a role in the body's metabolism.





The Digestive Process

More Than Just Eating and Eliminating

The Process

- Eating – The beginning of the journey, involving the mouth and the brain.
- Digestion – Occurs in the mouth, stomach and small intestine, with help from the liver and pancreas.
- Secretion – Occurs throughout the entire digestive tract.
- Mixing and Propulsion – Starts in the esophagus and continues through to the end.
- Absorption – Involves the small intestine and liver.
- Assimilation – The ultimate goal of the digestive process.
- Elimination – The end of the road.





Tongue in Cheek

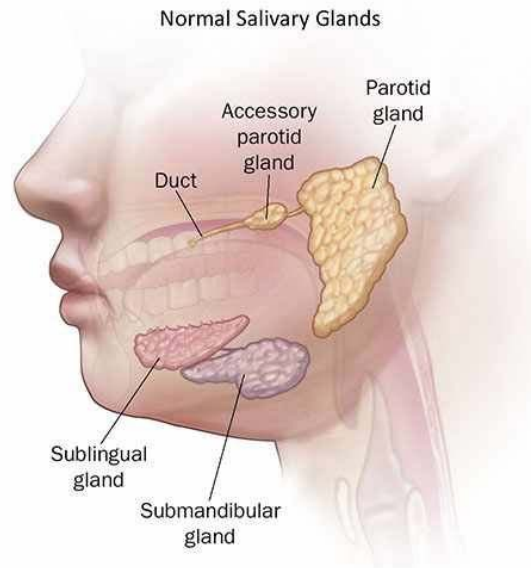
Understanding the first part of digestion



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First Phase of Digestion



- ▶ Functions of the mouth are to mechanically breakdown and liquefy foods, and initiate digestion of carbohydrates/fats.
- ▶ Healthy teeth are important for mechanically breaking down chunks of food.
- ▶ Chewing releases hormones from the parotid glands which stimulates immune protection.
- ▶ Salivary glands produce amylase and lipase.
- ▶ Saliva helps buffer acids, protects teeth and assists with swallowing. It also helps reduce inflammation through nitrate conversion.

Cephalic Phase of Digestion – Anticipation of food, sight, smell, taste, and memory will stimulate gastric juices.

Slowing down, enjoying food, and properly chewing can eliminate many digestive problems.



FUN Facts about the Mouth



- Many diseases are linked to oral health including heart disease, diabetes and osteoporosis.
- The tongue is the only muscle in the human body that works without any support from the skeleton.
- Relative to its size, the tongue is the strongest muscle in the human body.
- There are approximately 10,000 taste buds in your mouth, of which most are located on the tongue.
- We produce about 37,854 liters of saliva during our lives – enough to fill two swimming pools.
- The enamel on the surfaces of your teeth is the hardest substance in your whole body.
- **Smiling helps you live longer.** Every time you smile, your body produces greater amounts of antibodies, giving you an immunity boost.



Hard to Swallow

Understanding the road to your stomach

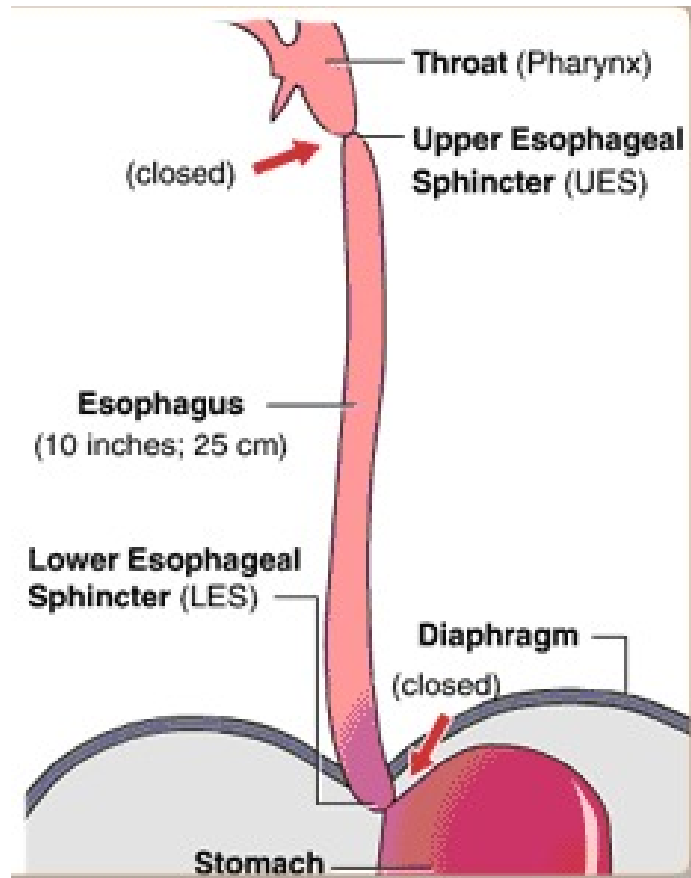


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Esophagus



- Function of the Esophagus is to transport food from mouth to stomach.
- Well chewed food passes through in 6 seconds. Dry food can take minutes.
- While eating, epiglottis blocks food from going into trachea and Upper Esophageal Sphincter allows food into esophagus.
- Lower Esophageal Sphincter allows food into stomach; prevents stomach acid and food from coming back up.
- *If LES does not remain closed, it can lead to heartburn.*





Butterflies in Your Stomach

Understanding the importance of breakdown

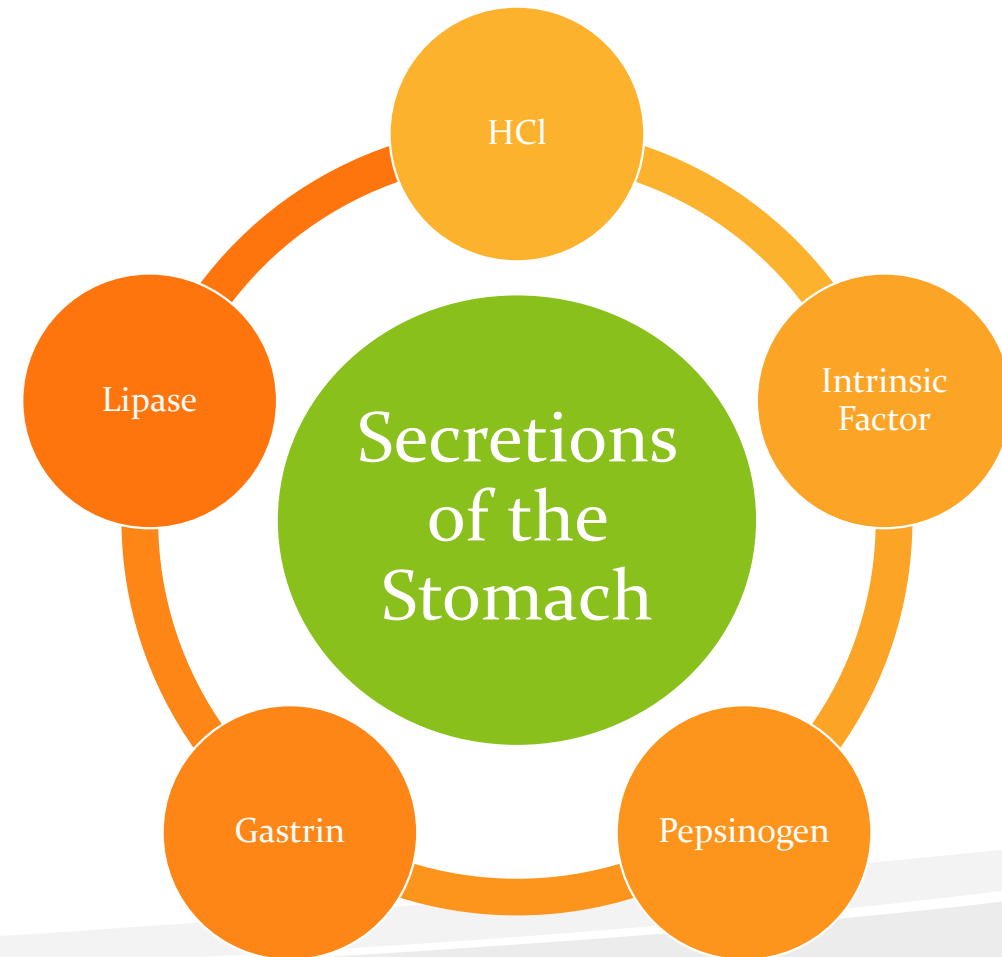


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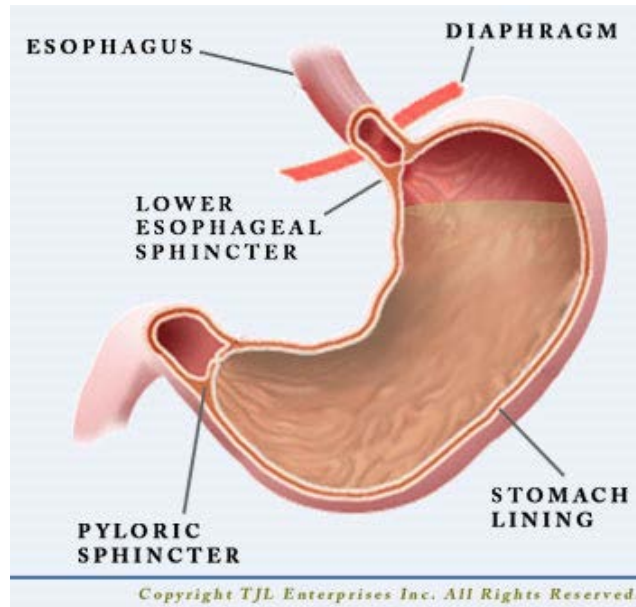
Gastric Juices

- **Hydrochloric Acid (HCl)** – Dissolves food, assists with protein breakdown and kills microbes.
- **Intrinsic Factor** – Binds to vitamin B₁₂ in order for it to be absorbed in the intestines.
- **Pepsinogen** – Converts to pepsin to break down proteins.
- **Gastrin** – Hormone that stimulates release of gastric juices. Helps regulate appetite and feelings of satiety.
- **Lipase** – Enzyme to help digest fats.



The Most Common Cause of Heartburn

Low Stomach Acid and Inability to Breakdown Food



- **GERD** is caused by stomach acid backing up into esophagus.
- Low stomach acid can relax LES and allow HCl to splash up into esophagus.
- Inability to breakdown food prolongs time in the stomach, allowing for gas buildup and upward pressure on the LES forcing it open.
- Consuming antacids or acid blockers can actually make heartburn worse.





Underestimating the Pancreas

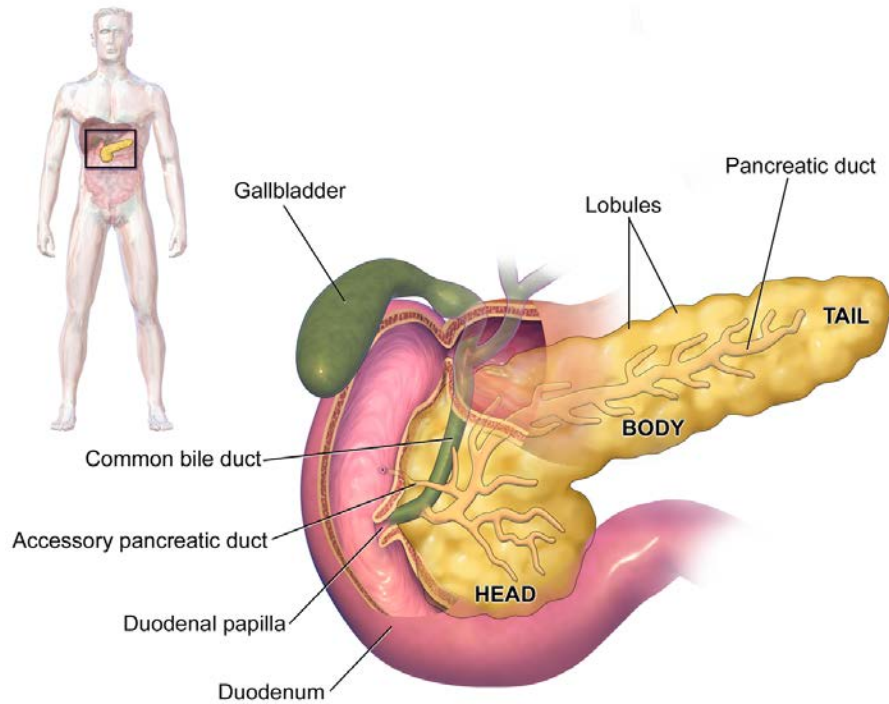
Understanding the function of enzymes



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Pancreas



- Function of the Pancreas is to aid digestion of food and produce insulin/glucagon.
- Pancreatic enzymes break down carbohydrates, fats, proteins and old RNA/DNA.
- Insulin is produced when blood sugar is high, glucagon is produce when blood sugar is low.
- **Dysfunction of the pancreas can lead to nutrient deficiencies, blood sugar dysregulation and many health complications.**





Big Jobs of the Small Intestine

Understanding the importance of absorption

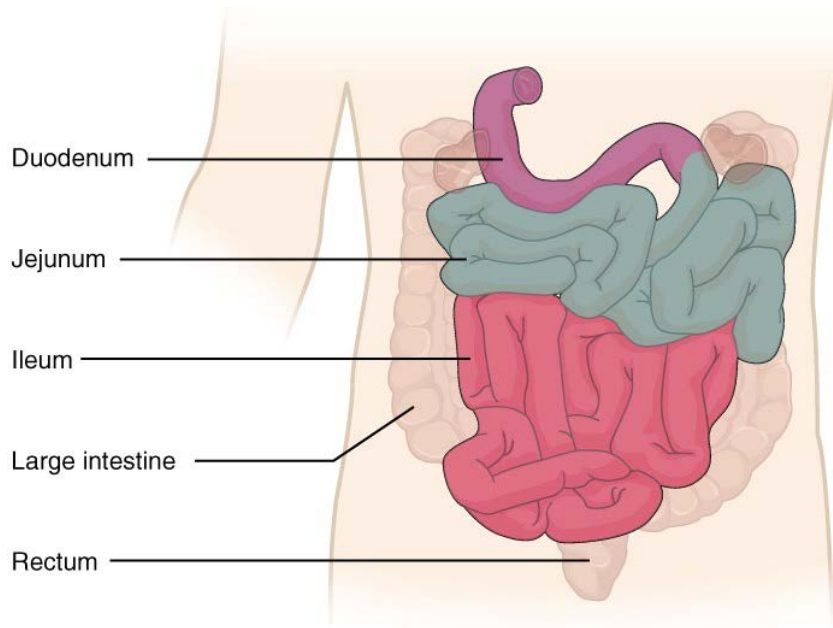


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Small Intestine



- Function of the Small Intestine is to complete digestion, allow nutrients to pass into the bloodstream and block absorption of foreign substances.
- Divided into three parts – Duodenum, Jejunum and Ileum
- 15-20 feet long and surface area would cover a tennis court.
- Villi and microvilli produce enzymes and absorb nutrients.
- ***Damage to the small intestine lining creates “leaky gut syndrome.”***





Absorption Through The Intestines

Location, Location, Location

- **Duodenum** – calcium, magnesium, iron, zinc, copper, manganese, vitamins B₁, B₂ and B₆, folate, vitamin C, monosaccharides, fat, and fat soluble vitamins A, D and E
- **Jejunum** – thiamine, pyridoxine, riboflavin, folic acid, disaccharides, proteins and amino acids
- **Ileum** – cholesterol, vitamin B₁₂, bile salts
- **Large Intestine** – potassium, water, sodium chloride, vitamin K (from colonic bacteria) and short chain fatty acids (from fiber digestion)





Love Your Liver, and Gallbladder

Understanding the importance of detoxification



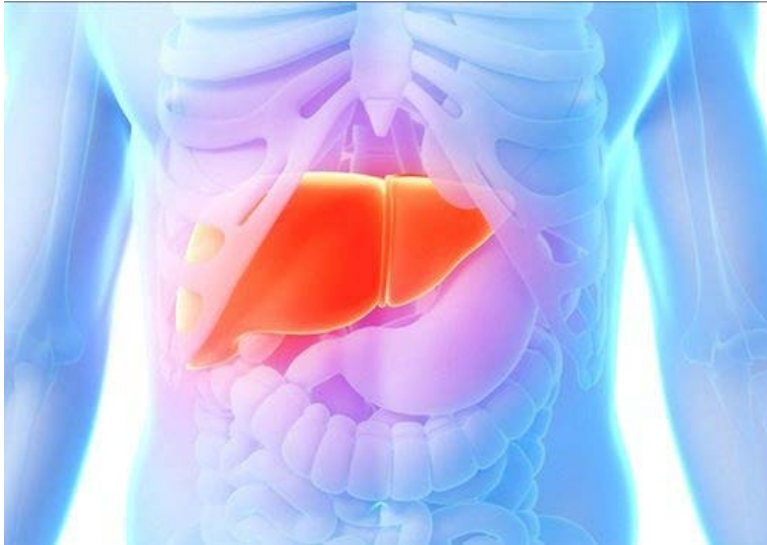
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Liver Facts

Did You Know the Human Liver...



- Weighs about 3 pounds
- Is the second largest organ in the body, second only to skin
(yes, skin is actually an organ!)
- Is the only organ in the human body that can regenerate itself after being injured.
- Contains 10% of the blood in the body
- Performs over 500 functions for the body





Why is the Liver so Important?

The liver performs many important functions in the body:

- Regulate most chemical levels in blood
- Produce cholesterol and special proteins to help carry fats throughout the body
- Process all of the blood leaving the digestive tract
- Convert harmful ammonia – a byproduct of protein metabolism – to a safer form, urea
- Regulate blood clotting
- Help the body fight infections
- Store and release glucose to regulate blood sugar levels
- Produce bile, which helps break down fats for absorption and carries waste to be eliminated
- Store Iron
- Metabolize carbohydrates, fats, and proteins into usable forms
- Store many nutrients – glycogen; fatty acids; vitamins A, D, E, K and B12; iron and copper – to provide a constant supply to the body
- Metabolize alcohol and drugs into their inactive metabolites
- Metabolize hormones produced by the body's own glands
- Protect the body from toxins





Gallbladder

The Liver's Holding Tank

- Function of the gallbladder is to store and concentrate bile.
- The liver produces bile and sends to gallbladder to hold in reserve. Eating fat stimulates the release of bile.
- Bile emulsifies fats, cholesterol and fat-soluble vitamins. This allows proper breakdown and absorption.
- **Gallbladder dysfunction is directly related to diet. Removal of the gallbladder complicates the intricate controlled release of bile.**



Detox 101 – Your Elimination Pathways

- **Detoxification starts in the liver.**
Two phases of liver detoxification - Phases 1 and 2.
 - **Phase 1** - Liver filters blood and neutralizes chemical or toxin, or converts it to an intermediate form for Phase 2.
 - Detoxifies compounds such as caffeine, acetaminophen and aspirin
 - **Phase 2** – Liver further breaks down chemical or toxin to then be safely excreted from the body.
 - Detoxifies major toxins such as: *Industrial Toxins, Carcinogens, Medications like steroids and morphine, Bacterial Toxins, Heavy Metals like mercury and lead, Phenolics found in plastics, Alcohol*
- **Once toxins are detoxified or neutralized, they can be eliminated:**
 - Passed to the gallbladder in bile for elimination through feces
 - Passed to kidneys for elimination through urine
 - Eliminated through sweat.





Living Large in the Intestine

Understanding what goes on in the large intestine

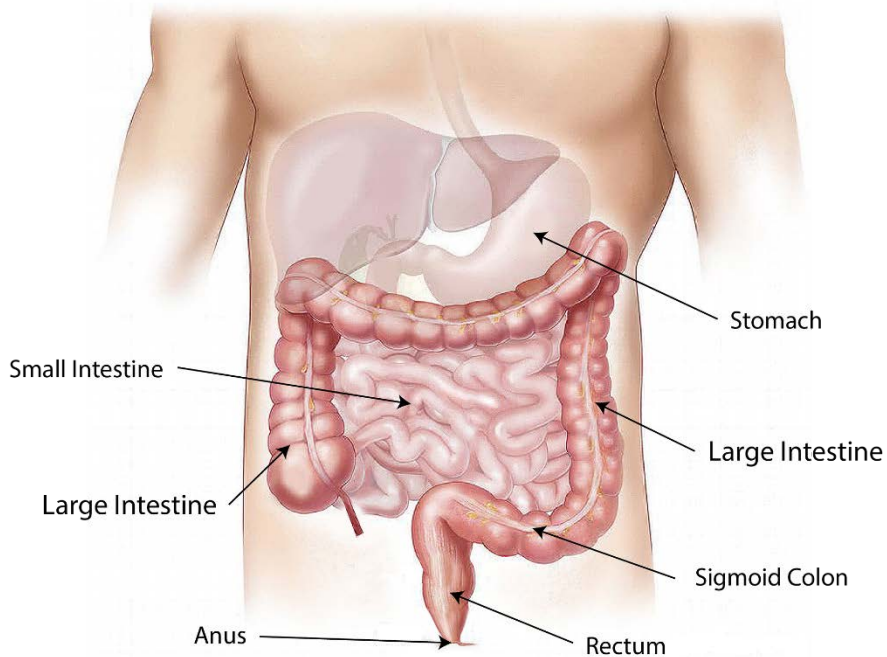


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The Large Intestine

The End of the Road



- **The large intestine consists of the colon and rectum.** Its major function is to absorb water from the remaining undigested food matter and eliminate the waste from the body.
- **Stool is formed in the transverse colon.** Roughly $\frac{2}{3}$ is composed of water and undigested fiber and food, the other $\frac{1}{3}$ is living and dead bacteria.
- **The majority of commensal and probiotic bacteria live in the large intestine.** Bifidobacteria ferment fibers into short-chain fatty acids that can be used by the body.
- **Eliminating is a choice.** When enough stool is formed, your intestine sends a signal to your brain that it's time to go. The final exit only opens on command.
- **Don't Ignore the Signals.** If you ignore the urge to go, water keeps getting absorbed, leading to constipation. Also, the longer waste sits in the colon, the more toxins get reabsorbed into the body and the intestinal lining gets damaged.





Get to Know Your Bug Community

Understanding the gut microbiome



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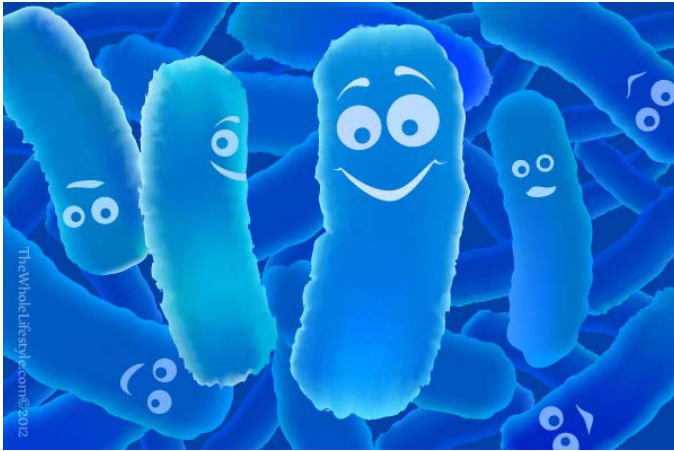
The Benefits of Bugs

Probiotic Bacteria Enhance Health in Many Ways

- Help digest lactose and proteins
- Balance intestinal pH
- Regulate peristalsis and improve diarrhea, constipation and IBS
- Reduce intestinal inflammation
- Protect gums and teeth
- Manufacture vitamins B₁, B₂, B₃, B₅, B₆, B₁₂ and K
- Manufacture essential fatty acids and short-chain fatty acids
- Increase absorption of minerals
- Prevent infections and food poisoning
- Prevent and alleviate eczema, asthma and allergies
- Break down bacterial toxins and protect against toxic substances
- Have antitumor and anticancer effects
- Prevent and control thrush, vaginal yeast infections and bladder infections
- Activate mucosal-associated lymphoid tissue (MALT)
- Normalize serum cholesterol and triglycerides
- Support healthy blood pressure levels
- Break down and rebuild hormones
- Break down bile acids
- Promote healthy metabolism and weight
- Beneficial for several health conditions

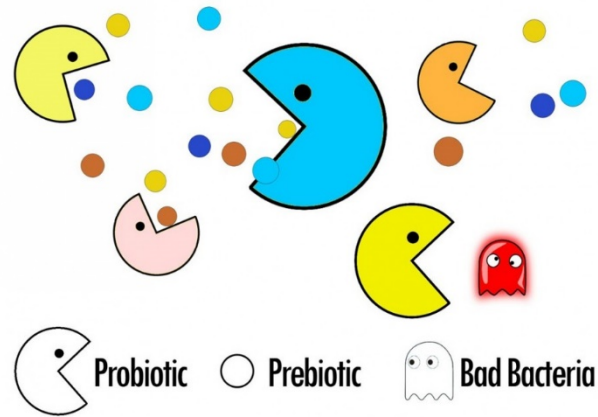


FUN Facts about Your Microbiome



- Bacteria comprise 10% of your dry body weight.
- You have 10 times more bacteria in your gut than you have cells in your body.
- Genetic research has discovered 40,000 different bacteria in the GI tract of different people, 80-90% are from two bacterial families.
- There are commensal bacteria (normal bacteria in your gut), probiotics (beneficial bacteria in your gut), and pathogens (microbes that can cause acute or chronic illness).
- Probiotics help to keep the microbiome in check. Without sufficient probiotics, other opportunistic bacteria, yeast and pathogens can take over.
- Medications, chemicals, C-section births, breast-feeding versus bottle-feeding, stress, diet, alcohol intake and lifestyle ALL affect the balance of the microbiome.

FUN Facts about Your Microbiome



- Two important groups of probiotics are lactobacilli and bifidobacteria.
 - Lactobacilli manufactures antibiotics effective against many types of bacteria.
 - Bifidobacteria and lactobacilli secrete certain acids which make the environment inhospitable to invading microbes.
 - *Saccharomyces boulardii*, another probiotic, protects and restores normal flora, stimulates production of antibodies against pathogens and prevents diarrhea.
-
- Probiotics work synergistically with prebiotics. Prebiotics are certain fibers such as inulin.
 - Prebiotics promote the growth of bifidobacteria and lactobacilli, lower colon pH, discourage growth of disease-causing bacteria, prevent constipation and diarrhea, help regulate blood sugar levels.
 - Probiotics live in the intestines for 12-14 days. It is beneficial to regularly consume probiotics and prebiotics.



Last Minute Thoughts

- Eating too fast can lead to many different digestive issues.
- Heartburn is most likely caused by low stomach acid.
- Liver health is important for detoxification and much more.
- Probiotics are important for many health reasons.
- Stress and poor diet can reduce stomach acid, tax the liver, damage your gut lining and wreak havoc on your microbiome.
- **Eating slowly and mindfully, reducing stress, consuming probiotics and choosing foods wisely** will have a huge impact on your gut...and overall health.





Resources

- *Digestive Wellness, 4th Ed.*, Elizabeth Lipski, PhD, CCN, CHN
- <http://www.freshdentalcare.co.uk/25-fun-facts-about-your-mouth-you-probably-didnt-know/>
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Photos Courtesy of:

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