

Optimum Digestion

The Human Digestive System: is a complex series of organs and glands that processes food. In order to use the food we eat, our body has to break the food down into smaller molecules that it can process; it also has to excrete waste. Most of the digestive organs (like the stomach and intestines) are tube-like and contain the food as it makes its way through the body. The digestive system is essentially a long, twisting tube (gastrointestinal tract) that runs from the mouth to the anus, plus a few other organs (like the liver and pancreas) that produce or store digestive chemicals.

The Digestive Process:

The start of the process - the mouth: Food is partly broken down by the process of chewing and by the chemical action of salivary enzymes (these enzymes are produced by the salivary glands and break down starches into smaller molecules).

On the way to the stomach: the oesophagus: After being chewed and swallowed, the food enters the oesophagus, a 25cm tube that runs from the mouth to the stomach. It uses rhythmic, wave-like muscle movements (called peristalsis like those in the gut) to force food from the throat into the stomach. This muscle movement gives us the ability to eat or drink even when we're upside-down.

In the stomach: The stomach is a large, sack-like organ that churns the food and bathes it in a very strong acid (gastric acid) made from hydrochloric acid, potassium and sodium, with a pH of 1.35 to 3.5 and is produced by the parietal cells. Other cells in your stomach produce bicarbonate to help buffer the acidity, as well as mucus that forms a viscous physical barrier to prevent gastric acid from damaging the stomach – stomach cells are continually turned over and renewed. When food hits your stomach, gastric acid begins the breakdown of protein and most minerals with pepsin to prepare for the important absorption of key nutrients (like iron B12, Vit. D etc). It also helps destroy bad or dangerous bacteria. Food in the stomach that is partly digested and mixed with stomach acids is called chyme.

In the small intestine: After the stomach, the chyme enters the duodenum, the first part of the small intestine. It then enters the jejunum and then the ileum (the final part of the small intestine). In the small intestine, bile (produced in the liver and stored in the gall bladder), pancreatic enzymes (lipase - fats into fatty acids and cholesterol / amylase - carbohydrates / trypsin and chymotrypsin - proteins), and other digestive enzymes produced by the inner wall of the small intestine help in the breakdown of food.

In the large intestine: After passing through the small intestine, food passes into the large intestine. In the large intestine, some of the water and electrolytes (like sodium) are removed from the food. Many microbes (bacteria like *Bacteroides*, *Lactobacillus acidophilus* and *Escherichia coli*) in the large intestine help in the digestion process. The first part of the large intestine is called the cecum (where the appendix is connected). Food then travels upward in the ascending colon. The food travels across the abdomen in the transverse colon, goes back down the other side of the body in the descending colon, and then through the sigmoid colon. Nutrients extracted from digested food enter the blood stream through the gut wall and into the hepatic portal system.

Hepatic Portal System: This is the system of veins comprising the hepatic portal vein and its tributaries. It is responsible for directing blood from the region of the gastrointestinal tract between the oesophagus and rectum and organs such as the spleen and pancreas. It functions to supply the liver with metabolites and also ensures that ingested substances are processed in the liver before reaching the systemic circulation. Blood passes into cavities between the hepatocytes (cells) of the liver called sinusoids, which feature porous cells allowing for the efficient transfer and processing of nutrients in the liver and beyond into the body.

The end of the process: Solid waste is then stored in the rectum until it is excreted via the anus.

Key Digestive Organs:

The pancreas: It is a gland organ that is located in the abdomen, part of which secretes a clear, watery, alkaline juice into the small intestine that contains important enzymes and hormones that help break down foods after it has left the stomach (see small intestine) and to buffer the acidity of the chyme.

The liver: is an accessory digestive gland and plays a major role in metabolism with numerous functions in the human body, including regulation of glycogen storage, decomposition of red blood cells, cholesterol production, plasma protein synthesis, hormone production, and detoxification. Other functions include protein synthesis; the production of biochemicals necessary for digestion and it also produces bile, an alkaline compound, which aids in digestion via the emulsification (initial breakdown) of lipids (fats).

The Microbiota: (formerly called gut flora) is the name given today to the microbe population living in our intestine. Our gut microbiota contains tens of trillions of microorganisms, including at least 1000 different species of known bacteria with more than 3 million genes (150 times more than human genes). Microbiota can, in total, weigh up to 2 kg. One third of the microbiota is common to most people, while two thirds are specific to each one of us, meaning it is like an individual identity card. Some of its critical functions are:

- It helps the body to digest certain foods that the stomach and small intestine have not been able to digest.
- It helps with the production of some vitamins (B and K).
- It helps us combat aggressions from other microorganisms, maintaining the wholeness of the intestinal mucosa.
- It plays an important role in the immune system, performing a barrier effect.
- A healthy and balanced gut microbiota is key to ensuring proper digestive functioning.

Nutrients to support Optimum Digestion (Below are some of the essential digestive nutrients and foods)

- **Vitamin D:** helps control the levels of calcium in your system, so that the nerve cells in the gut have access to sufficient calcium they need to transmit signals and for the gut to function properly.
- **Vitamin C:** helps your body produce enough collagen (the main structural protein found in animal connective tissue) to maintain the tissues of your digestive tract.
- **Vitamin A:** nourishes the mucosal tissues (the surface of the digestive tract), helping to ensure that each organ in the digestive tract can function properly and to secrete the compounds that help with digestion.
- **Fibre:** feeds the gut and aids in digestion. It also acts as a mild laxative, increases peristalsis and helps to clean the walls of the intestines, preventing carcinogenic toxins from settling in the colon.
- **Fermented foods:** such as kimchi, sauerkraut, or kefir are the ultimate prebiotics, as they are full of lactic-acid-producing bacteria that help maintain a healthy gut.
- **Essential Fats:** may be associated with increased beneficial gut microbiota growth and help to produce bile and for us to absorb fat-soluble vitamins. It is also anti-inflammatory.
- **Pulses:** are packed with oligosaccharides (large carbohydrate molecules) that feed good gut bacteria (which is one reason they're problematic for some) and fibre that helps keeps the gut clean & healthy.
- **Essential minerals:** such as **potassium**, **sodium** and **calcium** aid digestive function, helping the muscles in the walls of your digestive tract push food through your system.
- **L-Glutamine (an Amino Acid):** to protect the integrity of the gastrointestinal mucosa barrier.
- **Vitamin B5:** (with **zinc** and **quercetin** a plant chemical found in fruit and vegetables) promote gut healing.
- **Ginger:** aids digestion by stimulating digestive enzymes. Sipping ginger tea before or during a meal can reduce intestinal gas and bloating.
- **Peppermint:** is a natural antispasmodic that will help calm an irritated stomach.
- **Fennel:** helps keep your digestive system working and may reduce intestinal gas, bloating, and nausea.
- **Anti-inflammatory:** compounds such as **turmeric** help to calm inflammation in the gut.
- **Water:** fluids play an essential role in partnership with fibre to get solids through your system.

Please Note: This handout should only be used as a guide to help inform you as to the diet and lifestyle modifications that **may** help to support optimum digestion. It **should not** be used as definitive guide to optimum digestion. If you think you may have digestive issues then please contact your medical doctor, or a qualified nutritionist.