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Why is Digestive Health so important?

Everyday each living being will consume food to be nourished and have energy to live. Digestion is the necessary process of digesting food to help decompose or extract essential components. Within the human body there are a series of organs that work together in complex ways to provide the best form of digestion. Drawings from the 17th century of the human digestive system show that there has been an interest in the way our bodies work for quite some time. Although we understand the mechanics, it has recently been suggested that not enough research has been put into our delicate digestive system; while advances in brain science take place consistently, issues with digestion still occur, so why do we ignore them?

The human digestive system is made up of gastrointestinal tract (GI tract), the liver, pancreas and gall bladder. A series of hollow organs from the mouth to the anus create the GI tract (fig 1), these are the mouth, oesophagus, stomach, small intestine large intestine, and anus. The small intestine is separated into three parts, first comes the duodenum, then the jejunum and lastly the ileum. The large intestine is made up of the appendix, cecum, colon and rectum. The appendix is an almost finger shade pouch which is attached to the cecum. Together, enzymes, hormones, blood and nerves work to break down food. A large stretch of tissue called mesentery positions supports the digestive organs to keep them in place and allow them to successfully function. The GI tract needs to contain bacteria, gut flora and micro biome which helps with overall digestion. The nervous and circulatory systems will also help, harmoniously working together, nerves, hormones, bacteria, blood and the digestive organs are all necessary to help complete digestion so that fuel can be absorbed and made from the food and drink consumed.

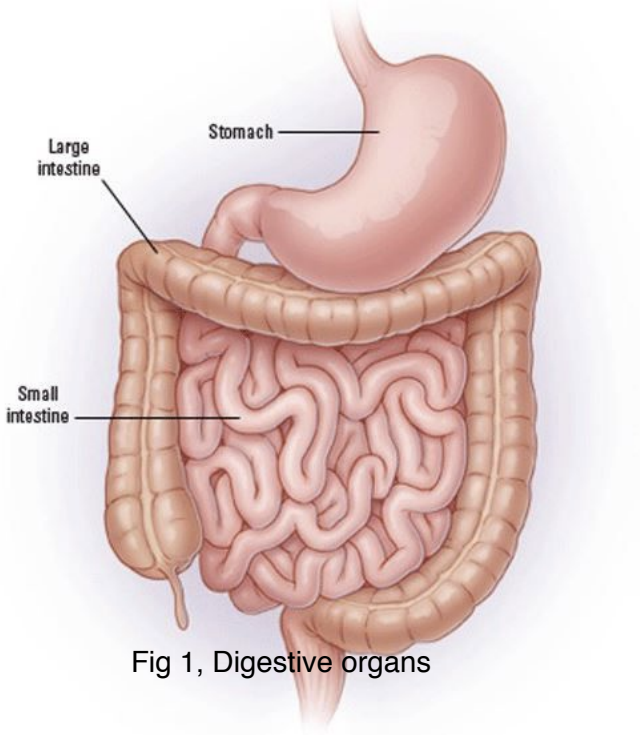


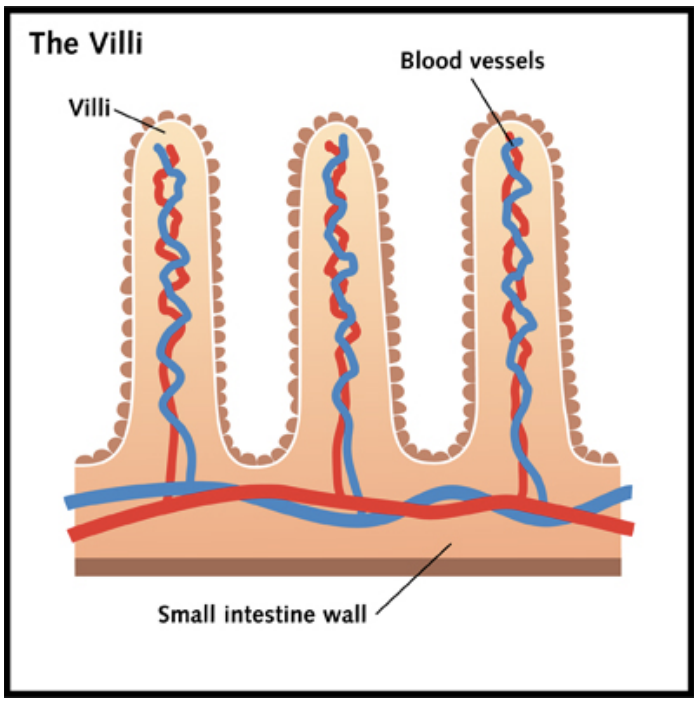
Fig 1, Digestive organs

Across our planet, humans on average consume between 1-2.7 kg/day of food, that means per person it would at up to 165 kg and more than 28,000 over a lifetime.[1] Every last morsel of this weight has to proceed through on of the most complicated and diverse systems of the body, the digestive system, consisting of 10 organs and covering 10 meters. It has only one vital role, but many processes. To transform raw materials of food into the energy and nutrients that keep us alive, (Carbohydrates, fats, vitamins, proteins).

Human digestion begins before food even enters the mouth. The senses of smell and sight trigger the ghrelinergic cells in the GI tract to release the peptide hunger hormone ghrelin, also known as lenormorelin, while other glands pump out saliva in mouth. While chewing, food mixes with saliva and enzymes help break down starch. The food then begins its journey down the 25cm tube, the oesophagus, to reach the stomach. Particular nerves in the tissue of the oesophagus sense the food and create peristalsis, a series of muscular contractions which push food into the stomach. The muscular stomach walls then pound the lump of food, breaking it up into smaller chunks. In the cells of the stomach lining, hormones trigger the release of acids and enzyme rich juices to

[1] https://www.youtube.com/watch?v=Og5xAdC8EUI

dissolve the food and break down protein. (Fig 1) At the same time, the pancreas, liver and gall bladder are alerted by these hormones to produce digestive juices and move bile (a liquid that digests fats necessary for brain health, immune system etc) to prepare for the next stage. After three hours in the stomach, the once whole food by now will have changed into a frothy liquid called chyme. At this point it is ready to move into the small intestine. The liver then sends bile into the gall bladder which secretes it into the first section of the small intestine, the duodenum. Here the fats floating around in the chyme are dissolved, making it easier for intestinal and pancreatic juices to digest them. Enzyme filled juices break down the fat molecules into fatty acids and glycerol to make them easier to absorb into the body. These enzymes also deconstruct proteins into amino acids and carbohydrates into glucose. Protease helps digest protein, Lipase for fat, Amalyse and others for digesting complex carbohydrates.[2] Equally, the extraction of hydrochloric acid is important for the extraction of nutrients. All of this takes place in the jejunum and ileum of the small intestine, which are covered with millions of tiny projections called villi. (Fig 2)[3] The villi create a larger surface area which maximises molecule absorption and transference into the bloodstream. The nutrient rich blood then travels around the body, sharing the nutrients with the organs and tissues. Any left over, water, fibre and dead cells then move on towards the large intestine/colon. Through the wall of the large intestine the body drains remaining fluid, the soft mass that is left is called stool. Into the rectum is squeezed the stool where nerves sense the expansion and tell the body that it needs to expel the waste.



Between 30-40 hours can be spent digesting food, but it remains one of the most important processes for our wellbeing. Nearly everything in our day to day lives can affect digestion, emotions, environment, air, water, personal hygiene products and anything likely to contain chemicals.[4]

Stress, anger and anxiety can be responsible for digestion issues such as bloating, gas, constipation, diarrhoea, etc. These are conditions that some suffer with each day, but not often will someone advise you to seek therapy, change your lifestyle to improve your moods and become less anxious which would avoid digestion problems, instead, most commonly, medications will be prescribed and diet plans given.

What we eat can also be a possible issue to our digestion. Commercial foods brim with chemicals, additives, growth hormones, food colouring, flavour enhancers and antibiotics to make them look appetising, taste nice and never go mouldy. Theoretically this is a good idea, and saves money, but these unnatural chemicals still have to be processed into our bodies, meaning they must have some kind of effect.

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[2]https://www.ck12.org/book/CK-12-Life-Science-Concepts-For-Middle-School/section/11.17/

[3]http://science.jrank.org/kids/article_images/eat_p30.jpg

[4]https://www.ck12.org/book/CK-12-Life-Science-Concepts-For-Middle-School/section/11.17/

Luckily, our gall bladder is able to eliminate toxins via the large intestine and the liver also detoxifies chemicals from what we consume, air, water, food, alcohol, prescription drugs, for example.Healthy liver function is crucial as it is also responsible for purifying and storing blood.[5] But, when the body is exposed to a large quantity of chemicals, the liver stops being able to cleanse and the chemicals are reabsorbed. This reabsorption can be dangerous to many crucial functions of our body including our digestive, and endocrine systems (glands around the body responsible for secreting hormones). This occurs when the reabsorbed chemicals become xeno-estrogens which move into the home (receptor sites) of the phyto-estrogens (natural oestrogen from foods). This results in a hormonal imbalance, which leaves the endocrine system, particularly the thyroid and adrenal glands under stress.[6]

Recent studies have shown that the chemicals in our everyday products can be dangerous to our neurodevelopment and may be a cause for autism and attention deficit disorders. This doesn't include the harmful chemicals in our food. While food has nutrients which are essential for our health, chemicals added during their production can increase disease risks. Pesticides, fertilisers, herbicides, artificial colours and flavours, preservatives and industrially produced sweeteners and fats are often ingredients of the food we eat everyday, even though they may not be on the label.

Scientific researchers at the Havard University of Public Health published in 2010 that exposure to organophosphates, an insecticide sprayed onto crops be may a contributing factor to ADHD (attention deficit hyperactivity disorder) in children. The urine of children who were only consuming organic produce showed significantly lower levels of organophosphates (organic compounds with one or more phosphate ester groups).[7] So while spending time reading labels to see how much fat and sugar is in our food, is it worthless when some of the most damaging chemicals aren't even on the label?

Companies will often use preservatives such as sulphites and nitrites in processed meats to prevent the growth of microorganisms and thus increase shelf life. These preservatives can be a risk to our health as our bodies convert nitrites into carcinogenic substances called nitrosamines.[8] In the “International Journal of Cancer” August 2008, Susanna Larsson at the Karolinska Institute in Stockholm published that the nitrosamine consumption from processed meats increases the risk of stomach cancer. While according to the Cleveland Clinic, preserved dried fruits, beer and wine containing sulphites may cause asthma attacks.[9] While research has shown highly negative effects of chemicals, there are also some pros to the use, in fertilisers for example. After World War 1 the use of modern fertilisers bloomed. Father of the Green Revolution in the 1960’s Norman Borlaug, argued that this kind of modern farming (using fertilisers and herbicides) could double food production in Africa, therefore lessening chances of famine.

Pesticides have many functions, they can prevent crop failure, create a perfect green lawn, and control invasive plants. Also, by reducing unsellable blemishes on fruits and vegetables, meaning a larger proportion of produce is marketable. The National Institute of Environmental Health Sciences says that the term “pesticide” means a chemical used to control fungi, weeds, and insects. The same institute also said the understanding of their effects on humans are incomplete. According to The National Coalition for Pesticide-Free Lawns, "Of 30 commonly used lawn pesticides, 19 are linked with cancer or carcinogencity, 13 are linked with birth defects, 21 with

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[5]https://www.webmd.com/digestive-disorders/picture-of-the-liver#1

[6]http://www.wayoflifematters.com/digestion-in-humans.html

[7]https://www.livestrong.com/article/497730-bad-effects-of-chemicals-in-our-food/

[8]https://www.livestrong.com/article/497730-bad-effects-of-chemicals-in-our-food/

[9]https://www.livestrong.com/article/497730-bad-effects-of-chemicals-in-our-food/

reproductive effects, 26 with liver or kidney damage, 15 with neurotoxicity, and 11 with disruption of the endocrine system."[10]

So, our magnificent bodies, as shown above can rid of toxins through the complex digestive system. Meaning in theory, we can absorb the nutrients from the food and expel the toxins. But, if all of our diet is filled with these harmful chemicals, will our body go into override? We are constantly attacked by viruses, bacteria and parasites, while at the same time we are exposed to millions of toxins, chemicals and pollutants. Because our body has the ability to protect itself, we only fall sick occasionally, when our immunity is low. If someone is sick quite often, maybe they are missing some of the essential factors for immunity: Healthy diet, daily activity, enough sleep, healthy environment (sunlight, fresh air, clean water, etc.)[11]

The colon of the digestive system is home to about 100 trillion bacterial cells, almost ten times more then human cells within the body. The micro biomes in the gut contain specific inflammation-reducing bacteria which can help reduce the risk of cancer, infection, heart disease and other other health conditions. These gut micro biomes require certain foods to keep them healthy, they are alive and need the best food and living conditions, like us. "The Diet Myth: The Real Science Behind What We Eat", written by Dr. Tim Spector, a professor of genetic epidemiology at King's College London talks about how fast food could completely make havoc on our gut micro biome. After his 23-year-old son decided to live on a diet of solely fast food for 10 days, his gut micro biome was stripped of a third of its 3,500 original bacterial species, while the bacteria that flourished were those closely linked to obesity. Another experiment in "Super Size Me" in which a man ate nothing but McDonald's for 30 days, showed that not only will a fast food diet affect your gut, but his liver, mood, and sex drive also suffered. [12]

In 2014, a study was carried out that swapped the high-fat, low-fibre diet, similar to the frequent McDonalds eaters, to a low-fat, high-fibre diet. 20 rural Africans ate fried food and meat, while 20 americans ate cornmeal porridge and root vegetables. After only two weeks of a western diet, the micro biomes of the Africans showed the production of a molecule called butyrate, linked to lower inflammation had been cut by 50%. To contrast, the micro biomes of the Americans eating healthier foods began producing almost twice as much butyrate. The same type of obesity-associated bacteria, bacteroidetes, that showed up in Dr. Spector's son's micro biomes was also prevalent in the African's. Although the results of this experiment are shocking and prove how even small changes in diet can have lifelong affects, it also suggests that it is never to late to make a change.[13]

One of the reasons the African diet promotes healthy gut micro biome, could be because of the higher levels of a type of fibre called inulin found in plant foods such as garlic, wheat, leeks and barely. These foods are like fertilisers for the micro biome, encouraging it to produce butyrate, the acid that feeds cells within the colon, keeping inflammation in order. Other studies also suggest that diets containing inulin increase bifidobacteria which break down carbohydrates to short-chain fatty acids.[14] These health promoting bacterias may also decrease risks of cancer, heart and digestive diseases.

As some foods are generally considered and or good for your health, this doesn't give room for interpretation and there is a fair amount of variation between people. It would be ideal if tests could

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[10]https://www.livestrong.com/article/497730-bad-effects-of-chemicals-in-our-food/

[11]https://www.indiatimes.com/health/healthyliving/how-your-body-protects-itself-242221.html

[12]https://edition.cnn.com/2015/05/27/health/gut-bacteria/index.html

[13]https://edition.cnn.com/2015/05/27/health/gut-bacteria/index.html

[14]https://edition.cnn.com/2015/05/27/health/gut-bacteria/index.html

be available which would predict which foods were compatible with a persons micro biome. For example, if an individual eats red meat, and retains high levels of bacteria that create a metabolite that has shown to be linked with atherosclerosis (a disease of the arteries from fat gathering on their inner walls). A test could be done to show that person that they had the bacteria linked to that disease, they could then eat foods which instead encourage different bacteria to grow which would eliminate the metabolite bacteria.[15] Some diets take this into consideration, for example, the blood type diet, where the food you eat matches your blood type, making digestion much more efficient.[16]

To conclude, I believe most of us have followed a path of ignoring what we can't see (in our gut for example) and instead focus our attention on the importance of preventing physical exterior injuries. Our bodies do have incredible defense systems, but we must take into consideration that they shouldn't have to constantly work hard to cleanse and rid of harmful chemical and toxins. We know how important it is to protect our heads, we wear helmets and seek attention even after a small bump; but no one seems to be giving much thought to the delicate lining of our digestive organs. By observing how our digestive system works we may be able to save money on prescribing expensive medications to treat the never ending issues of bloating, constipation, diarrhoea etc, by instead changing the foods we eat to rebuild and heal the digestive system that is obviously suffering.

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