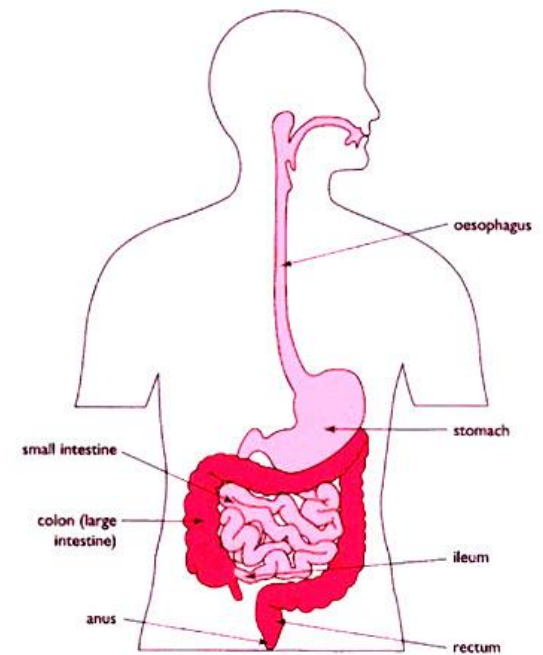


UNDERSTANDING THE DIGESTIVE SYSTEM



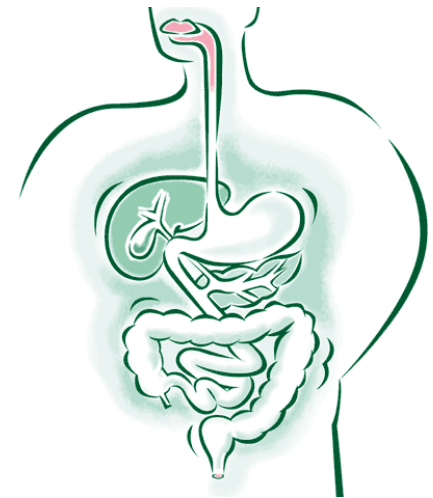
Understanding Digestion

- The key to solving food and digestive issues starts with an understanding of how the digestive and intestinal system works
- If you know what is supposed to happen and what the GI tract needs to function properly, it will be easier to understand the foods to eat and how to eat them
- Therefore we are going to start with an explanation of the GI Tract



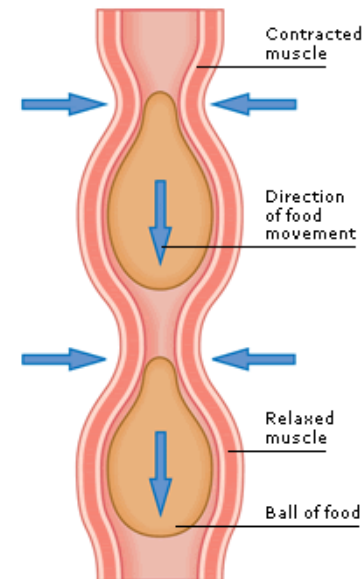
Understanding Digestion

- Digestion is the process that allows nutrients from your food to enter into your body and help you build and maintain all that you need to be healthy.
- Elimination is the process of ridding the body of the things it does not need.
- Food goes through three types of processes in the body: digestion, absorption and elimination.
- Our gastro-intestinal tract is one very long passageway through our body – like a tube that runs through us
- Technically, it is considered outside the body

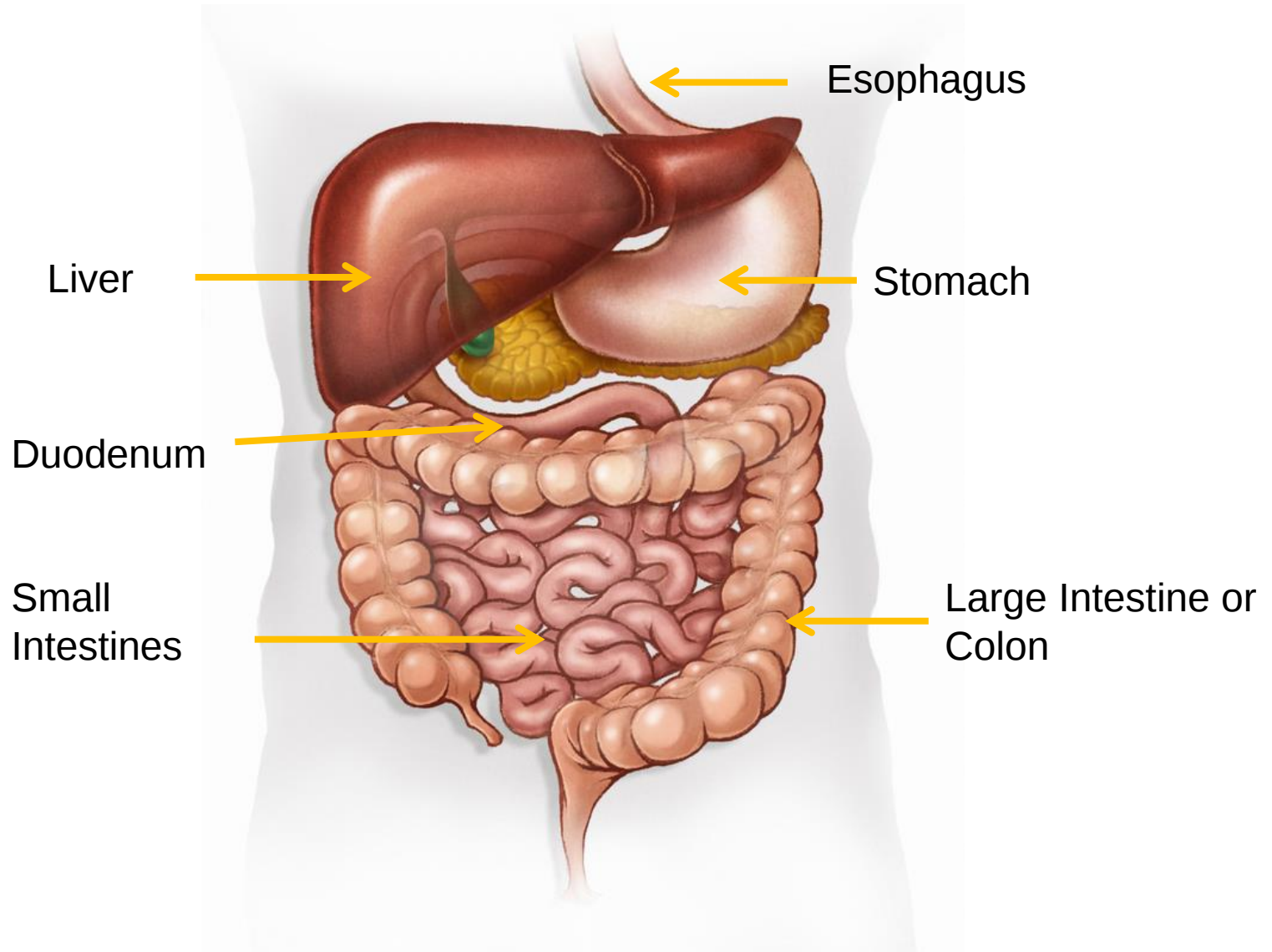


The Digestive Process

- The GI tract is responsible for making sure we break down all our food and absorb all the nutrients in the food
- It also has the task of removing all waste materials
- Food moves along the GI tract due to a process known as peristalsis, which is a series of rhythmic muscle contractions
- So we are going to start by explaining the key players and discussing how each type of food digests



Anatomy of the GI Tract



The Key Players

- The **mouth, the teeth and saliva** in the mouth are critical to successful digestion
- The **stomach** plays a major role in protein digestion and helps with fat digestion
- The **liver** makes bile (which is stored and secreted from the gall bladder). Bile aids fat digestion and carries toxins out of the liver and through the intestines
- The **small intestines** is where all the food finishes being digested and nutrients are absorbed into the body
- The **pancreas** secretes enzymes for digesting and bicarbonate for neutralizing stomach acid in the intestines
- **Gut bacteria** is involved with the production of specialty enzymes and aiding the bioavailability and absorption of nutrients

Carbohydrates

- Carbohydrates start their digestion process in the mouth
- Chewing the carbs allows for them to mix with saliva which contains amylase enzymes
- Amylase enzymes are specific for digesting carbs
- Once the carbs are swallowed, they move along the digestive tract because of peristalsis
- They do not need to do anything in the stomach
- Digestion is finished in the intestines – the carbs receives more amylase enzymes from the pancreas in the duodenum and specialty enzymes from gut bacteria and the brush border (an area on the surface of the lining)



Carbohydrates

- Carbs are found in three forms:
- Monosaccharides – single molecules of carbohydrate such as glucose, fructose and galactose
- Disaccharides – two molecules attached together such as sucrose, lactose, maltose
- Polysaccharides – many carbohydrates molecules attached together – found in grains, nuts, seeds and legumes (starch)
- The goal of carbohydrate digestion is to break down the carbs into single molecules

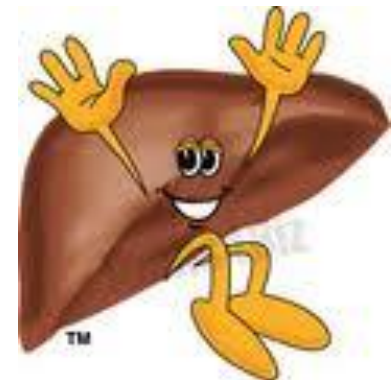


Carbohydrates

- Once the carbs have been broken down to a single carb molecule, the molecule is absorbed in to the blood stream and makes its way to the liver (via the portal vein)

The liver then makes a decision:

1. It can let the glucose be used for immediate energy by the body
 2. It can convert the glucose to glycogen (stored glucose)
 3. It can convert the glucose to fat for long term storage
- If it is a fructose or galactose molecule then the liver converts it to glucose for use as energy or glycogen or converts it to fat

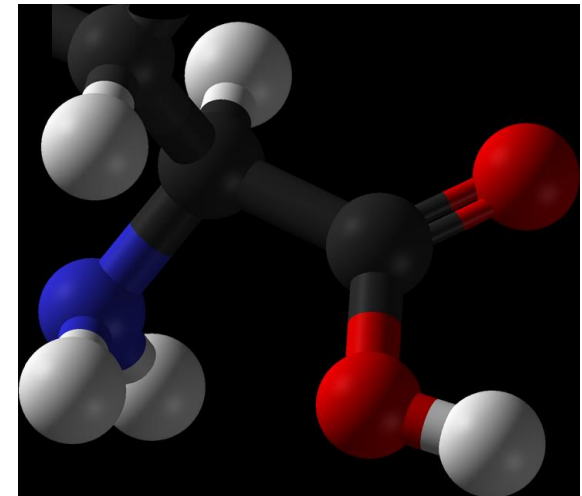


Protein

- Not a lot happens with protein when we chew except to help exposed surfaces to make it easier for enzymes and stomach acid to help break the protein down
- The action for protein all starts in the stomach
- The stomach releases the enzyme pepsinogen and hydrochloric acid (HCl) and combined with the muscle contractions of peristalsis, the process of breaking down large protein molecules into smaller molecules begins
- Once this occurs, the protein material moves in the small intestines

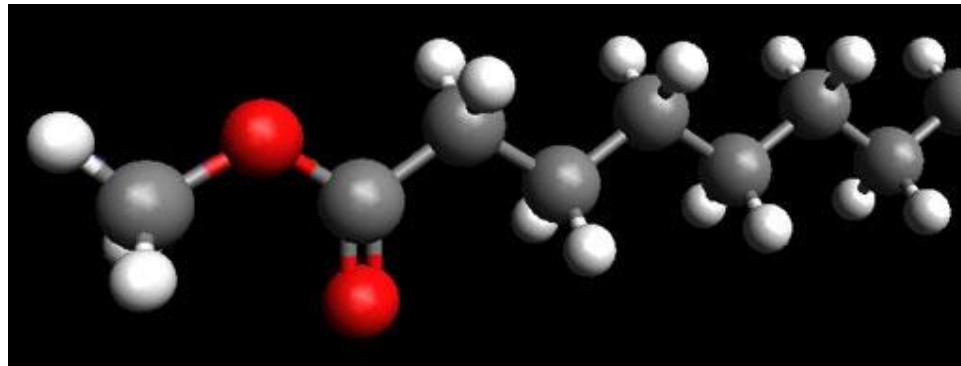
Protein Digestion

- Once the acid protein material is in the intestines, it is neutralized by bicarbonate (secreted by the pancreas)
- Then the pancreas secretes protease enzymes and finishes breaking down protein to single amino acids
- Only single amino acids can enter the blood stream under normal circumstances – anything bigger will not fit
- Once inside the bloodstream, they go to the liver where the liver decides how they will be used by the body



Fat

- Fat digestion begins in the mouth. Like protein, the chewing action helps expose surfaces that will aid enzymes
- Once the fat moves into the stomach, the HCl helps separate the fat from the rest of the food (usually protein)
- The fat then enters the duodenum where it meets up with bile secreted by the gall bladder
- The bile acts like a detergent to the fat to help break it down



Fat Digestion

- Lipase enzymes secreted by the pancreas finish the job by breaking down fat into single fatty acids (which is the smallest form of fat and the only size that can normally be absorbed into the body)
- Once this occurs, the fatty acids go into the body and go to the liver

The liver decides what happens with fat:

- a) Is it used to build something?
- b) Is it converted to energy?
- c) It is converted to a form of storage fat?



Vitamins and Minerals

- During the process of digestion, vitamins are released from the food for absorption in the small intestines into the bloodstream
- Minerals are also released but need to be extracted from the fiber wall in many foods – good bacteria helps with this
- Minerals need help to be absorbed so they must bind to amino acids and hitch a ride into the body
- Therefore, proper protein digestions is essential for the absorption of minerals.



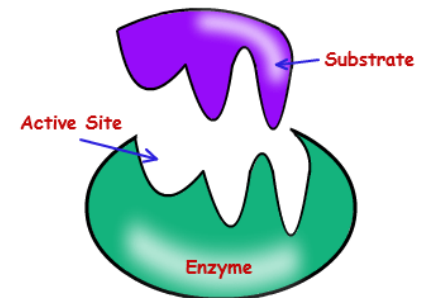
Phytonutrients

- Also known as phytochemicals (sometimes called antioxidants) are potent chemicals that have many health benefits
- They are the focus of a lot of current research (and often end up in supplements)
- Gut bacteria is essential to getting the most from the phytonutrients
- It is a complex relationship but the microbes ensure that the phytonutrients are more bioavailable, potentiate them and aid absorption

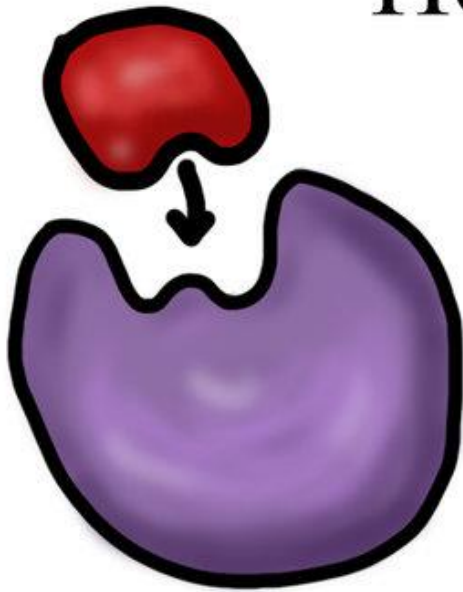


Enzymes

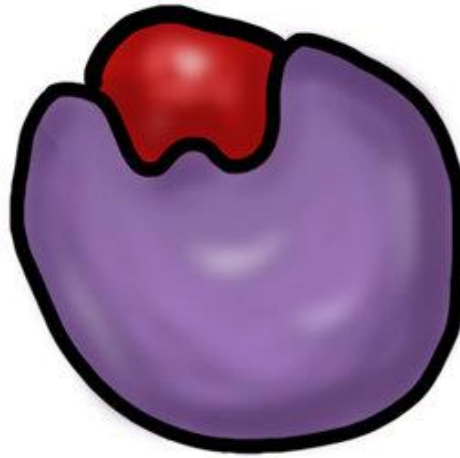
- Enzymes exist all through the body and are involved in every activity and process
- Digestive enzymes operate in an alkaline environment which has a pH above 7.
- The mouth and the intestines are alkaline – the stomach is not. Only stomach enzymes like pepsinogen operate in an acid environment.
- Any alkaline enzyme that passes through the stomach goes dormant in the stomach and then becomes active in the intestines
- This happens because the pancreas secretes bicarbonate to neutralize acid material from the stomach



How Enzymes Work



The substrate (reactant) moves toward the enzyme's active site.



The chemical reaction is triggered by the enzyme.



The enzyme releases the products.

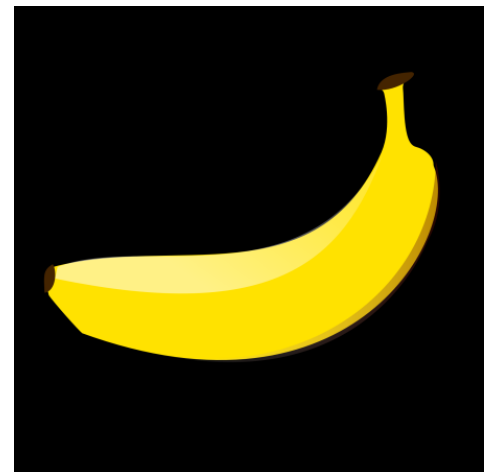
Fiber

- This is what left of the food (that contains fiber) after all the nutrients are removed and absorbed
- Fiber works with gut bacteria in order to release phytonutrients and minerals that are bound to fiber wall
- Certain types of fiber feed the good bacteria especially in the large intestines
- Fiber is also essential for healthy bowel movements



Elimination

- Once all the nutrients are removed from the food, fiber, water and bile (with toxins attached) move into the large intestines
- Over an 18 - 24 hour period, this gradually solidifies and darkens in colour as it moves through the large intestinal
- Good stool is either banana or “S” shaped and is soft and easy to pass.
- Soluble fibre, good bacteria and water is necessary for a proper stool
Insoluble fibre scrapes and cleans the colon



Stress, Sleep and Digestion

- Stress can blunt stomach acids or create too much and interfere with enzyme production
- It can lower good bacteria and raise bad bacteria levels
- Stress can cause constipation or diarrhea
- Can effect sleep - good sleep is necessary for energy
- Lack of energy can effect digestion
- Sleep is also needed to recover from stress and repair and maintain all functions in the body including the functions of the digestive system



And Finally...

- Now that we have discussed the basics of digestion, this can help you understand how important it is to eat the best foods for digestion
- Follow the steps to good digestion
- Don't stress about it
- And find the best way and the best foods for you to optimize your digestion

