



Digestion Honor

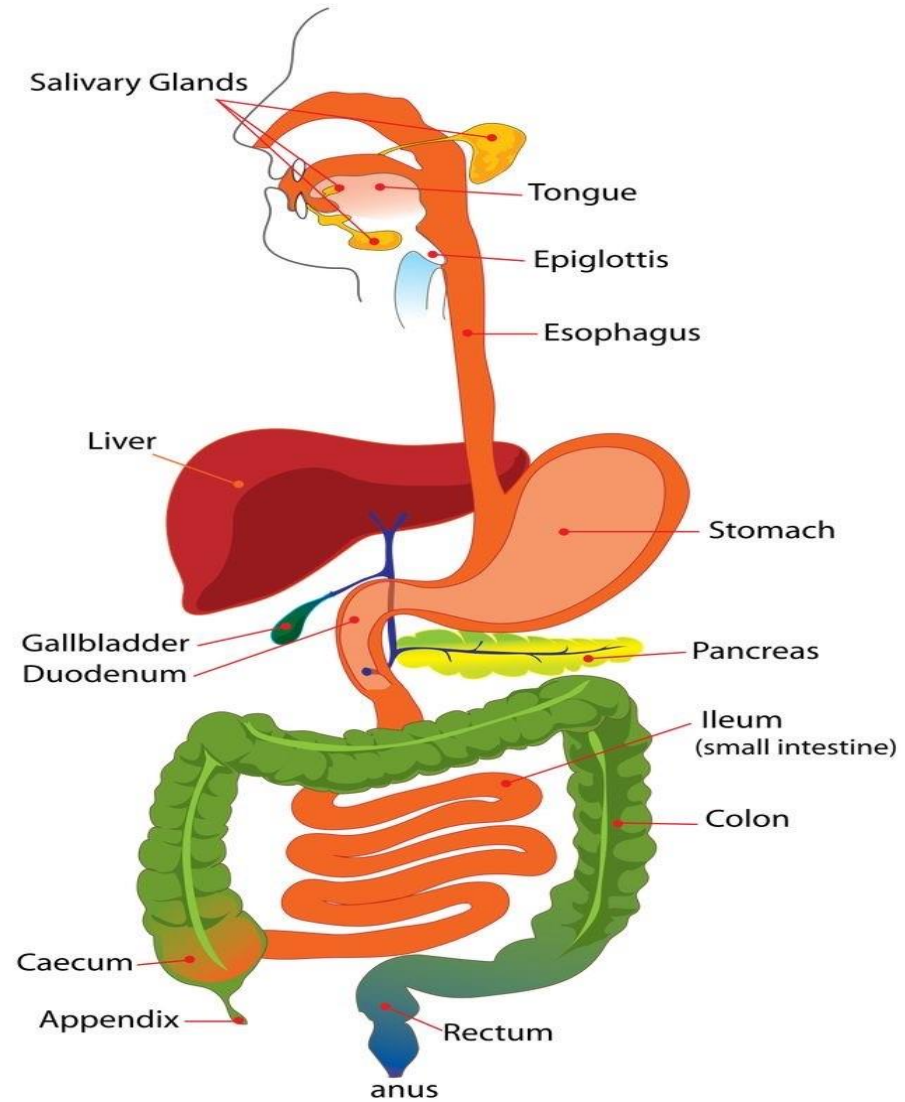
Patience Chiketero





Prerequisite

You need to have the
Nutrition Honour





Keeping a record of what we eat

- What did you eat today? How much water did you drink?
- Did you eat fruits yesterday? Today? Not sure?
- How much should you eat daily?
- Lets look at the food pyramid
- Did you exercise yesterday?
- What does the body require for nourishment?



Why write a Food Diary

- A food diary is a record of foods that you eat on a meal-by meal basis, daily, or weekly basis.
- It can include nutritional or other dietary information,
- Organise and track foods by food groups
- Allows you to monitor what, when, and how often you eat
- Guides you to see where your nutritional needs are.



How do you write a food diary

- Write everything down, no matter how small
- Do it now. Don't rely on memory at the end of day
- Be specific; record your food exactly how you eat it
- Estimate the amounts
- Record everything you eat each day. Keep it simple

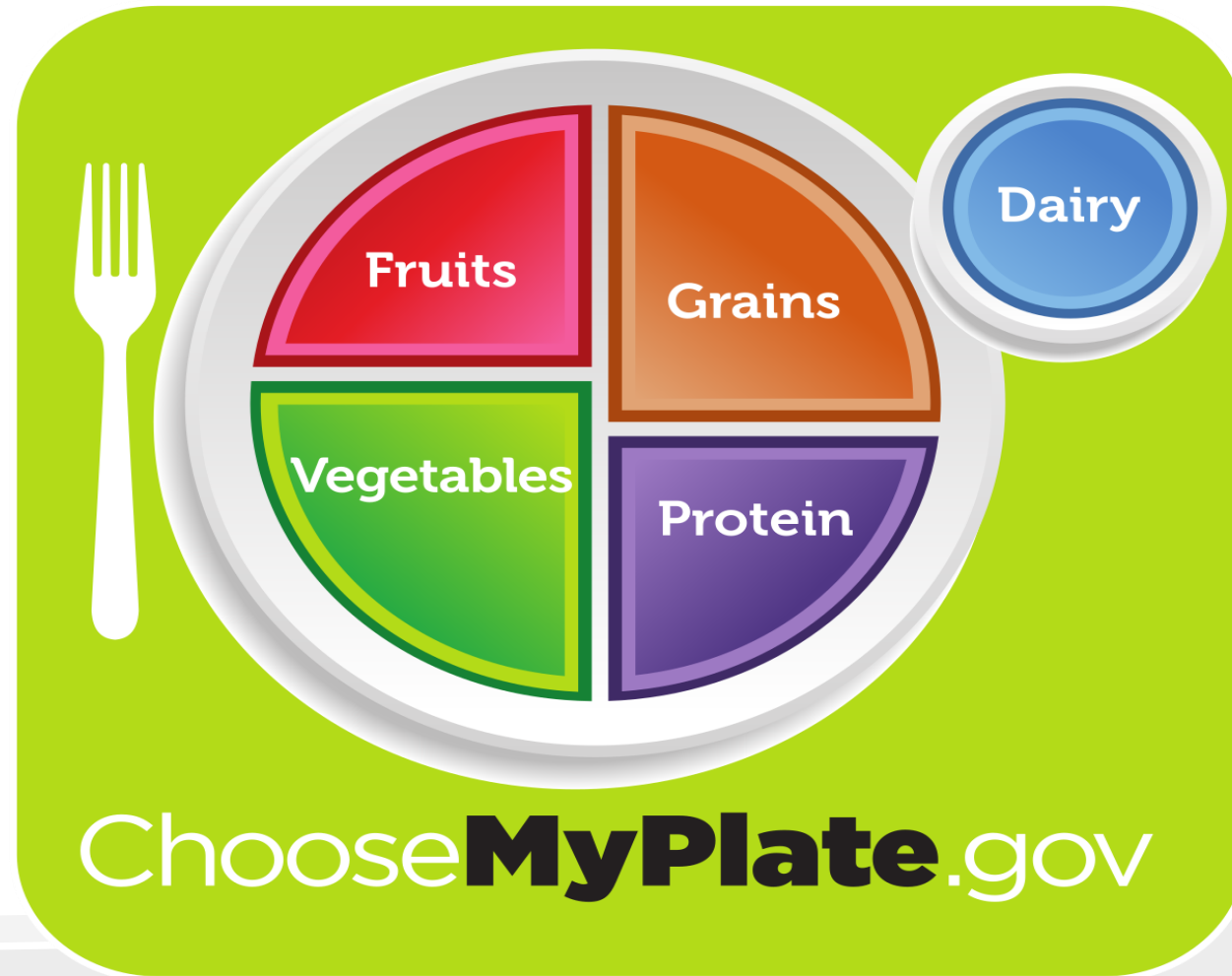


Nutrition apps for phones

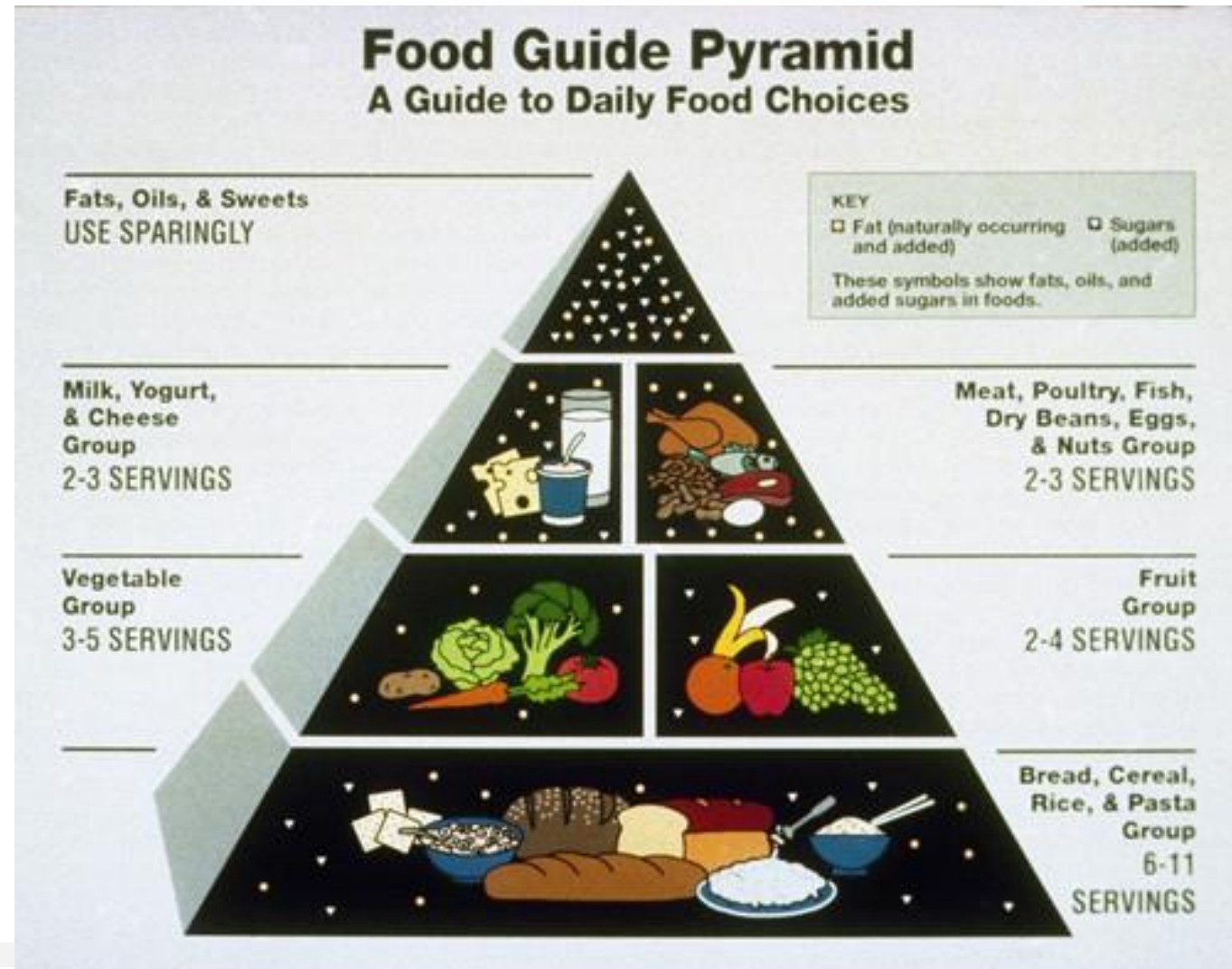
- MY FITNESS PAL
- CALORIE COUNTER
- SEE HOW YOU EAT FOOD DIARY
- MY NET DIARY



What can I put on my plate?



The food guide





Choices

QUALITY CARBOHYDRATES



FRUIT



**SWEET
POTATOES**



QUINOA



OATMEAL



LENTILS



BEANS



SQUASH



**WHOLE WHEAT
PASTA**



**BROWN OR
WILD RICE**



CEREAL

Make sure whole grain is the first ingredient and it has at least 4g of fiber and less than 8g of sugar per serving.



WHOLE GRAIN BREAD



The six essential nutrients for life

- Carbohydrates
- Proteins
- Fats
- Vitamins
- Minerals
- Water

Human Body: Digestive System

The main functions of the digestive system are mechanical and chemical digestion, and absorption. Digestion is the process in which the body breaks food down into smaller molecules so that nutrients can be easily absorbed. The entire digestion process can take anywhere from 24 to 50 hours.

Mouth/Esophagus

Digestion begins in the mouth through the mechanical and chemical breakdown of food. Smooth muscle tissue in the esophagus squeezes the food down toward the stomach in a process called peristalsis.

Stomach

Mechanical and chemical digestion continues in the stomach. Smooth muscle tissue in the stomach wall squeezes and churns the material, while enzymes and chemicals are added to help further break down the food.

Stomach structure

The internal structure of the stomach has ridges and folds called rugae. This increases the surface area within the stomach and allows it to expand to hold more food.

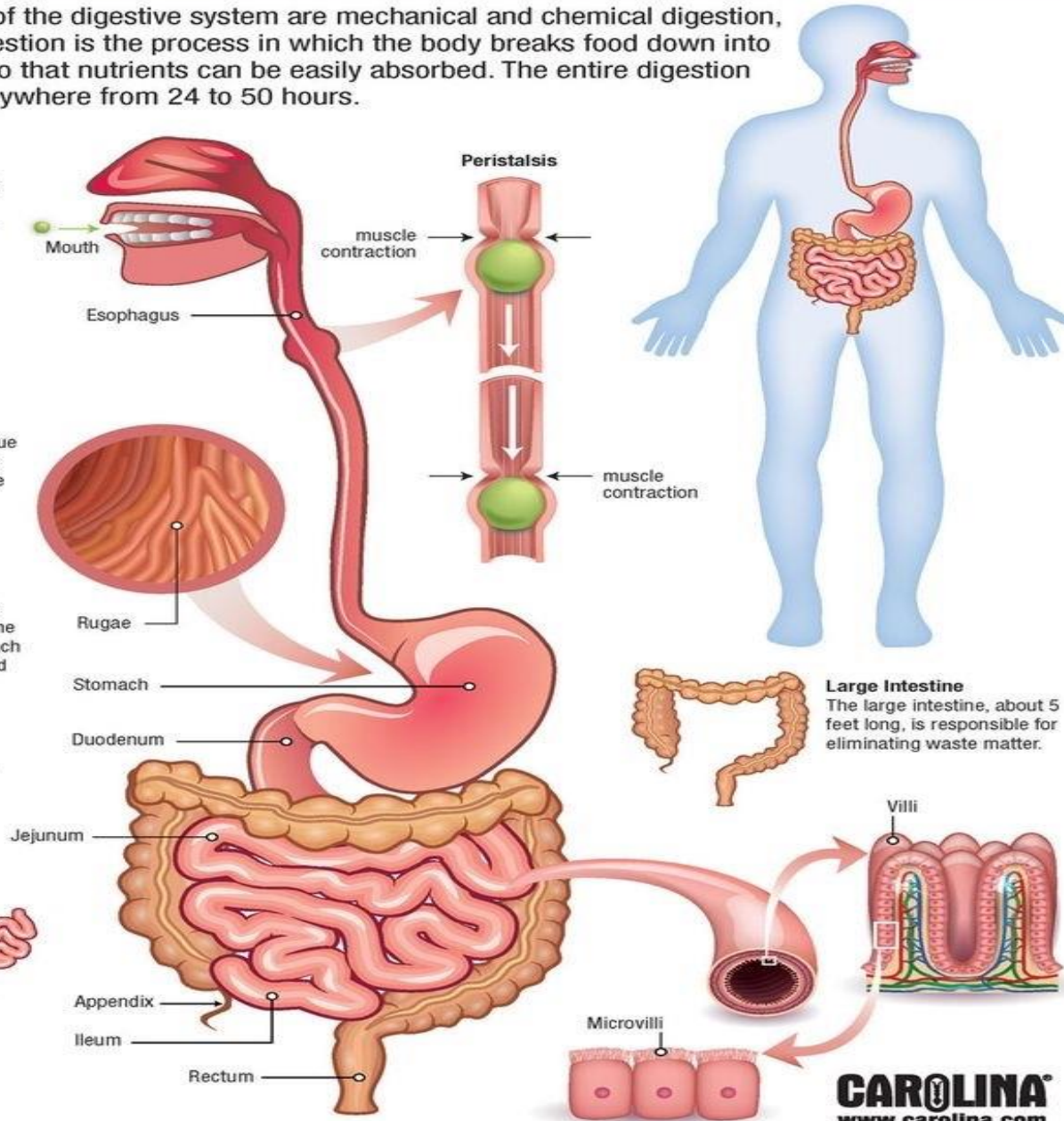
Intestines

The small intestine and large intestine (colon) combined average 25 feet long.

Small Intestine

The majority of absorption takes place in the small intestine, which is about 20 feet long. The small intestine has 3 sections: duodenum, jejunum, and ileum.

Finger-like extensions called villi and microvilli increase the surface area of the small intestine, allowing maximum absorption of nutrients and water.



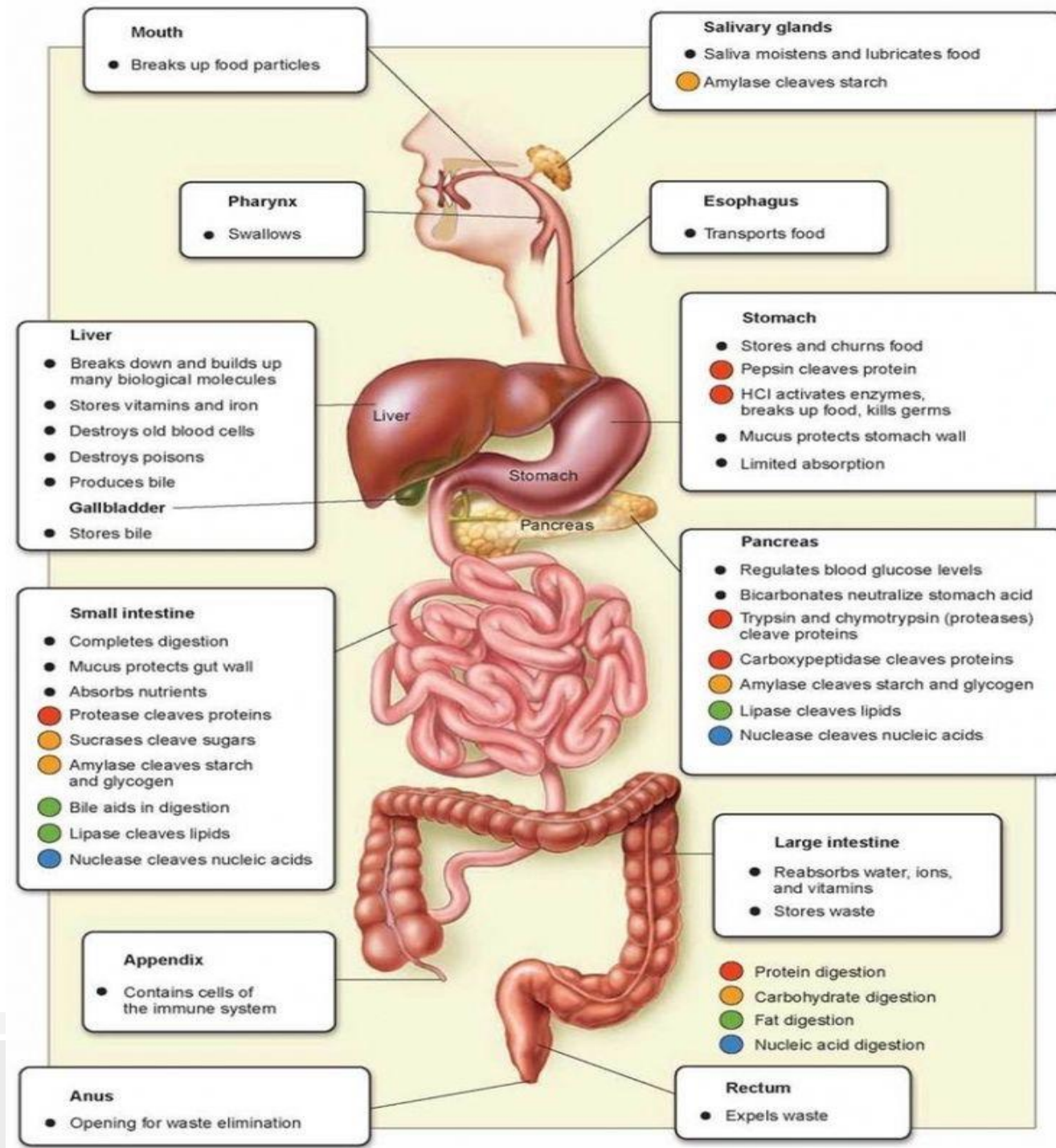


Digestion and Digestive system

- Digestion is the breakdown of food into substances that can be absorbed by the body into the blood.
- The digestive system is also known as the gastrointestinal tract or GI Tract in short.
- In simple terms: Digestion is how your body turns food you eat into nutrients it uses for energy, growth, and cell repair.
- The GI Tract is a long twisting tube that starts from the mouth and ends at your anus



The GI Tract





Saliva and its functions

- Saliva known as spit: is the moist, clear and usually somewhat frothy slimy substance produced in the mouth.
- Its produced and secreted by the salivary glands.
- It moistens food so it can be swallowed easily
- It contains an enzyme that breaks down starches into sugars - maltose and dextrin.



Saliva functions

- Protects teeth from tooth decay by plaque
- Neutralizes acids made from sugars in the mouth, preventing demineralisation of teeth.
- Saliva helps to repair the damaged crystals of the tooth enamel through remineralisation.



Did You Know?

- All enzymes are proteinaceous in nature.
- At lower temperatures, the enzyme salivary amylase is deactivated and at higher temperatures, the enzyme is denaturated.
- Therefore, more time will be taken by enzyme to digest the starch at lower and higher temperatures.
- At 37° C, the enzyme is most active, hence, takes less time to digest the starch.

Teeth and their role in digestion

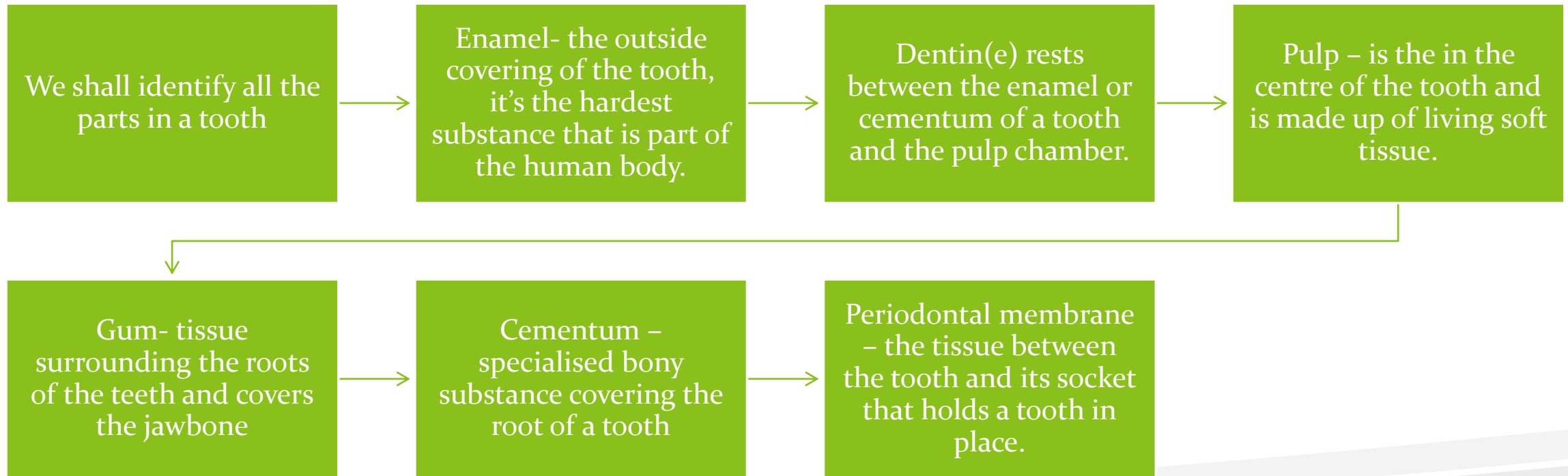
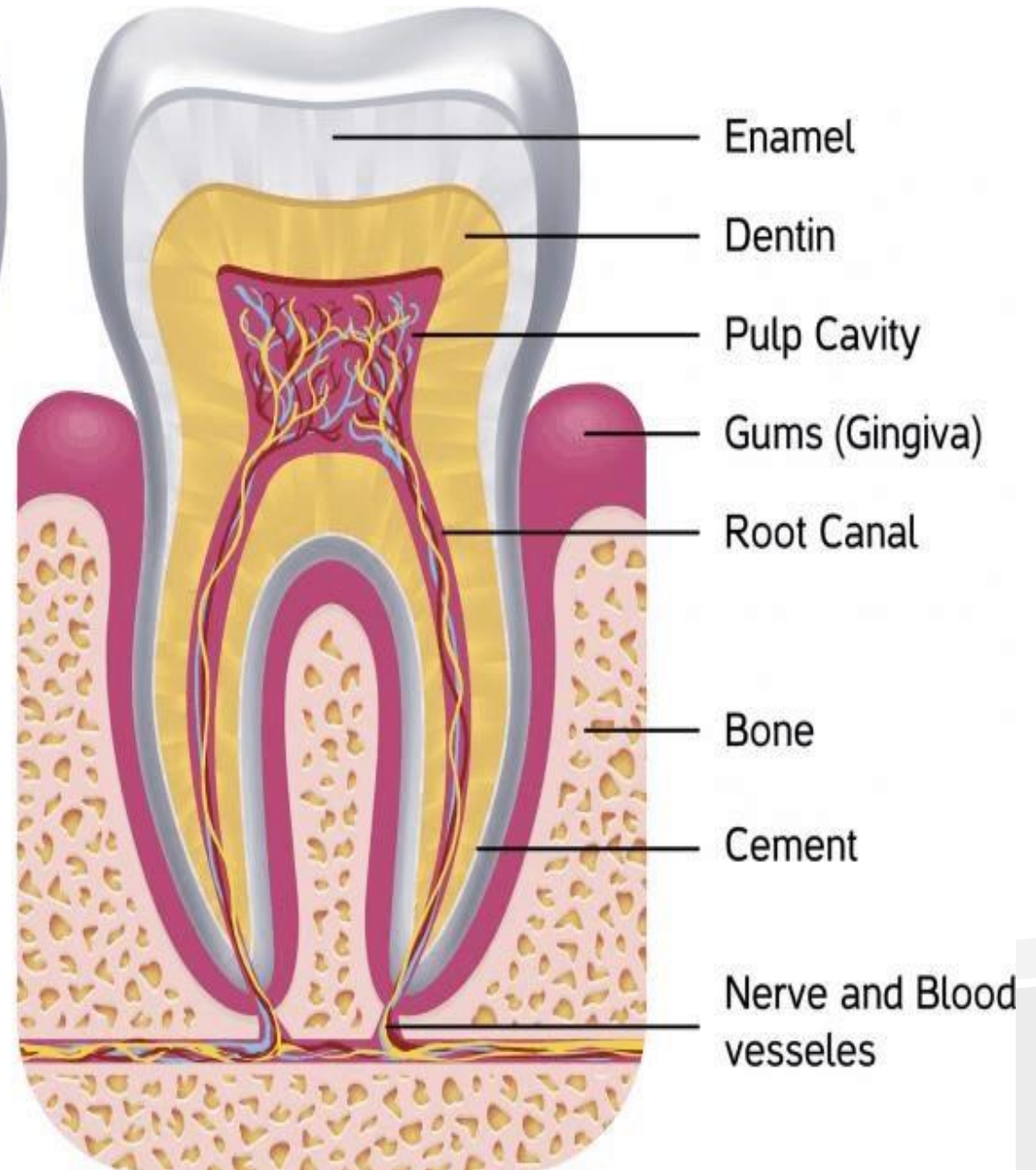
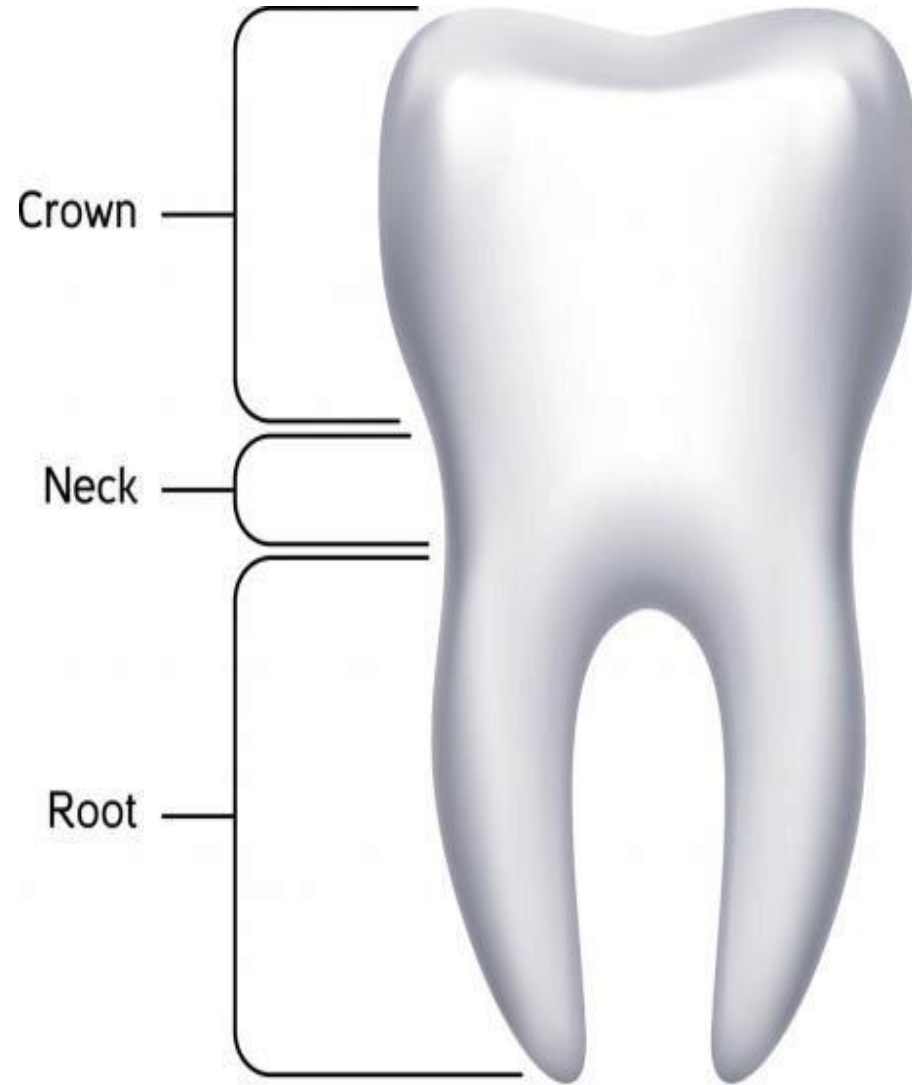
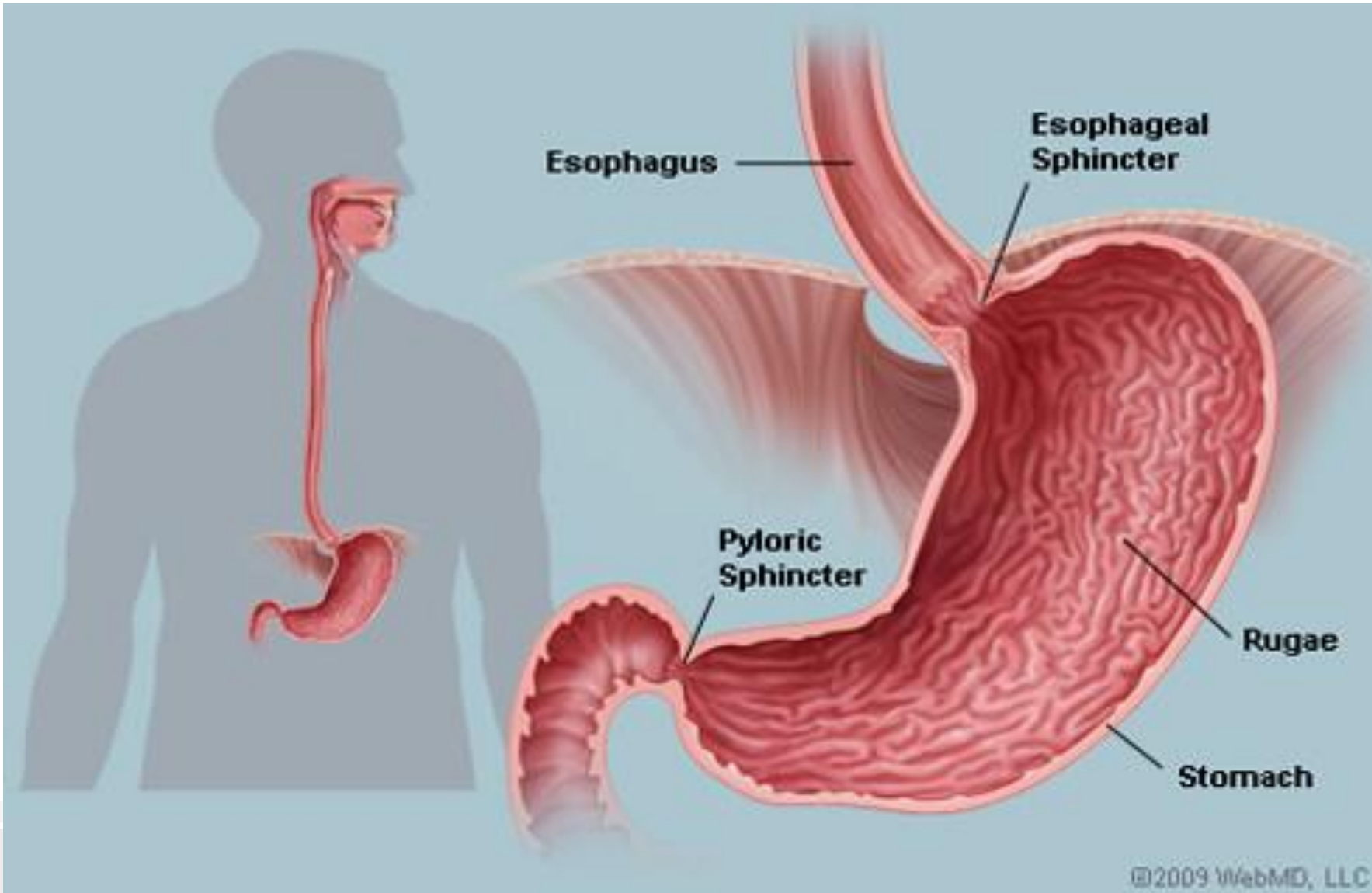


Diagram of tooth



TOOTH ANATOMY

The Stomach

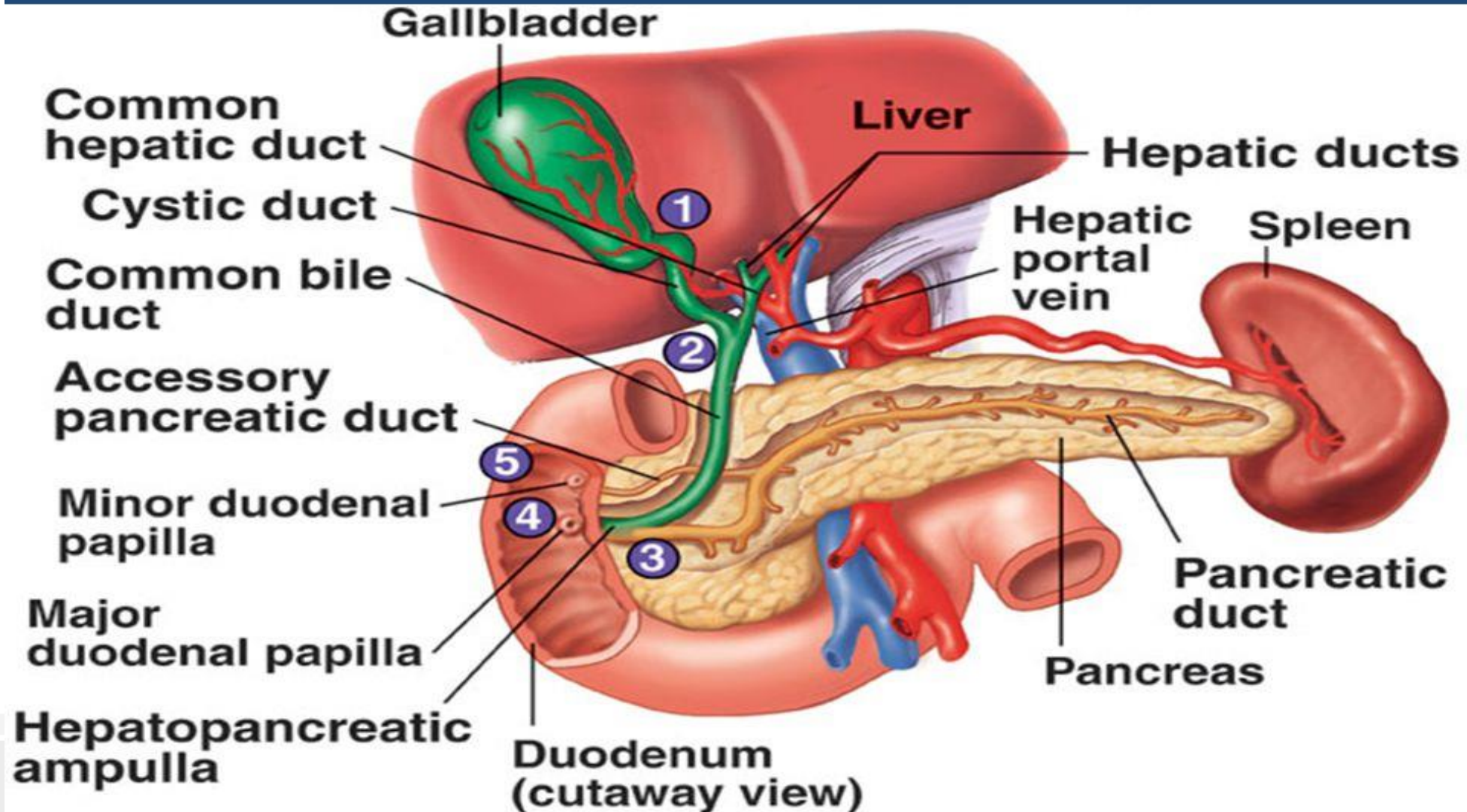




Related organs

- Liver – secretes bile into small intestines
- Gall bladder – the reservoir for bile
- Pancreas – secretes a fluid with enzymes into the small intestines
- These organs secrete fluids that help in digestion.

Parts of the duodenum & Their relations





Food Bolus and Chyme

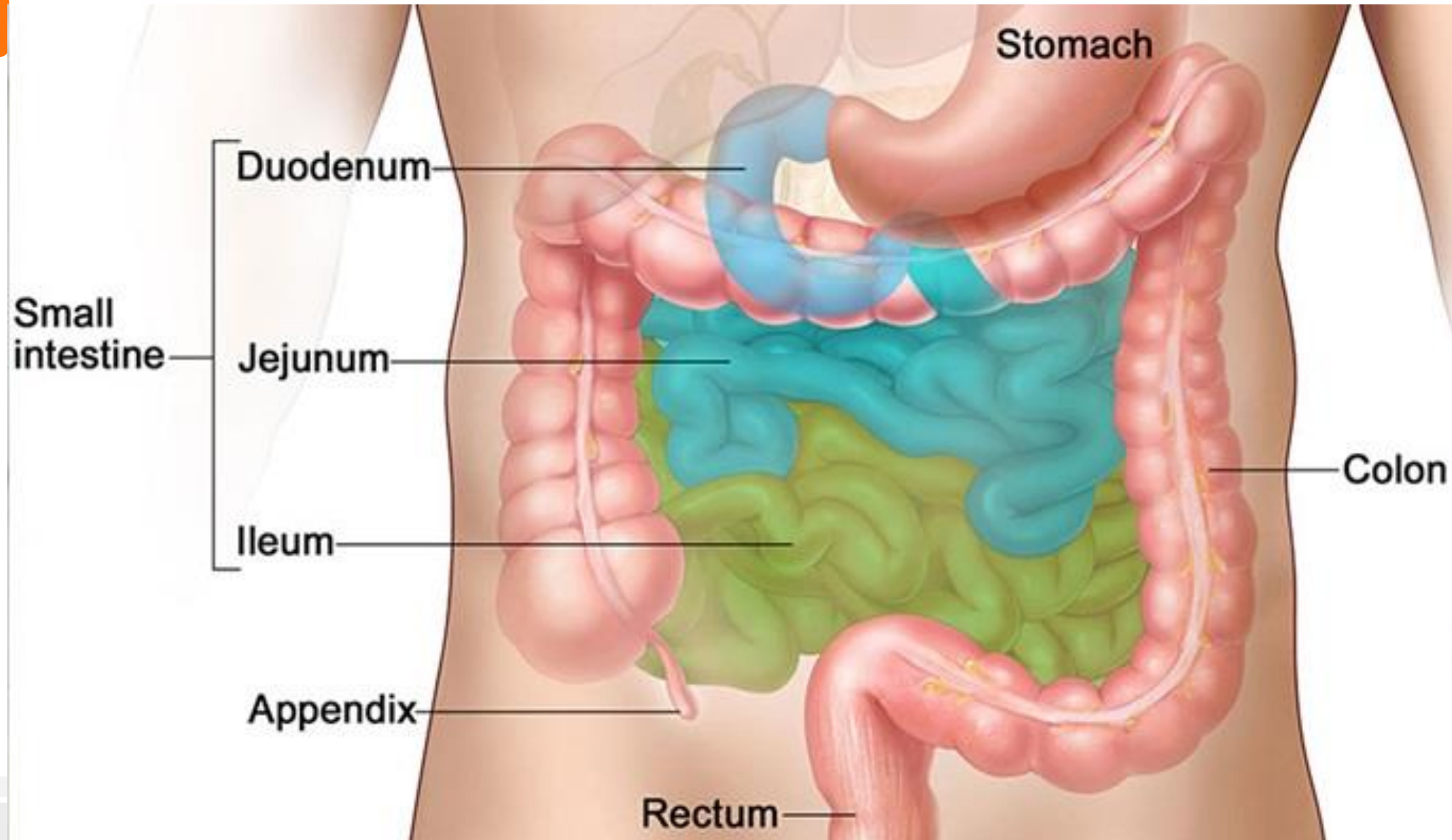
- Bolus is any fairly large quantity of matter, (food) making its way through the GI Tract.
- Chyme is the liquid substance found in the stomach before entering the duodenum. Its made of partially digested food, water, hydrochloric acid, and other various digestive enzymes.



Bile – source, function and storage

- Bile aka gall is a bitter, greenish-yellow fluid secreted by the liver.
- It is stored in the gallbladder between meals and is delivered into the duodenum in response to meals, where it aids the process of digestion of fats.

The Small Intestines





Let do some Quiz

- What size do the villi increase the surface area of the small intestines by?
 - a) Dinner plate
 - b) Dining table
 - c) Tennis court

How long are the small intestines?

- a) 3 metres
- b) 6-7 metres
- c) 10 metres



The Villi

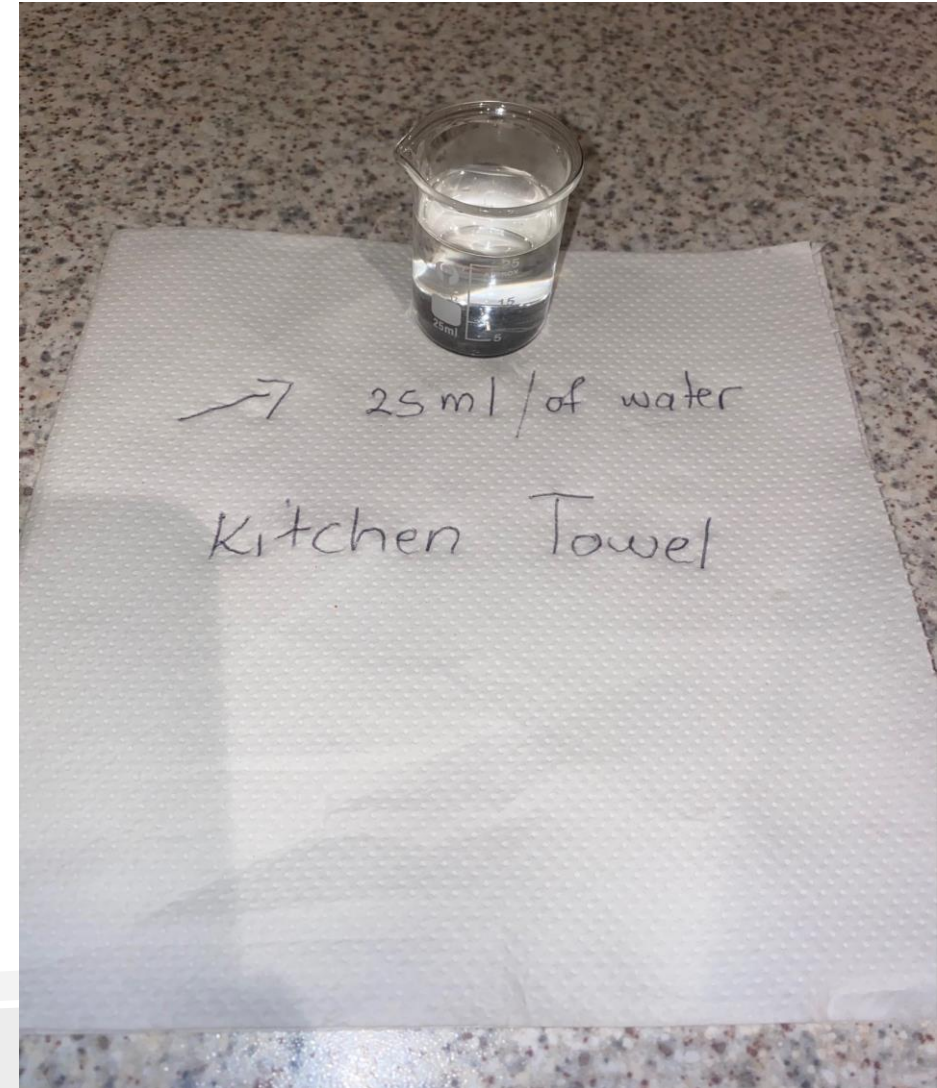
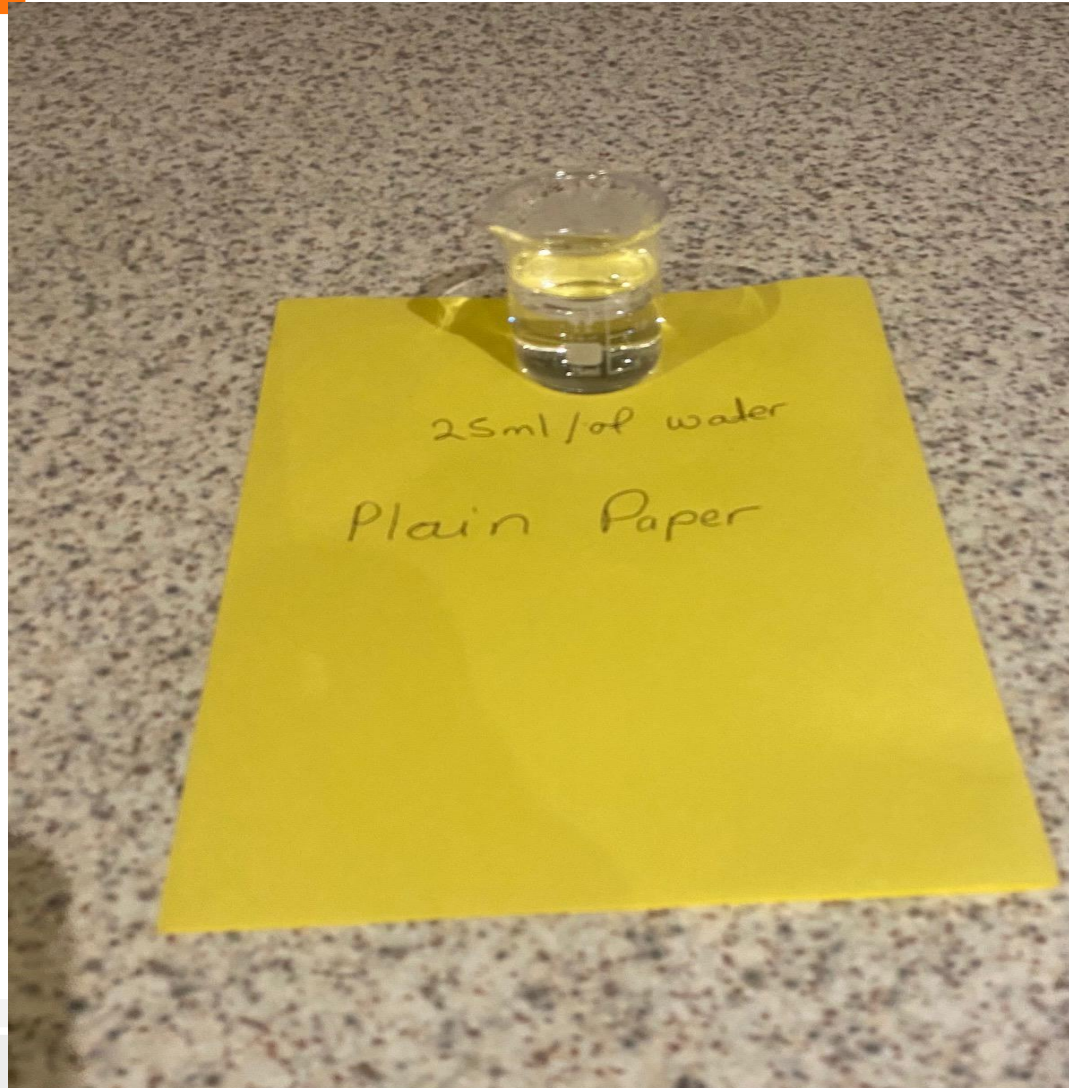
- These are tiny finger-like structures that protrude from the wall of the intestines
- These provide a large surface area with an extensive network of blood capillaries.
- They increase the surface area of the intestines to an area the same size of a tennis court!
- There are enzymes on their surface to aid digestion.
- They have a thin wall for quick absorption of fatty acids and glycerol into the blood stream.



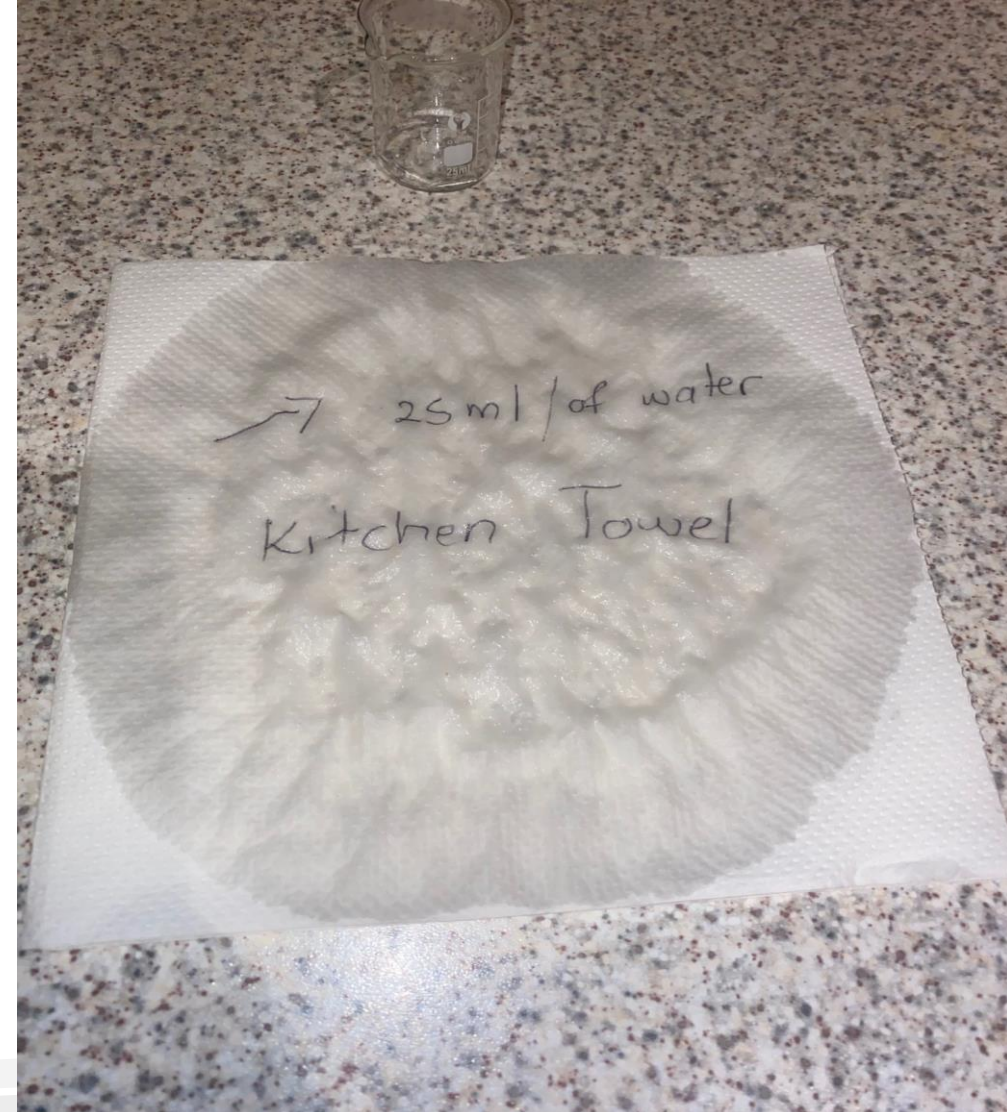
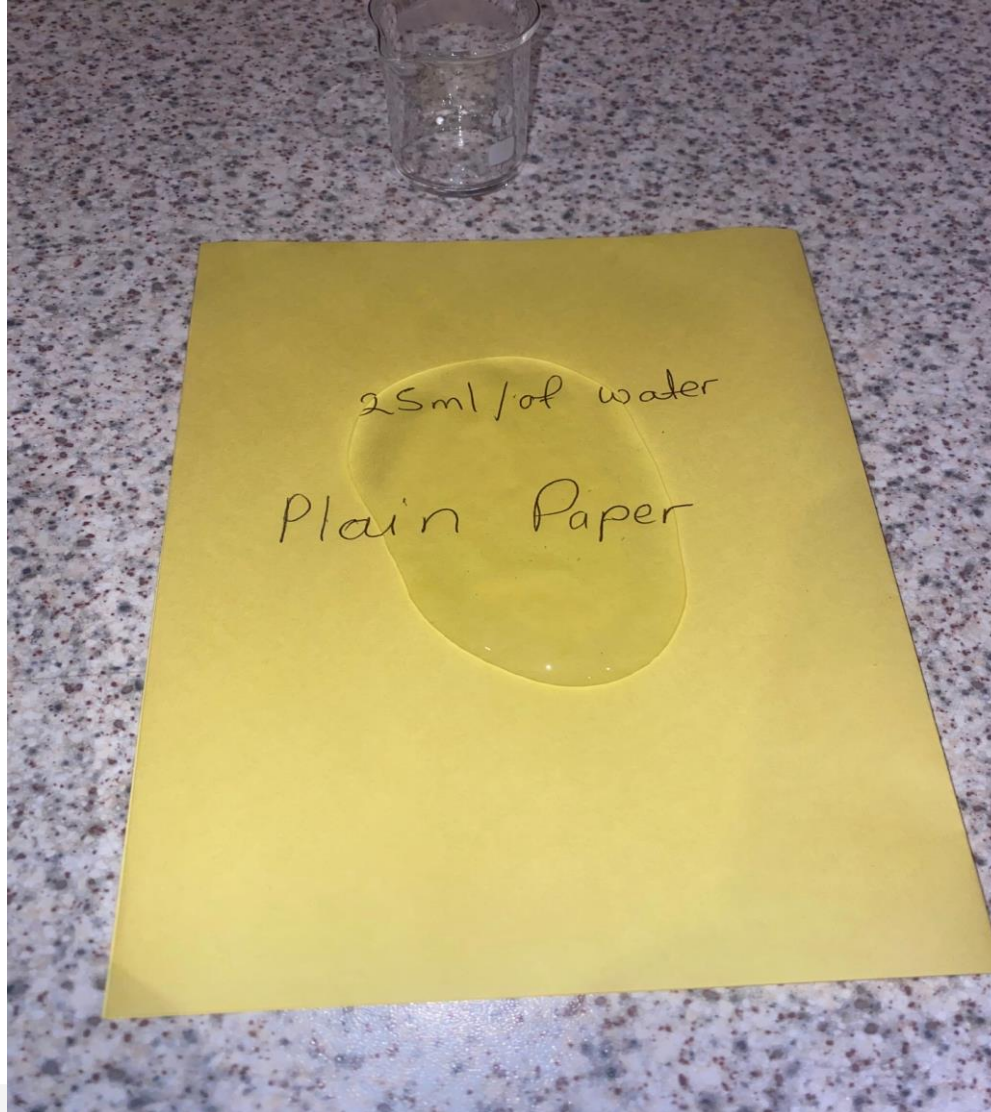
Lets Compare Absorption of Water

- Plain Paper Vs Paper towel
- Take plain paper and kitchen paper towel and half a cup of water.
- Pour on each type of paper and see how much water is absorbed by each paper.
- Plain paper is smooth but a paper towel is bumpy.
- The bumps in the paper towel are similar to the villi, as they increase the surface area of the paper towel, thus increasing the absorption capacity.
- Most of the water run off the surface of the plain paper, while most of it is absorbed by the paper towel.

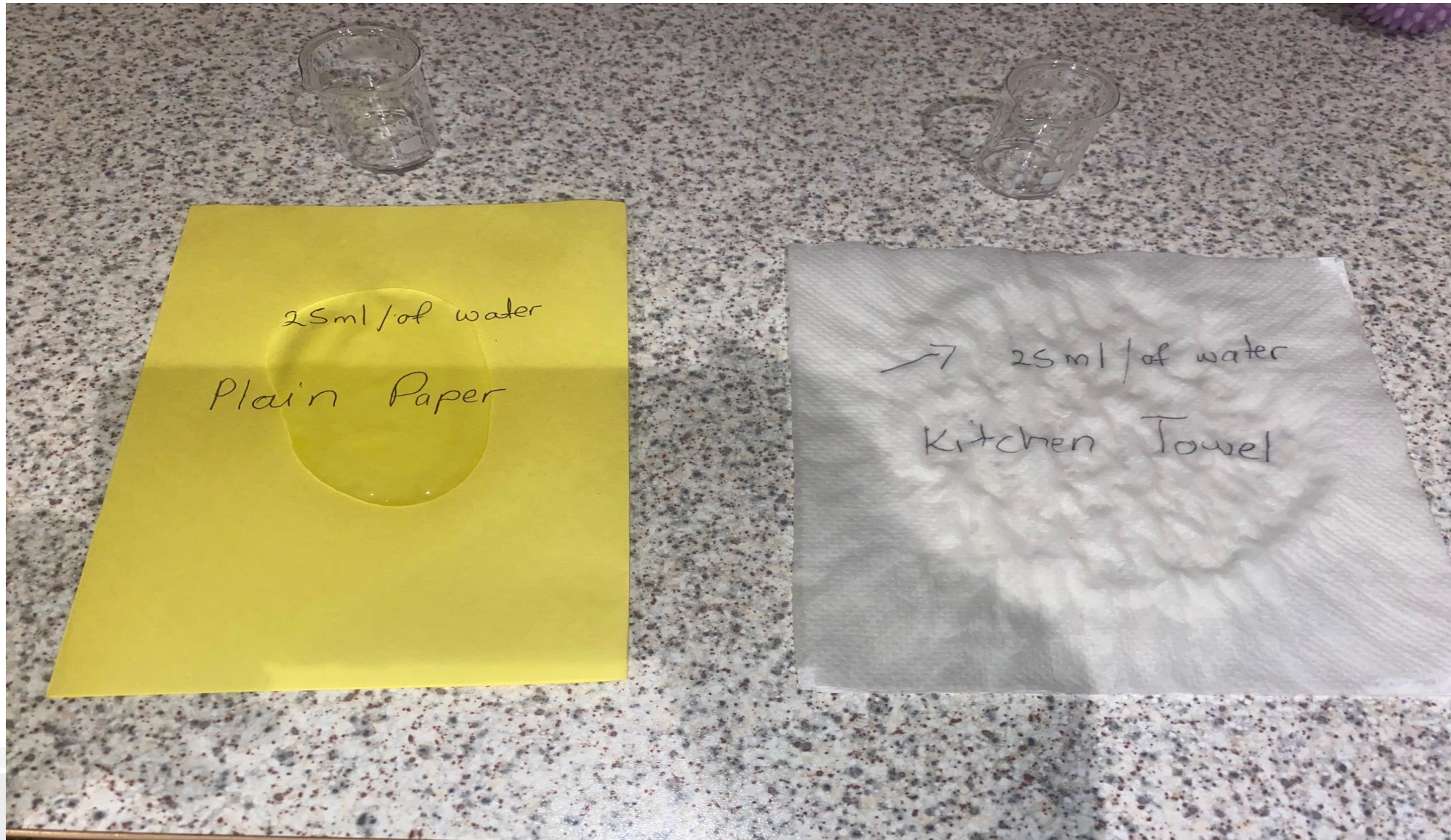
Experiment




What Can You See?



At The End

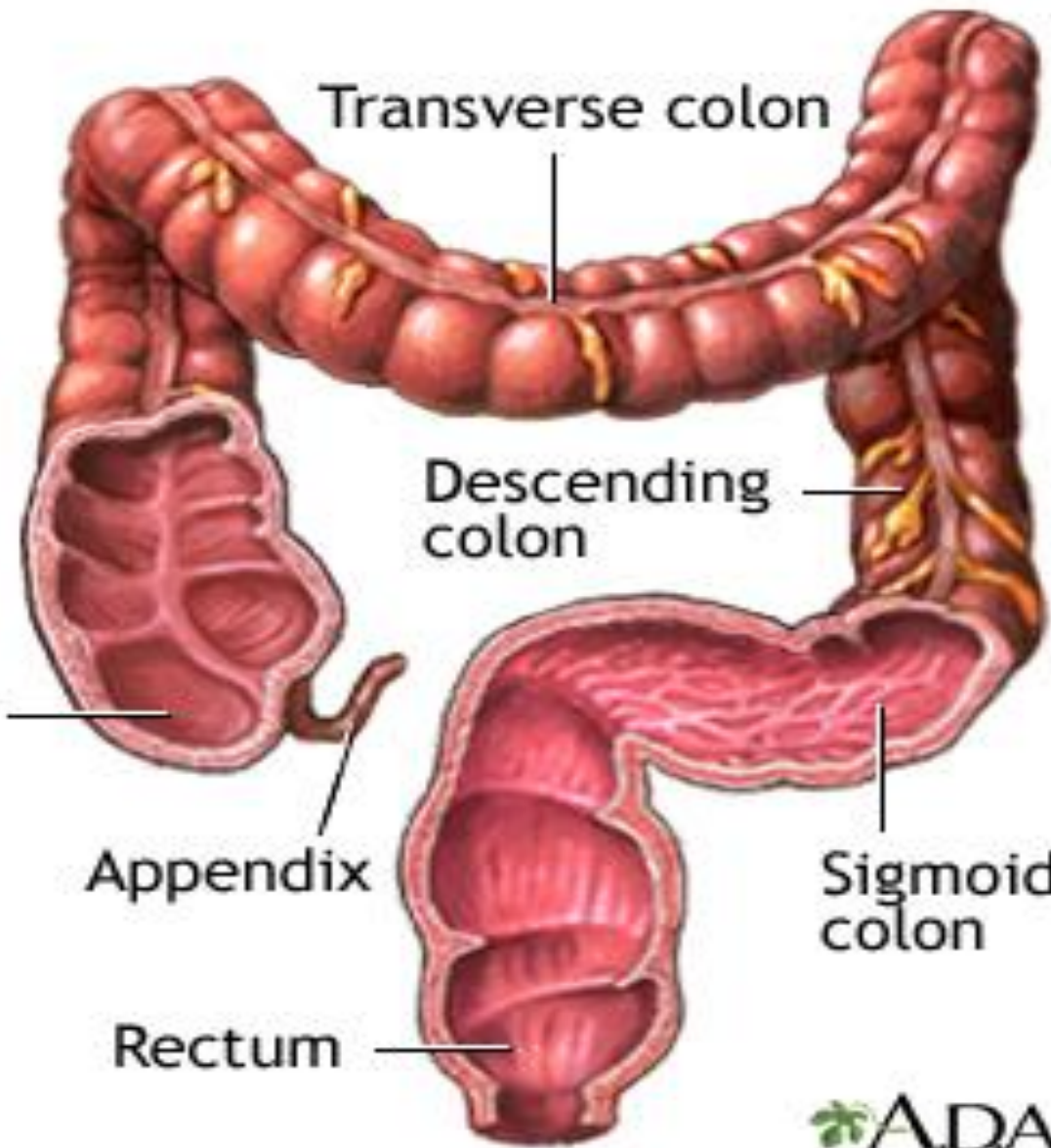




The large intestine (Colon) and water

- When the colon absorbs insufficient water, this results in diarrhoea.
- Food is mixed with large amounts of fluid; meaning digested food is essentially liquid before it reaches the colon.
- The colon absorbs the water, leaving the remaining material as a semisolid stool. If the colon is damaged or inflamed, it inhibits absorption and results in watery stool.

The Large Intestines (Colon)





The Colon with little water

- Less water or fluid in the colon results in constipation.
- Constipation is the condition where a person experiences hard faeces that are difficult to eliminate and may be very painful and require assistance.



Fibre an aid to digestion

- Fibre helps to prevent high cholesterol and help fight obesity.
- Lowers the risk of disease.
- Helps to move waste through the GI tract faster and easier.
- Reduces straining when going to the toilet.
- Helps to reduce contact time with harmful substances



Food times in GI tract

- Food stays in the stomach from 30 minutes to two hours
- It takes 2-6 hours in the small intestines
- 6-72 hours in the colon
- Any food that stays too long in the colon results in constipation as the fluid is absorbed from it.
- If food stays too long in the stomach it ferments and produces increasing amount of gas and a build up of toxins.



Impact of food staying too long in the GI tract

- Food will continue to ferment and produce more gas in the intestines.
- Now there is intestinal gas in place of stomach gas
- If the emptying of the stomach is delayed for too long, bile is moved backwards into the stomach causing irritation of the stomach lining from the caustic bile.



Impact of food stay in the GI tract

- Toxicity
- Fermentation
- Constipation
- Reflux disease
- Heartburn

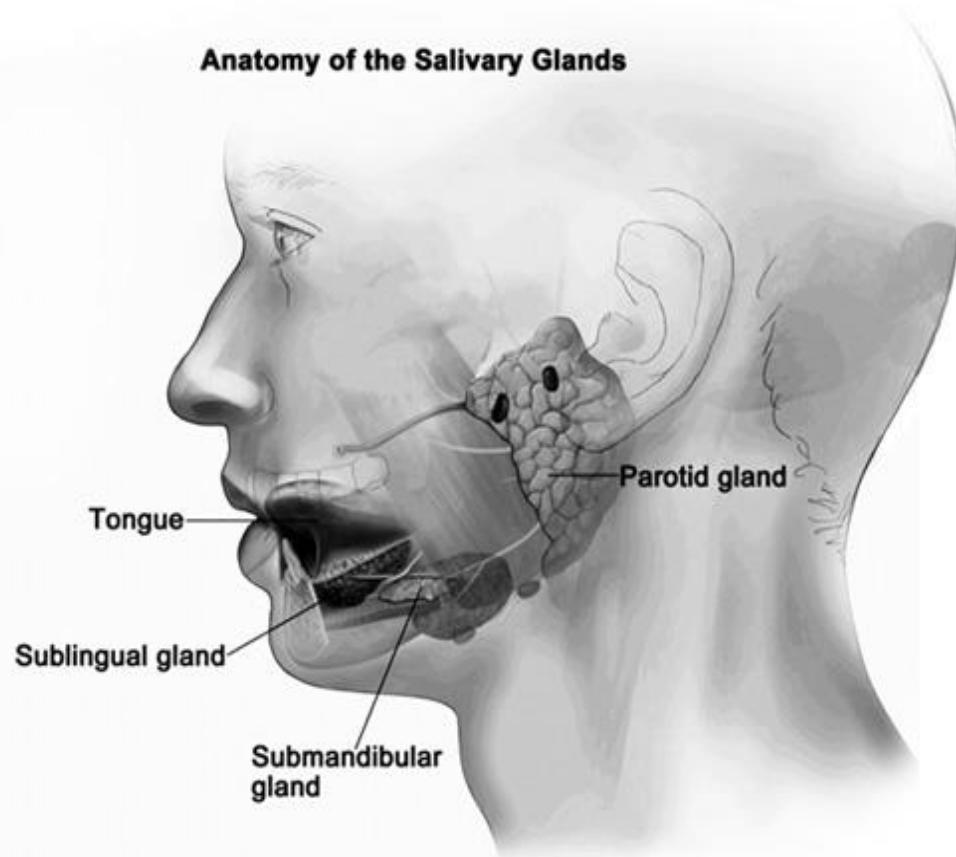


Digestion of Starch

- The iodine test is used to show the outcome of starch
- Amylase changes starch into a simpler form: the sugar maltose, which is soluble in water.
- Amylase is present in our saliva, and begins to act on the starch in our food while still in the mouth.
- When amylase reacts with starch, it cuts off the disaccharide maltose (two glucose molecules linked together).



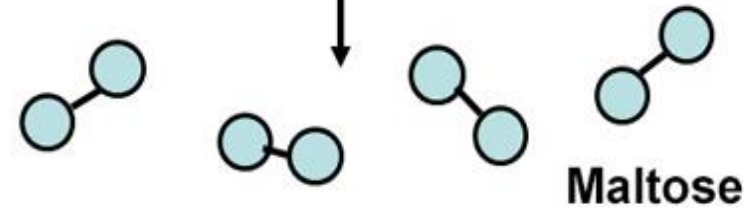
Anatomy of the Salivary Glands



Starch



Amylase



Digestion of Starch



Starch versus Iodine

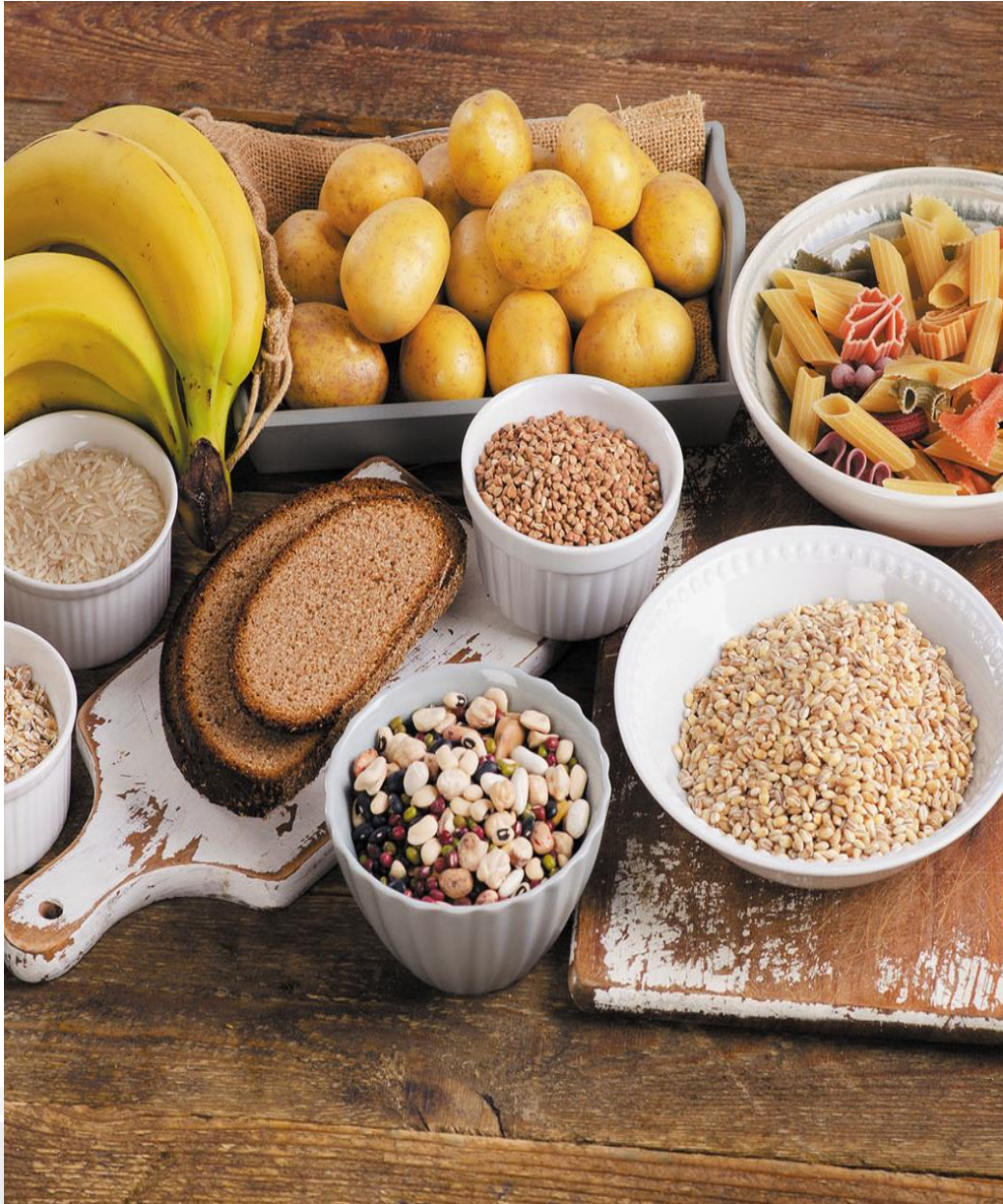
- As the reaction progresses, less starch will be present and more sugar (maltose) will be present. The activity of amylase can be observed by using iodine.
- Because iodine reacts with starch to form a dark brown/purple colour.
- Starch is converted into sugar by saliva, and when iodine comes into contact with starch it turns from brown to dark purple.
- See the experiment online at <http://amrita.olabs.edu.in/?sub=79&brch=18&sim=236&cnt=1>



What are Monosaccharides, Disaccharides, and Polysaccharides

- What's the most important Carbohydrate? The one that they are all made of.
- Monosaccharides – the simplest form of carbohydrates. Consists of one sugar, usually colourless, water soluble, crystalline solids, and some have a sweet taste. Examples are whole grain, legumes and a range of vegetables; fruits and honey.
- Disaccharides are sugars with two monosaccharides like maltose, sucrose and lactose
- Polysaccharides are complex carbohydrates made up of many monosaccharides joined together. They are large branched molecules. E.g. glycogen, starch and cellulose.

Carbohydrates



Healthy Carbs

Vegetables



Fruits



Whole Grains



Seeds



Nuts



Beans





Amino Acids

- Amino acids are the molecules from which proteins are built
- There are 20 standard amino acids used by cells in building up proteins.
- There are 9 essential amino acids required for protein synthesis that cannot be synthesised by our bodies and must be obtained from our food.



The essential amino acids

- These is histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine.
- Proves we are complex beings made in a very special way, the Lord created all these things.



Sources of the 9 Amino Acids

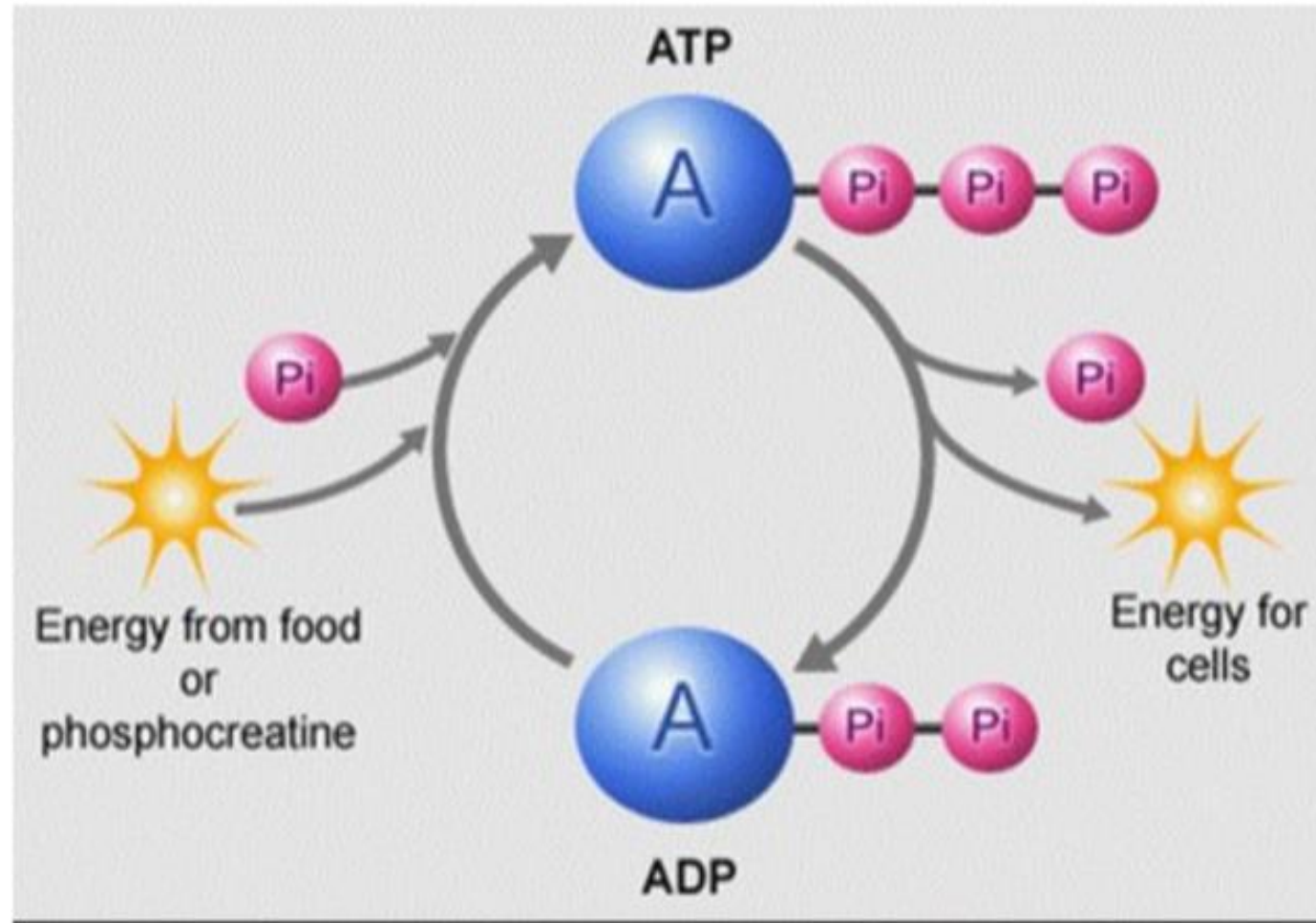
- Some food contains all the essential amino acids
- Milk and dairy products, eggs, fish, meat and poultry.
- If you don't eat meat, these can be found in plant foods
- Corn plus peas or beans, rice plus beans, lentils plus bread



ATP?

- ATP stands for Adenosine triphosphate; it's the vehicle for transporting energy around the body. All the energy the body uses is supplied by ATP.
- ATP is made by 3 chemical reactions called glycolysis, the Krebs cycle and oxidative phosphorylation.
- Yes these are mouthfuls I know, goes to show how fearfully and wonderfully we are made, as you look at all the complex processes that take place in our bodies.

Picture of ATP





The chemical reactions that forms ATP

- Glycolysis – takes place in the cytoplasm of the human cell and does not require oxygen. It produces 4 ATP molecules and consumes 2 out of 4 during the process.
- The Krebs cycle involves the chemical conversion of carbohydrates, fats and proteins into carbon dioxide and water to generate a form of usable energy ATP and another chemical NADH.
- Oxidative Phosphorylation converts the leftover NADH produced by the Krebs cycle into more ATP



Oxygen

- Glycolysis does not require oxygen,
- The other two ATP producing reactions require it.
- We need to breathe oxygen to supply it to these processes.



Water-Soluble Vitamins

- Water-soluble vitamins mean they dissolve in water and the body expels what it does not absorb.
- These are not stored in our bodies, excess amounts are secreted in urine. Tip we need to top them up daily!
- Only vitamin B₁₂ is stored in the liver
- These include the eight vitamin B's and C
- B₁, B₂, B₃, B₅, B₆, B₇, B₉, B₁₂ and Vitamin C



Fat-Soluble Vitamins

- Fat-soluble vitamins are most abundant in high fat foods and are much better absorbed into the bloodstream when eaten with fats.
- These can be stored in the liver and fat tissues as reserves and can cause toxicity when taken in excess.
- Fat-soluble vitamins are happy to stay for a while, some a few days and some up to 6 months
- They are carried to where they are needed by special carriers
- These include Vitamin A, D, E and K



Bible texts that refer to digestion

- Ezekiel 3:2

Then he said to me, “son of man, eat this scroll I am giving you and fill your stomach with it.” So I ate, and it tasted sweet as honey in my mouth.

- Matthew 15:17

Don't you see that whatever enters the mouth goes into the stomach then out of the body?

- 1 Corinthians 6:13

“Food for the stomach and the stomach for the food” – but God will destroy them both. The body is not meant for sexual immorality; but for the Lord and the Lord for the body.

- Proverbs 18:20

From the fruit of his mouth a man's stomach is filled; with the harvest from his lips he is satisfied.



E.G. White references to proper Digestion

- Counsels on Diet and foods, page 175, paragraph 2
- Selected messages book 2, page 415 paragraph 3
- Testimony Studies on diet and Foods, page 91, paragraph 7
- Child Guidance, page 390, paragraph 3
- A Call to Medical Evangelism and Health Education, page 36, paragraph 1




Aiding Digestion

- Take time to chew your food thoroughly to promote proper digestion.
- Some food combinations will create gases in the stomach, combine them well.
- Vitamins are required by the body, and most can not be stored, we need to top them up daily.
- Try not to eat and drink at the same time this impacts the work of the salivary amylase and other enzymes from digesting your food correctly.



Some Quiz

- What is the number-one health drink created especially to hydrate and cleanse all living things?
 - a) Tea
 - b) Apple juice
 - c) Fruit twist
 - d) Water
- The human body is made up of almost 70% water, which should constantly be replenished in order for our bodies and minds to function optimally.



Simple Water and Digestion

- Pure water still remains nature's wonder liquid.
- Water flushes harmful toxins out of the body, it energises the body and it keeps the body machinery hydrated so that we function optimally.
- If we are eating, resting and exercising properly, an adequate water intake will also help us lose weight.
- Drink water 40 minutes before or after food not with food as this changes the chemical state of the digestive enzymes.



“But those who drink the water I give will never be thirsty again. It becomes a fresh, bubbling spring within them, giving them eternal life.”

John 4 : 14



Thank you

