

The Digestive System is a Giant Food Processor

Mechanical Digestion

Food is chopped and ground into small pieces in the mouth.

Chemical Digestion

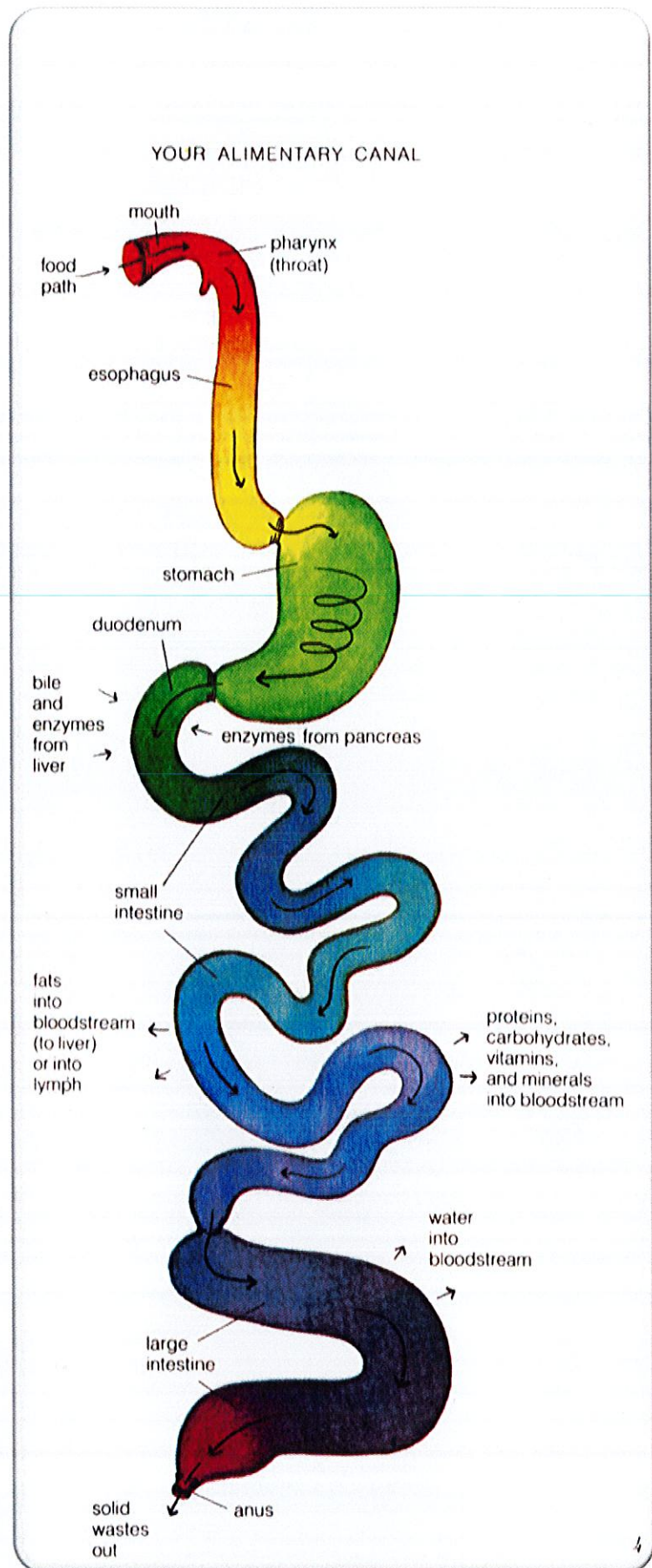
Food is broken down into simple nutrients by the chemical action of enzymes.

Nutrients

Carbohydrates are broken down into simple sugars (glucose) which is used by the cells for energy.

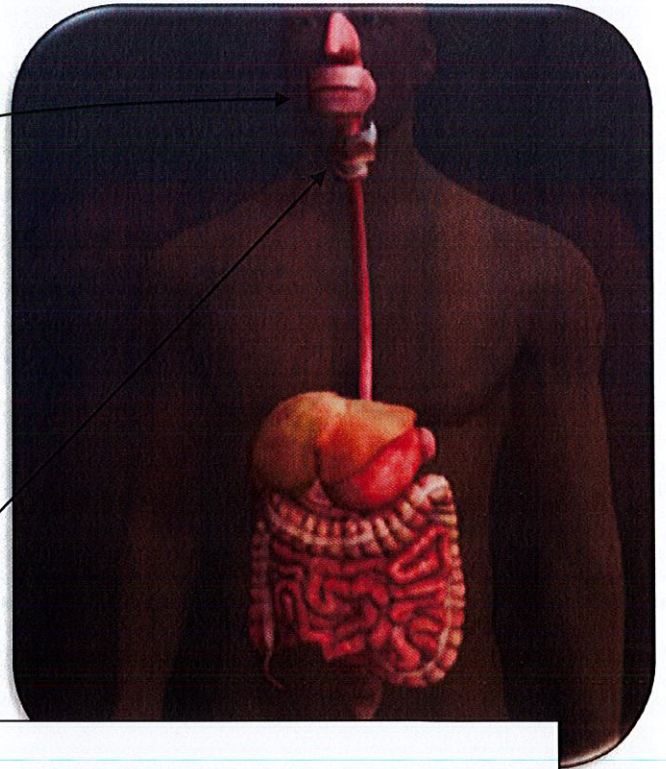
Proteins are broken down into amino acids (the building blocks of cells) which are used to repair old cells and build new cells (skin, blood, muscle, bone and nerve).

Fats are stored for future use. They contain vitamins.



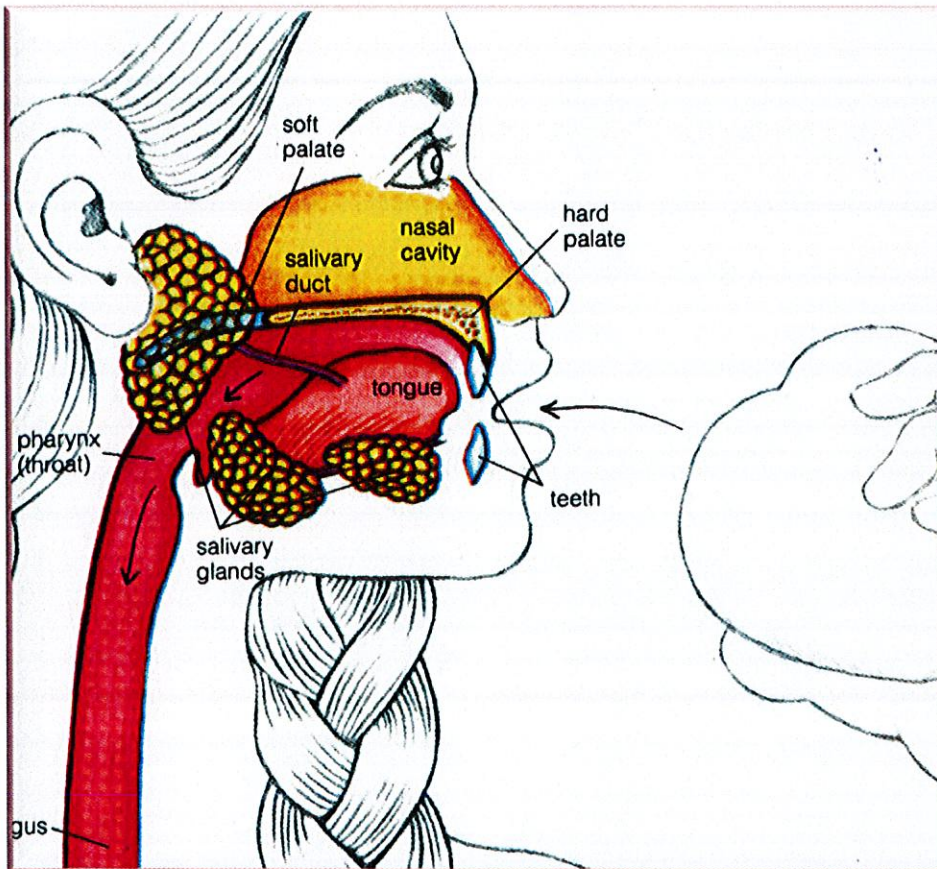
The Mouth

- Food is cooled or warmed to body temperature.
- Teeth chop and grind food and the tongue mashes the food.
- Saliva moistens the food and begins breaking down carbohydrates.
- The tongue moves the food to the back of the mouth to be swallowed.



The Throat

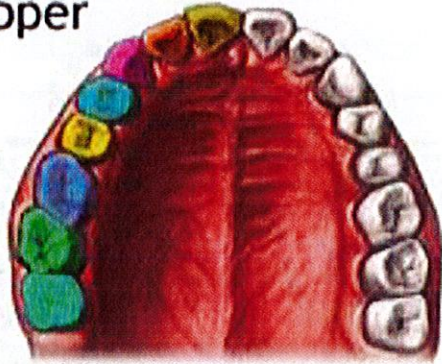
- The Epiglottis closes off the wind pipe (trachea).
- Muscles push food into the esophagus.



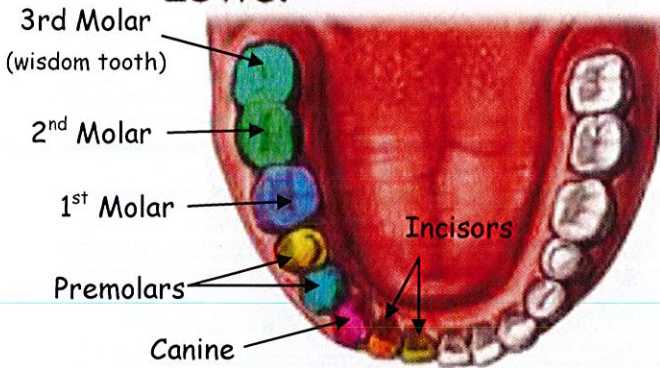
The Salivary Glands









- Produce *saliva*.
- Saliva is an enzyme (chemical) that begins the breakdown of starches.
- Food becomes moist and "mushy" so that it can be easily swallowed. The food is now called a **Bolis**.

Upper

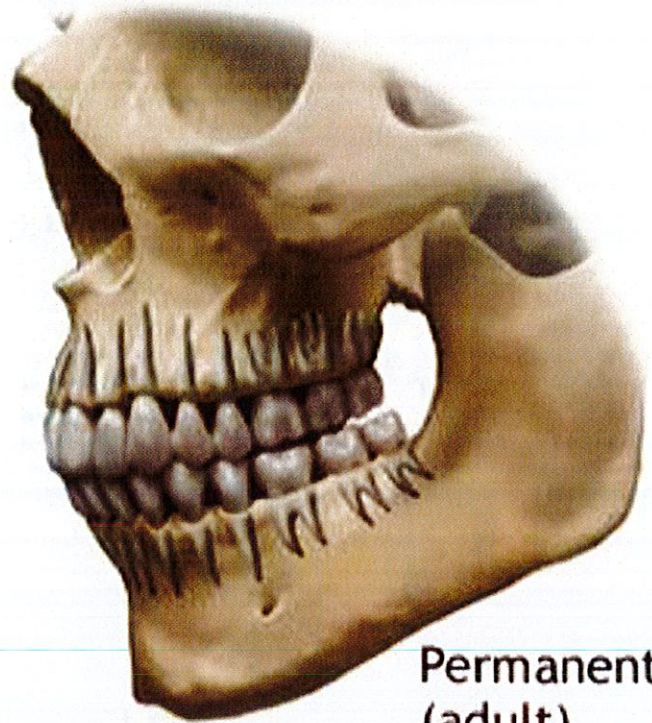


Lower



- | | | | |
|---|---------------------------|---|----------------------------|
|  | Central incisor |  | Second premolar (bicuspid) |
|  | Lateral incisor |  | First molar |
|  | Cuspid (canine) |  | Second molar |
|  | First premolar (bicuspid) |  | Third molar (Wisdom teeth) |

Adult 21-25 years old



Permanent (adult) teeth

ADAM.

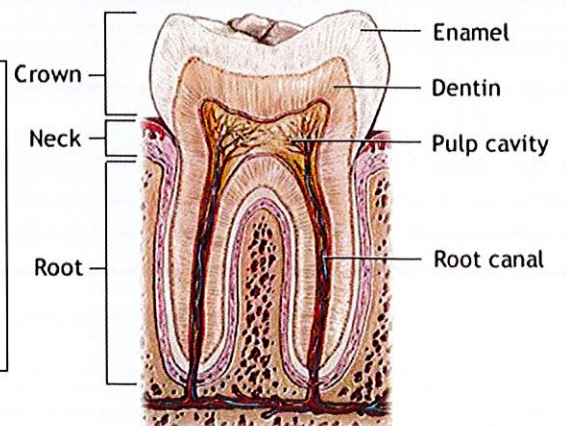
Your Teeth are specialized



- An adult has 32 teeth including 4 wisdom teeth.
- The Incisors are shaped like knives for cutting and slicing.
- The Canines have points for piercing and tearing.
- The Premolars and Molars have broad, bumpy surfaces for grinding.

Tooth Anatomy

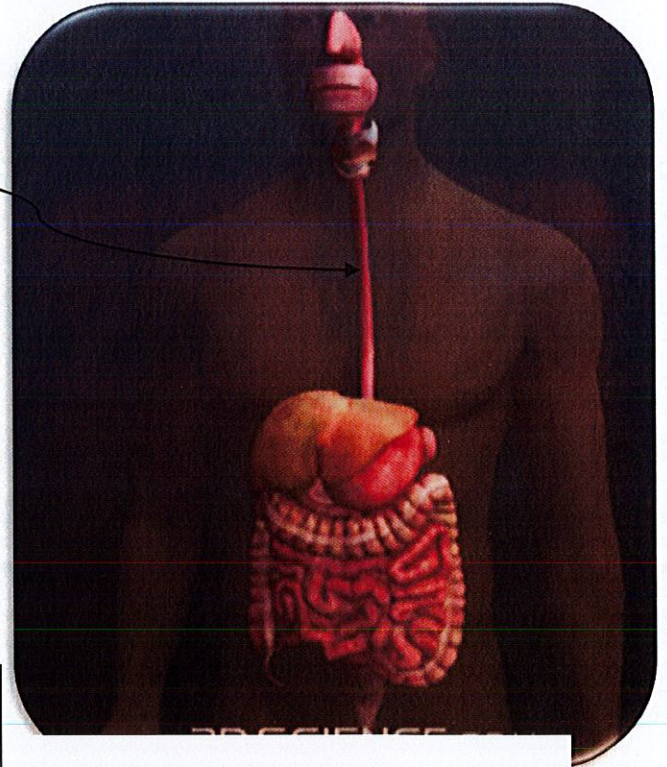
- Enamel is the hardest part of tooth. Made mostly of mineral.
- Dentin is softer than enamel. Contains some living cells.
- Pulp is also called the "nerve" of the cell. It is a soft tissue that contains living nerve cells.



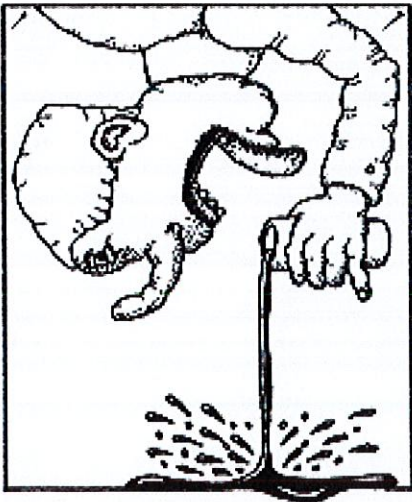
ADAM.

The Esophagus

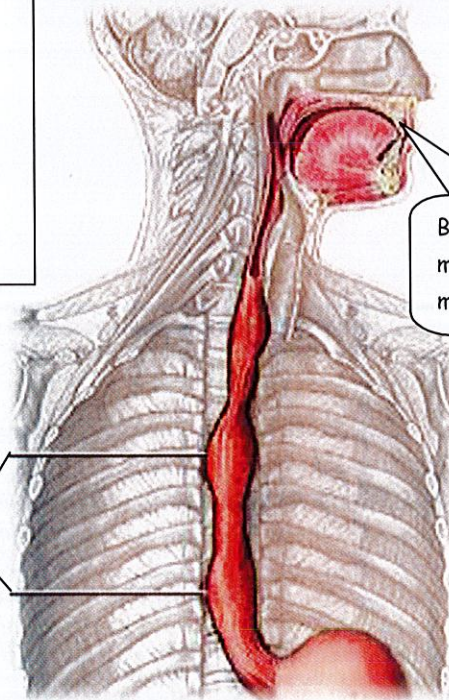
- Connects the pharynx (throat) to the stomach.
- About 10 inches long.
- Flat when empty but changes shape to allow food to travel to the stomach.
- Made of several layers of muscle that push food through to the stomach (peristalsis).



Peristalsis is the name given for the wavelike muscle contractions found in the esophagus, small intestines and large intestines. It is sort of like squeezing toothpaste through a tube.

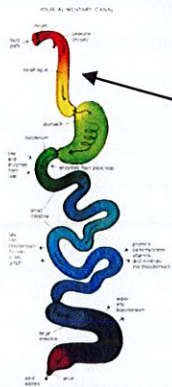


Yes, it is even possible to drink while upside down!!



Peristalsis

Bottom's up...I mean down...I mean.....



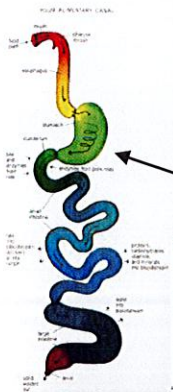
Esophagus

ADAM.

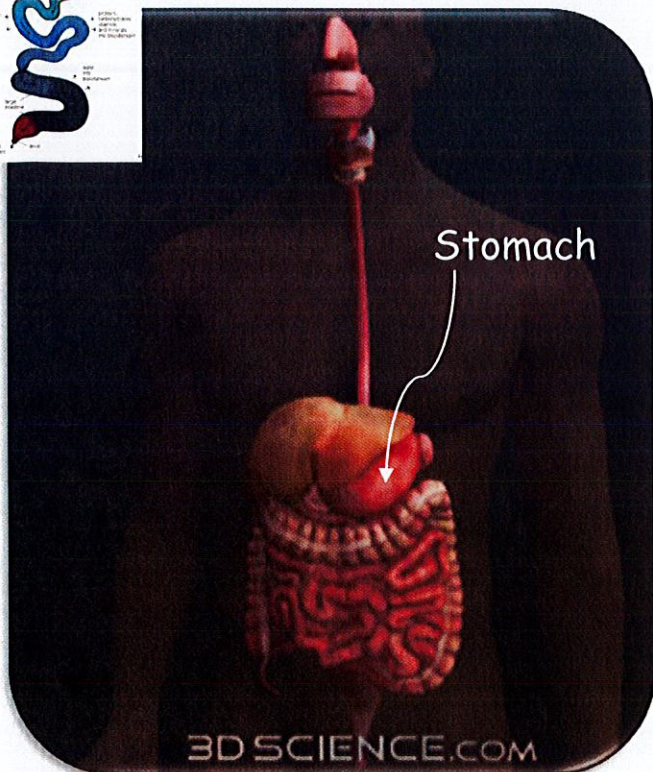
The Stomach

- Food enters the stomach from the esophagus.
- Hydrochloric Acid is produced in the stomach to digest proteins and kill off bacteria.
- Pepsin (a digestive enzyme) is produced to help digest proteins.
- Mucus is produced by glands of the stomach to protect the stomach from its own acid.
- Sphincter muscles control both ends of the stomach to allow food to enter and exit.
- The stomach is made of 3 strong layers of muscle which mixes and mashes the food with digestive enzymes.

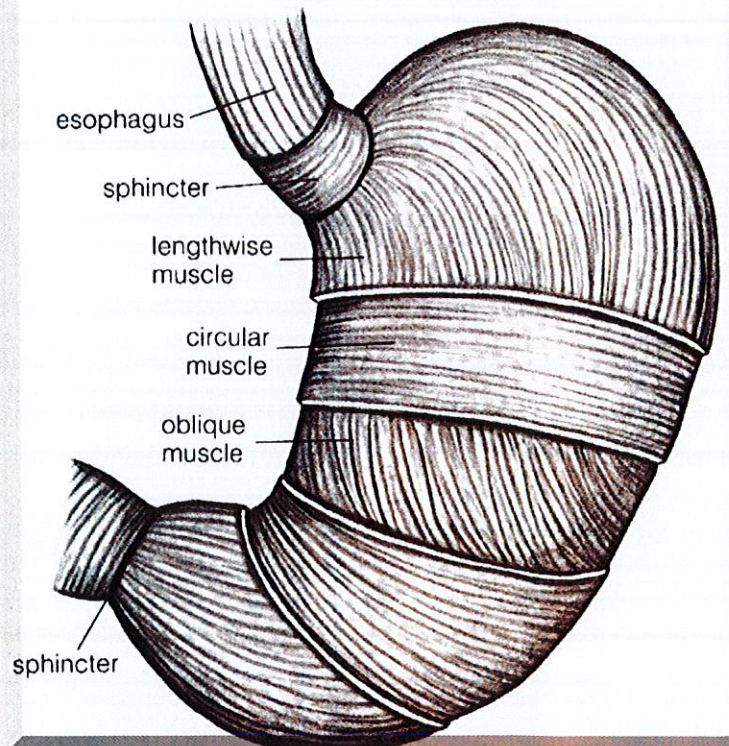
An *ulcer* forms when the stomach's protection breaks down its own acid begin to eat through the stomach.



Stomach

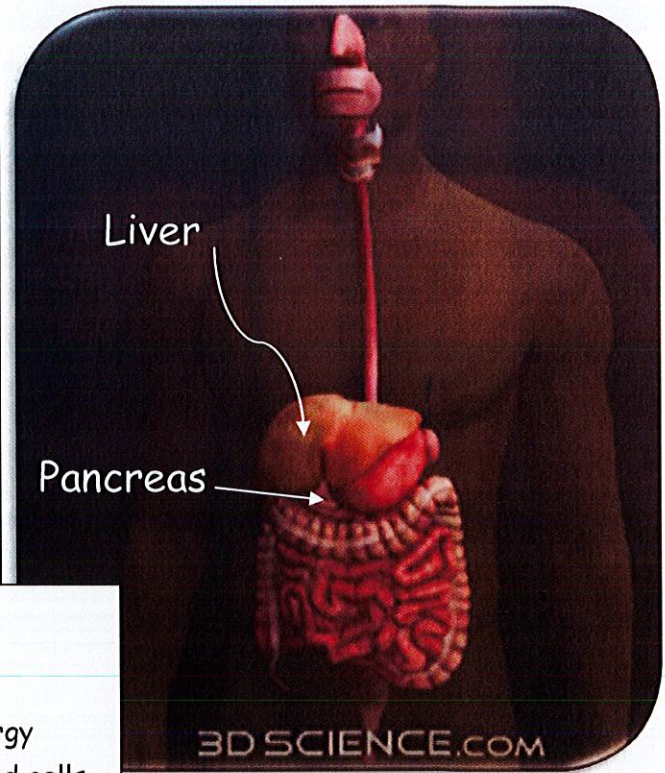


YOUR STOMACH



The Liver, Gallbladder, and Pancreas

- The Liver produces the enzyme (chemical) *bile*. Bile breaks down fats.
- Bile is stored in the gallbladder and enters the duodenum (1st part of small intestine) when needed.
- The Pancreas produces $\frac{1}{2}$ to 1 liter of enzymes (chemicals) daily. These enzymes are used to break down carbohydrates as well as fats and proteins.

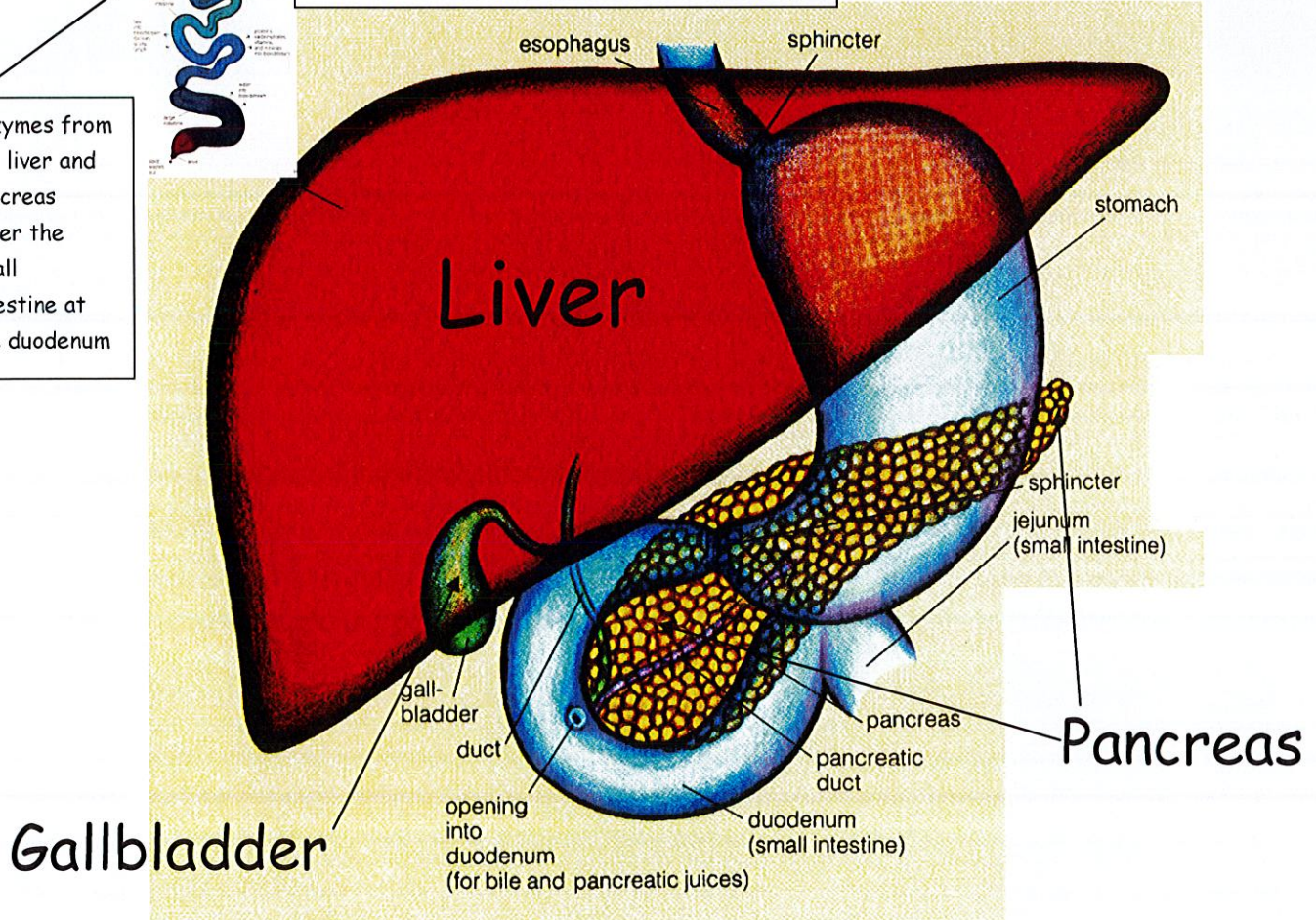


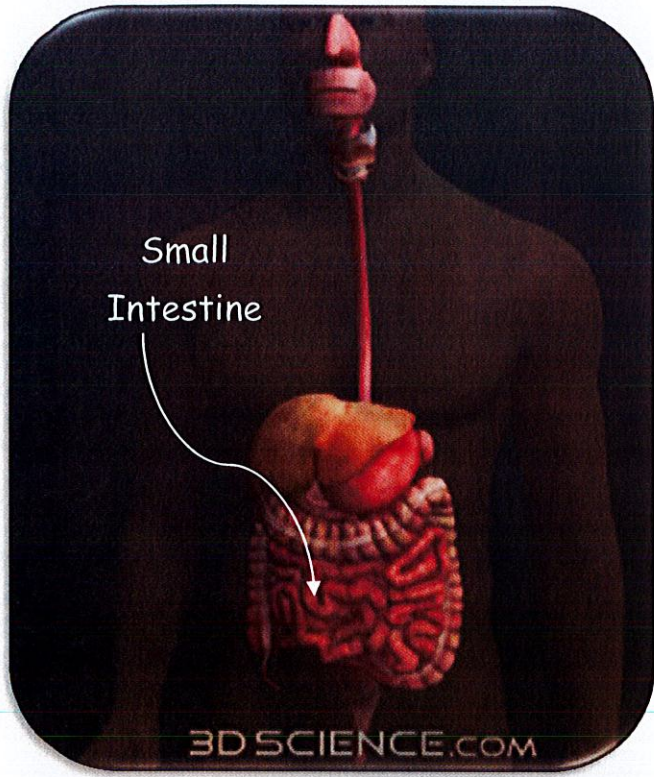
The Liver:

- Stores vitamins
- Stores glycogen for energy
- Breaks down old red blood cells
- Removes poisons from the body



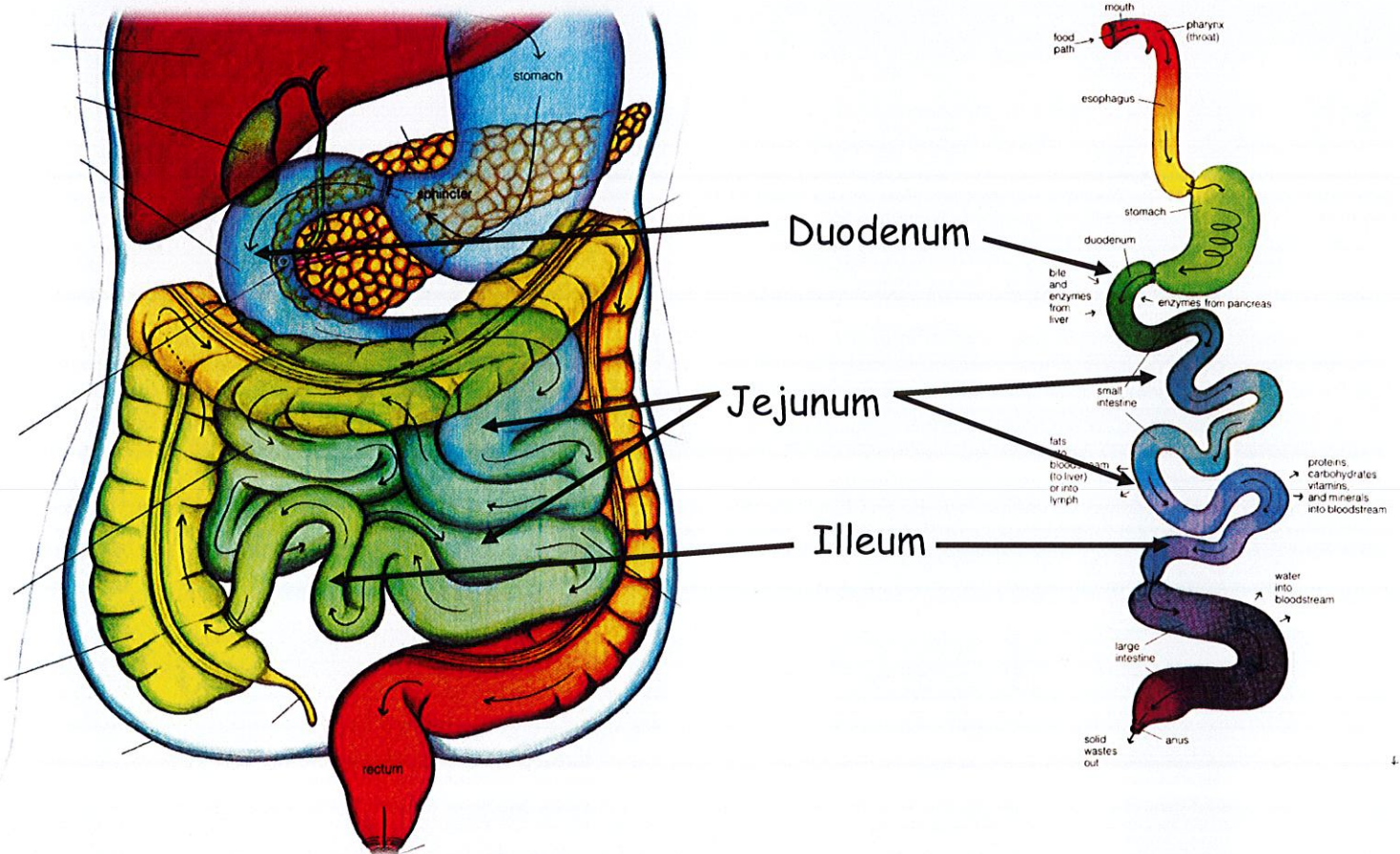
Enzymes from the liver and pancreas enter the small intestine at the duodenum





Small Intestine

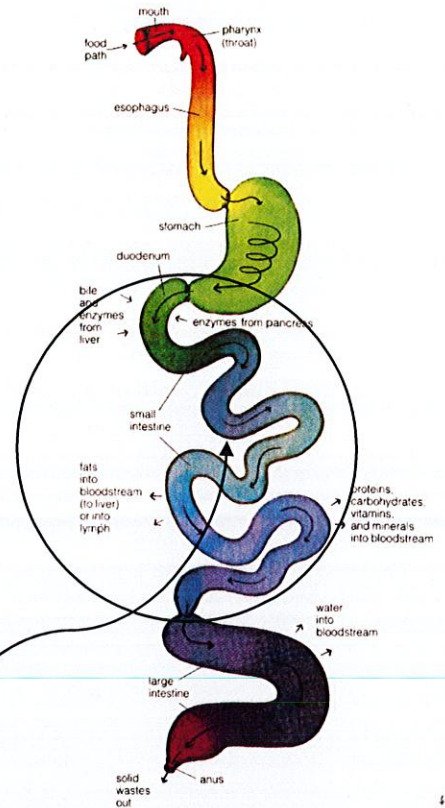
- The longest part of the alimentary canal (digestive tract).
- Divided into 3 parts:
 - Duodenum - first segment
 - Jejunum - middle segment
 - Ileum - last segment
- Digestive enzymes from the liver and pancreas help to break down food further.
- Nutrients are absorbed into the body through the *villi*.



Nutrients are absorbed through the small intestine where the blood carries them to all the cells of the body.

The Basic Nutrients are:

- Amino Acids
- Simple Sugars
- Fatty Acids



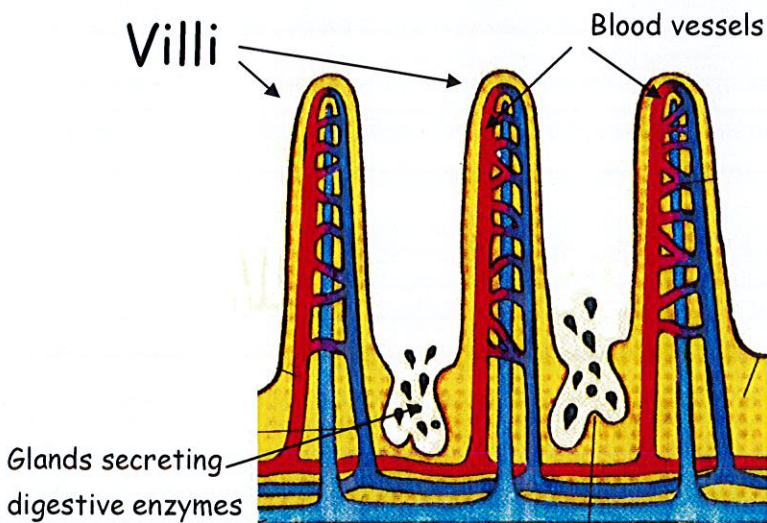
Small Intestine

The inside lining of the small intestine contains *Villi*.

These Villi tiny are fingerlike projections through which the nutrients are absorbed into the bloodstream. The Villi capture nutrients as they move through the small intestine.



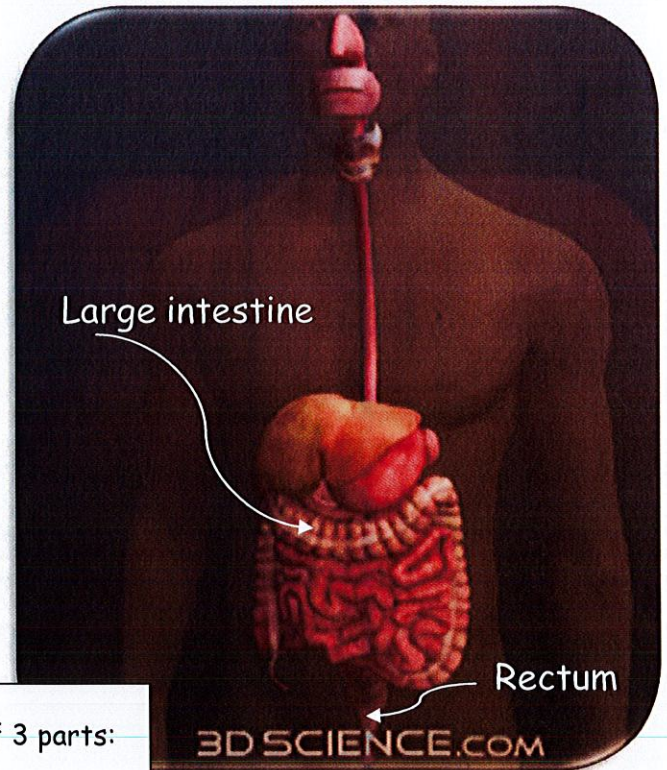
Photograph of Villi magnified (very high power)



Note; your microscope will not show nearly the detail as in this picture.

In the Large Intestine:

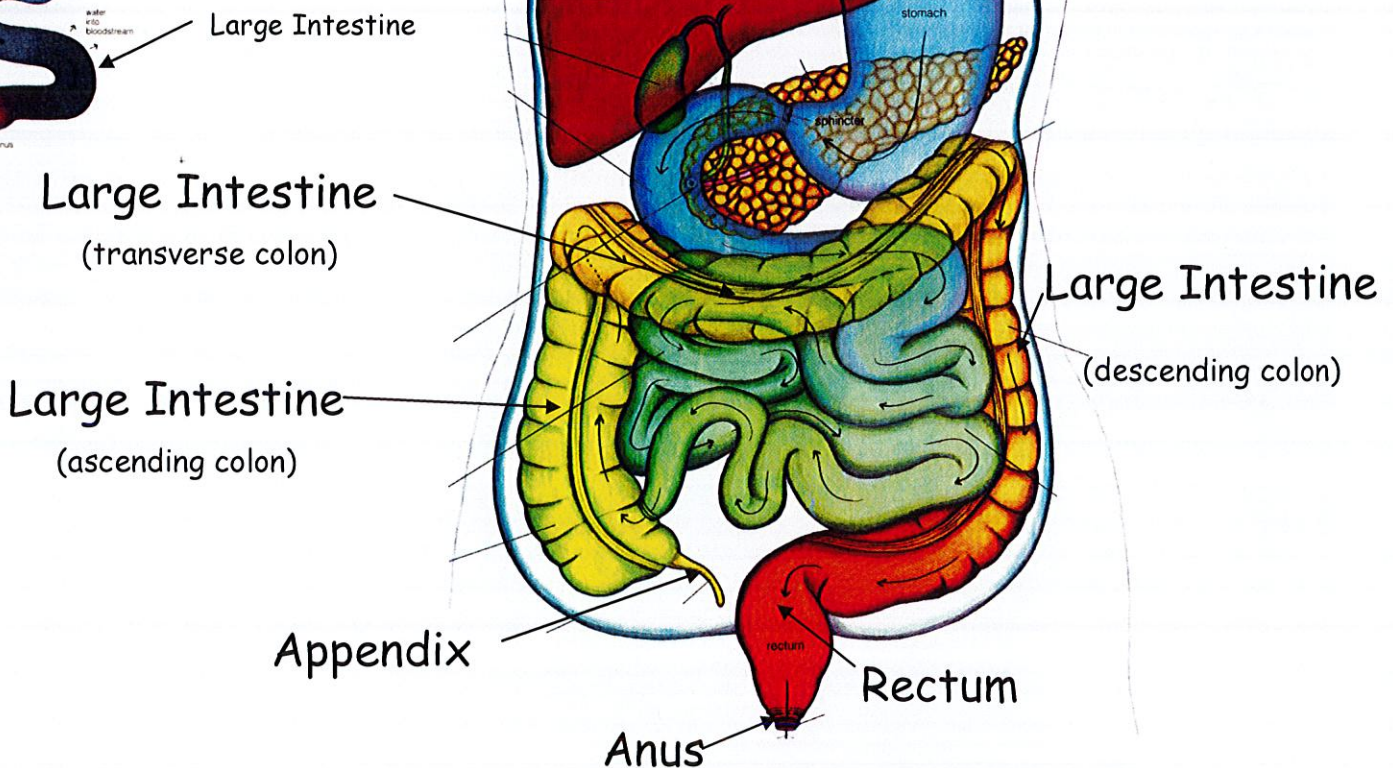
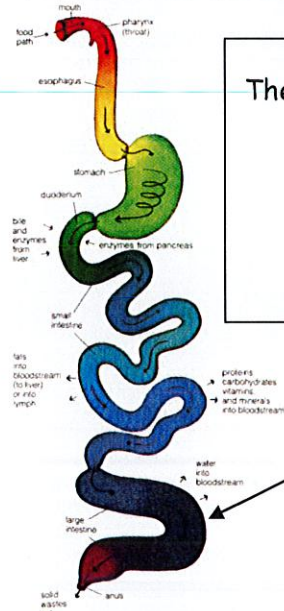
- Indigestible parts of food move from the small intestine to the large intestine.
- Water and vitamins are absorbed back in the blood to be reused.
- The remaining waste passes to the **RECTUM** where peristalsis forces it through the **ANUS** and out of the body.



The **Large Intestine** is made of 3 parts:

- Ascending colon
- Transverse colon
- Descending colon

Note: The Appendix serves no useful purpose. Perhaps it had a role in digesting rough foods many, many years ago.



Try to swallow this...

some interesting facts about your digestive system.

- The average digestive tract (alimentary canal) is 27 feet long!
- During a lifetime, a person will process between 60,000 to 100,000 pounds of food!
- Just the sight and smell of food begins the digestive process (saliva in your mouth, esophagus begins to ripple, stomach produces digestive enzymes)
- Your stomach can expand to hold $2\frac{1}{2}$ pints of food.
- The liver is the body's second largest organ weighing 3-4 pounds. (the skin is the largest organ)
- A meal takes between 15 to 48 hours to completely digest and move through the alimentary canal.

