Digestive System

*When can we start eating?*
What is Digestion?

- The break down of food into molecules that are small enough to be absorbed and used by the body
What is Digestion?

• This involves:
  • **Ingestion** and **propulsion** of food along digestive tract
  • **Break down** of food
  • **Absorption** of nutrients
  • **Elimination** of **waste** (fecal matter)
The digestive system can be broken down into two main parts:

- The **digestive tract**
  - The **path** that food travels along
- The **digestive glands**
  - These produce the **chemical secretions** necessary to digest (break down) the food
Mechanical vs Chemical

**Mechanical transformation:**
- Physically breaking down food into smaller bits without changing its chemical nature

**Chemical transformation:**
- Complex molecules are broken down into simpler molecules that can be absorbed by the body; chemical nature is changed
The Digestive Tract

- The digestive tract is made up of:
  - The **mouth**
  - The **pharynx**
  - The **esophagus**
  - The **stomach**
  - The **small intestine** (ileum)
  - The **large intestine** (colon)
The Digestive Glands

- The digestive glands:
  - The **salivary** glands
  - The **gastric** glands
  - The **liver**
  - The **pancreas**
  - The **intestinal** glands
Functions of the Digestive Tract

- **Mouth:**
  - **Ingestion** of food
    - This is where food enters the digestive tract
  - **Mechanical breakdown** of food through **mastication** (chewing)
  - **Chemical breakdown** of **starches** thanks to **saliva**
  - **Deglutination** (swallowing)
During swallowing:
- **Uvula** moves up to block the **nasal cavity**
  - So no food goes up your nose
- **Epiglottis** covers the **trachea** (airway)
  - So no food goes into your lungs
Functions of the Digestive Tract

• **Pharynx:**
  • The next step in the digestive tract
  • Moves food **from mouth to esophagus**
Functions of the Digestive Tract

- **Esophagus:**
  - Propels food towards the stomach
  - Uses peristalsis; a type of muscular contraction to move the food down the esophagus

*Never Google “worm GIFs”*
Functions of the Digestive Tract

• **Stomach:**
  - Churning of food to mix the chewed up food with secretions from digestive glands
  - Secretion of gastric juices (hydrochloric acid and enzymes) to break down proteins

We refer to the partially digested food as **chyme**

It has the consistency of cottage cheese... yum!
Functions of the Digestive Tract

- Small intestine:
  - More chemical breakdown of food:
    - Release of **intestinal** and **pancreatic juices** to break down proteins, carbohydrates and fats
    - Proteins $\rightarrow$ **amino acids**
    - Carbohydrates $\rightarrow$ **simple sugars** (glucose mostly)
    - Fats $\rightarrow$ **glycerol** and **fatty acids**
    - Also has **bile** from the **liver** to help breakdown fats
Functions of the Digestive Tract

- **Small intestine:**
  - **Absorption**
    - The *passage* of nutrients from the digestive tract into the *blood stream* (or *lymph*)
    - Most absorption occurs in the small intestine
      - Covered in many small folds called *villi* that increase the *surface area* for absorption
Functions of the Digestive Tract

- **Large intestine:**
  - Absorption of water
  - Only waste products left afterwards
- **Feces** is expelled from the **rectum** through the **anus**
Digestive Glands
Functions of the Digestive Glands

- **Salivary Glands:**
  - Secrete saliva
    - Lubricates the mashed food
    - Makes it easier to pass along the pharynx and esophagus
    - Starts the **chemical breakdown** of starches
      - Thanks to an enzyme called **amylase**
Functions of the Digestive Glands

• **Gastric Glands:**
  • Found on the inside lining of the stomach
  • **Secrete the gastric juices**
    • These contain hydrochloric acid and pepsin
    • Starts the chemical digestion of proteins
Functions of the Digestive Glands

• **Intestinal Glands:**
  - Found on the inside lining of the small intestine
  - Secrete the intestinal juices
  - Start the chemical digestion of fats
  - Also helps in chemical breakdown of proteins and carbohydrates
  - And helps neutralize the acid of the stomach
Functions of the Digestive Glands

Pancreas:
- Secretes the pancreatic juices
- Helps in chemical breakdown of fats, proteins and carbohydrates
- Also secretes insulin
  - The hormone responsible for regulating blood sugar!
Functions of the Digestive Glands

- **Liver:**
  - Produces **bile**
  - Helps in **mechanical breakdown of fats**
  - **Emulsifies the fat** (breaks it up into smaller molecules)
The whole point of digestion is to extract the required nutrients from the food we eat.

- In doing so, the digestive process is breaking each macronutrient into its components:
  - Carbs → simple sugars
  - Proteins → amino acids
  - Fats → glycerol and fatty acids
  - Water.... Stays as water