

# Digestion and absorption

[Nutrition](#)



Digestion a. The mouth: salivary alpha enzyme chew food, perceive taste, moisten food with saliva, lubricate food with mucus, release starch — digesting (amylase) enzymes, initiate swallowing reflex - Enzyme: alpha amylase with cooked starch as substrate — starch digestion enzyme an enzyme that catalyses the breakdown of starch into sugar - The Functions of Saliva - 1. Moistens and lubricates food, permitting swallowing 2. Holds taste producing substances in solution and bring them in contact w/ taste buds 3. Dilutes acids and salts, protecting mucosa and teeth 4. Cleansing effect on teeth, gums and buccal mucosa 5. Amylase may be cleansing agent for oral cavity by digestion starch particles near or on teeth. b. The Stomach: the role of HCL and pepsin store, mix, dissolve and continue digestion of food, dissolve food particles with secretions, kill microorganisms with acid, release protein-digesting (pepsin) enzyme, lubricate and protect stomach surface with mucus, regulate emptying of dissolved food into small intestine, produce intrinsic factor for vitamin B-12 absorption - Pepsin: protein splitting enzyme - Functions of HCL- 1. Enhances the conversion of pepsinogen to pepsin and provides a favorable pH for activity of pepsin 2. Reduces ferric iron to ferrous form 3. Sterilization of the gastric contents 4. Hydrolysis of some proteins and carbohydrates 5. Makes calcium more soluble \* Davenport theory of HCL production - Phases of Gastric Secretion- 1. Nervous: gastric secretion elicited by sensory stimuli 2. Gastric: gastric secretory production with the presence of food in the stomach- probable distention effect 3. Humeral: postabsorptive state, role of gastrin and histamine Gastrin facilitates HCL production// histamine is a powerful stimulant of gastric secretion c. The Pancreas: Secrete sodium bicarbonate and enzymes for digesting carbohydrate, fat, and protein - <https://assignbuster.com/digestion-absorption/>

Protein splitting enzymes; trypsinogen and chymotrypsinogen (zymogen forms), elastin and carboxypeptidases - Lipase: enzyme used to break down fats in food so they can be absorbed in the intestines - Amylase: an enzyme that hydrolyses dietary starch into disaccharides and trisaccharides which are converted by other enzymes to glucose to supply the body with energy - Bicarbonate secretion; pancreas secretes bicarbonate in order to neutralize the highly acidic substance coming from the stomach (HCl). The Gall bladder: - Store, concentrate, and later release bile into the small intestine - Production of bile by the liver & storage in the gall bladder Bile is produced in the liver and it is stored and concentrated in the gallbladder. It is emptied into the small intestine through the common duct - Micelle formation Micelle formation is essential for the absorption of fat-soluble vitamins and complicated lipids within the human body. Bile salts formed in the liver and secreted by the gall bladder allow micelles of fatty acids to form. - Functions of Bile Salts- 1. Accelerate the action of pancreatic lipase 2. Aid in the emulsification of fats w/ their power of lowering surface tension; they tend to stabilize such emulsions 3. Facilitate fat absorption with micelle formation 4. Keep cholesterol in solution 5. Have choleric action. The liver is stimulated to secrete bile as long as bile salts are absorbed. This secretion apparently continues during fat digestion and the absorption of bile salt — fatty acid complex, exactly during the period necessary for such secretion 6. Stimulate intestinal motility 7. The chief vehicle for the excretion of excess cholesterol e. Secretions of the small intestine mix and propel contents, lubricate with mucus, digest and absorb most substances using enzymes made by the pancreas and small intestine - Enzymes: carbohydrate and protein splitting, nucleases The small intestine secretes sucrase (breaks

<https://assignbuster.com/digestion-absorption/>

sucrose into glucose and fructose); maltase (breaks maltose into glucose); and lactase (breaks lactose into glucose and galactose, lactase is missing in a good percentage of people). It also secretes pepsin to split peptides (from protein) into amino acids. - NaCl and bicarbonate f. The Large Intestine Bacteria break down dietary fiber and other undigested carbohydrates, releasing acids and gas. The large intestine water and minerals, and forms feces for excretion. 1. Houses bacterial flora 2. Absorption of water, sodium, chloride and potassium 3. Synthesis of vitamin K and fatty acids 4. Bacterial degradation of undigested food residues such as fermentation of CHO, amino acids and proteins - The microflora: the bacterial colonies found in the large intestine and these bacteria are important for proper digestion and fecal excretion of waste products. -- Action on carbohydrates; production of butyric, lactic and other organic acids, ethyl alcohol, carbon dioxide, methane and hydrogen, some fiber may be digested by bacteria. -- Lipid Hydrolysis; hydrolysis of fats to glycerol and fatty acids, saturation of parts of unsaturated fatty acids (addition of hydrogen across double bonds), synthesis of fats by bacteria -- Action on undigested proteins Production of mercaptans and hydrogen sulfide from sulfur containing amino acids (cysteine to mercaptans — SH-CH) Lysine to putrescine — cadaverine and putrescine production Tryptophan to indoleacetic acid — indole and skatole production from tryptophan Tyrosine to phenol and cresol Tyramine production from tyrosine (Tyramine — blood pressure raising product similar to epinephrine) Histidine to histamine Absorption - Three components in absorption 1. Gut 2. Blood 3. Lymph - Brush border membrane concept (The brush border greatly increases the surface area available for the absorption of digested food.) Brush border membrane & the Villi (increases the surface

<https://assignbuster.com/digestion-absorption/>

area of intestinal wall, which increases the area that is available for absorption) -- Permeability depends on such factors as; thickness of membranes, lipid solubility of nutrient and temperature, molecular weight of nutrient

**-Processes-**

- 1. Passive Diffusion** - No carrier, lipid solubility, size or molecular weight, permeability depends on electrical charge of ions (+ or -) - When nutrient concentration is higher in the lumen of small intestine, the difference in the nutrient concentration drives the nutrient into absorptive cells by diffusion - Allows for absorption of glycerol, water and some minerals - welcomes FAT and other FAT-SOLUBLE molecules (oxygen, nitrogen, carbon dioxide, and alcohol)
- 1-1 Facilitated Transport** — carrier-mediated, no energy input, depends on concentration of nutrients, nutrient moves from a region of high concentration to region of lower concentration Ex) simple sugars such as mannose, arabinose, xylose, glucose, fructose and some amino acids - transports substance, as simple sugar fructose
- 2. Active Transport** - carrier-mediated, requires energy, uphill direction (lower concentration to higher concentration) Ex) water-soluble vitamins, several sugars (glucose, galactose), some amino acids, sodium, calcium, iron, potassium and chloride ( $\text{Na}^{++}/\text{K}^{+}$  pump and  $\text{Ca}^{++}$  pump), most amino acids (simple components of protein), carbohydrates - sites: intestines, renal tubules, gallbladder and all exocrine glands
- 3. Phagocytosis and Pinocytosis** - absorptive cells engulf compounds (phagocytosis) or liquids (pinocytosis) - cell membrane invaginates to surround the nutrient - the nutrient is extruded through membrane

- \* Pinocytosis — when cells ingest small molecules and fluids
- \* Phagocytosis — used by specialized cells to absorb large particles

**Convection Transport** — very small molecules are able to rapidly cross cell membranes through channels or pores Ex) urea and water

- 1. Stomach** —

<https://assignbuster.com/digestion-absorption/>

alcohol (20% of total), water (minor amount) 2. Small Intestine — Ca, Mg, I, and other minerals, glucose, amino acids, fats, vitamins, water (70%-90% of total), Alcohol (80% of total), Bile acids 3. Large Intestine — Sodium, Potassium, Some fatty acids, gases, water (10% to 30% of total)