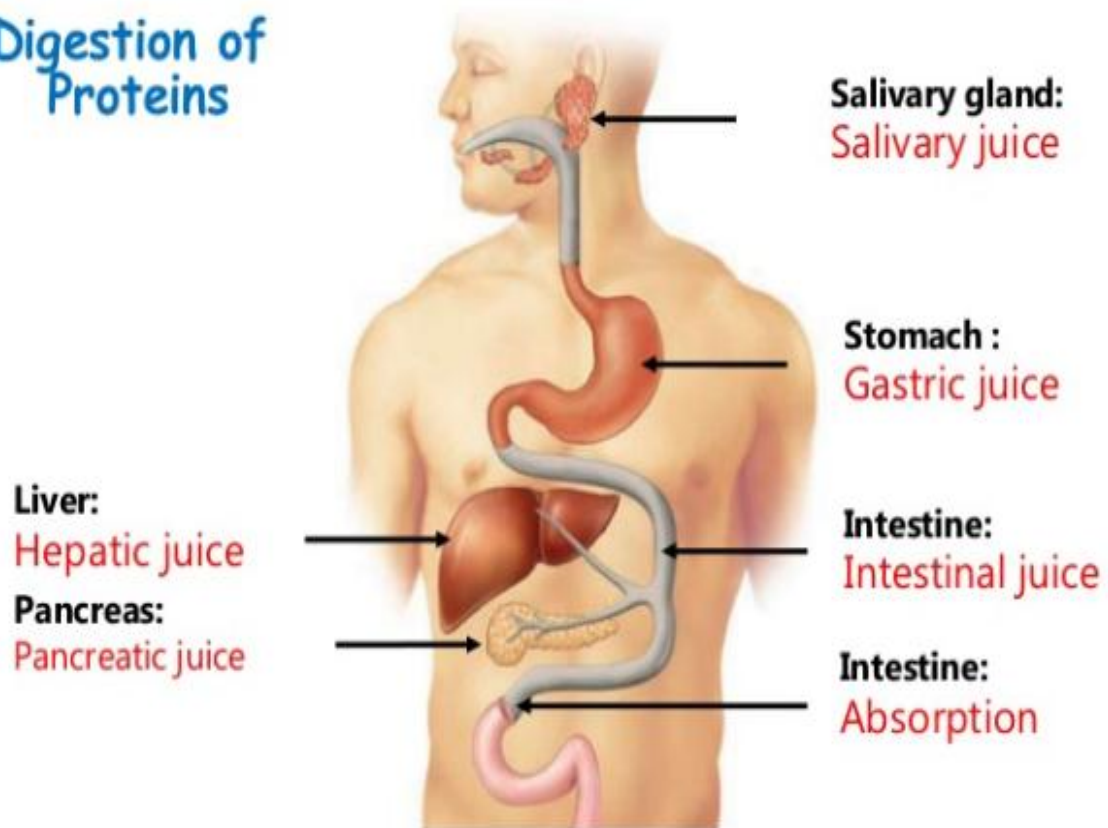


DIGESTION & ABSORPTION OF PROTEINS

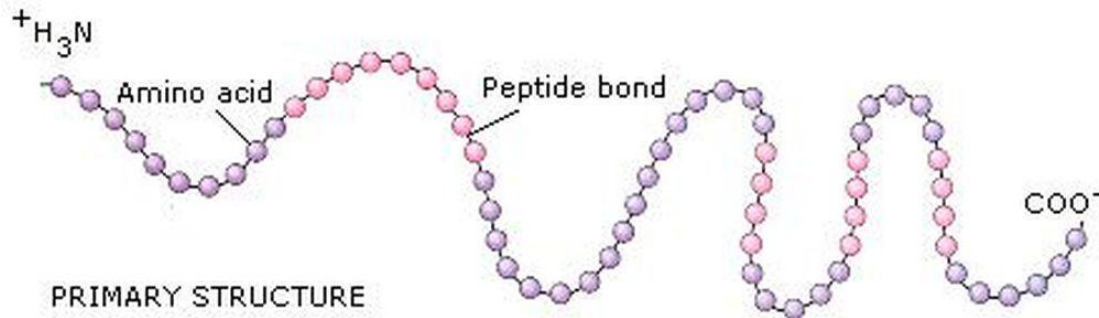
Digestion of Proteins



Proteins:- the primary constituents of the body. A regular & adequate supply of protein in the diet is essential for cell integrity & function. Dietary proteins are the primary sources of the nitrogen. Adult man requires 70 to 100 gm protein/day.

Dietary proteins serve three broad functions:

- ✚ Their constituent AAs are used for synthesis of body proteins.
- ✚ The carbon skeletons of AAs can be oxidized to yield energy
- ✚ Their “C” & “N” atoms may be used to synthesize other nitrogenous and non-nitrogenous metabolites.



DIGESTION OF PROTEINS

The process of digestion is defined as the ‘process by which macromolecules in food are broken down into their component small-molecule subunits’

Digestion is the disintegration of complex nutrients into simple, soluble and assimilable form.

Proteins are too large to be absorbed. The dietary proteins are hydrolyzed to amino acids by proteolytic enzymes, which can be easily absorbed. **Proteolytic enzymes** responsible for degrading proteins are produced by three different organs; The stomach, pancreas and the small intestine.

CHARACTERISTICS OF PROTEOLYTIC ENZYMES

Peptidases (Hydrolases; Class 3)

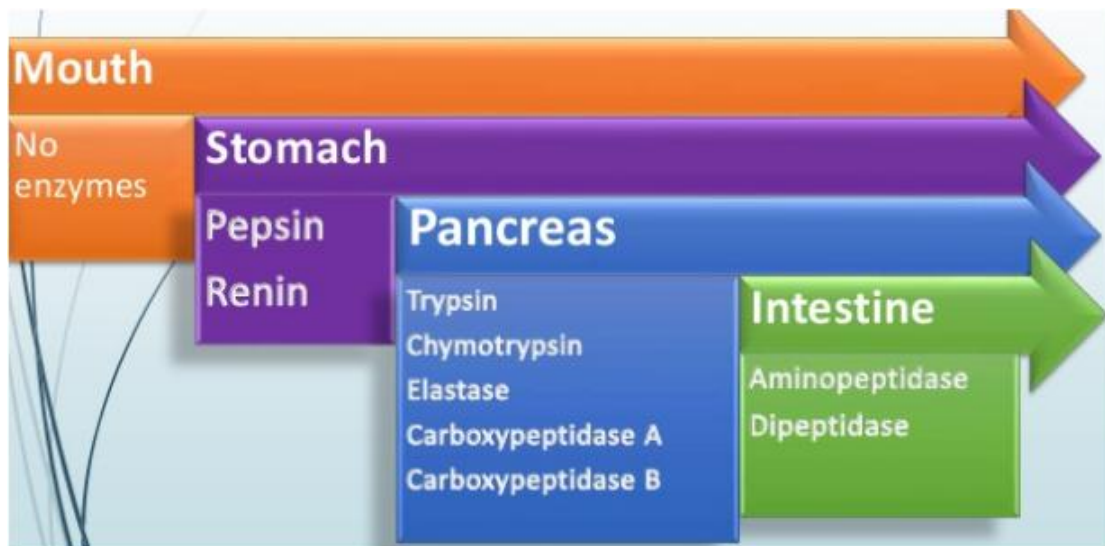
- **Endopeptidase** : acts inside the core of protein, forms small peptide fragments
- **Exopeptidase** : acts from the amino terminal or carboxyl terminal ends of protein
 - Aminopeptidase
 - Carboxypeptidase

Proenzymes (zymogens)

- Peptidases are secreted in the **inactive form**
- When zymogens reach the site of action they are activated

Digestion in Mouth

- ❖ No digestion of protein in mouth.
- ❖ No proteolytic enzymes present in the saliva.
- ❖ Function of the saliva - lubricate the food, this helps in making food soluble for the action of proteolytic enzymes.



Digestion in Stomach

- ❖ Digestion of protein starts in stomach.
- ❖ When proteins enters the stomach, it stimulates the secretion of the hormone gastrin, from gastric mucosal cells.
- ❖ This gastrin, in turn, stimulates the release of gastric juice, which contains...

Hydrochloric acid (HCL).

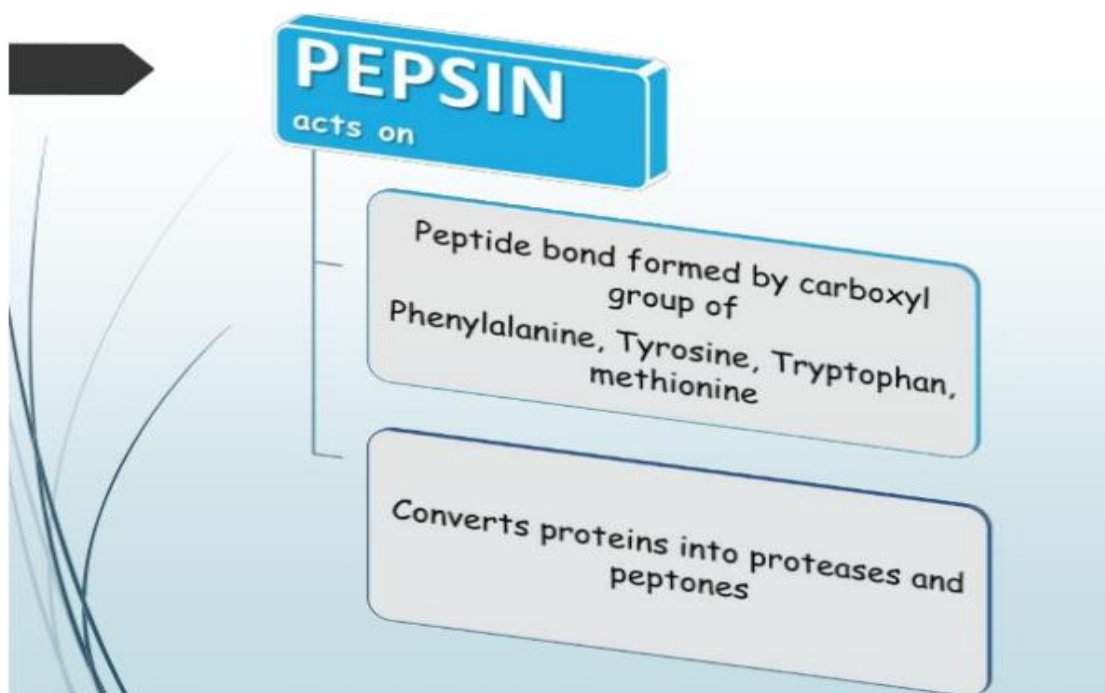
Pepsinogen (zymogen)

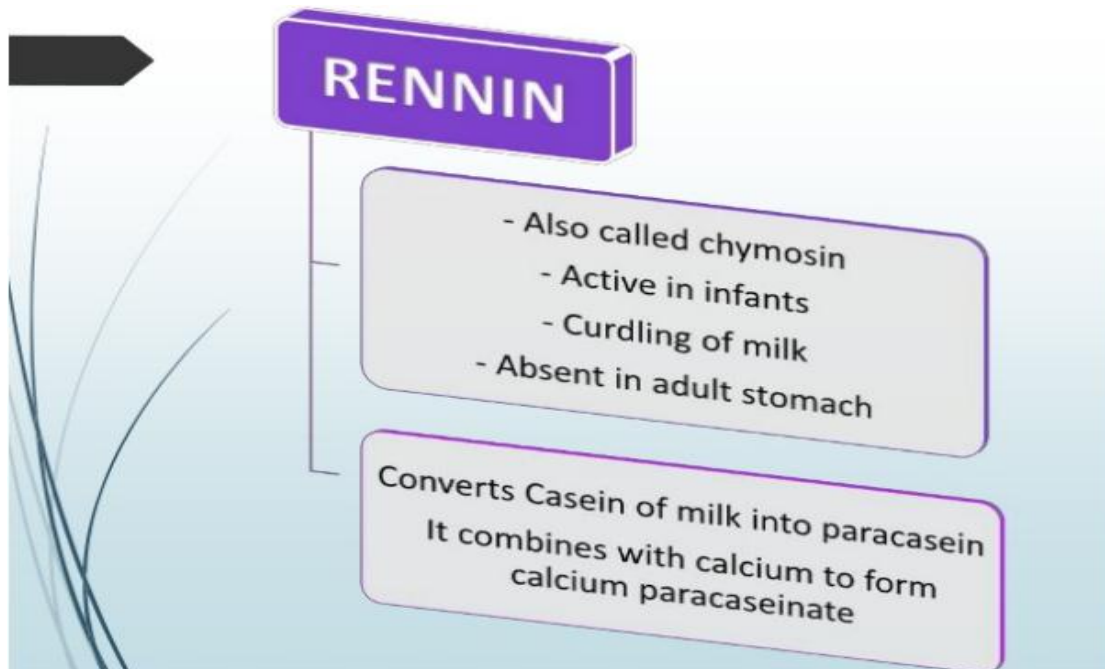
Rennin (in infants).

- ❖ The pH of gastric juice is 1.5-2.5

DIGESTION OF PROTEIN BEGINS IN THE STOMACH

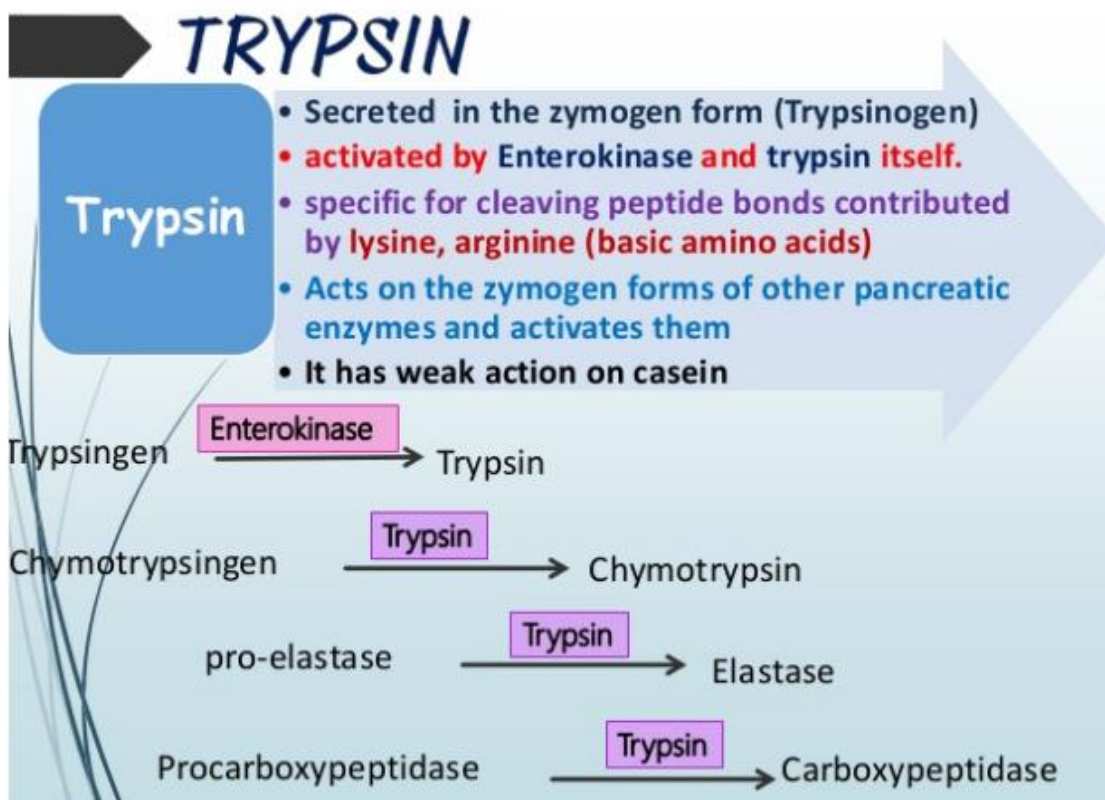
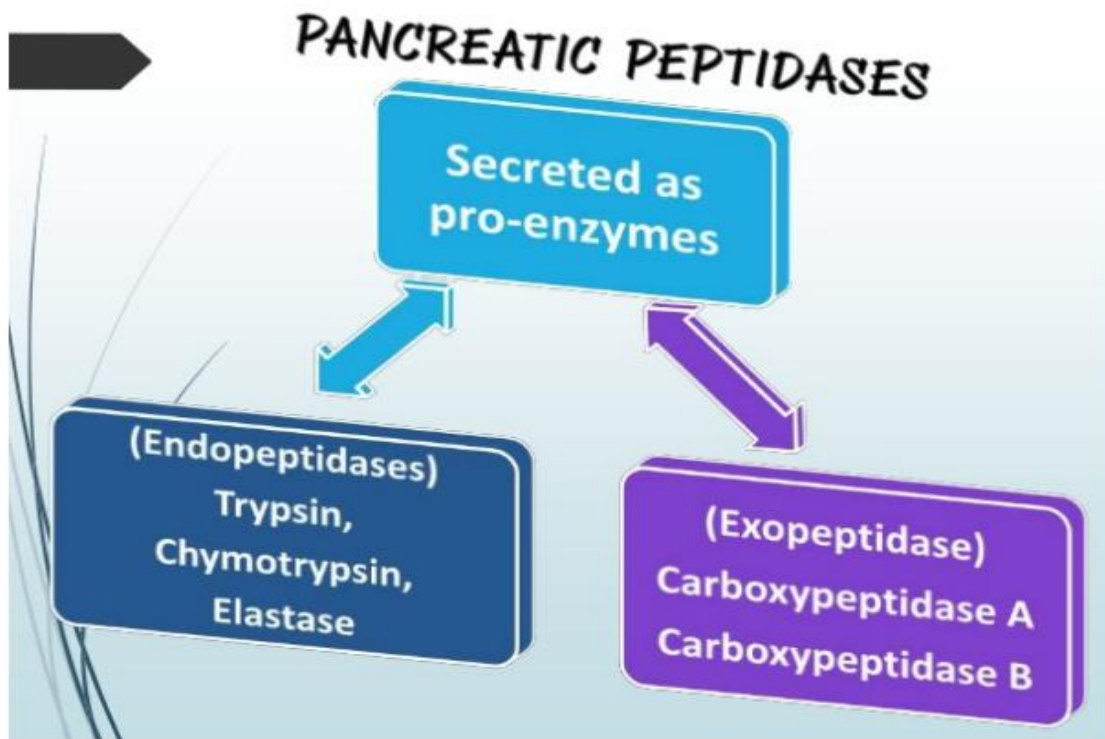
Stomach secrets	Hydrochloric acid (HCl)	Pepsinogen
<p>Strong acid (HCl)</p> <p>Proenzyme - pepsinogen</p>	<ul style="list-style-type: none"> • Denatures proteins • Decreases pH (2-3) • Activates pepsinogen • Kills some bacteria • Helps in the absorption of Vitamin B12 	<p>Secreted by Chief cells. Activated to pepsin by HCl. And autocatalysis.</p> <p>Pepsinogen</p> <pre> graph TD HCL[HCL] --> Pepsin Pepsinogen --> Pepsin Pepsin -.-> Autocatalysis Autocatalysis --> Pepsin </pre>





Digestion of proteins in the Intestine By Pancreatic Enzymes.

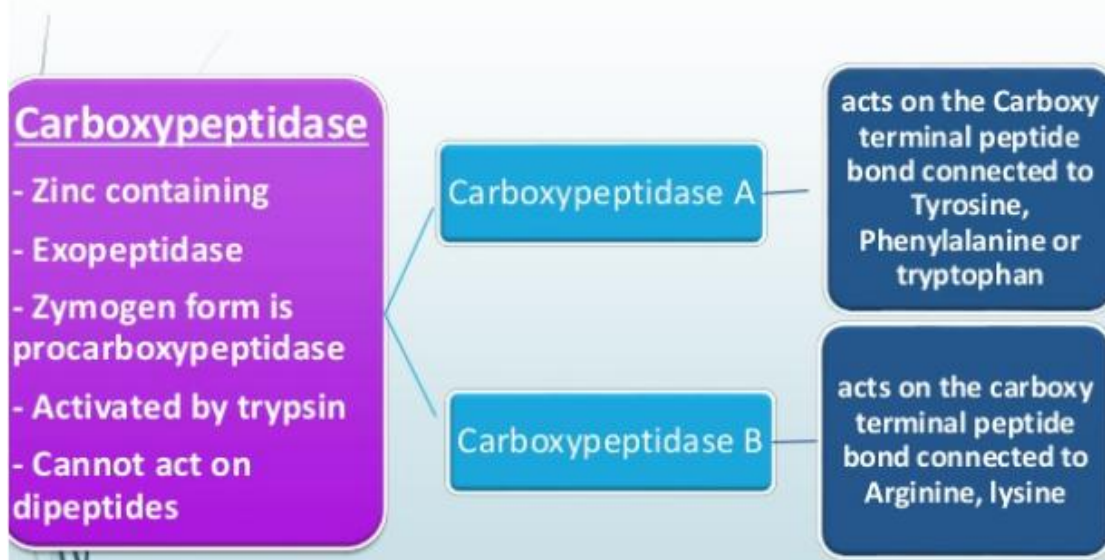
- √ As the acidic stomach contents pass into duodenum, the low pH triggers the secretion of the hormones...
- √ Secretin – stimulate pancreas to secrete bicarbonate. It neutralizes HCL and rises the pH from 1.5-2.5 to 7.0
- √ Cholecystokinin - stimulate secretion of pancreatic
- √ Endopeptidase – Trypsin, Chymotrypsin, Elastase
- √ Exopeptidase – Carboxypeptidases, Aminopeptidases



CHYMOTRYPSIN AND ELASTASE

CHYMOTRYPSIN (Endopeptidase)	ELASTASE (Endopeptidase)
<ul style="list-style-type: none"> <input type="checkbox"/> Zymogen form – Chymotrypsinogen <input type="checkbox"/> activated to chymotrypsin by trypsin <input type="checkbox"/> Hydrolyzes the peptide bond formed by the carboxyl group of aromatic amino acids 	<ul style="list-style-type: none"> <input type="checkbox"/> Zymogen form – Proelastase <input type="checkbox"/> activated to elastase by trypsin <input type="checkbox"/> Acts on peptide bonds formed by the amino acids like glycine, alanine, serine

CARBOXYPEPTIDASE



Digestion of proteins in the Intestine By Intestinal Enzymes

- ▶ The digestion products of hydrolysis by **pepsin, trypsin, elastase, chymotrypsin & carboxypeptidase** is completed by the **intestinal peptidases**, secreted by the mucosa of the small intestine.
- ▶ Some of these peptidases are...
 - ▶ Aminopeptidases
 - ▶ Dipeptidases

Amino peptidase

- Present on the luminal surface of the intestinal mucosa
- Is an exopeptidase.
- Acts on the N terminal peptide bond
- Release free amino acid

Di and Tri peptidases

- Present on the surface of the intestinal mucosal.
- Act on **dipeptides** & release free AAs
- Enterocytes take up some di & tripeptides
- These peptides are hydrolyzed to amino acids by **intracellular dipeptidase**