

Protein Metabolism: (Amino Acid Metabolism)

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Proteins are structural & functional constituents of the body. A regular and adequate supply of protein in diet is essential for cell integrity and function.

Dietary proteins are primary source of nitrogen that is metabolised by the body

Function of dietary protein

⇒ Provide amino acids which are used for synthesis of body's protein.

⇒ The carbon skeleton of amino acid can be oxidised to yield energy

⇒ Their carbon & nitrogen atom may be used to synthesise other nitrogen containing cellular constituents as well as non nitrogen containing metabolites.

Digestion & Absorption of protein:

Proteolytic enzymes produced by the different organs such as stomach, pancreas and small intestine perform breakdown of dietary protein into their constituent amino acids.

(A) Mouth :- No digestion

(B) Stomach :- Protein diet in stomach → stimulate secretion of gastrin

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stimulate
Secretion of HCl, Pepsin, Renin

Epithelial
Parietal Cell or Oxyntic cell secrete

(a) Hydrochloric Acid ⇒ Denature protein & make susceptible
amide bond breakdown using proteases.

Also provide acidic medium to work pepsin.

(b) Pepsin ⇒ secreted as pepsinogens in form of proenzyme in
inactive form.

activated by $\left\{ \begin{array}{l} \rightarrow \text{Pepsin itself} \\ \rightarrow \text{High HCl conc.} \end{array} \right.$

Action: \rightarrow Breakdown of peptide bond of aromatic amino acid
such as phenylalanine, tyrosine, tryptophane

\rightarrow And acidic amino acid (Aspartic acid, glutamic acid)

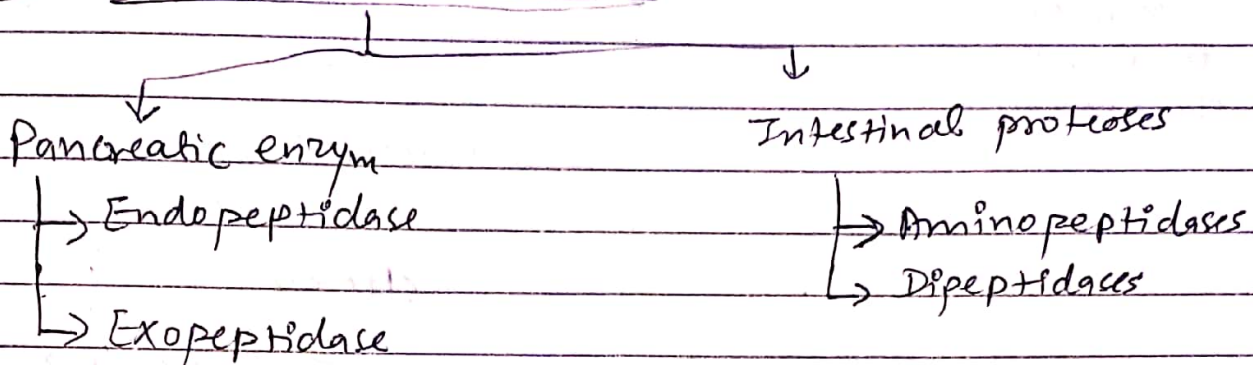
So pepsin cleave long polypeptide chain into a mixture of
smaller ~~polypeptide~~ oligopeptide and some amino acids.

(c) Rennin ⇒ secreted in infant only & also called Chymosin.

Action: to clot milk by slight hydrolysis of milk protein
Casein to produce paracasein

Casein $\xrightarrow[\text{Rennin}]{\text{Rennin}}$ Paracasein $\xrightarrow{\text{in presence of Calcium}}$ Calcium paracaseinate
Complex
(Insoluble curd)
 $\xleftarrow{\text{Pepsin}}$

C Digestion in Intestine (small)



① Pancreatic enzymes :->

(a) Endopeptidase :- Cleave internal peptide bond to produce smaller peptides.

Endopeptidase secreted by pancreas in inactive form (Proenzyme)

Proenzyme (Inactive)	Enzyme (active)
→ Trypsinogen	Trypsin
→ Chymotrypsinogen	Chymotrypsin
→ ProElastase	Elastase

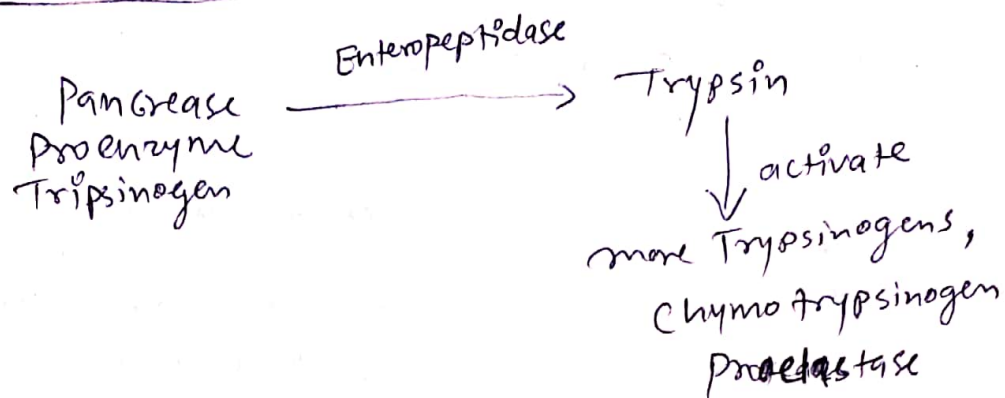
(b) Exopeptidase :- Cleave terminal peptide bond

Two types
 Carboxy peptidases: secreted by pancreas. Act on C-terminal of amino acid
 (Ca⁺⁺ dependent)

Aminopeptidase :-> secreted by mucosal cell & act on N-terminal amino acid.

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Activation of Pancreatic proenzyme



Trypsin \Rightarrow hydrolyse peptide bond whose carboxy group is contributed by lysine, Arginine

Chymotrypsin \Rightarrow cleave peptide bond of aromatic amino acid & leucine, methionine, asparagine, histidine

Elastase \Rightarrow cleave peptide bond formed by small nonpolar amino acid such as alanine, glycine, serine

Degradation of short peptides formed in the small intestine is continued by an exopeptidase

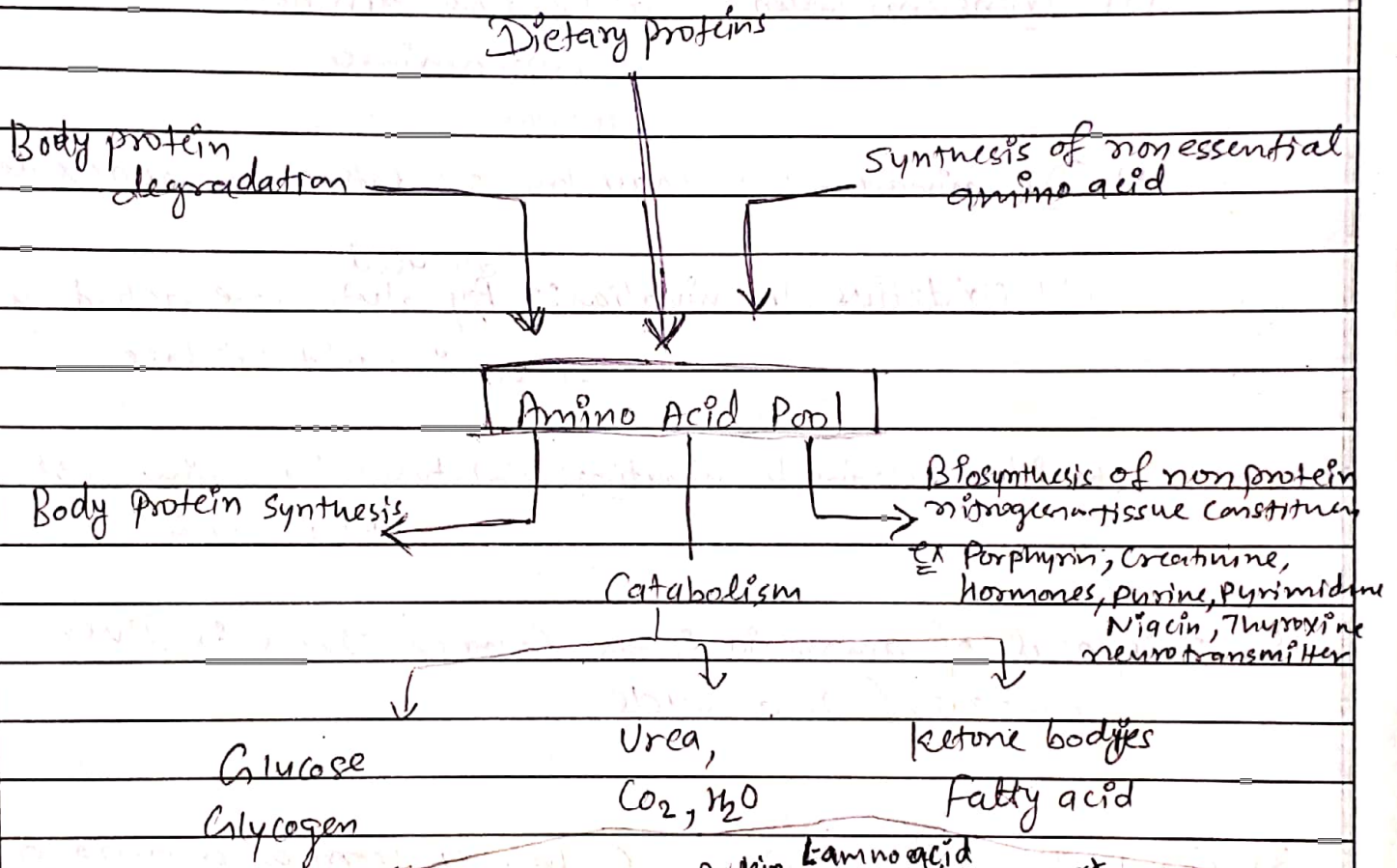
④ Digestion in intestine by intestinal protease \Rightarrow

Intestinal proteases secreted by mucosal membrane of small intestine and cleave small fragment of peptides. Two types proteases

Aminopeptidase \Rightarrow type of exopeptidase & hydrolyse peptide bond from N-terminal of small peptide.

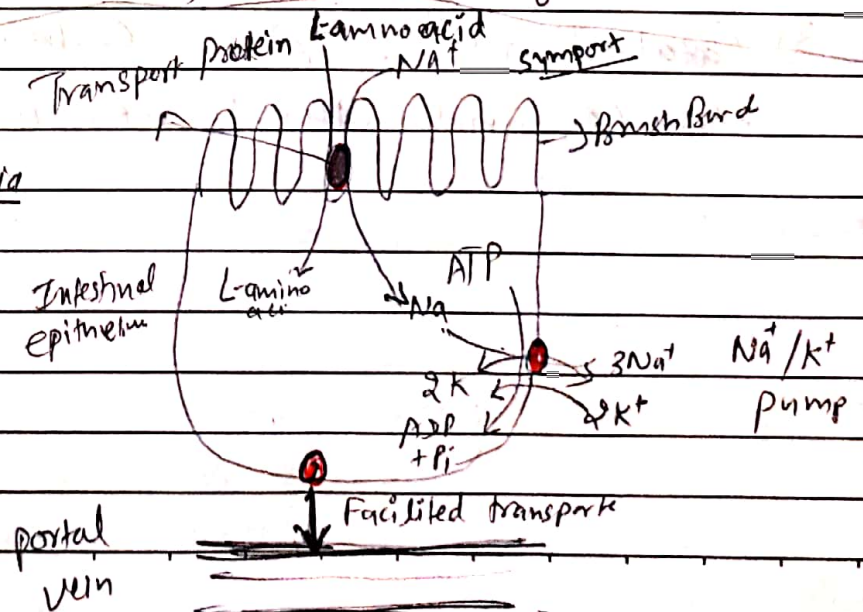
Dipeptidases \Rightarrow cleave dipeptide into amino acid. It finally convert all ingested protein into amino acid. It require Cobalt or Manganese ion for their activity.

Amino acid Pool



Absorption of Amino acid

Require energy



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