

Amino Acid Metabolism

- Proteins are most abundant organic compds.
- They perform various static and dynamic functions.
- **Static** → structure of cell [DEPTH OF BIOLOGY]
- **Dynamic** → Hom. synt., Neurotransmitter
- They are made up of L- α -Amino acids
- 20 Amino acids are found in proteins.
- **Essential amino acids** → can not be synth. by the body
- **Non-Essential amino acids** → can be synth. by the body.
- Some amino acids are precursors for biologically important compound. [DEPTH OF BIOLOGY]
Eg:- Melanin, Serotonin, Creatinine
- Some amino acids directly acts as neurotransmitters
Eg:- Glycine, Glutamate.

Nutritionally essential amino acid :-

leucine, lysine, valine, Isoleucine, Tryptophan, histidine, methionine, phenylalanine, threonine

Nutritionally Non-Essential amino acid :-

[DEPTH OF BIOLOGY]

Eg - Proline, Serine, Tyrosine, Alanine, Arginine, Asparagine, Glycine, Glutamic acid, Cysteine, Glutamine, Aspartic acid.

conditional amino acids are usually not essential, except in times of illness and stress.

* Glutamine and glutamate together constitutes 50% of body pool of amino acids. [DEPTH OF BIOLOGY]

→ 20 amino acids present without modification.

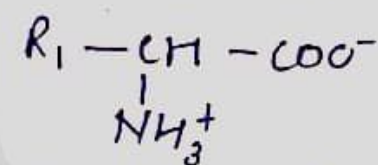
But, there can be 2 more amino acids (selenocysteine and pyrrolysine) — these can be incorporated by special translation mechanism.

General Reactions of Amino Acid Metabolism

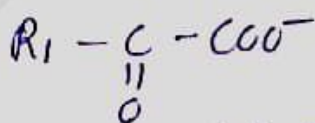
Transamination → [DEPTH OF BIOLOGY]

Amino group transfer from amino acid to a keto acid.

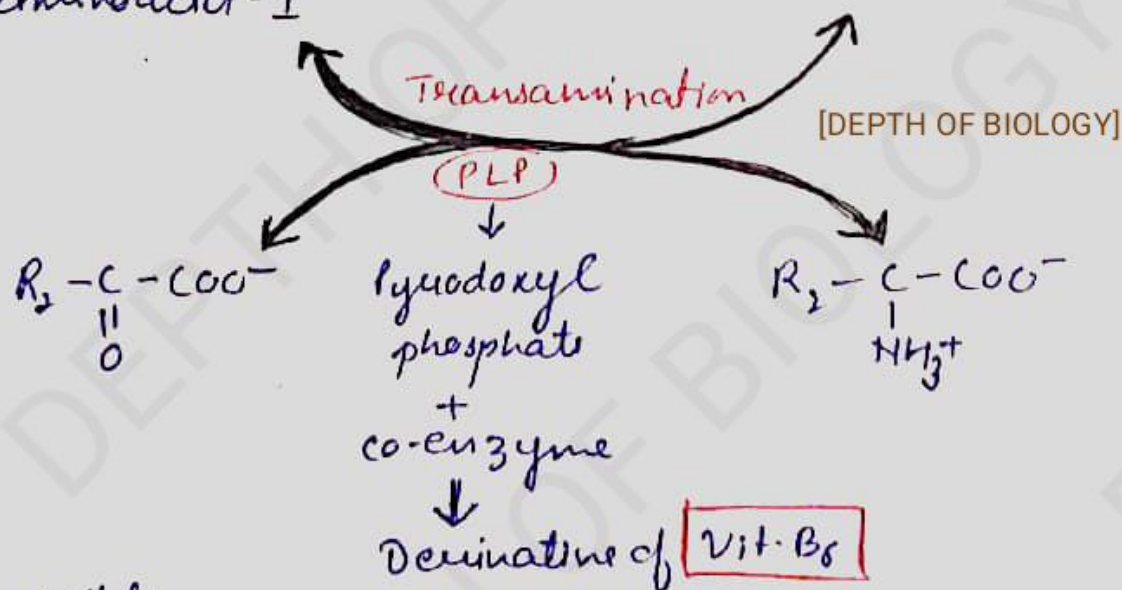
Coenz. → (1st) ROR of Enzyme.



Amino acid - I



Keto acid - I



• Reversible

• No free NH₃ is liberated

• Transfer of amino group from donor amino acid to recipient keto acid.

• α-amino acid participates in Rxn. [DEPTH OF BIOLOGY]

Deamination :- goes alongside transamination

Removal of amino group as ammonia.

→ liberated ammonia is used for urea synthesis.

Transamination and Deamination



occurs simment. So the term **Transdeamination** is used.

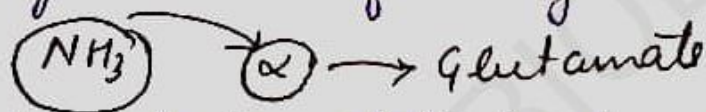
Glutamate molecule acts as a link b/w transamination and deamination.

[DEPTH OF BIOLOGY]

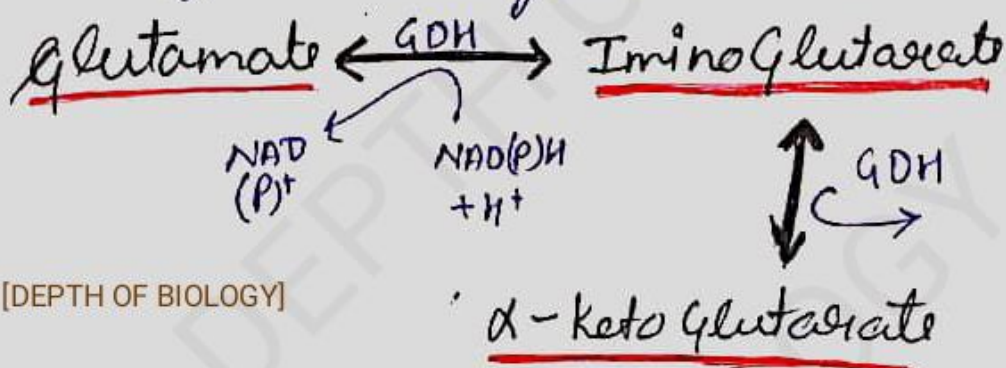
→ It can be oxid. or. Alon-oxid.

Oxid. Deamination ⇒

- Liberation of NH_3 coupled with oxid.
- Mostly takes place in liver and kidney.
- Amino group of most of amino acid are transferred to α -ketoglutarate to form glutamate



- Glutamate is oxidatively deaminated by Glutamate dehydrogenase.
- L-Glutamate dehydrogenase plays a central role in amino acid deamination. [DEPTH OF BIOLOGY]
- It is Zinc containing mitochondrial enzyme which utilize NAD^+ and NADP^+ as Coenzymes
- Activated by GDP, ADP
- Inact. by ATP, GTP, Thyroid



[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

Non-oxid. Deamination \Rightarrow

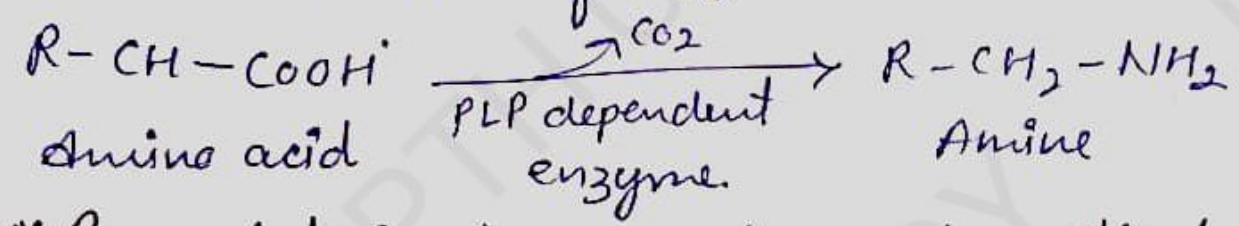
certain amino acid can be non-oxidatively (without oxid.) deaminated by specific enzyme and form ammonia

\rightarrow They don't have major role in NH_3 formation

Eg - Dehydrases, Desulfhydrases, Histidases

Decarboxylation [DEPTH OF BIOLOGY]

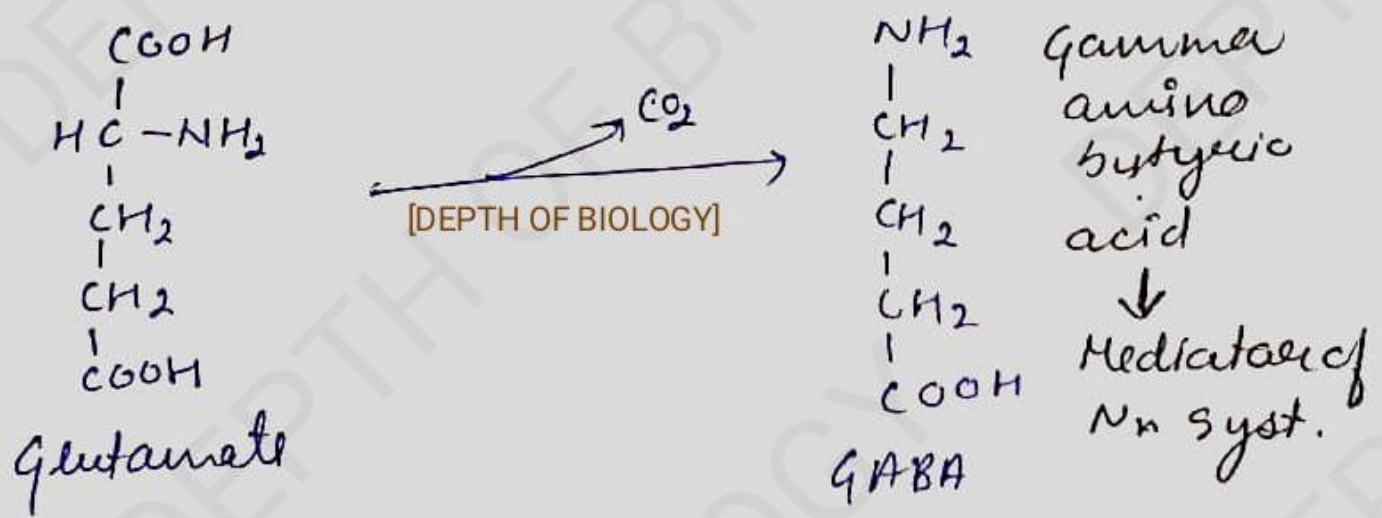
(removal of CO_2)



* Removal of CO_2 from amino acids with formation of enzymes.

- Enzyme involved is decarboxylase which is pyridoxal phosphate dependent (PLP). [DEPTH OF BIOLOGY]

- The physiologically active amines epinephrine, Nor epinephrine, dopamine, Serotonin, Amino butyrate and Histamine are formed through decarboxylation of the corresponding precursor amino acids.



[DEPTH OF BIOLOGY]

Glucose Alanine cycle \rightarrow Muscle related skeletal and liver
Glutamate \rightarrow to Pyruvate (Amino transfer)

Histidine $\xrightarrow{\text{CO}_2}$ Histamine [DEPTH OF BIOLOGY]
Histamine \rightarrow Mediator of Inflammation and allergic rxn.

Enzymes of certain microorganism carbohydrate aminoacid and result into the formation of diamines.

Ornithine $\xrightarrow{\text{CO}_2}$ Putrescine

Glutamine and Alanine \longrightarrow Transfer NH_3

[DEPTH OF BIOLOGY]