



Ammonia Assimilation and
Transamination

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Assimilation and
transamination**

Nitrate Assimilation

(Green plants, some fungi and bacteria)



Ammonia Assimilation

- Conversion of ammonia generated from nitrate assimilation or photorespiration into amino acid.
- 2 pathways – i. Primary Pathway
ii. Alternative Pathway

Primary Pathway

2 enzymes involved :

a) **Glutamine synthetase (GS)** –

Available in two forms- in cytosol , and roo
plastid/shoot chloroplast

a) **Glutamate synthase** (also known as
GOGAT)

GOGAT – Glutamine 2-oxo-glutarate
aminotransferase

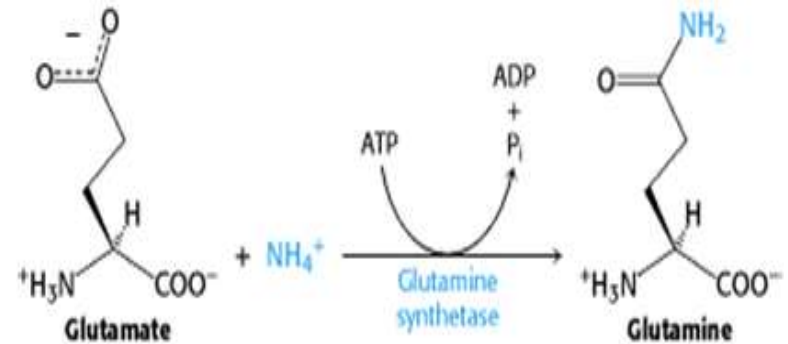
Glutamine synthetase action

Cytosolic form –

- Expressed in germinating seeds or in vascular bundle of roots and shoots.
- Produce glutamine for intracellular nitrogen transport.

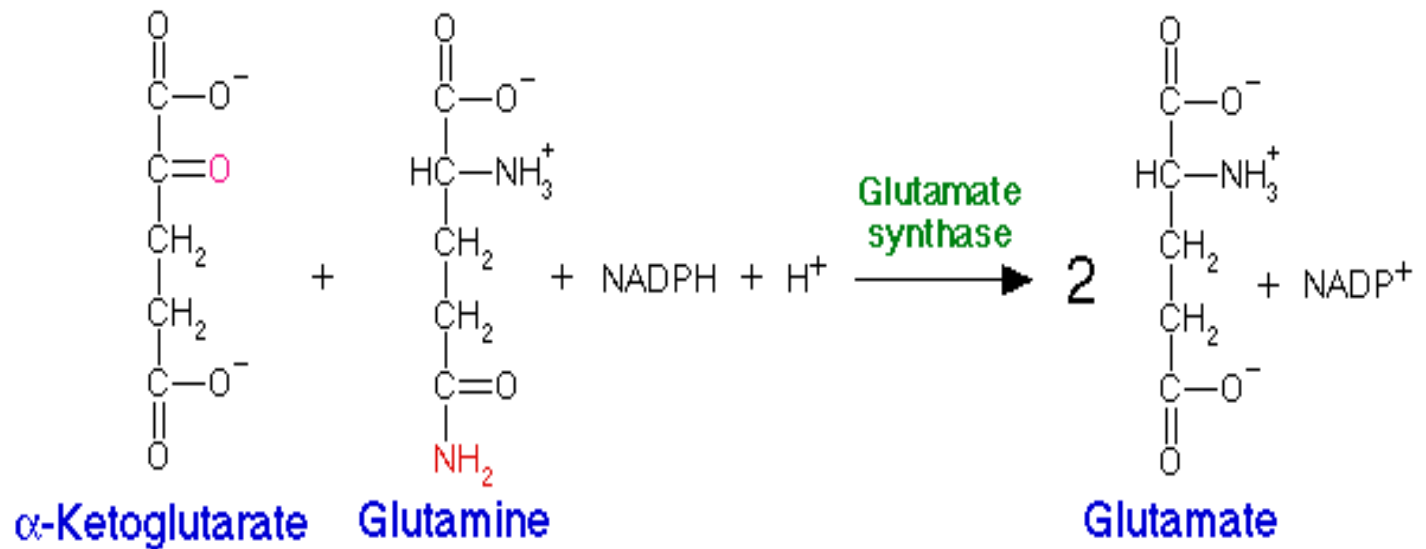
Root plastid/Shoot chloroplast form –

- In roots, it produces amide nitrogen for local consumption.
- In shoots, it reassimilates photorespiratory NH_4^+



Glutamate synthase action

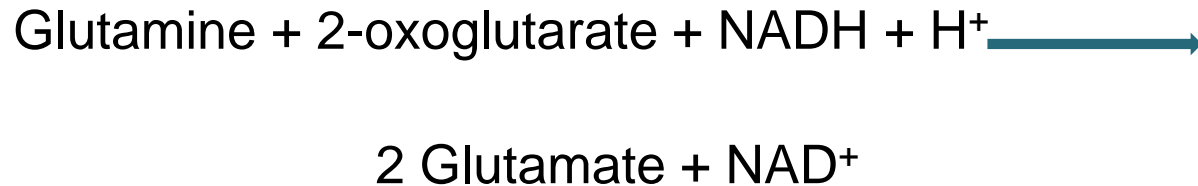
- Transfers **amide** group of glutamine to 2-oxoglutarate, and yields two glutamate molecules.



Types of GOGAT

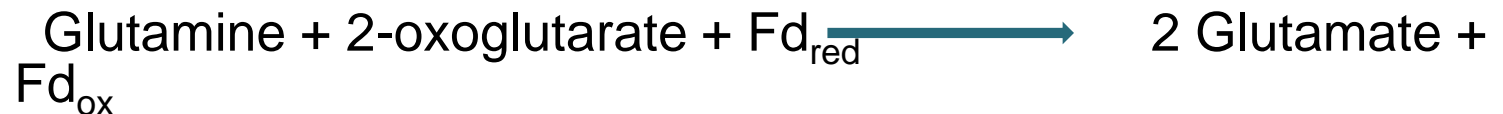
- **NADH-GOGAT**

- accepts electrons from NADH.
- located in plastids of non-photosynthetic tissue like roots or VB of developing leaves.



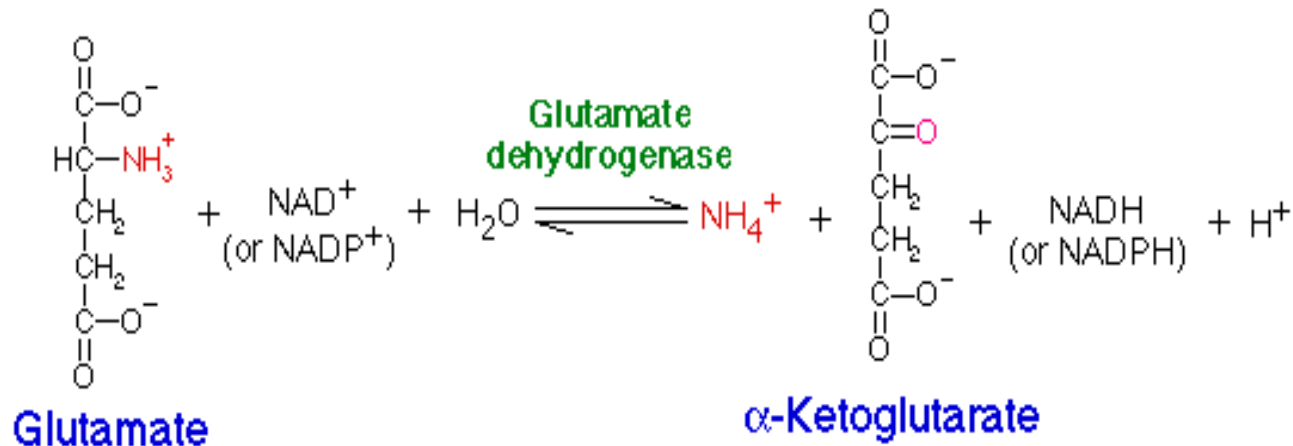
- **Fd-GOGAT**

- accepts electron from ferredoxin.
- located in chloroplast and serves in photorespiratory nitrogen metabolism.



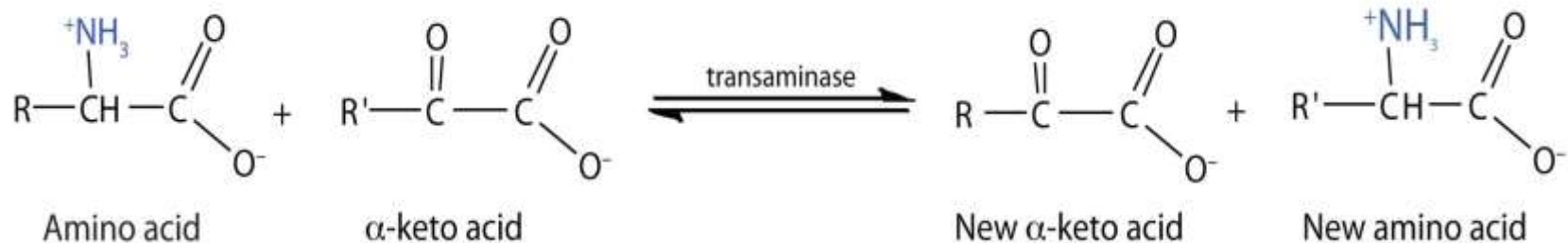
Alternative Pathway

- The enzyme involved is **Glutamate Dehydrogenase** (GDH), hence known as GDH pathway.
- Catalyzes synthesis and deamination of glutamate.
- Reversible



Transamination Reaction

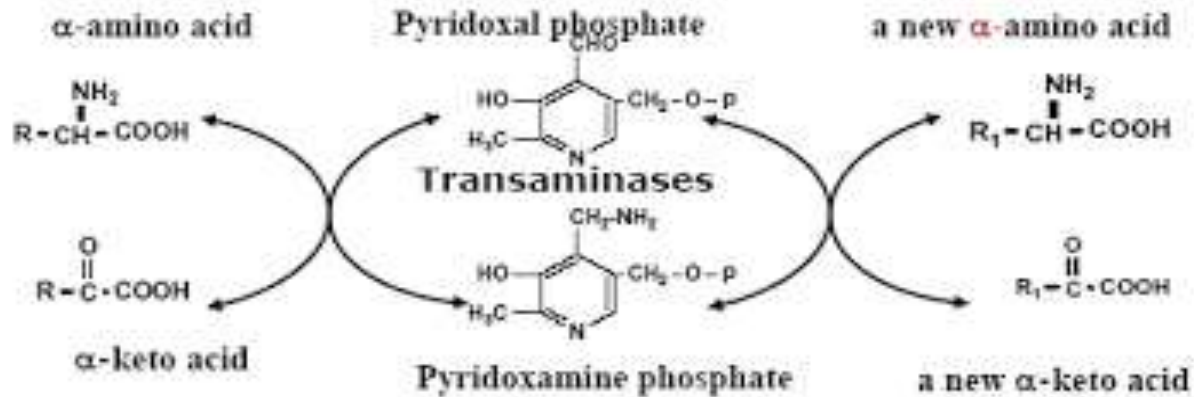
- Transfer of amino group of an amino acid to α -keto acid resulting in formation of new amino acid and new keto acid.
- Catalyzed by **Transaminase** (Aminotransferase)
- Co-factor: **Pyridoxal phosphate** (Vitamin B₆)
- **Reversible**



- Not all amino acids undergo transamination reaction.

Eg. Lysine, Threonine, Proline,
Hydroxy proline

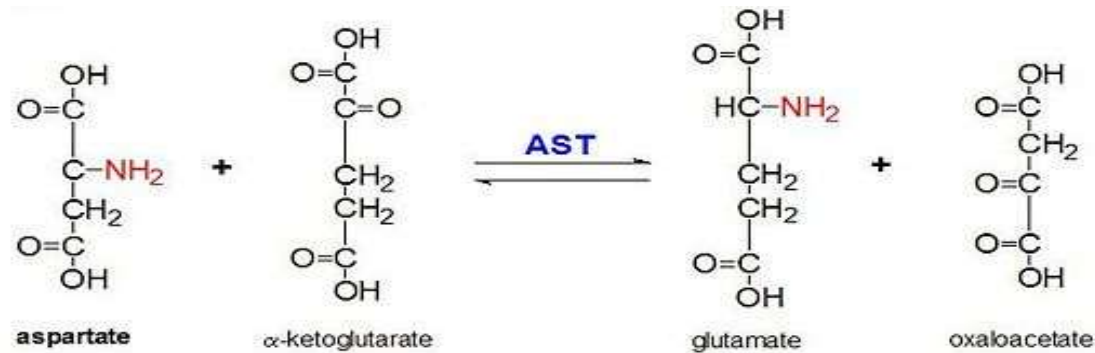
Role of Pyridoxal Phosphate(PLP)



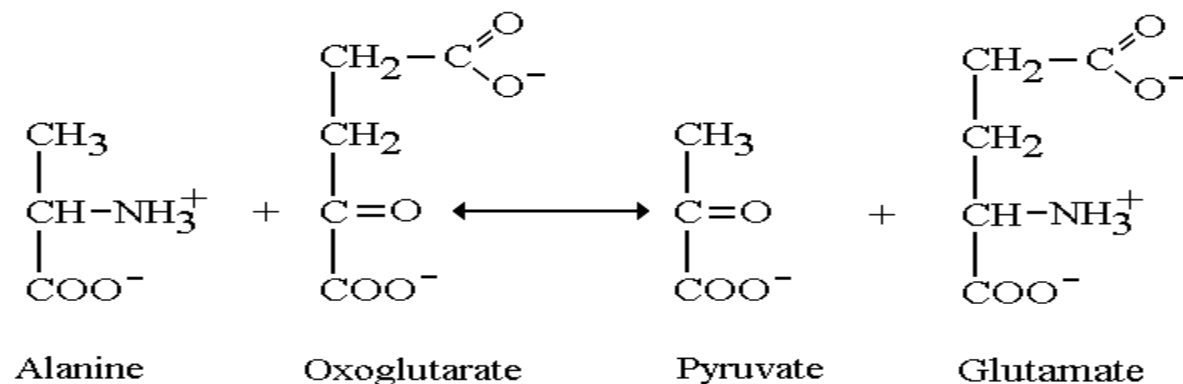
- Serves as a **carrier of amino group**
- Transfer of α -amino group to PLP forms Pyridoxamine Phosphate, and a keto acid.
- α -amino group is finally transferred to acceptor keto acid to form a new amino acid.

Example:

- Catalyzed by Aspartate Transaminase



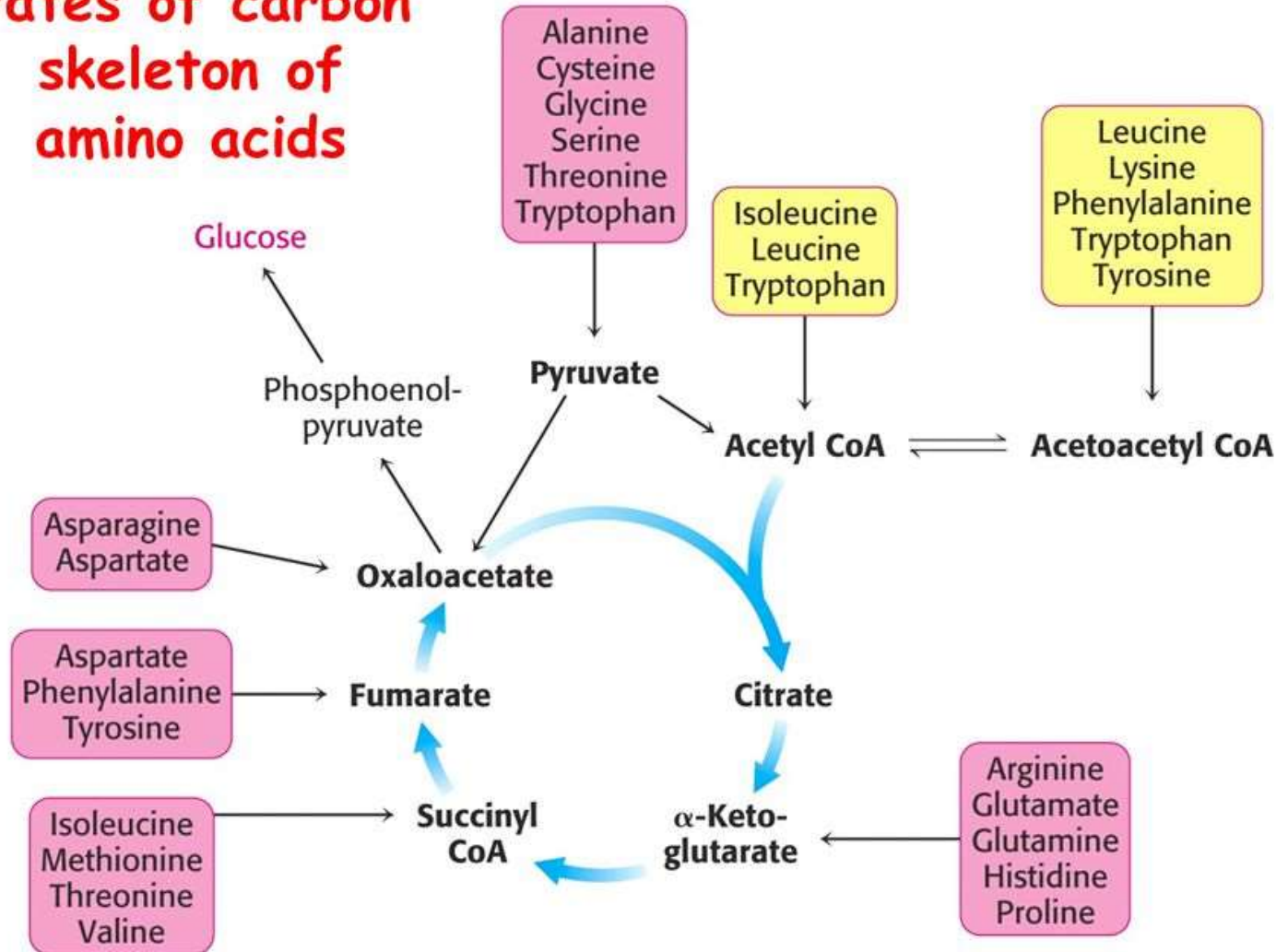
- Catalyzed by Alanine Transaminase



Significance

- Formation of non-essential amino acids
Eg: Alanine , Aspartate
- Recycling of carbon skeletons.
Eg: Oxaloacetate, Pyruvate

Fates of carbon skeleton of amino acids



Thank You

