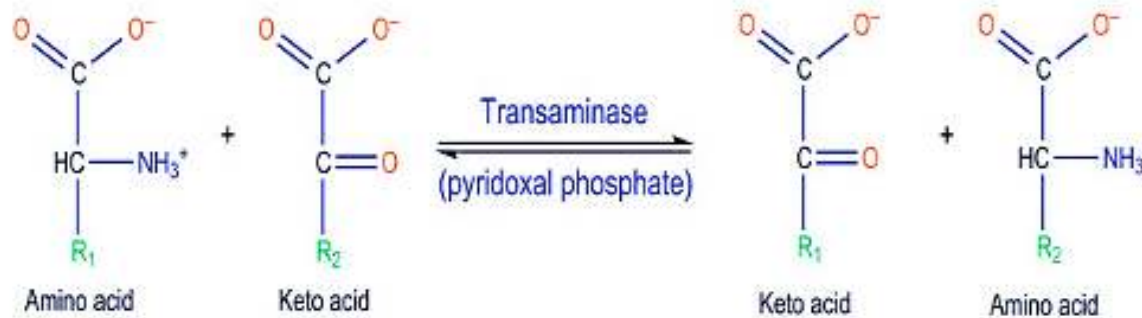


What is Transamination?

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- Important method of **nitrogen metabolism of amino acids**.
- Transamination is the **transfer of an amine group from an amino acid to a keto acid** (amino acid without an amine group), thus **creating a new amino acid and keto acid**.
- Transamination reactions combine **reversible amination and deamination**, and they mediate redistribution of amino groups among amino acids.
- **Transaminases (aminotransferases)** are widely distributed in human tissues and are particularly active in **heart muscle, liver, skeletal muscle, and kidney**.
- The general reaction of transamination is:



Concerned enzyme

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- The reaction is catalyzed by **transaminase or amino transferase**.
- **Enzymes act on L-amino acid** but not on D-isomers.
- They occur **both mitochondria and cytosol** as separate enzyme.
- There are **many transferases, each acts on a particular amino acid and a particular keto acid**.

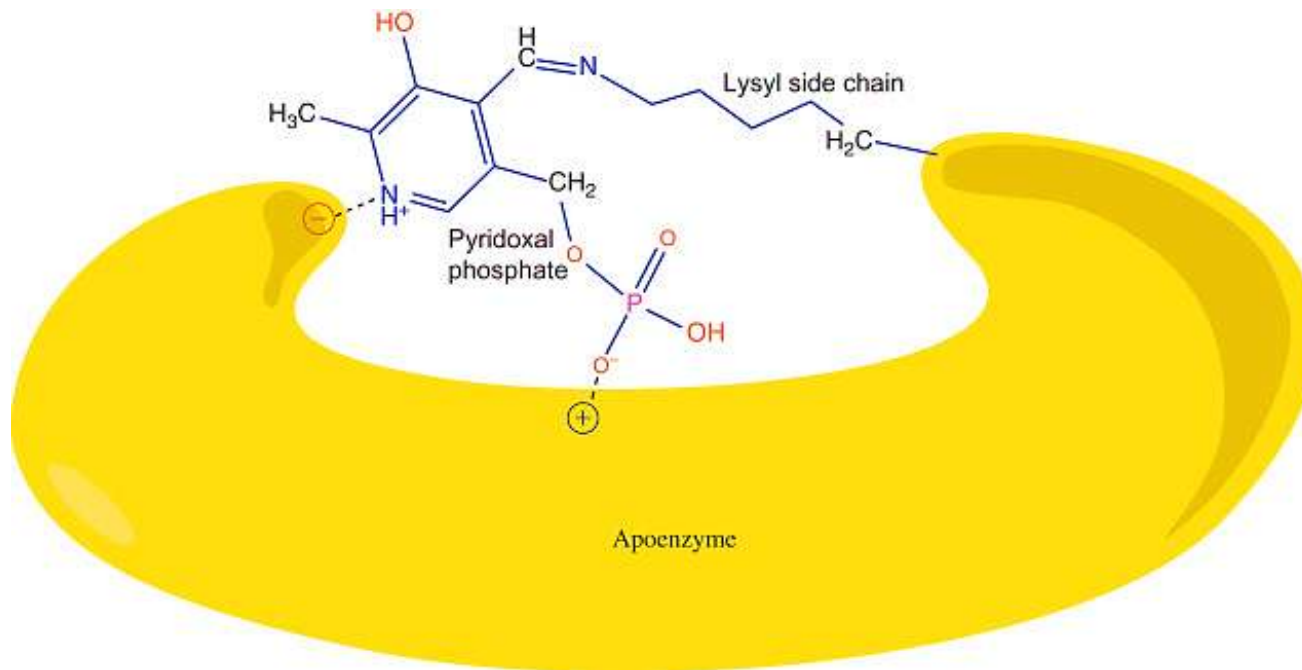
Amino and keto acid

- All naturally occurring amino acids undergo transamination.
- **Exceptions** include basic amino acids **lysine, hydroxyl amino acids, serine and threonine** and heterocyclic amino acids **proline and hydroxyl-proline**.
- Keto acids like **pyruvic acid, oxaloacetic acid and α -ketoglutaric acid** are commonly involved.
- Glyoxylate and glutamic γ semialdehyde may also act as amino-receptors in transamination.

E-PLP Complex

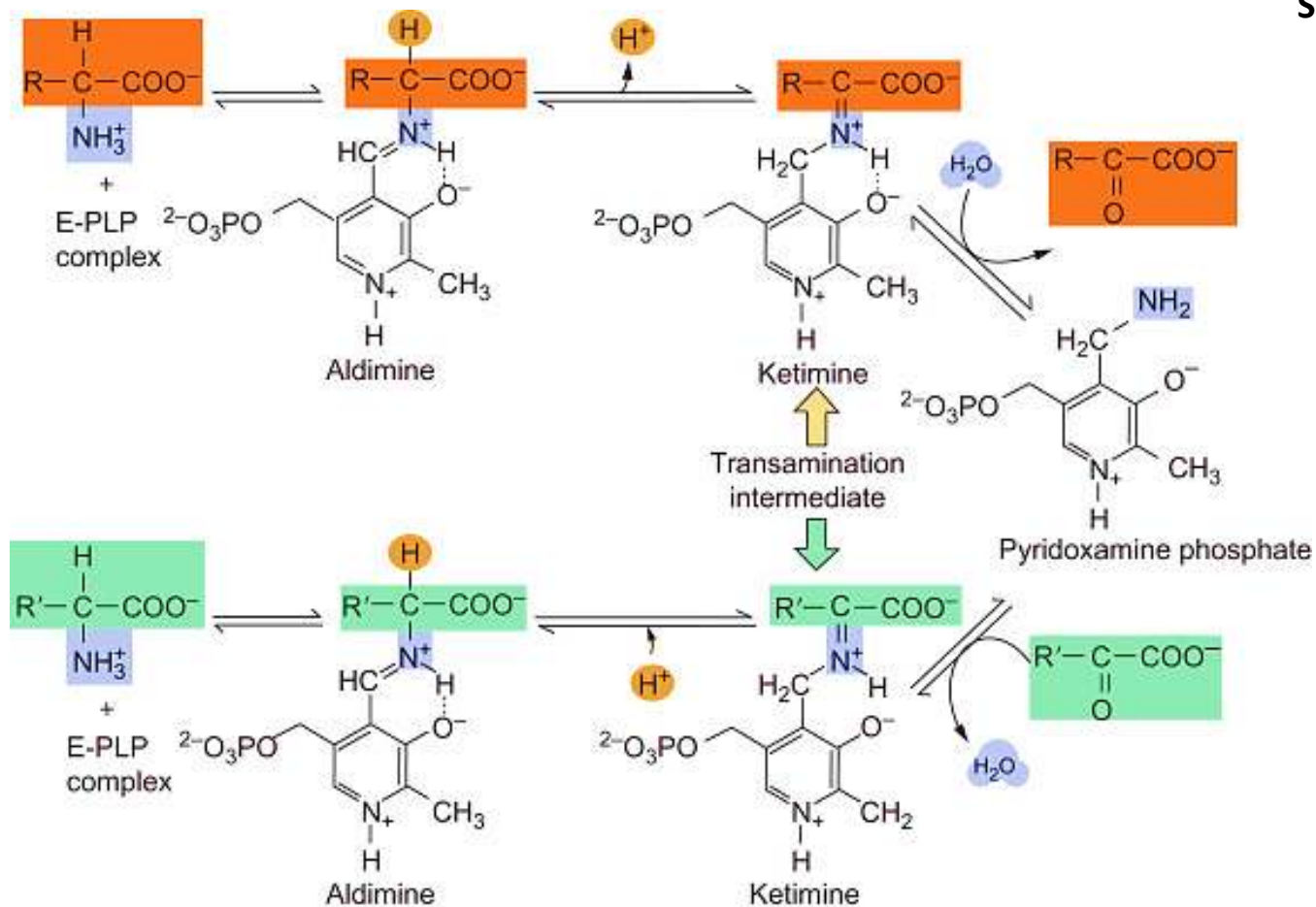
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All transaminase reactions have the same mechanism and use **pyridoxal phosphate (a derivative of vitamin B6)**. Pyridoxal phosphate is linked to the enzyme **by formation of a Schiff base between its aldehyde group and the ϵ -amino group of a specific lysyl residue at the active site** and held **noncovalently through its positively charged nitrogen atom and the negatively charged phosphate group**.



Mechanism

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Tautomers are **isomers of a compound which differ only in the position of the protons and electrons**. The carbon skeleton of the compound is unchanged. A reaction which involves simple proton transfer in an intramolecular fashion is called a **tautomerism**.

Double displacement type of bisubstrate reaction

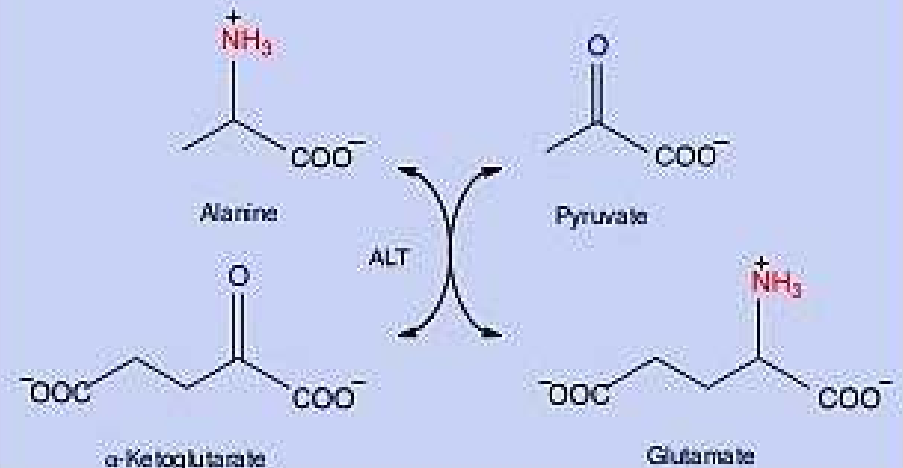
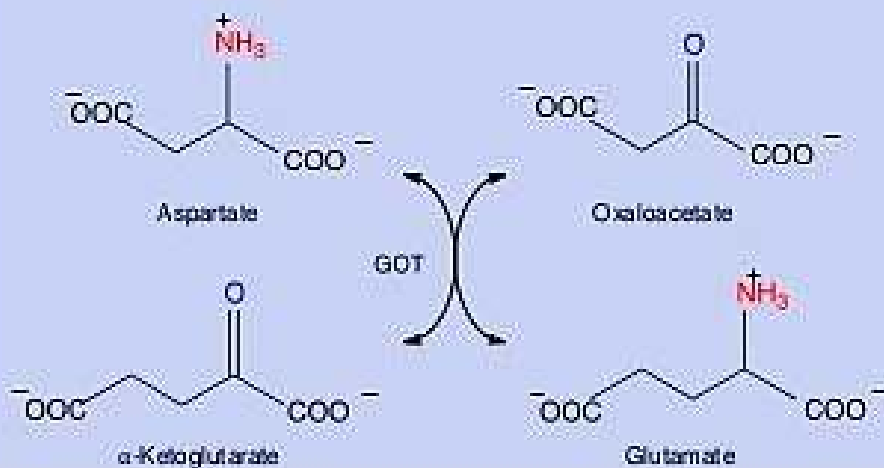
- Enzyme binds to its cofactor, pyridoxal phosphate and **enzyme-pyridoxal phosphate is formed.**
- The **participant amino acid (1) binds** with pyridoxal phosphate linked with enzyme . **Enzyme Schiff Base I formed and water goes out.**
- Next, enzyme Schiff Base I **tautomerizes from its aldimine form to the ketimine form or Enzyme-Schiff Base II**, which **reacts with water and dissociates into a new keto acid (1)** and enzyme pyridoxamine- phosphate.
- Then, the **original participant keto acid (2) combines with pyridoxamine phosphate linked with enzyme.**
- Enzyme **Schiff Base II' is formed and one molecule of water is goes out.**
- Next, **enzyme Schiff Base II' tautomerizes from its ketimine form to the aldimine form or Enzyme Schiff Base I'**, which reacts with water and **dissociates into a new amino acid (2) and enzyme pyridoxal phosphate.**

Examples of Transamination

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1. Interconversion of aspartate and α -ketoglutarate into oxaloacetate and glutamate by *serum glutamate-oxaloacetate-aminotransferase (GOT)* also called *aspartate aminotransferase (AST)* found in cytoplasm as well as mitochondria

2. Interconversion of alanine and α -ketoglutarate into pyruvate and glutamate by *serum glutamate-pyruvate aminotransferase (GPT)*, also called *alanine transaminase (ALT)* primarily found in liver



- Circulating levels of AST and ALT are key liver function test

Significances

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- Important method of nitrogen catabolism of amino acids.
- It helps in synthesis of new amino acids from keto acid.
- It produces pyruvic acid, oxaloacetic acid which are in turn used for gluconeogenesis.

❖ SGPT (Serum Glutamate Pyruvate Transaminase)



❖ SGOT (Serum Glutamate Oxaloacetate Transaminase)

