

4.1.3. Urea Cycle

Urea synthesis occurs in liver and is further carried to kidneys through blood. Kidneys are the excretory organ of the body. Urea cycle being the first metabolic pathway was discovered by **Hans Krebs** and **Kurt Henseleit** in **1932**. Urea cycle partly occurs in mitochondria and partly in cytoplasm. Urea is the final product of amino acid or protein metabolism.

The ammonia formed from the metabolism of amino acids is toxic to body. Thus, the ammonia is detoxified and converted to urea through the urea cycle.

In a urea molecule $\text{H}_2\text{N}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$, two amino groups are present, in which one nitrogen atom comes from ammonia and the other is transferred from amino acid aspartate. Synthesis of urea occurs by a five step cyclic process, involving five distinct enzymes. The mitochondria carry the first two enzymes and the remaining is present in cytosol.

Following steps are involved in urea cycle (**figure 4.7**):

Step 1: Synthesis of Carbamoyl Phosphate by

This cycle takes place by the following steps! →

- ① 1 molecule of NH_3 , 1 molecule of CO_2 combine to form carbamyl-phosphate. This reaction is catalysed by the carbamyl-phosphate synthetase enzyme. 2 ATP are used in this reaction.
- ② Carbamyl-phosphate reacts with ornithine to form citrulline.

- ③ Citrulline reacts with Aspartic acid to form Argino-succinic acid. This reaction is catalysed by Argino-succinic synthetase. 1 molecule of ATP is used in this process.
- ④ Argino-succinic acid converts into Arginine and fumaric acid in the presence of Argino succinate enzyme.
- ⑤ Arginine now breaks down into Ornithine and Urea in presence of Arginase enzyme. Ornithine again enters the cycle.

