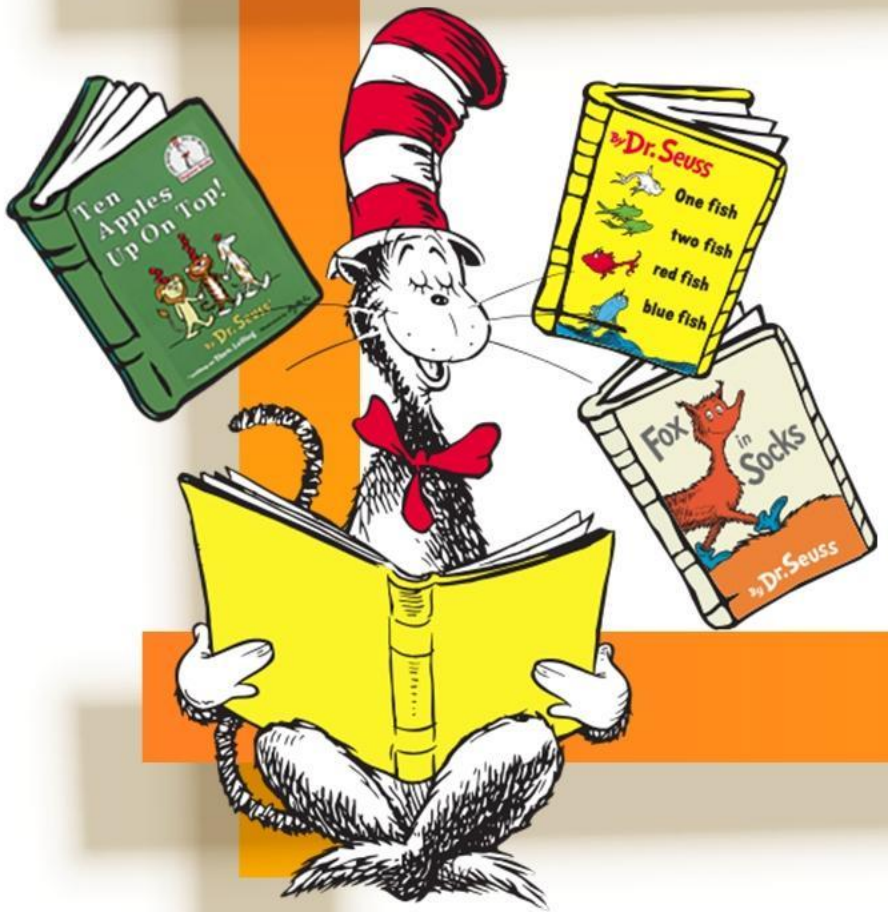


Protein metabolism

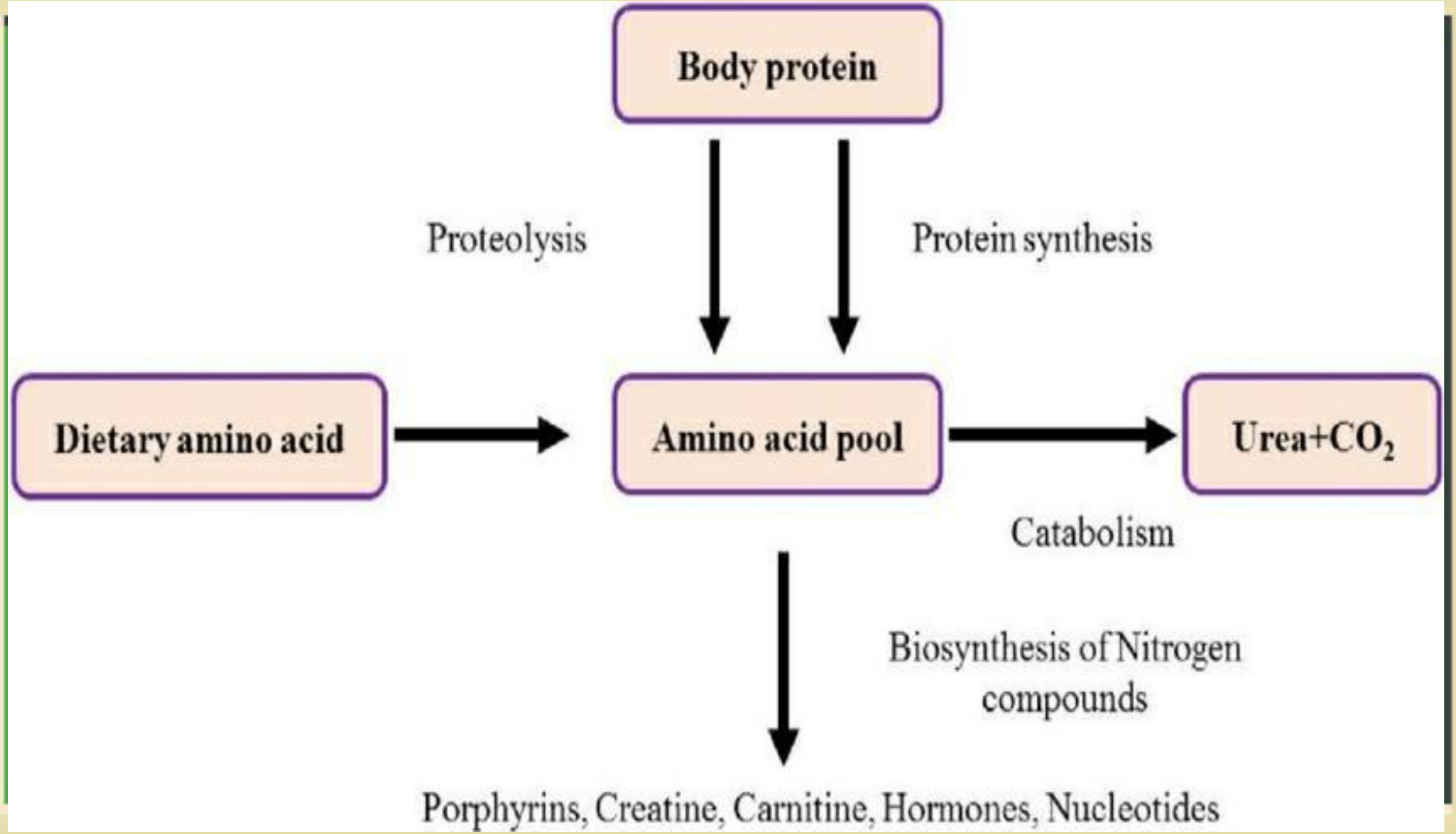
SYNOPSIS

1.INTRODUCTION
2.PROTEIN TURNOVER
3.AMMINO ACID POOL
4.METABOLISM OF AMMONIA
5.UTILIZATION OF AMMONIA
6.TRANSPORT OF AMMONIA
7.UREA CYCLE
8.REGULATION OF UREA CYCLE.

Introduction – protein metabolism Denotes the various biochemical Processes Responsible for the Synthesis of protein and amino acids the breakdown of proteins by catabolism.

Protein turnover

In cell biology, **protein turnover** refers to the replacement of older proteins as they are broken down within the cell. Different types of proteins have very different turnover rates


Body protein
Proteolysis
Protein synthesis
Dietary amino acid
Amino acid pool
Urea+CO_2
Catabolism
Biosynthesis of Nitrogen compounds
Porphyrins, Creatine, Carnitine, Hormones, Nucleotides

Amino acid pool

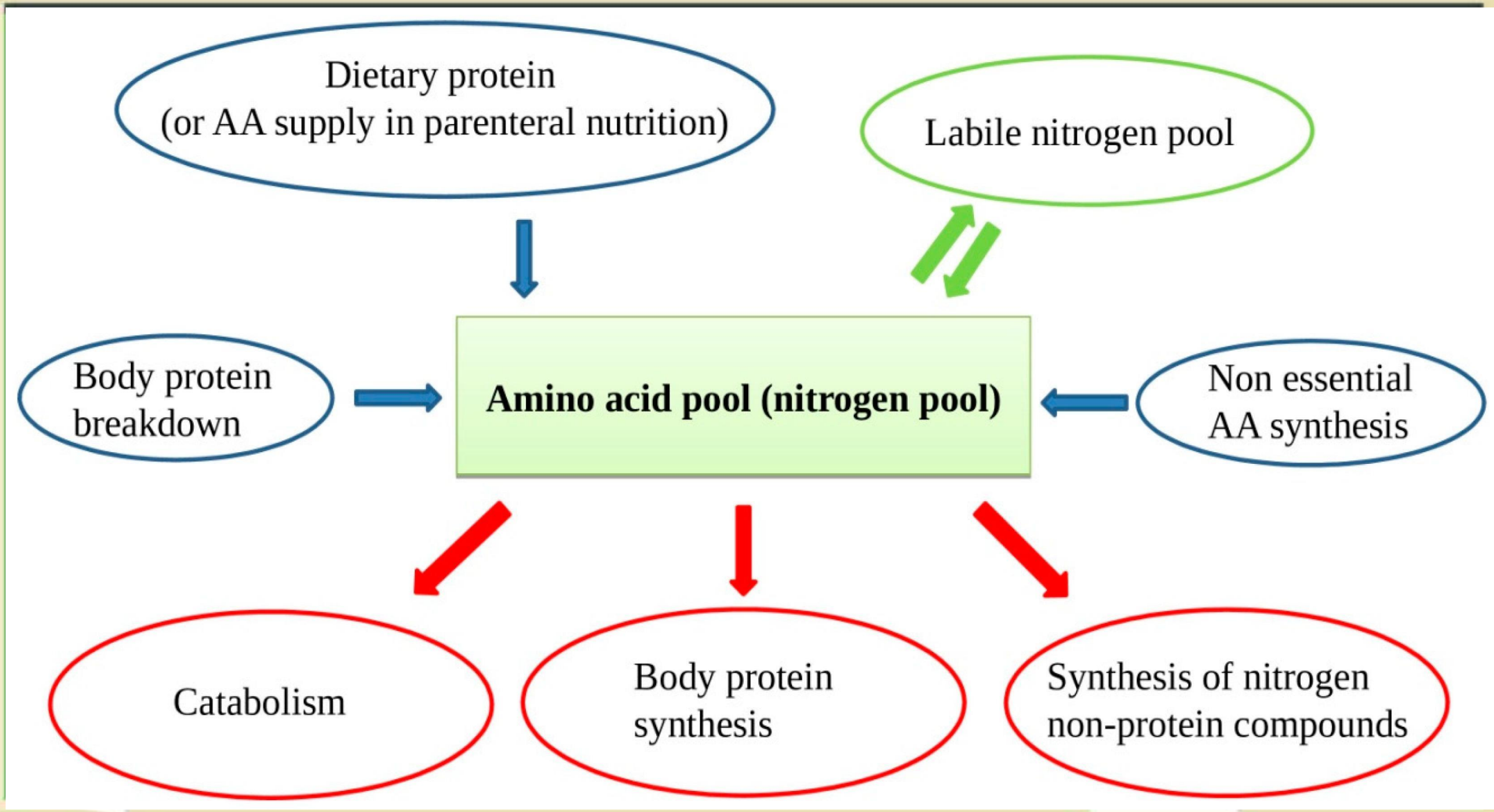
- Amino acid released by dietary and tissue protein
- Mix with free amino acids of body constitutes = 100 gm.
- Glutamate , glutamine – 50%
- Essential amino acids – 10
- Remaining Non – Essential amino acids

- Proteins rich in proline , Glutamate ,serine and Threonine are rapidly degrated and have short helf lives

Amino acid pool -: Amino acid released by

1. Dietary and
2. Tissue Protein .

- There is no storage form of amino acid like glycogen and Triglyceride .
- Excess intake of proteins (Amino acid) are metabolised then oxidised to provide energy or converted glucose or fat.
- Amino groups lost as Urea – Excreted.


Dietary protein
(or AA supply in parenteral nutrition)
Labile nitrogen pool
Body protein
breakdown
Amino acid pool (nitrogen pool)
Non essential
AA synthesis
Catabolism
Body protein
synthesis
Synthesis of nitrogen
non-protein compounds

Metabolism of Ammonia

- SOURCESOF AMMONIA

1. Amino acid synthesises protein ,
2. Protein degrated to amino acid,
3. From liver -: (a) Transamination
   (b) Oxidative deamination
4. From kidney -: Glutaminase reaction
5. From Intestine -: By bacterial Action
6. From Died -: Aminos

7. From Catabolism -: Purines (Adnine)
   Pyrimidine (Cytosine)
8. From - non Oxidative : Deamination : Aminoacids

UTILIZATION OF AMMONIA

- Glutamate + Ammonia. → Glutamine
- Glutamine synthetase : Liver Brain and Kidney
- Brain-: Major Mechanism for removal of Ammonia is Glutamate formation
- aKG + NH3+ NADPH + H+ → Glutamate+ NADP+
- Glutamate mey be considered as a major transport from of NH3 from tissue to liver .

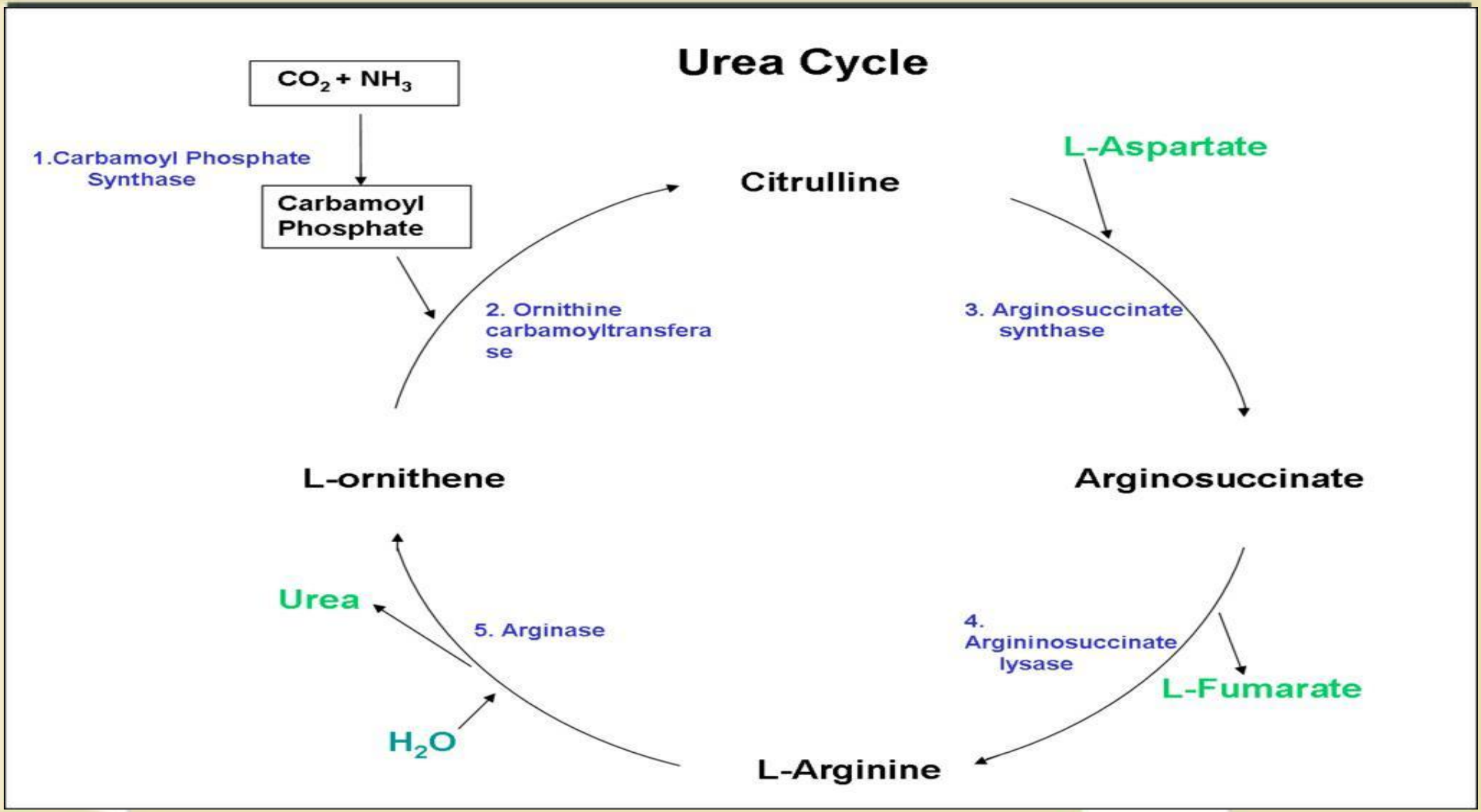
TRANSPORT OF AMMONIA

- Ammonia is constantly Produced in tissue
- Plasma Ammonia – 10-20 úg/dl
- Elevated levels couse symptoms of Ammonia Intoxication
- SYMPTOMS -: Tremor, Slurring of speech Blurring of vition → Coma and death.

UREA CYCLE

- Enzymes of urea cycle
- Regulation of urea cycle
- Energetics of urea cycle
- Clinical significance of blood urea
- Disorders of urea cycle

- Urea cycle is also called as krebs Henseleits or Omithine cycle.
- Site -: Liver.
- Urea synthesized in liver released into blood cleared by kidneys.
- Urea cycle delivered into five steps


Urea Cycle
$CO_2 + NH_3$
1.Carbamoyl Phosphate Synthase
Carbamoyl Phosphate
2. Ornithine carbamoyltransfera se
Citrulline
L-Aspartate
3. Arginosuccinate synthase
Arginosuccinate
4. Argininosuccinate lysase
L-Fumarate
L-Arginine
5. Arginase
Urea
H_2O
L-ornithene

Nitrogen atomes of urea are delivered from ammonia and alpha amino group of aspartic acid .

One mole of urea synthesis requires 4 mole of ATP

Step 1. Glutamate ,glutamine- 50%.

CO_2 + Ammonia + 2 ATP $\longrightarrow$ Carbomoyl Phosphate+2ADP+ppi

Carbomoyl phosphate synthase 1 (CPS-1)

It is mitocondria enzymes .

Allosteric Activater is N- Acetyl Glutamate .

Step 2. Formation of Citrulline.

- Carbomoyal Phosphate + Ornithine

↓ Ornithine Transcarbomoylase.

Citrulline+ pi

- Ornithine trans carbomoylase is also a mitocondria enzymes.

This step onwards the reactions occurred in cytoplasm.

- Step 3. Formation of Argininosuccinate.
- Citrulline + Aspartate+ ATP .

↓ Argininosuccinate Synthase

Argininosuccinate + AMP + ppi

Step 4. Formation of Arginine .

Argininosuccinate

↓ Argininosuccinase

. Arginine + Fumarate .

Step 5. Formation Of Urea

Arginine + H_2O ⟶ Ornithine + Urea .

Regulation Of Urea Cycle .

(A) Carbamoyl Phosphate Synthase – 1

Allosyeric activator – N – Acetylglutamate more Glutamate , more Acetylglutamate , more CPS-1 Activity, leads more Urea synthesis .

(B) During Starvation , urea cycle enzyme activities are increased to meet the demands of increased rate of protein Catabolism.


Thank You