

Musculoskeletal block

Creatine Metabolism

Lecture 2

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Color index:

Red= important

Purple = addition

Orange = Explanation

Objectives:

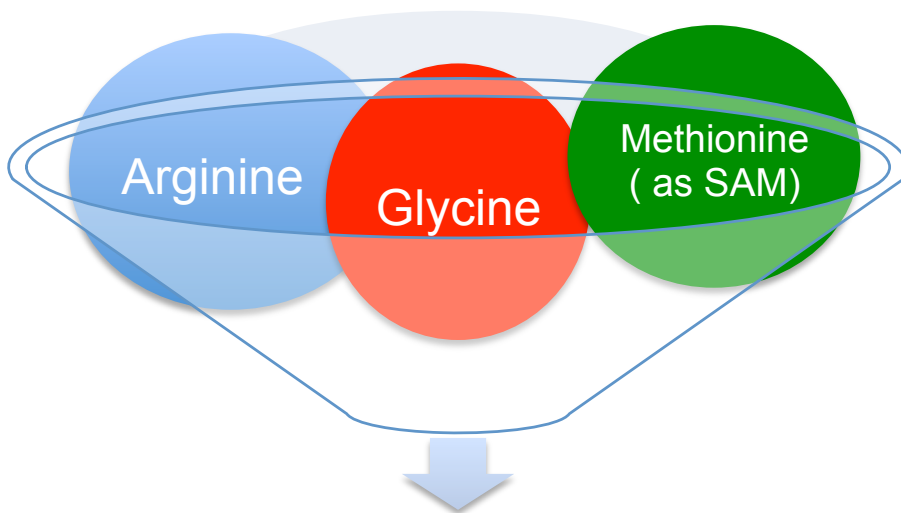
- To study the importance of creatine in muscle as a storage form of energy.
- To understand the biosynthesis of creatine.
- To study the process of creatine degradation and formation of creatinine as an end product.
- To understand the clinical importance of creatinine as a sensitive indicator of kidney function.
- To study different types of creatine kinase (CK) and their clinical importance.

Keywords:

- Creatine.
- Creatine phosphate.

Abbreviations

- SAM = S-Adenosylmethionine.
- SAH = S-Adenosylhomocysteine.



Amino Acids required for synthesis

Sites of biosynthesis → kidney → liver

If you are asked what is the site of synthesis the answer will be liver.

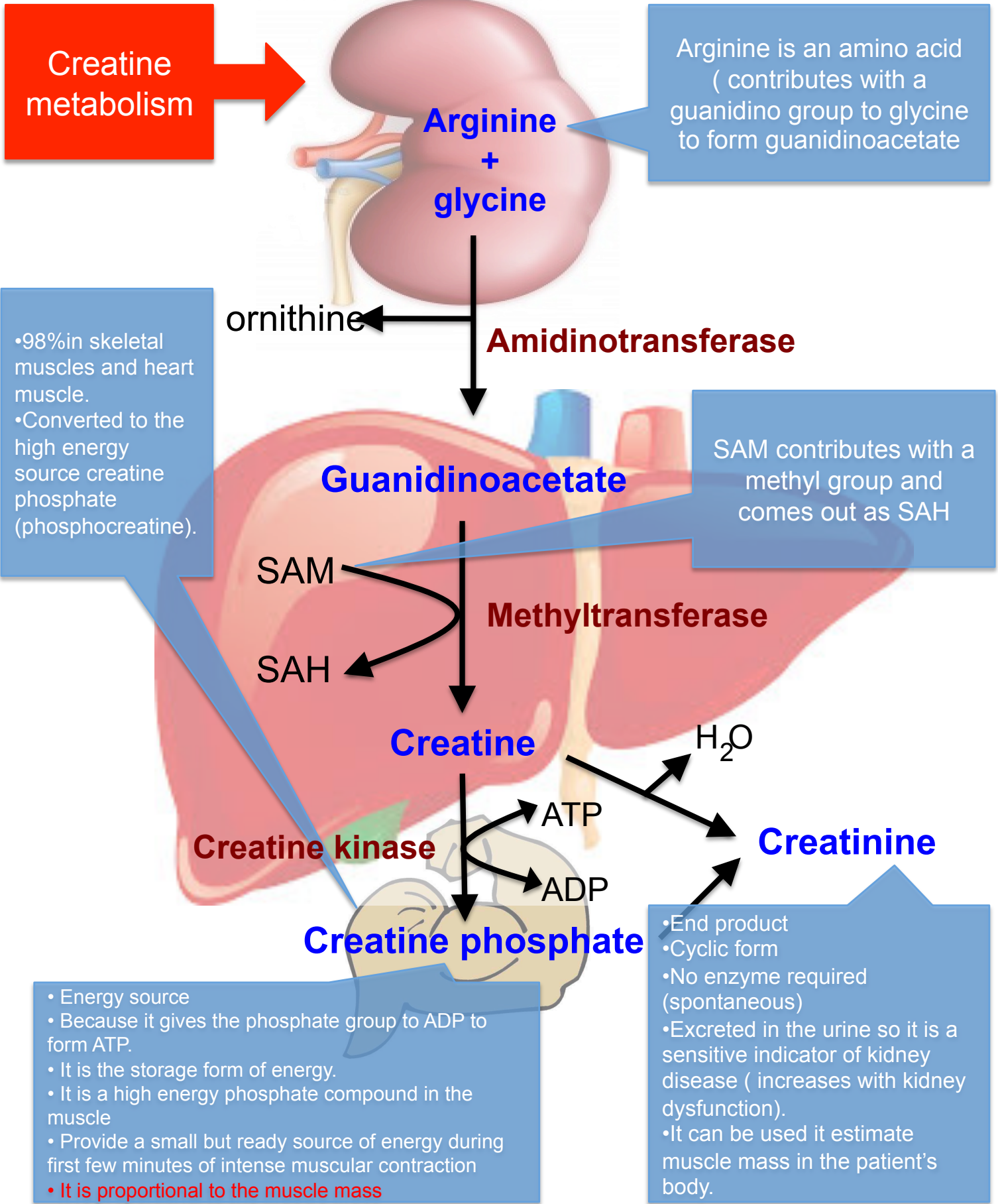
Distribution of creatine in the body

- From liver, transported to other tissues
- **98% are present in skeletal and heart muscles**
- In Muscle, gets converted to the high energy source **creatine phosphate (phosphocreatine)**

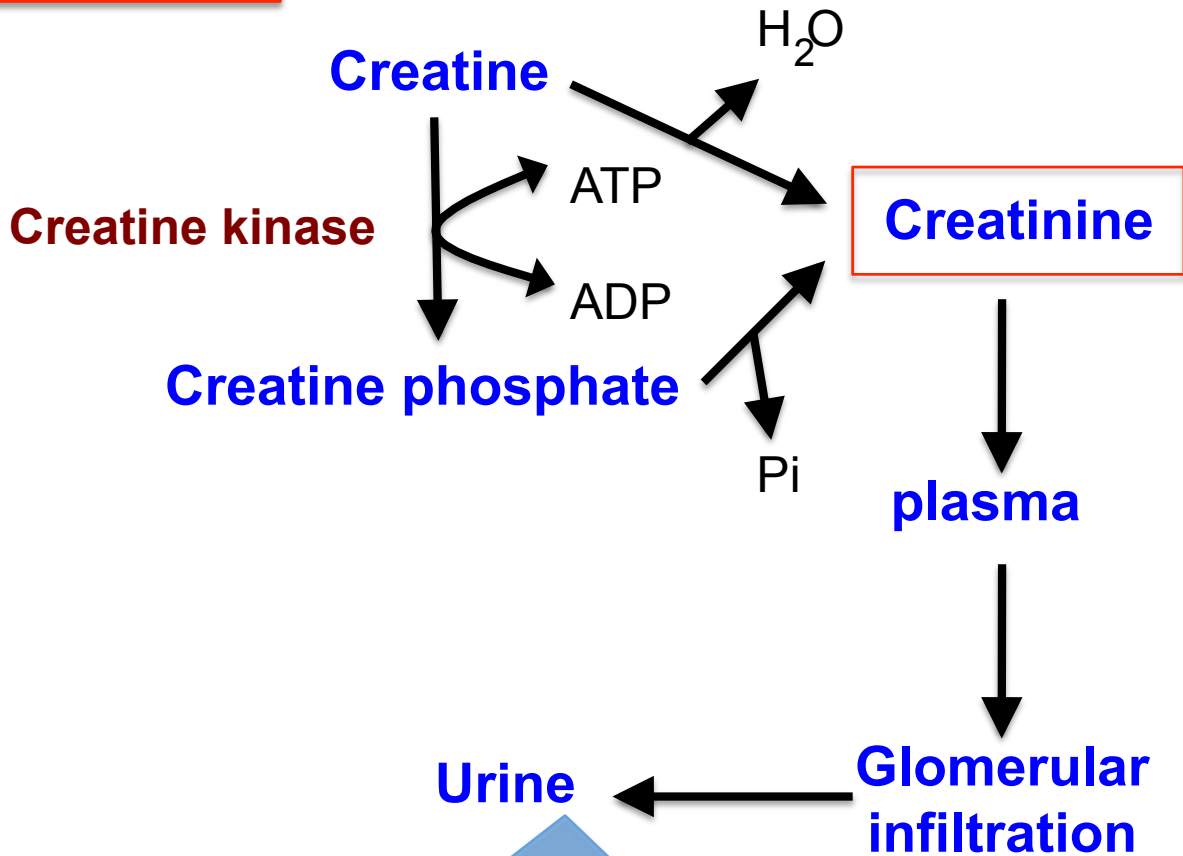
creatine phosphate

- Is a high-energy phosphate compound
- Acts as a storage form of energy in the muscle
- Provides a small but, ready source of energy during first few minutes of intense muscular contraction

Note : creatine and creatinine are not the same!



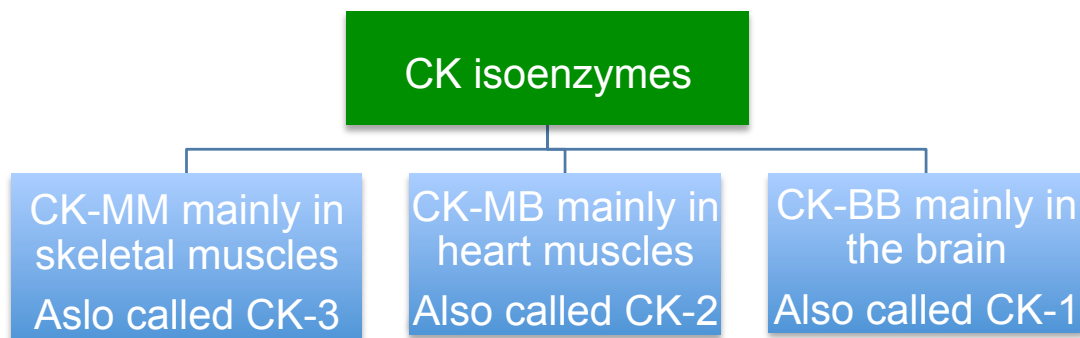
Creatine degradation



- A typical male excretes about 15mmol of creatinine per day
- A decrease in muscle mass due to muscular dystrophy or paralysis leads to decreased level of creatinine in urine
- The amount of creatinine in urine is used as an indicator for the proper collection of 24 hours urine sample (normal range is 15-25 mg/kg/d)

Creatine kinase

- CK is responsible for the generation of energy in contractile muscular tissues.
- CK levels are changed in disorders of cardiac and skeletal muscle.
- CK is required for conversion of creatine into creatine phosphate



↑ CK serum increases :

Crush injuries (Damage of skeletal muscles)

Myocardial infarction (Damage of heart muscle)

Creatine in
plasma

Normal creatinine level is 0.7 to 1.4 mg/dl.
Normal creatine level is 0.2 to 0.4 mg/dl.

Quiz yourself

1- What is the site of creatine synthesis:

- a) Stomach.
- b) Liver.
- c) Muscles.
- d) Brain.

2- Which of the following is the storage site of Creatine phosphate:

- a) Stomach.
- B) Liver.
- c) Muscles.
- D) Brain.

3- Creatinine is a sensitive indicator of:

- a) Liver diseases.
- b) Kidney diseases.
- c) Cardiac diseases.
- d) Diabetes mellitus.

4- creatinine is excreted in the:

- a) saliva.
- b) Faeces.
- c) sweat.
- d) urine.

5- which of the following amino acids contributes in the synthesis of creatine:

- a) Histidine.
- b) Serine.
- c) Glycine.
- d) Glutamine..

6- A 20 year old man had an accident with a shock and low BP, which of the following will be found in the patient's blood:

- a) Alkaline Phosphate.
- b) Creatine kinase.
- c) Glucose 6-phosphate
- d) Alanine aminotransferase.

7- Which of the following acts as a methyl donor in creatine synthesis:

- a) SAM.
- b) SAH.
- c) Arginine
- d) SAA.

8- CK-MM isoenzyme is mainly in the:

- a) Kidney.
- b) Heart muscles.
- c) Brain.
- d) Skeletal muscles.

ANSWERS:

- 1-B
- 2-C
- 3-B
- 4-D
- 5-C
- 6-B
- 7-A
- 8-D



GOOD LUCK!

From our team members :

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