

The Syllabus

MLB-G-DSE-B-6-2

Clinical Biochemistry (4 + 2 = 6 credits)

MLB-G-DSE-B-6-2-TH (4 credits/50 marks)

Unit 1 (20 hours)

Idea about the features of pathogenic and non-pathogenic microorganisms. General properties of synthetic and naturally occurring antimicrobial drugs: selective toxicity, and modes of action, of Penicillin, Chloramphenicol and Streptomycin. Antibiotic resistance.: mechanism of drug resistance, origin & transmission of drug resistance in microbes.

Unit 2 (20 hours)

Mechanism of Bacterial Pathogenicity: entry, colonization, pathogenicity, course of infectious disease, duration of symptoms

Mechanism of damage of host cell Exo-and endotoxins - definition and general properties.

General properties and importance of clinically important enzymes like SGOT, SGPT, Alkaline phosphatase and Creatine kinase, lactate dehydrogenase

Alkaline Phosphatase

Marker of **Liver** and **Bone**

Alkaline Phosphatase (ALP)

- ALP(Alkaline phosphotase)is a hydrolase enzyme responsible for removing phosphate groups from many types of molecule including neucleotides ,proteins and alkaloids.
- The process of removing the phosphate group is called dephosphorylation.

Sources of Alkaline Phosphatase (ALP)

- In humans, alkaline phosphatase is present in all tissues throughout the entire body, but is particularly concentrated in the
 - ✓ Liver
 - ✓ Bile Duct
 - ✓ Kidney
 - ✓ Bone
 - ✓ Intestinal Mucosa
 - ✓ Placenta

Normal Values of Alkaline Phosphatase (ALP) in Blood

- Normal value for 20-50 years of old man is 53-128 u/l.
- normal values for 20-50 years of old woman is 42-98 u/l.
- Normal values slightly different if you are older than 60 and is in range of 56-119 u/l for man and for woman it is in range of 53-141 u/l.
- children have high ALP level because of their growth phase.
- pregnant women typically have higher ALP values due to contributions from the placenta.

Clinical Significance of Alkaline Phosphatase (ALP)

- ALP test is used to detect Liver disease, Bone disorders, biliary obstruction and cancer.
 - In conditions affecting the liver(e.g, hepatitis) damaged liver cells releases increase amounts of ALP in to the blood.
 - ALP test is used to detect biliary obstruction(blocked bile duct)because ALP is especially high in the edges of cells that join to form bile ducts.If one or more of them are obstructed.
 - Any condition that affects bone growth or causes increased activity of bone cells can affect ALP levels in the blood.
 - Test may be used to detect cancers that have spread to
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Clinical Significance of Alkaline Phosphatase (ALP)

- Test may be used to diagnose Paget's disease that causes malformed bones.
- If ALP results are increased but it is not clear whether it is due to liver or bone disease then tests for ALP isoenzyme may also be done to determine the cause.
- A GGT test (gamma-glutamyl transferase) may also be done to differentiate between liver and bone diseases. GGT is high in liver but in bone disease.

Clinical Conditions where the levels of Alkaline Phosphatase is Elevated

- Biliary obstruction
- Bone conditions
- Osteoblastic bone tumors
- Osteomalacia
- Osteoporosis
- Hepatitis
- Cirrhosis
- Myelofibrosis
- Leukemoid reaction
- Lymphoma
- Paget's disease
- Sarcoidosis
- Hyperthyroidism
- Hyperparathyroidism
- Myocardial infarction
- Pregnancy

Normal range is 20-141u/l

Elevated levels can reach above 1000u/l

Clinical Conditions where the levels of Alkaline Phosphatase is Lowered

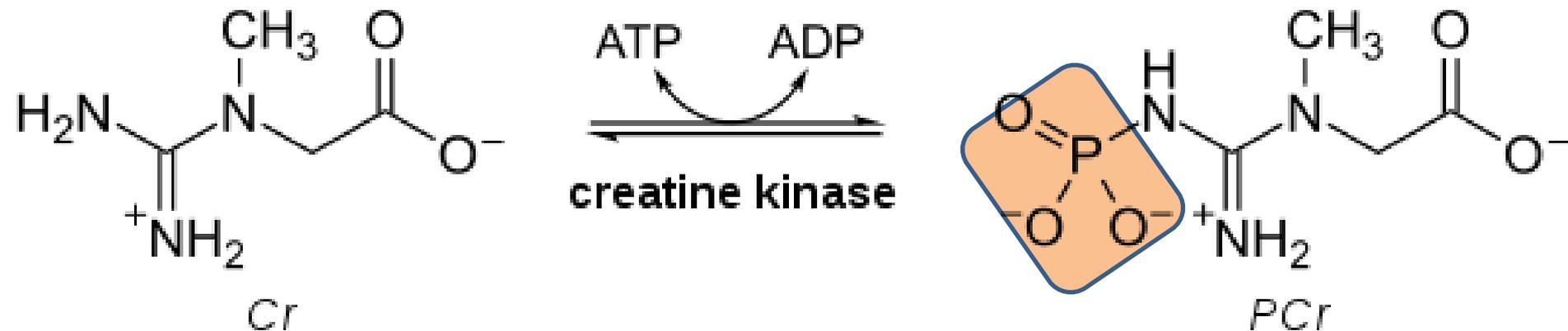
- Hypophosphatasia, an autosomal recessive disease
- Postmenopausal women receiving estrogen therapy because of aging
- Men with recent heart surgery, malnutrition, magnesium deficiency, hypothyroidism, or severe anemia
- Children with achondroplasia and cretinism
- Children after a severe episode of enteritis
- Pernicious anemia
- Aplastic anemia
- Chronic myelogenous leukemia
- Wilson's disease
- Hypothyroidism
- Pernicious anaem

Creatine Kinase

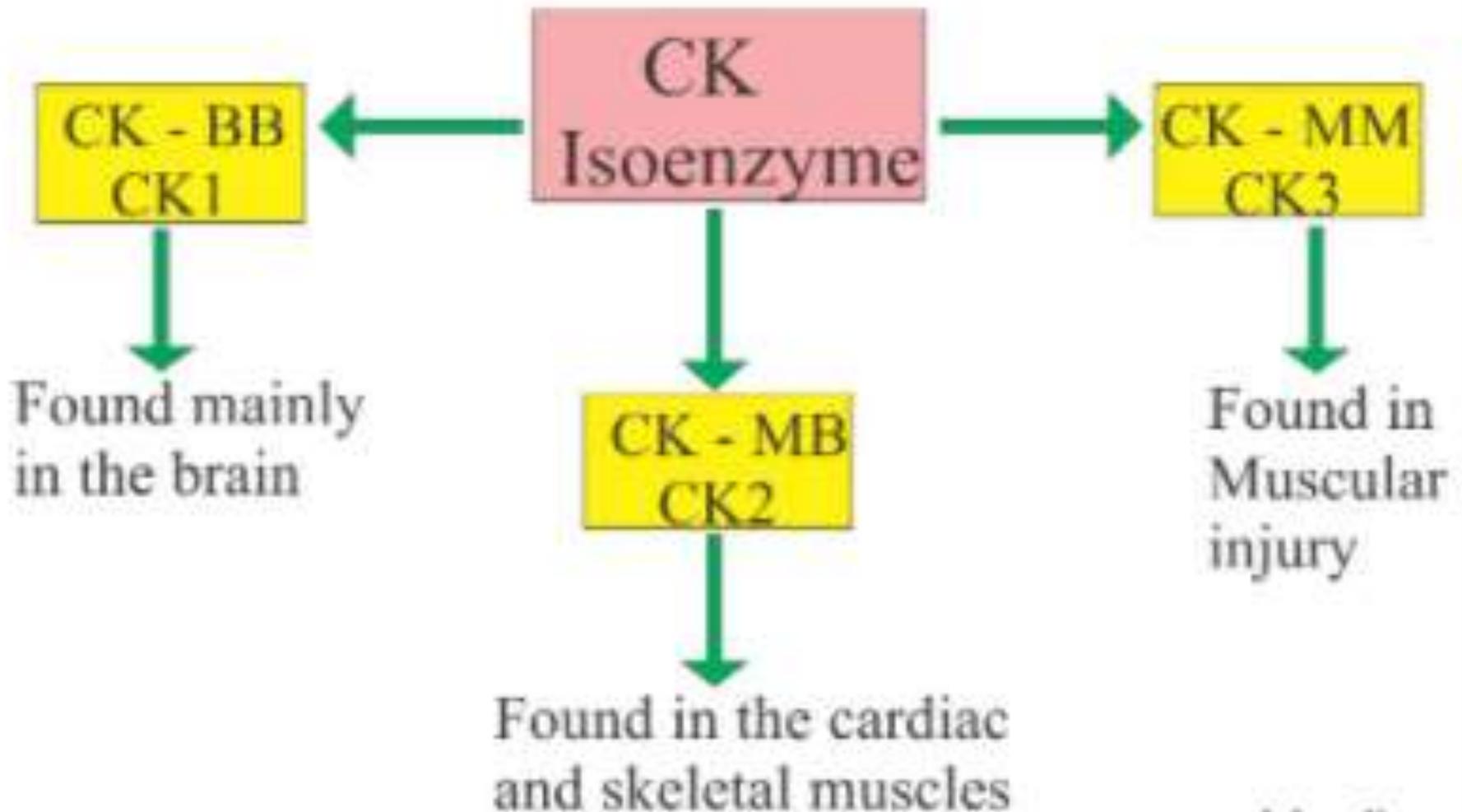
Marker of **Muscle Injury**....
Mainly **Myocardial Infarction**

Introduction:

- Enzyme catalysing Creatine and ATP to Phosphocreatine (PCr) and ADP
- Action – This enzyme is associated with the regeneration and storage of high energy phosphate (ATP).
- It catalyzes the following reversible reaction in the body.



Isoenzymes of Creatine Kinase (CK)



Isoenzymes of Creatine Kinase (CK)

| Isoenzyme name | Composition | Present in | Elevated in |
|----------------|-------------|-----------------------------|-----------------------------|
| CK-1 | BB | Brain | CNS diseases |
| CK-2 | MB | Myocardium / Heart | Acute myocardial infarction |
| CK-3 | MM | Skeletal muscle, Myocardium | |

The Normal Range of Creatine Kinase (CK)

55 to 170 units/L for men

30 to 135 units/L for women

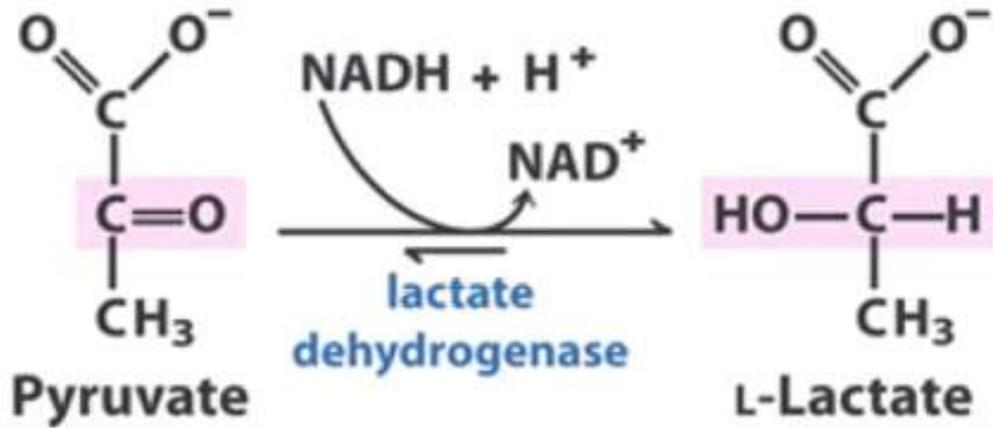
68 to 580 units/L for newborns

Conditions where level of Creatine Kinase (CK) is elevated

CK-MM generally rises in response to muscle damage in your heart, brain, or skeleton after a crush injury, seizures, muscular dystrophy, muscle inflammation, or another skeletal muscle disorder.

CK-MB generally rises in response to a heart attack, inflammation of the heart muscle, muscular dystrophy, and other problems related to the heart.

CK-BB tends to rise in response to a brain injury, meningitis, abnormal cell growth, severe shock, stroke, hypothermia, or restricted blood flow to the bowel.



Lactate Dehydrogenase

Marker of **Tissue Damage, Injury** and **Heart Failure**

Isoenzymes of Lactate Dehydrogenase(LDH)

- There are five isoenzymes of LDH.
- LDH-1 found in heart and in RBC as well as in brain.
- LDH-2 found in the reticuloendothelial system.
- LDH-3 found in the lungs.
- LDH-4 found in the kidneys,placenta and pancrease.
- LDH-5 found in the liver and striated muscle.

The Normal Range of LDH in Blood is 140 – 280 u/l

Clinical Significance of Lactate Dehydrogenase(LDH)

LDH may be used as a general indicator for the severity of acute and chronic tissue damage.

LDH may be used to detect and monitor progressive conditions such as anemia including hemolytic anemia, megaloblastic anemia and severe infections.

LDH determine prognosis or monitor treatment i.e chemotherapy of cancer such as germ cell tumors e.g testicular and ovarian cancer, lymphoma, leukemia and neuroblastoma.

Physiological site of Lactate Dehydrogenase(LDH)

- LDH is extensively found in body tissues such as blood cells, lungs, kidney, liver, muscles, tumor cells and heart muscles.

When is it Released in Blood ?

- LDH released during tissue damage, common marker of injuries and diseases such as heart failure.

Conditions in which Lactate Dehydrogenase(LDH) is elevated

- Blood flow deficiency
 - Hemolytic anemia
 - Infectious mononucleosis
 - liver disease
 - low blood pressure
 - Muscle injury
 - Muscle weakness,loss of muscle tissue(muscular dystrophy)
- Cancer
 - Pancreatitis
 - Stroke
 - Tissue death

Thank You