

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

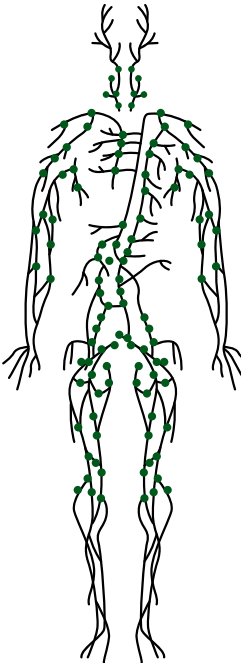


Biochemistry

MID | Past Papers

﴿وَقُلْ رَبِّ ادْخُلْنِي مَدْخَلَ صِدْقٍ وَأَخْرِجْنِي مَخْرَجَ صِدْقٍ وَاجْعَلْ لِي مِنْ لَدُنْكَ سُلْطَانًا نَصِيرًا﴾
ربنا آتانا من لَدُنْكَ رَحْمَةً وَهَيِّئْ لَنَا مِنْ أَمْرِنَا رَشَدًا

Lectures 4-5



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LEC 4

Take a deep breath

Q1: Fetuses have less 2,3-BPG than adults due to:

A. Their rapid glycolic pathway

B. PKM enzyme is less efficient

C. PKL enzyme is more activate

Q2: Which of the following is wrong regarding G6PD deficiency:

- a. More common in males than females
- b. It's a result of a point mutation
- c. It leads to hemolysis
- d. In Jordan, it is a common disease due to instability of the enzyme with normal activity

Q3: 2,3-BPG is different in fetuses due to a change in:

- a. His 146
- b. His 143 on beta chain or alpha chain
- c. His 143 on beta chain only

Q4: The reason why liver is not affected by deficiency of pyruvate kinase is:

- A) ATP and NADH are compensated by other metabolic pathways.
- B) The enzyme is not regulated.
- C) Reduced activity is compensated by increased expression.
- D) Reduced activity is compensated by alternative expression of pyruvate kinase M1.
- E) Reduced pyruvate level is compensated by increase uptake of pyruvate.

Q5: Which of the following doesn't happen in RBC?

A) PPP

B) Heme Synthesis

C) glycolysis

Answer: B

Q6: G6PD Mediterranean is characterized by:

- A) Reduced stability of the enzyme.
- B) Reduced expression, stability, and activity of the enzyme.
- C) Reduced activity of the enzyme.
- D) Reduced expression of the enzyme.
- E) Reduced stability and activity of the enzyme.

Q7: Which of the following regarding glutathione and G6PD deficiency is NOT CORRECT?

- A) Glutathione is a tri-peptide that consists of (gly-cys-glu)
- B) G6PD production of NADPH is required to maintain glutathione in a reduced state
- C) G6PD A variant (class III) is associated with 80% enzyme activity in reticulocyte cells
- D) In cells such as the liver, G6PD is not the only way for the production of NADPH
- E) G6PD deficiency is associated with non-sense and frameshift mutations

Q8: Mutation of distal histidine into tyrosine results in:

- A) Inability to bind to methemoglobin reductase.
- B) Inability to release oxygen.
- C) Oxidation of iron.
- D) Attraction of carbon monoxide.
- E) Stabilization of the R form of hemoglobin.

Q9: An amino acid substitution in one of chains of hemoglobin could lead to hemoglobinopathy (hemoglobin with abnormal function) for any of the following reasons EXCEPT:

- A) An increase in the 2,3-BPG binding affinity
- B) A change in the affinity of subunits contact
- C) A change in the solubility properties of reduced hemoglobin
- D) An increase in the hydrophilic property of heme-pocket
- E) An increase tendency of the heme iron to exist in the reduced state

Q10: Fetal pyruvate kinase influence in having hemoglobin with higher oxygen affinity is by:

- A) producing more ATP
- B) producing more 2,3-BPG
- C) producing less 2,3-BPG

Q11: Choose the correct statement:

- A) Pyruvate kinase has 2 isozymes and 2 isoforms.
- B) Pyruvate kinase is activated by phosphorylation.
- C) Fetal pyruvate kinase is PKM1.
- D) The difference between PKL and PKR is the transcription termination site.
- E) The difference between PKM1 and PKM2 is the alternative splicing.

Q12: G6PD deficiency class 2 (Mediterranean)
produce an enzyme with

- A) more activity
- B) less stability
- C) less activity
- D) B+C

Q13: Which of the following is wrong about G6PD deficiency?

- A) GSH is normally maintained in the reduced form by Glutathione reductase
- B) G6PD gene is located on the X chromosome
- C) G6PD deficiency is mainly caused by large deletions

Q14: A compensatory mechanism to allow adequate oxygen delivery to the tissue at the high altitudes with oxygen concentrations are low is which one of the following:

- A) An increase in 2,3-BPG synthesis by the red cell
- B) A decrease in 2,3-BPG synthesis by the red cell
- C) An increase in hemoglobin synthesis by the red cell
- D) A decrease in hemoglobin synthesis by the red cell
- E) Decreasing the blood pH

Q15: Four of the following statements describe a metabolic pathway in the erythrocytes. One statement does not describe this pathway, choose it.

- A) The rate-limiting step produces fructose 1,6-bisphosphate.
- B) The last step is regulated by alanine and Protein Kinase A.
- C) If an infection occurs whenever this pathway is defected, Heinz bodies would be seen in blood smears.
- D) If the last step's enzyme is defected, liver won't be affected.
- E) It produces coenzymes that are essential for preventing methemoglobinemia.

Q16: Which of the following is true?

- A) most cells, unlike RBCs, have another pathway to synthesize NADPH
- B) NADH is required for the activity of cytochrome b5 reductase
- C) G6PD deficient Mediterranean variant shows severe enzyme deficiency of young cells
- D) all of the above are true

Q17: Which of the following doesn't cause a hemoglobinopathy?

- A) increasing the tendency of iron to stay in the ferrous form
- B) decreasing numbers of hemoglobin
- C) changing hemoglobin structure

Q18: A patient with chronic moderate anemia with high 2,3-BPG and low ATP

pyruvate kinase deficiency

Q19: Wrong about G6PD deficiency

GSH is normally maintained in the reduced form by GSH-peroxidase

Q20: The reason why liver is not affected by deficiency of pyruvate kinase is:

Reduced activity is compensated by increased expression

“Among patients with rare genetic defects of glycolytic enzymes, the majority has a deficiency in PK. **(Note: Liver PK is encoded by the same gene as the RBC isozyme. However, liver cells show no effect because they can synthesize more PK and can also generate ATP by oxidative phosphorylation.)**” — Abali, E. E., & Cline, S. D. (2022). Lippincott Illustrated Reviews: Biochemistry (8th ed.). Wolters Kluwer.

To be safe, choose increased expression, as it is the primary reason

Q21: Choose the correct statement:

The difference between PKM1 and PKM2 is the alternative splicing

Q22: Mutation of distal histidine into tyrosine results in:

Oxidation of iron.

Q23: Which of the following is wrong about G6PD deficiency?

G6PD deficiency is mainly caused by large deletions

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LEC 5

Almost there

Q1: True about iron regulatory elements

- A) It stabilizes mRNA transcripts on the 3' UTR & occupied by iron regulatory proteins
- B) It degrades mRNA transcripts on the 5' UTR & occupied by iron regulatory protein.
- C) They are bound to iron bound iron regulatory proteins

Q2: What is responsible for iron transport into enterocytes:

- A) Ferroportin
- B) DMT1
- C) Transferrin
- D) Ferrireductase
- E) Ferroxidase

Q3: Which of the following is true about hepcidin

- A) Decreases iron absorption into intestines
- B) Decreases number of iron transporters
- C) Released in state of high iron load
- D) Decrease iron release from all cells
- E) all are true

Q4: We need Vitamin C for iron absorption in order to:

- A. Release iron from heme by heme oxygenase
- B. Open the ferroportin channel to efflux iron
- C. Activate the divalent metal transporter
- D. Transfer ferric into ferrous by ferric reductase

Q5: All the following increase the Hepcidin except:

- A. Over-expression of hemojuvelin.
- B. Stimulation of transferrin receptor
- C. Increased erythropoietin
- D. Increased release of bone morphogenetic protein

Q6: Which of the following regarding iron absorption is NOT TRUE:

- A) The daily iron intake is usually equal to daily iron requirement.
- B) Women have less stored iron than men.
- C) More than 65% of iron is present in hemoglobin.
- D) Iron absorption is mainly in the upper part of the jejunum.
- E) There is more iron absorption from meat and meat products than from vegetables.

Q7: Heme oxygenase's function is:

- A) Converting ferric to ferrous.
- B) Absorption of iron.
- C) Carries iron in blood.
- D) Release iron out of heme.
- E) Oxidation of iron molecules.

Q8: The following does not cause an increase in expression of hepcidin:

- A) Stimulation of transferrin receptor 2.
- B) Increased release of erythroferrone.
- C) Overexpression of hemojuvelin.
- D) Increased release of inflammatory cytokines.
- E) Increased release of bone morphogenetic protein 6.

Q9: One of the following about iron metabolism in the body is NOT true:

- A) Iron is important for the formation of not only hemoglobin but also other essential proteins in the body.
- B) The total iron quantity in the body averages 4–5 g.
- C) There is heme iron and non-heme iron, non-heme iron is absorbed more efficiently than heme iron.
- D) The amount of iron absorbed is normally about 3–6% of the ingested amount.
- E) The average daily iron intake is about 20–30 mg.

Q10: Which of the following is a way of iron regulation in our body:

ANSWER: TFR2 binds HFE and sends intracellular signal

Q11: True about ferroportin:

ANSWER: It's found in different tissues

Q12: True about transferrin:

ANSWER: It binds with ferric iron

**Good
Luck**

**Wishing you all
the best.**

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Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			