FAVISM

Presented By

Shuzan Ali Mohammed Ali

Medical Biochemistry & Molecular Biology

Faculty of Medicine – Benha University

2023

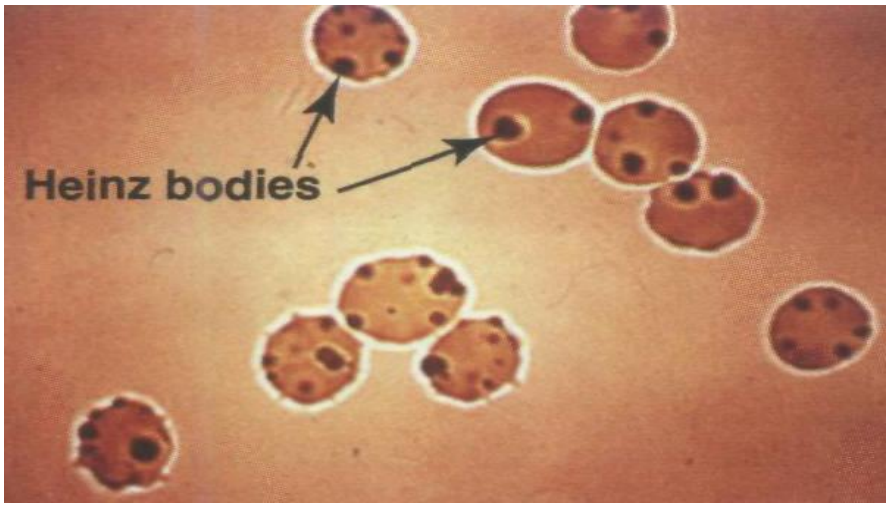
Favism

Definition:

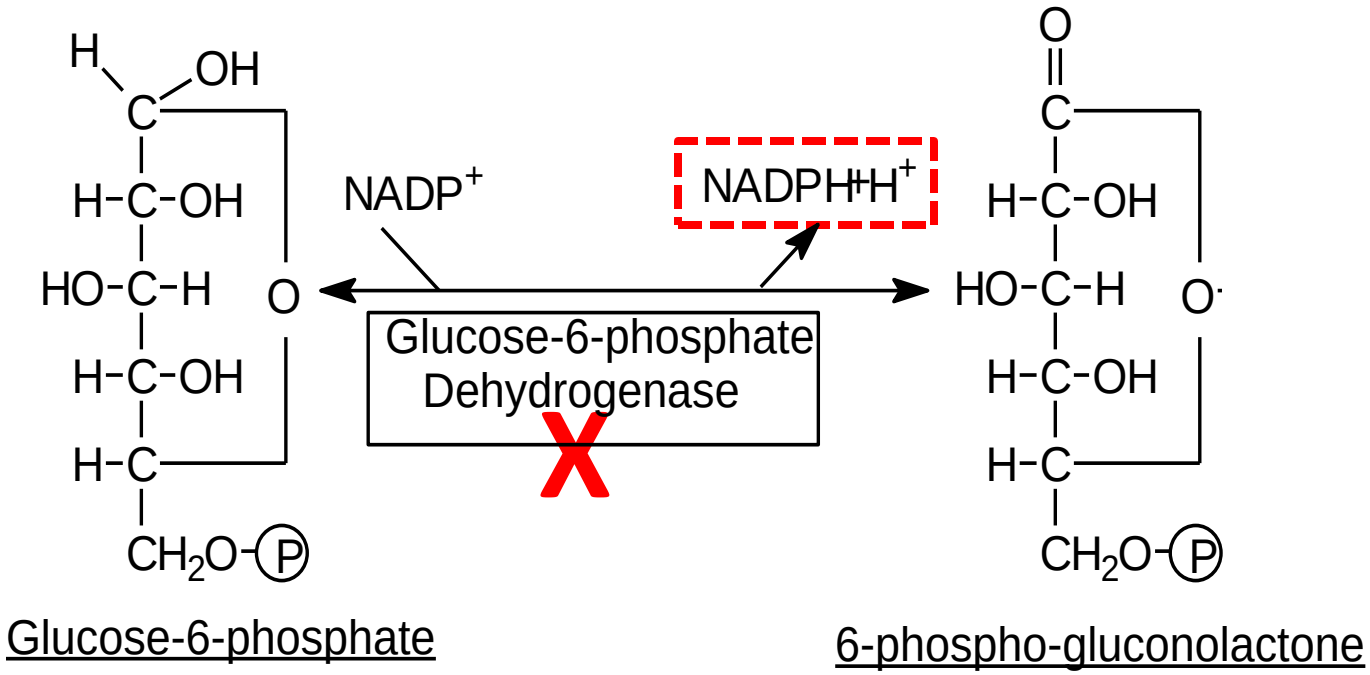
- Favism is a genetically inherited disease (x-linked recessive) with increased fragility of RBCs and hemolysis occurs after intake of some drugs (**aspirin, sulfa and antimalarial drugs**) or intake of **fava beans**.

Cause: Deficiency of **G-6-P dehydrogenase (G-6-PD)** enzyme

- G6PD deficiency is the most common disease-producing enzyme abnormality in humans.



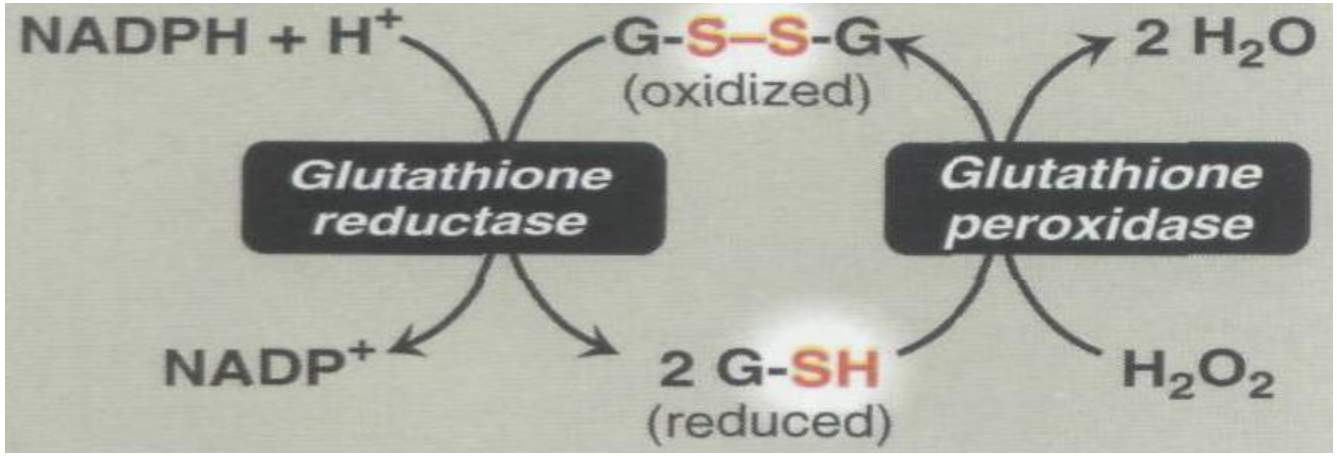
Favism



G6PD is the enzyme of the rate-limiting first step of the pentose phosphate pathway.

Mechanism of favism:

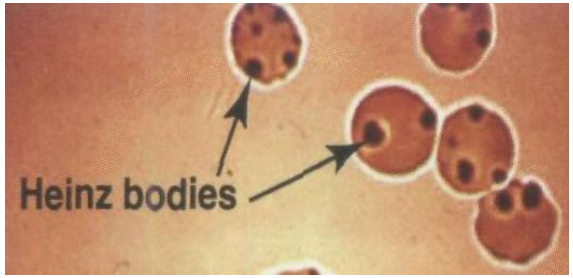
- H_2O_2 is **powerful oxidant** that damage cellular DNA, proteins & phospholipids
- H_2O_2 is normally detoxified to H_2O by **glutathione peroxidase** which needs reduced glutathione **(G-SH).** Oxidized glutathione **(G-S-S-G)** develops from the reaction.
- **G-SH** is regenerated from **G-S-S-G** by **Glutathione reductase** which needs **NADPH + H^+**.



Mechanism of favism:

- **In favism, fava beans (contain powerful oxidizing agents) & oxidizing drugs increase H_2O_2 formation which can't be detoxified to H_2O due ↓ NADPH + H^+ production (G6PD deficiency)**
- ↓ NADPH+H^+ leads to hemolytic anemia due to:

1. Cross linking of hemoglobin molecules with formation of **Heinz bodies**



2. **↓ synthesis of fatty acids & cholesterol** in the **cell membrane of RBCs** so ↑fragility hence hemolysis of RBCs (→ jaundice & dark urine).

- **Treatment**: Avoid fava beans and oxidizing drugs.

  Blood transfusion after hemolytic crisis.

Case presentation on favism

Case (1):

A 21 years old **male** received **primaquine** for treatment of **malaria**. Two days later, he complaint of **dark-colored urine** & **yellowish discoloration of sclera**. Investigations showed **low RBCs count, elevated reticulocyte count** & **Heinz bodies** inside RBCs.

1. **What is the possible diagnosis? Favism (G6PD Deficiency)**

2. **What is the name of the defective pathway in this case?**
Pentose phosphate pathway (hexose monophosphate pathway)

3. **What is the mechanism of hemolytic anemia in this patient?**

Antimalaria drugs (primaquine) are oxidizing drugs so ↑ H_2O_2 formation which can't be detoxified to H_2O due ↓ $NADPH+H^+$ production **(G6PD deficiency)** → **cross linking of hemoglobin** molecules & **↓ synthesis of fatty acids & cholesterol** in **RBCs membrane → hemolysis.**

Case presentation on favism

Case (2):

A 6 year old **boy** presented to the Emergency Department with severe pallor. His mother gave history of **ingestion of fava beans** 2 days ago. She also said that a similar condition which necessitated blood transfusion happened to her son before. On examination, **severe anemia & jaundice** were noticed. Lab investigations showed **hemolytic anemia & indirect hyperbilirubinemia & Heinz bodies** inside RBCs.

1. **What is the possible diagnosis? Favism (G6PD Deficiency)**
2. **What is the name of the defective enzyme?**
   Glucose -6-phosphate dehydrogenase (G-6-PD)
3. **What biochemical tests confirm this defective enzyme?**
   a) **Detection of G6PD deficiency by enzyme assay**
   b) **Detection of G6PD gene mutation by molecular analysis**

1. In favism, which of the following does not occur:
   a) Decreased synthesis of Heinz bodies in RBCs
   b) Decreased synthesis of cholesterol in RBCs membrane
   c) Decreased synthesis of fatty acids in RBCs membrane
   d) Decreased NADPH+H^+ synthesized by HMP pathway

2. Favism is inherited as:
   a) X-linked recessive
   b) X-linked dominant
   c) Autosomal recessive
   d) Autosomal dominant

MCQs

3. These are triggering agents for hemolytic crisis in favism, Except:
   a) Sulfa drugs
   b) Glucose infusion
   c) Antimalarial drugs
   d) Fava beans

4. An enzyme that forms H_2O from H_2O_2 is:

a) Glutathione synthase

b) Glucose oxidase

c) Glutathione peroxidase

d) Glycogen synthase

MCQs

5. G6PD is the enzyme of the rate-limiting first step of:

a) Krebs' cycle

b) Gluconeogenesis

c) Fatty acid synthesis

d) Pentose phosphate pathway

6. Favism is characterized by the following, **Except**:

a) It is due to glucose 6 dehydrogenase deficiency

b) It is due to glucose 6 phosphatase deficiency

c) RBCs show Heinz bodies

d) It is a recessive disease

Good luck