Glucose 6-phosphate dehydrogenase deficiency

GENERAL INFORMATION

Description:

Glucose-6-phosphatase dehydrogenase deficiency is the most common disease-producing enzymopathy in humans. The disease is highly polymorphic. Many variant alleles have been described and their clinical manifestations depend on the variant; the most frequent are the Mediterranean variants (severe form), the African variants (moderate form), the Mahidol (moderate form) and Canton (severe form) variants in South East Asia. Rare and more severe forms of G6PD deficiency exist in association with chronic non-spherocytic hemolytic anaemia.

Alternative names:

- G-6-PD deficiency; Hemolytic anemia due to G6PD deficiency; Favism

Classification:

- Defects of phagocyte function

Inheritance:

X-linked

OMIM:

- +305900 Glucose-6-phosphate dehydrogenase; G6PD anemia, nonspherocytic hemolytic, due to G6PD deficiency, included

Cross references:

Phenotype related immunodeficiencies:

- IDR factfile for X-CGD
- IDR factfile for p22phox deficiency
- IDR factfile for p47phox deficiency
- IDR factfile for p67phox deficiency

Incidence:

Incidence is not known.

CLINICAL INFORMATION

Description:

The presentation is similar to that of CGD, when less than 5% enzyme activity is present. Most patients are asymptomatic. Some patients present with or report a history of neonatal jaundice, often requiring exchange transfusion. A history of infection or drug-induced hemolysis is also common. Gallstones may be a prominent feature. Splenomegaly may be present. The red blood cells of individuals with defective or inactive glucose dehidrogenase tend to undergo hemolysis (the loss of hemoglobin through the damaged membrane) causing anemia. Haemolytic anemia can be triggered by certain foods (fava beans) and drugs (sulphones such as dapsone, primaquines, salicylates). NBT test is diagnostic and the enzyme activity can be measured. Deficiency of glucose-6-phosphatase dehydrogenase is associated with hemolytic anemia in two different situations. First, in areas in which malaria has been endemic, glucose-6-phosphatase dehydrogenase deficiency alleles have reached high frequencies (1% to 50%) and deficient individuals, though essentially asymptomatic in the steady state, have a high risk of acute hemolytic attacks. Sporadic cases of glucose 6-phosphate dehydrogenase deficiency occur at a very low frequencies, and they usually present a more severe phenotype, namely chronic nonspherocytic hemolytic anemia (CNSHA).

Diagnosis:

Diagnostic laboratories:

Clinical:

- Glucose-6-phosphate-dehydrogenase deficiency, ORPHANET
- Glucose-6-phosphate dehydrogenase deficiency, eMedicine

Genetic:

- GeneTest
- France, EDDNAL
- Italy, EDDNAL
- Portugal, EDDNAL
- United Kingdom, EDDNAL

Therapeutic options:

- Avoid precipitating causes of haemolysis: oxidative drugs and fava beans; a list of oxidative drugs should be delivered to the affected patient. Neonatal jaundice (NNJ) requires phototherapy. Transfusion is necessary in severe anaemic episodes.
- Glucose-6-phosphate dehydrogenase deficiency, eMedicine

Research programs, clinical trials:

- European Initiative for Primary Immunodeficiencies.
- A Test to Predict the Hemolytic Potential of Drugs in G6PD Deficiency, Clinical.Trials.gov

GENE INFORMATION

Names:

HUGO name: G6PD
Alias(es): G6PD1, Glucose-6-phosphate dehydrogenase, Glucose-6-phosphate 1-dehydrogenase

Localization:

Reference sequences:

DNA: AF277315 (NCBI) L44140 (EMBL) X55448 (EMBL) M23423 (EMBL) X53815 (EMBL) , **cDNA:** BC000337 (NCBI) , **Protein:** (SWISSPROT) Other Sequences

Chromosomal Location:

Xq28

Maps:

G6PD (Map View)

Other gene-based resources:

Ensembl: ENSG00000160211, GENATLAS: G6PD, GeneCard: G6PD, UniGene: 461047, Entrez Gene: 2539, euGenes: 2539, GDB: 120621

PROTEIN INFORMATION

Description:

Protein function:

Produces pentose sugars for nucleic acid synthesis and main producer of NADPH reducing power.

Catalytic activity:

D-glucose 6-phosphate + NADPH(+) = d-glucono-1,5-lactone 6-phosphate + NADPH.

Subunit:

Homodimer or homotetramer.

Protein function:

2 isoforms; a long form and short form; are produced by alternative splicing. The isoforms are found in different tissues.

Pathway:

Pentose phosphate pathway.

Other features:

Other related resourses:

InterPro: IPR001282; G6PD, Pfam: PF00479; G6PD, Pfam: PF02781; G6PD_C, ProDom: PD001129; G6PD, PROSITE: PS00069; G6P_DEHYDROGENASE

Expression pattern for human:

Tissue	Exp. (%)	Clones
eye, cornea	11.72	1:451
leukopheresis	8.12	7:4557
whole blood	6.48	3:2445
lung, cell line	6.03	1:876
blood, white cells	5.81	1:910
B cells from burkitt lymphoma	4.93	2:2143
T cells from T cell leukemia	4.41	2:2397
esophagus	3.58	2:2949
blood	3.34	8:12646
leukocyte	2.94	5:8982

OTHER RESOURCES

Societies:

General:

- International Patient Organization for Primary Immunodeficiencies
- Immune Deficiency Foundation
- European Society for Immunodeficiencies
- NIH/National Institute of Allergy and Infectious Diseases

Disease specific:

- G6PD Deficiency, favism association