Glucose-6-Phosphate Dehydrogenase (G6PD) Deficiency: **G6PD Gene Deletion/Duplication**

### Condition Description

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is the most common human enzyme deficiency; an estimated 400 million people worldwide are affected [1]. G6PD deficiency is an X-linked condition that causes destruction of red blood cells. G6PD is in the hexose monophosphate pathway, the only NADPH-generation process in mature red blood cells, which lack the citric acid cycle. Deficiency of G6PD, in various forms, is the basis of favism, primaquine sensitivity and some other drug-sensitive hemolytic anemias, anemia and jaundice in the newborn, and chronic hemolytic anemia. Symptoms of a hemolytic crisis can include dark urine, an enlarged spleen, fatigue, paleness, shortness of breath, rapid heart rate, and jaundice. Severe hemolytic crisis can produce hemoglobinuria. Laboratory tests may reveal an elevated absolute reticulocyte count, elevated bilirubin levels, elevated serum LDH, low red blood cell count, and low hemoglobin levels. Transfusions may occasionally be needed. Spontaneous recovery from hemolytic crises is the usual outcome, although kidney failure or death may occur following a severe hemolytic event.

Different variants of the enzyme are found in high frequency in African, Mediterranean, and Asiatic populations [2]. Heterozygote advantage from malaria has been proposed to account for the high frequency of the particular alleles in particular populations [3]. The G6PD (Xq28) variants have been divided into 5 classes according to the level of enzyme activity. These are: class 1—enzyme deficiency with chronic hemolytic anemia; class 2—severe enzyme deficiency (less than 10%); class 3—moderate to mild enzyme deficiency (10-60%); class 4—very mild or no enzyme deficiency (60%); class 5—increased enzyme activity.

### References:


### Genes

**G6PD**

### Indications

This test is indicated for:

- Confirmation of a clinical diagnosis of G6PD deficiency in individuals who have tested negative for sequence analysis
- Carrier testing in adults with a family history of G6PD deficiency who have tested negative for sequence analysis

### Methodology

DNA isolated from peripheral blood is hybridized to a CGH array to detect deletions and duplications. The targeted CGH array has overlapping probes which cover the entire genomic region. Please note that a "backbone" of probes across the entire genome are included on the array for analytical and quality control purposes. Rarely, off-target copy number variants causative of disease may be identified that may or may not be related to the patient's phenotype. Only known pathogenic off-target copy number variants will be reported. Off-target copy number variants of unknown clinical significance will not be reported.

### Detection

Detection is limited to duplications and deletions. The CGH array will not detect point or intronic mutations. Results of molecular analysis must be interpreted in the context of the patient's clinical and/or biochemical phenotype.

### Specimen Requirements

Submit only 1 of the following specimen types

* Preferred specimen type: Whole Blood

### Type: Whole Blood

Specimen Requirements:

In EDTA (purple top) tube:
- Infants (2 years): 3-5 ml
Older Children & Adults: 5-10 ml

Specimen Collection and Shipping: Refrigerate until time of shipment. Ship sample within 5 days of collection at room temperature with overnight delivery.

**Type: Saliva**

Specimen Requirements:

Oragene™ Saliva Collection kit (available through EGL) used according to manufacturer instructions.

Specimen Collection and Shipping: Store sample at room temperature. Ship sample within 5 days of collection at room temperature with overnight delivery.

**Special Instructions**

Submit copies of diagnostic biochemical test results with the sample, if appropriate. Contact the laboratory if further information is needed.

Sequence analysis is required before deletion/duplication analysis by targeted CGH array. If sequencing is performed outside of EGL Genetics, please submit a copy of the sequencing report with the test requisition.

**Related Tests**

- Sequence analysis of the *G6PD* gene is available and is required before deletion/duplication analysis.
- Prenatal testing is available to couples who are confirmed carriers of mutations. Please contact the laboratory genetic counselor to discuss appropriate testing prior to collecting a prenatal specimen.