Phosphoglycerate Kinase-1 Deficiency: PGK1 Gene Sequencing

Test Code: SPGK1
Turnaround time: 4 weeks
CPT Codes: 81479 x1

Condition Description

Phosphoglycerate kinase-1 (PGK) deficiency is an X-linked condition with a highly variable clinical phenotype that can include hemolytic anemia, myopathy, rhabdomyolysis, intellectual disability, and other neurologic involvement. These symptoms may occur individually or in various combinations. The anemia may be severe and transfusion dependent. Episodes of rhabdomyolysis, myoglobinuria, and acute renal failure may occur without hemolytic anemia, especially after exercise. Reported neurological manifestations include seizures, severe encephalopathy, spastic tetraparesis, and hemiplegic migraines.

Individuals with PGK deficiency tend to fall into two groups: those that have a predominantly hemolytic form and those that have a predominantly myopathic form. Varying degrees of intellectual disability and other neurological symptoms can be seen in both forms. The clinical phenotype is usually similar in affected individuals in the same family. Female carriers of PGK deficiency may show chronic, mild hemolytic anemia.

Mutations in the PGK1 gene (Xq13) cause PGK deficiency. Most families have unique mutations. The PGK1 gene encodes the phosphoglycerate kinase-1 protein, which catalyzes the reversible conversion of 1,3-diphosphoglycerate to 3-phosphoglycerate during glycolysis, generating one molecule of ATP.

For patients with suspected PGK deficiency, sequence analysis is recommended as the first step in mutation identification. For patients in whom mutations are not identified by full gene sequencing, deletion/duplication analysis is appropriate.

References:
- OMIM #300653: Phosphoglycerate Kinase 1 Deficiency

Genes

PGK1

Indications

This test is indicated for:

- Confirmation of a clinical diagnosis of PGK.
- Carrier testing in adult females with a family history of PGK.

Methodology

PCR amplification of 11 exons contained in the PGK1 gene is performed on the patient's genomic DNA. Direct sequencing of amplification products is performed in both forward and reverse directions, using automated fluorescence dideoxy sequencing methods. The patient's gene sequences are then compared to a normal reference sequence. Sequence variations are classified as mutations, benign variants unrelated to disease, or variations of unknown clinical significance. Variants of unknown clinical significance may require further studies of the patient and/or family members. This assay does not interrogate the promoter region, deep intronic regions, or other regulatory elements, and does not detect large deletions.

Detection

Clinical Sensitivity: Unknown. Mutations in the promoter region, some mutations in the introns and other regulatory element mutations cannot be detected by this analysis. Large deletions will not be detected by this analysis. Results of molecular analysis should be interpreted in the context of the patient's biochemical phenotype.

Analytical Sensitivity: ~99%

Specimen Requirements

Submit only 1 of the following specimen types

Type: Whole Blood (EDTA)

Specimen Requirements:
EDTA (Purple Top)
Infants and Young Children (2 years of age to 10 years old): 3-5 ml
Older Children & Adults: 5-10 ml
Autopsy: 2-3 ml unclotted cord or cardiac blood

Specimen Collection and Shipping:
Ship sample at room temperature for receipt at EGL within 24 hours of collection. Do not refrigerate or freeze.

**Type: DNA, Isolated**

**Specimen Requirements:**
Microtainer
8µg
Isolation using the Perkin Elmer™ Chemagen™ Automated Extraction method or Qiagen™ Puregene kit for DNA extraction is recommended.

**Specimen Collection and Shipping:**
Refrigerate until time of shipment in 100 ng/µL in TE buffer. Ship sample at room temperature with overnight delivery.

**Type: Saliva**

**Specimen Requirements:**
Oragene™ Saliva Collection Kit
Orangene™ Saliva Collection Kit used according to manufacturer instructions. Please contact EGL for a Saliva Collection Kit for patients that cannot provide a blood sample.

**Specimen Collection and Shipping:**
Please do not refrigerate or freeze saliva sample. Please store and ship at room temperature.

**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**
- Deletion/duplication analysis of the \textit{PGK1} gene by CGH array is available for those individuals in whom sequence analysis is negative.
- A next generation sequence analysis panel of 90+ XLID genes is available.
- A CGH array-based test for deletion/duplication analysis of 90+ XLID genes is available.

- Custom diagnostic mutation analysis (KM) is available to family members if mutations are identified by targeted mutation testing or sequencing analysis.
- Prenatal testing is available only for known familial mutations to individuals who are confirmed carriers of mutations. Please contact the laboratory genetic counselor to discuss appropriate testing prior to collecting a prenatal specimen.