Glucose-6-Phosphate Dehydrogenase (G6PD) Deficiency: \textit{G6PD} Gene Deletion/Duplication

\textbf{Test Code:} JT  
\textbf{Turnaround time:} 2 weeks  
\textbf{CPT Codes:} 81228 x1

\section*{Condition Description}

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is the most common human enzyme deficiency; an estimated 400 million people worldwide are affected \cite{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, primateaue 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 \cite{2}. Heterozygote advantage from malaria has been proposed to account for the high frequency of the particular alleles in particular populations \cite{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.

\section*{References:}

\begin{enumerate}
  \item Porter et al. Variation of glucose-6-phosphate dehydrogenase in different populations. Lancet 1964, I:895-899.
\end{enumerate}

\section*{Genes}

\textbf{G6PD}

\section*{Indications}

This test is indicated for:

\begin{itemize}
  \item Confirmation of a clinical diagnosis of G6PD deficiency in individuals who have tested negative for sequence analysis
  \item Carrier testing in adults with a family history of G6PD deficiency who have tested negative for sequence analysis
\end{itemize}

\section*{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.

\section*{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.

\section*{Specimen Requirements}

Submit only 1 of the following specimen types

\begin{itemize}
  \item **Type: DNA, Isolated**
  \item **Specimen Requirements:**
    \begin{itemize}
      \item Microtainer
      \item 3µg
    \end{itemize}
    Isolation using the Perkin Elmer™Chemagen™ Chemagen™ Automated Extraction method or Qiagen™ Puregene kit for DNA extraction is recommended.
  \item **Specimen Collection and Shipping:**
    Refrigerate until time of shipment in 100 ng/µL in TE buffer. Ship sample at room temperature with overnight delivery.
  \end{itemize}

\begin{itemize}
  \item **Type: Whole Blood (EDTA)**
\end{itemize}

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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 72 hours of collection. Do not freeze.

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.