Peroxisome Biogenesis Disorders, Zellweger Syndrome Spectrum, \textit{PEX1}-related: \textit{PEX1} Gene Sequencing

\textbf{Condition Description}

Peroxisome biogenesis disorders, Zellweger syndrome spectrum (PBD, ZSS) is a continuum that encompasses three distinct phenotypes; Zellweger syndrome (ZS), neonatal adrenoleukodystrophy (NALD), and infantile Refsum disease (IRD). Individuals with PBD, ZSS usually present during the newborn period or later in childhood. Features during the newborn period include hypotonia, poor feeding, distinctive facial features, seizures, and liver cysts with hepatic dysfunction. Infants with ZS, the most severe phenotype on the spectrum, are significantly impaired and usually do not survive past the first year of life. Those that do survive past the first year have developmental delay with hypotonia, liver dysfunction, sensorineural hearing loss, and retinal dystrophy. Features of NALD and IRD (the least severe phenotype on the spectrum) are variable. They include developmental delays, liver dysfunction, episodes of intracranial bleeding, hearing loss, and vision impairments. PBD, ZSS can be slowly progressive.

PBD, ZSS is inherited in an autosomal recessive manner. Biochemical assays can definitively diagnose PBD, ZSS. Mutations in twelve different PEX genes have been identified to cause PBD, ZSS. They are the \textit{PEX1}, \textit{PEX2}, \textit{PEX3}, \textit{PEX5}, \textit{PEX6}, \textit{PEX10}, \textit{PEX12}, \textit{PEX13}, \textit{PEX14}, \textit{PEX16}, \textit{PEX19}, and \textit{PEX26} genes. About 68\% of individuals with PBD, ZSS have mutations in the \textit{PEX1} gene. Mutations in the \textit{PEX6}, \textit{PEX10}, \textit{PEX12}, and \textit{PEX26} genes account for an additional 26\% of mutations in individuals with PBD, ZSS.

Please note that this test is for the \textit{PEX1} gene (7q21-q22) only.

For patients with suspected PBD, ZSS, 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.

\textbf{References:}

- GeneReviews
- OMIM \#602136: \textit{PEX1} gene
- OMIM \#214100: ZS

\textbf{Genes}

\textbf{PEX1}

\textbf{Indications}

This test is indicated for:

- Confirmation of a clinical diagnosis of peroxisome biogenesis disorders, Zellweger syndrome spectrum.
- Carrier testing in adults with a family history of peroxisome biogenesis disorders, Zellweger syndrome spectrum.

\textbf{Methodology}

\textbf{Next Generation Sequencing:} In-solution hybridization of all coding exons is performed on the patient's genomic DNA. Although some deep intronic regions may also be analyzed, this assay is not meant to interrogate most promoter regions, deep intronic regions, or other regulatory elements, and does not detect single or multi-exon deletions or duplications. Direct sequencing of the captured regions is performed using next generation sequencing. The patient's gene sequences are then compared to a standard reference sequence. Potentially causative variants and areas of low coverage are Sanger-sequenced. Sequence variations are classified as pathogenic, likely pathogenic, benign, likely benign, or variants of unknown significance. Variants of unknown significance may require further studies of the patient and/or family members.

\textbf{Detection}

Clinical Sensitivity: Mutations in the \textit{PEX1} gene account for \textasciitilde68\% of individuals with PBD, ZSS. 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 clinical and/or biochemical phenotype.

Analytical Sensitivity: \textasciitilde99\%

\textbf{Specimen Requirements}

Submit only 1 of the following specimen types

* Preferred specimen type: Whole Blood

\textbf{Type: Whole Blood}

Specimen Requirements:

In EDTA (purple top) or ACD (yellow 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.

**Related Tests**

- Deletion/duplication analysis of the PEX1 gene by CGH array is available for those individuals in whom sequence analysis is negative.
- Sequence and deletion/duplication analysis for the PEX2, PEX3, PEX6, PEX12, PEX14 and PEX26 genes are also 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.