**SHOX-related Haploinsufficiency Disorders: SHOX Gene Sequencing**

**Test Code:** SSHOX  
**Turnaround time:** 4 weeks  
**CPT Codes:** 81479 x1

### Condition Description

SHOX-related haploinsufficiency disorders are a spectrum of disorders that range from Leri-Weill dyschondrosteosis (LWD) (severe) to SHOX-related short stature (mild). LWD is characterized by three features; mesomelia (the middle portion of the limb is shorter in relation to the proximal portion), Madelung deformity (abnormal alignment of the radius, ulna, and carpal bones at the wrist), and short stature. Individuals with SHOX-related short stature have disproportionate short stature and/or wrist abnormalities.

Mutations in the SHOX gene, located on the pseudoautosomal regions of the X and Y chromosomes (Xp22.3 and Yp11.3), cause SHOX-related haploinsufficiency disorders. Mutations/deletions can be identified in ~70% of individuals with LWD. SHOX-related haploinsufficiency disorders are inherited in a pseudoautosomal dominant manner.

Individuals who have mutations in two copies of the SHOX gene have Langer mesomelic dysplasia (LMD). LMD is much more severe than LWD and is characterized by severe short stature and severe skeletal dysplasia.

References:

- GeneReviews
- OMIM #312865: SHOX gene
- OMIM #127300: LWD
- OMIM #249700: LMD
- OMIM #300582: SHOX-related short stature

### Genes

**SHOX**

### Indications

This test is indicated for:

- Confirmation of a clinical diagnosis of SHOX-related haploinsufficiency disorders.  
- Carrier testing in adults with a family history of SHOX-related haploinsufficiency disorders.

### Methodology

PCR amplification of 5 exons contained in the SHOX 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: Mutations/deletions can be identified in ~70% of individuals with LWD. 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: ~99%

### Specimen Requirements

**Submit only 1 of the following specimen types**

**Type:** DNA, Isolated

**Specimen Requirements:**

- Microtainer
- 8µg

Isolation using the Perkin Elmer™Chemagen™ 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

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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.

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 72 hours of collection. Do not freeze.

Related Tests
- 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.