**BRAF Gene Deletion/Duplication**

**Test Code:** DBRAF  
**Turnaround time:** 2 weeks  
**CPT Codes:** 81228 x1

**Condition Description**

Germline mutations in the *BRAF* gene have been reported to be associated with cardiofaciocutaneous (CFC) syndrome. Somatic mutations in *BRAF* have also been reported at a high frequency in numerous cancers.

**CFC Syndrome**

Cardiofaciocutaneous (CFC) syndrome is characterized by features in three primary systems: cardiac, craniofacial, and ectodermal; however, other systems may be involved as well. Cardiac abnormalities can include pulmonic stenosis and other valve dysplasias, septal defects, hypertrophic cardiomyopathy, and rhythm disturbances. Individuals with CFC syndrome have a distinctive craniofacial appearance. Ectodermal features include skin findings, such as xerosis, hyperkeratosis, ichthyosis, keratosis pilaris, ulerthema oophorogenes, eczema, pigmented moles, palmoplantar hyperkeratosis; hair findings such as sparse, curly, fine or thick, woolly, or brittle hair, and possible absent eyelashes and eyebrows; and the nails may be dystrophic or fast growing. Cognitive delay (ranging from mild to severe) is seen in all affected individuals. Neoplasias have been reported in some individuals with CFC.

There are four genes known to be associated with CFC. Mutations in the *BRAF* gene account for ~75% of cases, MAP2K1 and MAP2K2 account for ~25% of cases, and KRAS accounts for <2% of cases. CFC syndrome is inherited in an autosomal dominant manner; however, most cases of CFC syndrome arise de novo.

**Cancer**

Somatic mutations in *BRAF* have been reported at a high frequency in numerous cancers including melanoma, thyroid, colorectal, and ovarian. One mutation, p.V600E, which results in increased kinase activity, accounts for more than 90% of *BRAF* mutations identified in human cancer. The presence of the p.V600E BRAF mutation in microsatellite instability high (MSI-H) colorectal cancers provides evidence that the cancer is sporadic and not caused by Lynch syndrome.

For patients with a suspected *BRAF* associated condition, 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. Please note that this test is for the *BRAF* (7q35) gene only.

**References:**

- Bettstetter, M. *et al.* Distinction of hereditary nonpolyposis colorectal cancer and sporadic microsatellite-unstable colorectal cancer through quantification of *MLH1* methylation by real-time PCR. Clin Cancer Res. 2007; 13:3221-3228.

**Genes**

**BRAF**

**Indications**

This test is indicated for:

- Confirmation of a clinical diagnosis of a CFC syndrome in an individual in whom sequence analysis was negative.

**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.

**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*

**Type:** DNA, Isolated

**Specimen Requirements:**

- Microtainer
3µg 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: 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.

**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 *BRAF* gene is available and is required before deletion/duplication analysis.
- Sequence and deletion/duplication analysis of the *KRAS*, *SOS1*, *RAF1*, *MAP2K1*, *MAP2K2* and *PTPN11* genes are 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 to couples who have had a previously affected child with an identified mutation. Please contact the laboratory genetic counselor to discuss appropriate testing prior to collecting a prenatal specimen.