### 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, ulerythema 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.

Click here for the GeneTests summary on CFC syndrome.

#### 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. Please note that a “backbone” of probes across the entire genome are included on the array for analytical and quality control purposes. Rarely, off-target copy number variants causative of disease may be identified that may or may not be related to the patient’s phenotype. Only known pathogenic off-target copy number variants will be reported. Off-target copy number variants of unknown clinical significance will not be reported.

### 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.

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Submit only 1 of the following specimen types

* Preferred specimen type: Whole Blood

**Type: Whole Blood**

Specimen Requirements:

In EDTA (purple 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.

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.