Cystic Fibrosis: \textit{CFTR} Expanded Mutation Panel

\textbf{Test Code:} MM530  
\textbf{Turnaround time:} 2 weeks  
\textbf{CPT Codes:} 81220 x1

\section*{Condition Description}
Cystic fibrosis (CF) is a chronic genetic condition involving multiple organ systems. Classical CF primarily involves the respiratory and digestive systems, and may have a range of clinical severity. Pulmonary symptoms often include lower airway inflammation, chronic cough, chronic sinusitis, and recurrent infections. Digestive symptoms often include meconium ileus, pancreatic insufficiency resulting in malabsorption and/or failure to thrive, diabetes mellitus, and hepatobiliary disease. Congenital bilateral absence of the vas deferens (CBAVD) is seen in men without pulmonary or digestive symptoms of CF, and results in azoospermia [1]. CBAVD is a significant cause of male infertility.

CF is caused by mutations in the cystic fibrosis transmembrane conductance regulator (\textit{CFTR}) gene. Individuals with mutations in the \textit{CFTR} gene may also present with milder or atypical symptoms such as pancreatitis or chronic sinusitis.

The incidence of CF is approximately 1 in 2500 live births among Caucasians and is inherited in an autosomal recessive pattern. The carrier frequency is estimated to be approximately 1 in 25 in the Caucasian population, 1 in 24 in the Ashkenazi Jewish population, 1 in 61 in the African American population, 1 in 58 in the Hispanic population and 1 in 94 in the Asian population.

The current recommendation from the American College of Obstetrics and Gynecologists [2, 3] and the American College of Medical Genetics Subcommittee on Cystic Fibrosis [4] is that screening for cystic fibrosis be offered to all patients, regardless of ethnicity, by a minimum panel of 23 common mutations [4].

This test offers an expanded panel of 142 mutations to account for mutations more common in non-Caucasian ethnic groups, as well as rarer mutations across all ethnic groups.

Click \texttt{here} for a complete list of \textit{CFTR} mutations.

For those providers wishing to order only the ACOG/ACMG recommended 39-mutation panel, see test code CF.


\section*{References}

\section*{Genes}
\textit{CFTR}

\section*{Indications}
Testing is indicated for:

- Individuals with a diagnosis of CF, or atypical presentations of CF (chronic pancreatitis, sinusitis).  
- Males with congenital bilateral absence of the vas deferens (CBAVD).  
- Carrier screening for individuals of Caucasian or Ashkenazi Jewish background.  
- Family members of an affected individual at risk to be carriers of CF.

\section*{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. This assay detects 142 mutations in the \textit{CFTR} gene, including the 23 mutations recommended by ACMG and ACOG.

\section*{Detection}
\textbf{Next Generation Sequencing:} Clinical Sensitivity: Unknown. Mutations in the promoter region, some mutations in the introns and other regulatory element mutations cannot be detected by this analysis. Large deletions/duplications will not be detected by this analysis. Results of molecular analysis
should be interpreted in the context of the patient's clinical/biochemical phenotype.

Analytical Sensitivity: ~99%.

### Specimen Requirements

Submit only 1 of the following specimen types

**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: Ship sample at room temperature with overnight delivery.

**Type: Saliva**

Specimen Requirements:

- Oragene™ Saliva Collection Kit.

Specimen Collection and Shipping: Store sample at room temperature. Ship sample within 5 days of collection at room temperature with overnight delivery.

**Type: Isolated DNA**

Specimen Requirements:

- In microtainer: 60 ug

Isolation using the Qiagen™ Puregene kit for DNA extraction is recommended.

Specimen Collection and Shipping: Refrigerate until time of shipment in 100 ng/ul of TE buffer. Ship sample at room temperature with overnight delivery.

### Related Tests

- Sequencing and deletion/duplication analysis of the *CFTR* gene is available for individuals who test negative with the common mutation panel, when other mutations are suspected.
- *CFTR* poly T analysis is performed as a reflex test when an R117H mutation is detected or when evaluating males with CBAVD.
- Ashkenazi Jewish Carrier Panel is available to screen for the panel of 19 autosomal recessive conditions common in individuals of Ashkenazi Jewish background.
- Prenatal testing is available to couples who are confirmed carriers of gene mutations. Please contact the laboratory genetic counselor to discuss appropriate testing prior to collecting a prenatal specimen.
- Cystic fibrosis basic panel (test code CF).