MAYO CLINIC LABORATORIES

Test Definition: FLT

FLT3 Mutation Analysis, Varies

Overview

Useful For

Prognostic indication for some patients with acute myeloid leukemia

This test **should not be used** to monitor residual disease following treatment.

Testing Algorithm

For more information see:

-Acute Leukemias of Ambiguous Lineage Testing Algorithm

-Acute Myeloid Leukemia: Testing Algorithm

-Acute Myeloid Leukemia: Relapsed with Previous Remission Testing Algorithm

Special Instructions

- Hematopathology Patient Information
- Acute Leukemias of Ambiguous Lineage Testing Algorithm
- Acute Myeloid Leukemia: Testing Algorithm
- Acute Myeloid Leukemia: Relapsed with Previous Remission Algorithm

Method Name

Polymerase Chain Reaction (PCR)/Capillary Electrophoresis

NY State Available

Yes

Specimen

Specimen Type

Varies

Ordering Guidance

This test is intended to be used as a prognostic test at diagnosis and should not be used to monitor residual disease following treatment.

Shipping Instructions

Specimen must arrive within 7 days of collection.

Necessary Information

The following information is required:

1. Pertinent clinical history
2. Clinical or morphologic suspicion
3. Date and time of collection

4. Specimen source

Specimen Required

Submit only 1 of the following specimens:

Specimen Type: Whole blood
Container/Tube: Lavender top (EDTA) or yellow top (ACD)
Specimen Volume: 3 mL
Collections Instructions:
1. Invert several times to mix blood.
2. Send specimen in original tube. **Do not aliquot**.
3. Label specimen as whole blood.
Specimen Stability Information: Ambient (preferred) 7 days/Refrigerate 7 days

Specimen Type: Bone marrow
Container/Tube: Lavender top (EDTA) or yellow top (ACD)
Specimen Volume: 2 mL
Collections Instructions:
1. Invert several times to mix bone marrow.
2. Send specimens in original tube. **Do not aliquot.**
3. Label specimen as bone marrow.
Specimen Stability Information: Ambient (preferred) 7 days/Refrigerate 7 days

Specimen Type: Extracted DNA from whole blood or bone marrow
Container/Tube: 1.5- to 2-mL tube
Specimen Volume: Entire specimen
Collection Instructions:
1. DNA must be extracted from blood or bone marrow within 7 days of collection
2. Label specimen as extracted DNA and source of specimen
2. Provide volume and concentration of DNA on the label.
Specimen Stability Information: Frozen (preferred)/Refrigerate/Ambient
Additional Information: DNA must be extracted in a CLIA-certified laboratory or equivalent and must be extracted from a specimen type listed as acceptable for this test (including applicable anticoagulants). We cannot guarantee that all extraction methods are compatible with this test. If testing fails, one repeat will be attempted, and if unsuccessful, the test will be reported as failed and a charge will be applied.

Forms

1. Hematopathology Patient Information (T676)
2. If not ordering electronically, complete, print, and send a Hematopathology/Cytogenetics Test Request (T726) with the specimen.

Specimen Minimum Volume

Whole blood, Bone marrow: 1 mL; Extracted DNA: 50 mcL at 20 ng/mcL concentration

Reject Due To

Gross	Reject

hemolysis	
Bone marrow biopsies	Reject
Slides	Reject
Paraffin shavings	Reject
Moderately to severely clotted	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Varies	Varies	7 days	

Clinical & Interpretive

Clinical Information

The FMS-like tyrosine gene (*FLT3*) codes for a transmembrane receptor/signaling protein (FLT3) of the tyrosine kinase group. Binding of FLT3 ligand to the FLT3 receptor ultimately leads to production of proteins that cause cell growth and inhibit cell death through apoptosis. Recently, variants in *FLT3* have been found in some hematopoietic neoplasms and are particularly common in adult acute myeloid leukemia (AML) with an overall incidence of approximately 20% to 30%. The highest genetic variant rates are seen in adult patients with AML and normal- or intermediate-risk cytogenetics and in patients with acute promyelocytic leukemia.

The most common *FLT3* variant consists of internal tandem duplication (ITD) of DNA sequences found in exons 14 or 15. In some subgroups of adults with AML, the presence of an *FLT3* ITD variant has been found to be an adverse prognostic indicator. The second most common variant is a point alteration in the codon for an aspartate residue (D835) that resides in the activation loop of the FLT3 protein. D835 alterations have been identified in approximately 7% of AML cases but, at this time, it is not clear if the presence of this alteration has any prognostic significance. It is thought that both types of *FLT3* variants lead to constitutive (always present, independent of internal or external stimuli) *FLT3* activation.

Identification of an *FLT3* variant in AML is clinically useful, not only because of the prognostic information it provides, but also because FLT3-inhibitory drugs have shown promise as useful therapeutic agents.

Reference Values

An interpretive report will be provided.

Interpretation

An interpretive report will be issued indicating whether the *FLT3* internal tandem duplication (ITD), D835 alteration, or both were detected.

Variant status will be indicated as positive or negative. If ITD positive, an allelic ratio will be reported.

Cautions

This test is not designed for monitoring residual disease following treatment and the following should be noted: the sensitivity of the test is less than other methods designed for residual disease testing, and there have been several reports of *FLT3* variants being lost or gained in neoplastic cells following treatment.

Clinical Reference

1. Levis M, Small D. FLT3. ITDoes matter in leukemia. Leukemia. 2003;17(9):1738-1752
2. Gilliland DG, Griffin JD. The roles of *FLT3* in hematopoiesis and leukemia. Blood. 2002;100(5):1532-1542
3. He R, Devine DJ, Tu ZJ, et al. Hybridization capture-based next generation sequencing reliably detects FLT3 mutations and classifies FLT3-internal tandem duplication allelic ratio in acute myeloid leukemia: a comparative study to standard fragment analysis. Mod Pathol. 2019;33(3):334-34

Performance

Method Description

This polymerase chain reaction (PCR)-based assay is designed to detect the presence of 2 separate variants in *FLT3*: internal tandem duplication (ITD) of coding sequence for the intracellular juxtamembrane domain and point alterations in the codon for Asp835 (D835). Genomic DNA is extracted from nucleated cells in the sample. A multiplex PCR is then performed using 2 sets of primers. One primer in each set is labeled with a fluorescent dye to aid in PCR-fragment analysis. The PCR products are then analyzed using capillary electrophoresis.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Saturday

Report Available

3 to 6 days

Specimen Retention Time

Whole blood/Bone marrow: 2 weeks; Extracted DNA: 3 months

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.

- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

81245-FLT3 (fms-related tyrosine kinase) (eg, acute myeloid leukemia), gene analysis, internal tandem duplication (ITD) variants (ie, exons 14, 15)
81246-FLT3 (fms-related tyrosine kinase 3) (eg, acute myeloid leukemia), gene analysis; tyrosine kinase domain (TKD) variants (eg, D835, I836)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
FLT	FLT3 Mutation Analysis, V	79210-1

Result ID	Test Result Name	Result LOINC® Value
MP009	Specimen Type	31208-2
19236	Final Diagnosis:	34574-4
41935	FLT3 Result	79210-1