

## Overview

### Useful For

Detecting a neoplastic clone associated with the common chromosome abnormalities seen in patients with myeloid/lymphoid neoplasms with eosinophilia and gene rearrangement (including *PDGFRA*, *PDGFRB*, *FGFR1*, *JAK2*, and *ABL1*) using specified probes set

Supporting a diagnosis of malignancy when a clone is present

An adjunct to conventional chromosome studies

### Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
EOSMB	Probe, Each Additional (EOSMF)	No, (Bill Only)	No
EOS3B	Probe, Tri-color (EOSMF)	No, (Bill Only)	No

### Testing Algorithm

This test includes a charge for the probe application, analysis, and professional interpretation of results for one probe set (2 individual fluorescence in situ hybridization [FISH] probes or 3 individual FISH probes). Additional charges will be incurred for all reflex or additional probe sets performed.

If the patient is being treated for known abnormalities, indicate the abnormality and which probes should be used.

**When specified**, any of the following probes will be performed:

4q12 deletion or rearrangement, FIP1L1, CHIC2, PDGFRA

4q12 rearrangement, PDGFRA

5q32 rearrangement, PDGFRB

t(5;12), PDGFRB/ETV6

8p11.2 rearrangement, FGFR1

9p24.1 rearrangement, JAK2

9q34 rearrangement, ABL1

t(9;22), BCR/ABL1

Appropriate ancillary probes may be performed at consultant discretion to render comprehensive assessment. Any additional probes will have the results included within the final report and will be performed at an additional charge.

For more information see the following:

[-Eosinophilia: Bone Marrow Diagnostic Algorithm.](#)

[-Mast Cell Disorder: Diagnostic Algorithm, Bone Marrow](#)

### Special Instructions

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- [Mast Cell Disorder: Diagnostic Algorithm, Bone Marrow](#)
  - [Eosinophilia: Bone Marrow Diagnostic Algorithm](#)

**Method Name**

Fluorescence In Situ Hybridization (FISH)

**NY State Available**

Yes

**Specimen****Specimen Type**

Varies

**Ordering Guidance**

This test is intended for instances when limited chronic eosinophilia fluorescence in situ hybridization (FISH) probes are needed. The FISH probes to be analyzed must be specified on the request, otherwise test processing may be delayed in order to determine the intended analysis. If specific probes are not included with this test request, this test may be canceled and automatically reordered by the laboratory as EOSDF / Chronic Eosinophilia, Diagnostic FISH, Varies.

If the entire chronic eosinophilia FISH panel is preferred, order EOSDF / Chronic Eosinophilia, Diagnostic, FISH, Varies.

Paraffin embedded tissue testing is **not available** for these probe sets.

This test is ordered for targeted FISH probes to be evaluated based on specific abnormalities or on abnormalities identified in the diagnostic sample.

At diagnosis, a EOSDF / Chronic Eosinophilia, Diagnostic, FISH, Varies panel and a conventional chromosome study should be performed.

**Shipping Instructions**

Advise Express Mail or equivalent if not on courier service.

**Necessary Information**

1. **A list of probes requested for analysis is required.** Probes available for this test are listed in the Testing Algorithm section.
2. A reason for testing should be with each specimen. The laboratory will not reject testing if this information is not provided; however, appropriate testing and interpretation may be compromised or delayed. If not provided, an appropriate indication for testing may be entered by Mayo Clinic Laboratories.
3. A pathology and/or flow cytometry report may be requested by the laboratory to optimize testing and aid in interpretation of results.

**Specimen Required**

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Submit only 1 of the following specimens:

**Preferred****Specimen Type:** Bone marrow**Container/Tube:****Preferred:** Yellow top (ACD)**Acceptable:** Green top (heparin) or lavender top (EDTA)**Specimen Volume:** 2-3 mL**Collection Instructions:**

1. It is preferable to send the first aspirate from the bone marrow collection.
2. Invert several times to mix bone marrow.
3. Send bone marrow specimen in original tube. **Do not aliquot.**

**Acceptable****Specimen Type:** Blood**Container/Tube:****Preferred:** Yellow top (ACD)**Acceptable:** Green top (heparin) or lavender top (EDTA)**Specimen Volume:** 6 mL**Collection Instructions:**

1. Invert several times to mix blood.
2. Send whole blood specimen in original tube. **Do not aliquot.**

**Forms**

If not ordering electronically, complete, print, and send a [Hematopathology/Cytogenetics Test Request](#) (T726) with the specimen.

**Specimen Minimum Volume**

Blood: 2 mL

Bone Marrow: 1 mL

**Reject Due To**

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

**Specimen Stability Information**

Specimen Type	Temperature	Time	Special Container
Varies	Ambient (preferred)		
	Refrigerated		

**Clinical & Interpretive****Clinical Information**

The myeloid/lymphoid neoplasms with eosinophilia and rearrangements of *PDGFRA*, *PDGFRB*, *FGFR1*, and *JAK2* represent a significantly diverse group of hematologic malignancies. Despite the disparate clinical presentations, which

include chronic myeloid neoplasms (chronic myelomonocytic leukemia, chronic myeloproliferative neoplasms, chronic eosinophilic leukemia) versus more acute myeloid and lymphoid neoplasms (acute myeloid leukemia, B- and T-lymphoblastic leukemia/lymphoma and mixed phenotypic acute leukemias), this diagnostic subgroup shares rearrangements involving 4 specific gene regions: *PDGFRA*, *PDGFRB*, *FGFR1*, and *JAK2*.

While conventional chromosome studies may detect many of the rearrangements associated with these gene rearrangements, several are cytogenetically "cryptic", including the most common abnormality involving *PDGFRA* activation. This one megabase submicroscopic, intrachromosomal deletion results in loss of the *CHIC2* gene region with subsequent fusion of neighboring genes *FIP1L1* and *PDGFRA*. In addition to this more common, cryptic deletion, the *PDGFRA* gene has many translocation partners described (at least 15) that similarly result in *PDGFRA* upregulation.

The *PDGFRB*, *FGFR1*, and *JAK2* gene regions similarly have numerous translocation/inversion partners described, at least 50 for *PDGFRB*, 10 for *FGFR1*, and 40 for *JAK2*. Despite the significant heterogeneity in gene partners, the identification of *PDGFRA*, *PDGFRB*, *FGFR1*, and *JAK2* rearrangements is critical for disease categorization and potential therapeutic intervention. Both *PDGFRA* and *PDGFRB* have the potential for response to targeted tyrosine kinase inhibitor therapies such as imatinib mesylate. Similarly, *JAK2* rearrangements have the potential for response to targeted inhibitor therapy. Rearrangements of *FGFR1* are typically more aggressive and less responsive to targeted inhibitors.

While not formally included in the World Health Organization categorization of myeloid/lymphoid neoplasms with *PDGFRA*, *PDGFRB*, *FGFR1*, or *JAK2* rearrangements, rearrangements of the *ABL1* gene, other than with the *BCR* locus, can result in similar clinical phenotypes. Thus, the *ABL1* gene region has been included in this fluorescence in situ hybridization panel evaluation to appropriately interrogate this gene region, particularly since these patients may not be identified by conventional karyotype analysis and may significantly benefit from targeted tyrosine kinase therapies.

### Reference Values

An interpretive report will be provided.

### Interpretation

A neoplastic clone is detected when the percent of cells with an abnormality exceeds the normal reference range for any given probe.

The absence of an abnormal clone does not rule out the presence of a neoplastic disorder.

### Cautions

This test is not approved by the US Food and Drug Administration, and it is best used as an adjunct to clinical and pathologic information.

Fluorescence in situ hybridization (FISH) is not a substitute for conventional chromosome studies because the latter detects many chromosome abnormalities associated with other hematological disorders that would be missed by this FISH panel test.

Bone marrow is the preferred sample type for this FISH test. If bone marrow is not available, a blood specimen may be used if there are neoplastic cells in the blood specimen (as verified by a hematopathologist).

### Supportive Data

Each probe was independently tested and verified on unstimulated peripheral blood and bone marrow specimens.

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Normal cutoffs were calculated based on the results of 25 normal specimens. Each probe set was evaluated to confirm the probe set detected the abnormality it was designed to detect.

**Clinical Reference**

Myeloid/lymphoid neoplasms with eosinophilia and gene rearrangement. In: Swerdlow SH, Campo E, Harris NL, et al, eds. WHO Classification of Tumours. Vol 2. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues. 4th ed. IARC Press; 2017:71-80

**Performance****Method Description**

This test is performed using commercially available and laboratory-developed probes. Rearrangements or deletions involving *CHIC2*, *PDGFRA*, *PDGFRB*, *FGFR1*, *JAK2*, and *ABL1* are detected using a tri or dual-color break-apart (BAP) strategy probe. Dual-color, dual-fusion fluorescence in situ hybridization (D-FISH) strategy probe sets are used in reflex testing when rearrangements of the *PDGFRB* and *ABL1* gene are detected. For enumeration and BAP strategy probe sets, 100 interphase nuclei are scored; 200 interphase nuclei are scored when D-FISH probes are used. All results are expressed as the percent abnormal nuclei.(Unpublished Mayo method)

**PDF Report**

No

**Day(s) Performed**

Monday through Friday

**Report Available**

7 to 10 days

**Specimen Retention Time**

4 weeks

**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**

88271 x2, 88275 x1, 88291 x1-FISH Probe, Analysis, Interpretation; 1 probe sets  
 88271 x2, 88275 x1-FISH Probe, Analysis; each additional probe set (if appropriate)  
 88271 x1-FISH Probe; coverage for sets containing 3 probes (if appropriate)

**LOINC® Information**

Test ID	Test Order Name	Order LOINC® Value
EOSMF	Chronic Eosinophilia, Spec FISH	107544-9

Result ID	Test Result Name	Result LOINC® Value
614256	Result Summary	50397-9
614257	Interpretation	69965-2
614258	Result Table	93356-4
614259	Result	62356-1
GC113	Reason for Referral	42349-1
GC114	Probes Requested	78040-3
GC115	Specimen	31208-2
614260	Source	31208-2
614261	Method	85069-3
614262	Additional Information	48767-8
614263	Disclaimer	62364-5
614264	Released By	18771-6