MAYO CLINIC LABORATORIES

Test Definition: BLYM

B-Cell Lymphoma, FISH, Tissue

Overview

Useful For

Detecting, at diagnosis, recurrent common chromosome abnormalities associated with various B-cell lymphomas in paraffin-embedded tissue specimens

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
_PRAA	Probe, Each Additional (BLYM)	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). Additional charges will be incurred for all reflex or additional probe sets performed. No analysis charges will be incurred if an insufficient number of representative cells are available for analysis.

This FISH test allows different combinations of probes to be utilized based on the suspected lymphoma subtype, patient's age, and clinical question. See the **Common Chromosome Abnormalities in B-cell Lymphomas** table in Clinical Information for specific gene locations associated with these B-cell lymphoma subtypes.

Both the break-apart MYC and the MYC/IGH dual-fusion FISH probes are analyzed simultaneously when MYC is requested. The BCL2/IGH FISH probe set will only be performed, at the laboratory's discretion, to resolve or confirm unbalanced *BCL2* rearrangement concerns.

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, the following algorithms are available:
-Aggressive B-cell Lymphoma Diagnostic Algorithm
-Gastric MALT Lymphoma Diagnostic Algorithm
-Gastric MALT Posttherapy Follow-up Algorithm

Special Instructions

- Aggressive B-cell Lymphoma Diagnostic Algorithm
- Gastric MALT Posttherapy Follow-up Algorithm
- Gastric MALT Lymphoma Diagnostic Algorithm

Method Name

Fluorescence In Situ Hybridization (FISH)

NY State Available

Yes

Specimen

Specimen Type
Tissue

Ordering Guidance
This test does not include a pathology consultation. If a pathology consultation is requested, order PATHC / Pathology Consultation, and appropriate testing will be added at the discretion of the pathologist and performed at an additional charge.

Mayo Clinic Hematopathology consultants are involved in both the pre-analytic (tissue adequacy and probe selection, when applicable) and post-analytic (interpretation of fluorescence in situ hybridization [FISH] results in context of specific case, when applicable) phases.

This assay detects chromosome abnormalities observed in paraffin-embedded tissue samples of patients with B-cell lymphoma. If a non-paraffin embedded bone marrow or blood sample is received for this test, the test will be canceled, and BLPMF / B-Cell Lymphoma, Specified FISH, Varies will be added and performed as the appropriate test.

If either the break-apart MYC or the MYC/IGH D-FISH probe sets are requested in isolation, both probe sets will be performed concurrently to optimize the detection of MYC rearrangements.

For patients with T-cell lymphoma, order TLYM / T-Cell Lymphoma, FISH, Tissue.

Shipping Instructions
Advise Express Mail or equivalent if not on courier service.

Necessary Information
1. A pathology report is required for testing to be performed. If not provided, appropriate testing and/or interpretation may be compromised or delayed. Acceptable pathology reports include working drafts, preliminary pathology, or surgical pathology reports.
2. The following information must be included in the report provided:
-Patient name
-Block number - must be on all blocks, slides, and paperwork
-Date of collection
-Tissue source
3. A reason for testing must be provided. If this information is not provided, an appropriate indication for testing may be entered by Mayo Clinic Laboratories.
4. A list of probes is required if select probes are necessary or if the patient is being tracked for known abnormalities. See Table in Clinical Information.

Specimen Required

Submit only 1 of the following specimens:

Preferred
Specimen Type: Tissue block (fresh tissue is **not acceptable**)
Collection Instructions:
1. Submit a formalin-fixed, paraffin-embedded tumor tissue block.
2. Blocks prepared with alternative fixation methods (eg, Prefer, Bouin's) will be attempted but are less favorable for successful results. Provide fixation method used.
Additional Information:
1. Paraffin-embedded specimens can be from any anatomic location (skin, soft tissue, lymph node, etc).
2. Decalcified paraffin-embedded specimens will have testing attempted; however, the success rate is approximately 50%. T**esting may be canceled** if sufficient tumor tissue is not present.
3. **Submitted fresh tissue specimens will be canceled upon receipt**. If only fresh tissue is available, embed in paraffin prior to sending.

Acceptable
Specimen Type: Tissue slides
Slides: 1 Hematoxylin and eosin-stained and 2 unstained for each probe set
Collection Instructions:
1. Include 1 hematoxylin and eosin-stained slide for the entire test order.
2. For each probe set ordered, 2 consecutive, unstained, 5 micron-thick sections placed on positively charged slides.
3. If ordering MYC, 4 unstained slides are necessary; the break-apart MYC and the MYC/IGH D-FISH probe sets are performed simultaneously.
Additional Information: Broken or cracked unstained slides will be rejected. Stained slides that were broken and repaired (ie, double mounted) at the client site will not be rejected, as, in most cases, they can still be reviewed under the microscope. However, due to the double mounting, digital scanning cannot be performed.

Forms

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

Specimen Minimum Volume

See Specimen Required

Reject Due To

Broken or cracked unstained slides	Reject
Broken or cracked stained slides that cannot be repaired	Reject

Specimen Stability Information

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

Clinical & Interpretive

Clinical Information

Mature B-cell lymphoma can be low grade, intermediate grade, or high grade, and the prognosis and clinical course are highly variable. Genetic abnormalities have emerged as one of the most important prognostic markers in B-cell lymphomas and can aid in diagnosis. Several chromosome abnormalities and variants of these abnormalities have been associated with various lymphoma subtypes (see Table). Fluorescence in situ hybridization (FISH) permits the detection of recurrent gene rearrangements associated with various chromosome translocations and inversions in B-cell lymphoma. FISH is available for the specific B-cell lymphoma subtypes; see Table.

Table. **Common Chromosome Abnormalities in B-cell Lymphomas**

Lymphoma type	Chromosome abnormality	FISH probe
Burkitt (pediatric, < or =18 years old)	8q24.21 rearrangement	5'/3' MYC
	t(2;8)(p12;q24.21)	IGK/MYC
	t(8;14)(q24.21;q32)	MYC/IGH
	t(8;22)(q24.21;q11.2)	MYC/IGL
	3q27 rearrangement	3'/5' BCL6
	18q21 rearrangement	3'/5' BCL2
Diffuse large B-cell, "double-hit"	8q24.21 rearrangement	5'/3' MYC
	t(8;14)(q24.21;q32)	MYC/IGH
	----Reflex: t(8;22)(q24.21;q11.2)	MYC/IGL
	----Reflex: t(2;8)(p12;q24.21)	IGK/MYC
	----Reflex: 3q27 rearrangement	3'/5' BCL6
	----Reflex: 18q21 rearrangement	3'/5' BCL2
Large BCL IRF4 rearranged	6p24.3 rearrangement	5'/3' IRF4
	18q21 rearrangement	3'/5' BCL2
	3q27 rearrangement	3'/5' BCL6
Follicular	18q21 rearrangement	3'/5' BCL2
	3q27 rearrangement	3'/5' BCL6
	Predominantly diffuse subtype only: deletion of 1p36	TNFRSF14/1q22
Mantle cell	t(11;14)(q13;q32)	CCND1/IGH
	11q13 rearrangement	5'/3' CCND1
	Blastoid subtype only: deletion of 17p	TP53/D17Z1
	Blastoid subtype only: 8q24.21 rearrangement	5'/3' MYC

	Cyclin D1-negative MCL subtype only: 12p13.32 rearrangement	5'/3' CCND2
Extranodal marginal zone lymphoma of mucosa-associated lymphoid tissue	18q21 rearrangement	5'/3' MALT1
Splenic marginal zone	Deletion of 7q	D7Z1/7q32
	Deletion of 17p	TP53/D17Z1

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 set.

A positive result is supportive of a diagnosis of a B-cell lymphoma. The specific abnormality detected may help determine a B-cell lymphoma subtype and/or contribute to the prognosis.

The absence of an abnormal clone, or Negative result, does not rule out the presence of a neoplastic disorder or change the pathologic diagnosis.

Cautions

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

Fixatives other than formalin (eg, Prefer, Bouin's) may not be successful for fluorescence in situ hybridization (FISH) assays. Non-formalin fixed specimens will not be rejected.

Paraffin-embedded tissues that have been decalcified may not be successful for FISH analysis. The success rate of FISH studies on decalcified tissue is approximately 50%.

FISH studies will be attempted if sufficient tumor is present for analysis. The pathologist reviewing the hematoxylin and eosin-stained slide may find it necessary to cancel testing if insufficient tissue/tumor is available for testing.

If no FISH signals or a lack of sufficient tumor tissue are observed post-hybridization, the case will be released indicating a lack of FISH results.

Broken or cracked unstained slides are not compatible with the instrumentation used in our performing laboratories and will be rejected. Additional material may be requested.

Attempts will be made to repair broken or cracked stained slides; however, if they are unable to be repaired (ie, shattered in transit), they will be rejected and discarded due to safety concerns.

Clinical Reference

Swerdlow SH, Campo E, Harris NL, eds, et al. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues. 4th ed. IARC Press; 2017. WHO Classification of Tumours. Vol 2

Performance

Method Description

This test is performed using commercially available and laboratory-developed probes. Deletion of the *TNFRSF14* locus from chromosome 1, the 7q32 locus from chromosome 7, and the *TP53* locus from chromosome 17 are detected using enumeration strategy probe sets. Rearrangements involving *MYC, BCL2, BCL6, IRF4, CCND1, CCND2* or *MALT1* are detected using dual-color break-apart (BAP) strategy probe sets. Dual-color, dual-fusion fluorescence in situ hybridization (D-FISH) strategy probe sets are used to detect t(2;8), t(8;14), t(8;22), and t(11;14).

At the laboratory's discretion, the IGH/BCL2 FISH probe set will be performed, when necessary, to resolve or confirm an unbalanced *BCL2* rearrangement. *IGH::BCL2* fusion is detected using a dual color, dual fusion probe set.

Paraffin-embedded tissue samples are cut at 5 microns and mounted on positively charged glass slides. The selection of tissue and the identification of target areas on the hematoxylin and eosin (H and E)-stained slide are performed by a pathologist. Using the H and E-stained slide as a reference, target areas are etched with a diamond-tipped engraving tool on the back of the unstained slide to be assayed. Each probe set is hybridized to the appropriate target areas, as indicated on the H and E, and 100 interphase nuclei are scored within the targeted areas. The results are expressed as the percent of abnormal nuclei.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

4 to 10 days

Specimen Retention Time

Slides and H and E used for analysis are retained by the laboratory in accordance with regulatory requirements. Client provided paraffin blocks and extra unstained slides (if provided) will be returned after testing is complete.

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

88377 (if 1 probe set)
88377 x 2 (if 2 probe sets)
88377 x 3 (if 3 probe sets)
88377 x 4 (if 4 probe sets)
88377 x 5 (if 5 probe sets)
88377 x 6 (if 6 probe sets)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
BLYM	B-cell Lymphoma, FISH, Tissue	101651-8

Result ID	Test Result Name	Result LOINC® Value
603063	Result Summary	50397-9
603064	Interpretation	69965-2
603065	Result Table	93356-4
603066	Result	62356-1
GC026	Reason for Referral	42349-1
603067	Specimen	31208-2
603068	Source	85298-8
603069	Tissue ID	80398-1
603070	Method	85069-3
603071	Additional Information	48767-8
603072	Disclaimer	62364-5
603073	Released By	18771-6