Test Definition: TALMF

T-Cell Acute Lymphoblastic Leukemia/Lymphoma (ALL), Specified FISH, Varies

Overview

Useful For

Detecting recurrent common chromosome abnormalities associated with T-cell acute lymphoblastic leukemia/lymphoma (T-ALL) using **client-specified** probe set(s)

An adjunct to conventional chromosome studies in patients with T-ALL

Evaluating specimens in which standard cytogenetic studies are unsuccessful

Identifying and tracking known chromosome abnormalities in patients with T-ALL and monitoring response to therapy

This test **should not be used** to screen for residual T-ALL

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
TALMB	Probe, Each Additional (TALMF)	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. Analysis charges will be incurred based on the number of cells analyzed per probe set. If no cells are available for analysis, no analysis charges will be incurred.

This test is performed using client-specified FISH probes and is not intended as a panel test. Specific probes must be listed in the probe request field. Reflex probes can be performed when appropriate if specified in the order request field.

When specified, any of the following probes will be performed:
1p33 rearrangement or STIL deletion, request probe TAL1/STIL
t(5;14)(q35;q32) or *TLX3::BCL11B* fusion, request probe TLX3/BCL11B
t(5q32;var) or *PDGFRB* rearrangement, request probe PDGFRB break-apart
t(7q34;var) or *TRB* rearrangement, request probe TRB break-apart
t(6;7)(q23;q34) or *TRB:MYB* fusion, request probe MYB/TRB
t(7;10)(q34;q24) or *TRB::TLX1* fusion, request probe TRB/TLX1
t(7;11)(q34;p15) or *TRB::LMO1* fusion, request probe TRB/LMO1
t(7;11)(q34;p13) or *TRB::LMO2* fusion, request probe TRB/LMO2
t(9p24.1;var) or *JAK2* rearrangement, request probe JAK2 break-apart

ABL1 amplification or t(9;22)(q34;q11.2), request probe ABL1/BCR
t(9q34;var) or *ABL1* rearrangement, request probe ABL1 break-apart
t(10;11)(p12;q14) or *PICALM:: MLLT10* fusion, request probe MLLT10/PICALM
t(11q23;var) or *KMT2A* rearrangement, request probe KMT2A break-apart
t(4;11)(q21;q23) or *KMT2A::AFF1* fusion, request probe AFF1/KMT2A
t(6;11)(q27;q23) or *KMT2A::AFDN* fusion, request probe AFDN/KMT2A
t(9;11)(p22;q23) or *KMT2A::MLLT3* fusion, request probe MLLT3/KMT2A
t(10;11)(p12;q23) or *KMT2A::MLLT10* fusion, request probe MLLT10/KMT2A
t(11;19)(q23;p13.3) or *KMT2A::MLLT1* fusion, request probe KMT2A/MLLT1
t(11;19)(q23;p13.1) or *KMT2A::ELL* fusion, request probe KMT2A/ELL
t(14q11.2;var) or *TRA* rearrangement, request probe TRA break-apart
t(8;14)(q24.1;q11.2) or *TRA::MYC* fusion, request probe MYC/TRA
t(10;14)(q24;q11.2) or *TRA::TLX1* fusion, request probe TLX1/TRA
t(11;14)(p15;q11.2) or *TRA::LMO1* fusion, request probe LMO1/TRA
t(11;14)(p13;q11.2) or *TRA::LMO2* fusion, request probe LMO2/TRA
-17/17p-, request probe TP53/D17Z1

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.

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** T-cell acute lymphoblastic leukemia/lymphoma (T-ALL) fluorescence in situ hybridization (FISH) probes are needed based on specific abnormalities or abnormalities identified in the diagnostic sample. **The FISH probes to be analyzed must be specified on the ordering request.** If targeted FISH probes are not included with this test order, test processing will be delayed and the test may be canceled and automatically reordered by the laboratory as TALAF / T-Cell Acute Lymphoblastic Leukemia/Lymphoma (ALL), FISH, Adult, Varies or TALFP / Pediatric T-Lymphoblastic Leukemia/Lymphoma panel, FISH, Varies?depending on the age of the patient.

At diagnosis, conventional cytogenetic studies (CHRBM / Chromosome Analysis, Hematologic Disorders, Bone Marrow) and a complete T-ALL FISH panel (either TALAF or TALFP) should be performed.

If a complete T-cell ALL FISH panel is preferred for an **adult patient who is 31 years or older**, order TALAF / T-Cell Acute Lymphoblastic Leukemia/Lymphoma (ALL), FISH, Adult, Varies.

If a complete T-cell ALL FISH panel is preferred for a **pediatric patient who is 30 years or younger**, order TALFP / Pediatric T-Lymphoblastic Leukemia/Lymphoma panel, FISH, Varies.

If this test is ordered and the laboratory is informed that the patient is on a Children's Oncology Group (COG) protocol, this test will be canceled and automatically reordered by the laboratory as COGTF / T-Cell Acute Lymphoblastic Leukemia/Lymphoma (ALL), Children's Oncology Group Enrollment Testing, FISH, Varies.

If the patient clinically relapses, a conventional chromosome study is useful to identify cytogenetic changes in the neoplastic clone or the possible emergence of a new therapy-related myeloid clone.

For testing paraffin-embedded tissue samples from patients with T-lymphoblastic leukemia/lymphoma (T-LBL), order TLBLF / T-Cell Lymphoblastic Leukemia/Lymphoma, FISH, Tissue. If a paraffin-embedded tissue sample is submitted for this test, this test will be canceled and TLBLF will be added and performed as the appropriate test.

Additional Testing Requirements

At diagnosis, conventional cytogenetic studies (CHRBM / Chromosome Analysis, Hematologic Disorders, Bone Marrow) and a complete TALAF / T-Cell Acute Lymphoblastic Leukemia/Lymphoma (ALL), FISH, Adult, Varies or TALFP / Pediatric T-Lymphoblastic Leukemia/Lymphoma panel, FISH, Varies? should be performed, depending on patient's age. If there is limited specimen available, only fluorescence in situ hybridization testing will 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 must be provided. If this information is not provided, an appropriate indication for testing may be entered by Mayo Clinic Laboratories.
3. A flow cytometry and/or a bone marrow pathology report should be submitted with each specimen. The laboratory will not reject testing if this information is not provided, but appropriate testing and interpretation may be compromised or delayed.

Specimen Required

Submit only 1 of the following specimens:

Preferred
Specimen Type: Bone marrow
Container/Tube:
Preferred: Yellow top (ACD)
Acceptable: Green top (sodium heparin) or lavender top (EDTA)

Specimen Volume: 2 to 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: Whole blood
Container/Tube:
Preferred: Yellow top (ACD)
Acceptable: Green top (sodium 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
Bone marrow: 1 mL; Whole blood: 2 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
Acute lymphoblastic leukemia (ALL) accounts for approximately 70% of all childhood leukemia cases (aged 0 to 19 years), making it the most common childhood cancer.

Approximately 85% of pediatric cases of ALL are of B-cell lineage (B-ALL) and 15% are of T-cell lineage (T-ALL). T-ALL is more common in adolescents than younger children and accounts for 25% of adult ALL. When occurring as a primary lymphoblastic lymphoma (LBL), approximately 90% are T-cell lineage versus only 10% B-cell lineage. T-LBL often present as a mediastinal mass in younger patients, with or without concurrent bone marrow involvement.

An abnormal karyotype is found in 50% to 70% of T-ALL cases, although many of the classic abnormalities are "cryptic" by conventional chromosome studies and must be identified by fluorescence in situ hybridization (FISH) studies and are associated with various prognoses. One predictive marker, amplification of the *ABL1* gene region, has been identified in 5% of T-ALL, and these patients may be responsive to targeted tyrosine kinase inhibitors.

A summary of the characteristic chromosome abnormalities identified in T-ALL is listed in the following table.

Table. Common Chromosome Abnormalities in T-cell Acute Lymphoblastic/Leukemia

Cytogenetic change	Genes involved
del(1p33)	*TAL1/STIL*
t(5;14)(q35;q32)	*TLX3::BCL11B*
t(5q32;var)	*PDGFRB*
t(10;11)(p13;q14)	*PICALM::MLLT10*
Episomal amplification	*ABL1*
t(9p24.1;var)	*JAK2*
t(9q34;var)	*ABL1*
t(11q23;var)	*KMT2A*
t(4;11)(q21;q23)	*KMT2A::AFF1*
t(6;11)(q27;q23)	KMT2A::*AFDN*
t(9;11)(p21.3;q23)	*KMT2A::MLLT3*
t(10;11)(p13;q23)	*KMT2A::MLLT10*
t(11;19)(q23;p13.1)	*KMT2A::ELL*
t(11;19)(q23;p13.3)	*KMT2A::MLLT1*
t(7q34;var)	*TRB*
t(6;7)(q23;q34)	*TRB::MYB*
t(7;10)(q34;q24)	*TRB* ::*TLX1*
t(7;11)(q34;p15)	*TRB* ::*LMO1*
t(7;11)(q34;p13)	*TRB* ::*LMO2*
t(14q11.2;var)	*TRA*
t(8;14)(q24.21;q11.2)	*TRA::MYC*
t(10;14)(q24;q11.2)	*TLX1*::*TRA*
t(11;14)(p15;q11.2)	*LMO1*::*TRA*
t(11;14)(p13;q11.2)	*LMO2* ::*TRA*
del(17p)	*TP53*
Complex karyotype (> or =4 abnormalities)	

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.

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 existing clinical and pathologic information.

Fluorescence in situ hybridization (FISH) is not a substitute for conventional chromosome studies because the latter detects chromosome abnormalities associated with other hematological disorders that would go undetected in a targeted T-cell acute lymphoblastic leukemia/lymphoma FISH test.

Bone marrow is the preferred sample type for this fluorescence in situ hybridization (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).

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

Clinical Reference

1. WHO Classification of Tumours Editorial Board, eds. Haematolymphoid tumours. 5th ed. IARC Press; 2024. WHO Classification of Tumours, Volume 11
2. Gesk S, Martin-Subero JI, Harder L, et al. Molecular cytogenetic detection of chromosomal breakpoints in T-cell receptor gene loci. Leukemia. 2003;17:738-745
3. Chin M, Mugishima H, Takamura M, et al. Hemophagocytic syndrome and hepatosplenic (gamma)(delta) T-cell lymphoma with isochromosome 7q and 8 trisomy. J Pediatr Hematol Oncol. 2004;26(6):375-378
4. Graux C, Cools J, Michaux L, Vandenberghe P, Hagemeijer A. Cytogenetics and molecular genetics of T-cell acute lymphoblastic leukemia: from thymocyte to lymphoblast. Leukemia. 2006;20:1496-1510
5. Cayuela JM, Madani A, Sanhes L, Stern MH, Sigaux F. Multiple tumor-suppressor gene 1 inactivation is the most frequent genetic alteration in T-cell acute lymphoblastic leukemia. Blood. 1996;87:2180-2186
6. Hayette S, Tigaud I, Maguer-Satta V, et al. Recurrent involvement of the *MLL* gene in adult T-lineage acute lymphoblastic leukemia. Blood. 2002;99:4647-4649
7. Graux C, Cools J, Melotte C, et al. Fusion of *NUP214* to *ABL1* on amplified episomes in T-cell acute lymphoblastic leukemia. Nat Genet. 2004;36:1084-1089

Performance

Method Description

This test is performed using commercially available and laboratory-developed probes. Rearrangements involving *TAL1/STIL, PDGFRB, TRB, JAK2, ABL1, KMT2A*, and *TRA* are detected using dual-color break-apart (BAP) strategy probes. Dual-color, dual-fusion fluorescence in situ hybridization (D-FISH) strategy probe sets are used to detect t(5;14), t(9;22), t(10;11), and in reflex testing when rearrangements of *KMT2A, TRB*, or *TRA* genes are detected. Amplification of the *ABL1* gene region is detected using a D-FISH probe strategy to enumerate copies of the ABL1 probe. 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
88271x2, 88275x1, 88291x1-FISH Probe, Analysis, Interpretation; 1 probe set
88271x2, 88275x1 - FISH Probe, Analysis; each additional probe set (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
TALMF	ALL (T-cell), Specified FISH	In Process

Test Definition: TALMF

T-Cell Acute Lymphoblastic Leukemia/Lymphoma (ALL), Specified FISH, Varies

Result ID	Test Result Name	Result LOINC® Value
614325	Result Summary	50397-9
614326	Interpretation	69965-2
614327	Result Table	93356-4
614328	Result	62356-1
GC134	Reason for Referral	42349-1
GC135	Probes Requested	78040-3
GC136	Specimen	31208-2
614329	Source	31208-2
614330	Method	85069-3
614331	Additional Information	48767-8
614332	Disclaimer	62364-5
614333	Released By	18771-6