

Acute Lymphoblastic Leukemia Panel by FISH, Adult

Indications for Ordering

Risk stratification and therapeutic management in adults with newly diagnosed B-cell acute lymphoblastic leukemia (B-ALL)

Test Description

Fluorescence in situ hybridization

- FISH probes detect
 - *BCR-ABL1* t(9;22)
 - *KMT2A (MLL)* 11q23 rearrangement (partner not determined)
 - *TCF3 (E2A)* rearrangement (partner not determined)
 - *IGH* rearrangement (partner not determined)
 - *MYC* rearrangement (partner not determined)
- Performed on bone marrow (BM) or peripheral blood cells on unstimulated cultures from either direct harvest or 24-hour culture

Tests to Consider

Typical testing strategy

At diagnosis, minimum ALL workup includes BM aspirate for

- Morphology
- Immunophenotyping
- Cytogenetics
- ALL panel by FISH, adult
- Ph-like ALL panel by FISH

Primary test

[Acute Lymphocytic Leukemia \(ALL\) Panel by FISH, Adult 2002647](#)

- Recommended FISH panel for adults with newly diagnosed B-ALL

Related tests

[Leukemia/Lymphoma Phenotyping by Flow Cytometry 2008003](#)

- Aids in diagnosis of hematopoietic neoplasms

[Chromosome Analysis, Bone Marrow 2002292](#)

- Diagnosis, prognosis, and monitoring of hematopoietic neoplasms

[Chromosome Analysis, Bone Marrow with Reflex to Genomic Microarray 2007130](#)

- Diagnosis, prognosis, and monitoring of hematopoietic neoplasms
- Microarray performed when karyotype results are reported as "normal" or "no growth"

[Cytogenomic SNP Microarray – Oncology 2006325](#)

- Preferred test for fresh specimens at time of diagnosis to detect prognostically important genomic abnormalities in leukemias/lymphomas and solid tumors involving
 - Loss/gain of DNA
 - Loss of heterozygosity (LOH)
- Monitor disease progression and response to therapy

[Ph-Like Acute Lymphocytic Leukemia \(ALL\) Panel by FISH 3000455](#)

- Recommended FISH panel for individuals suspected of having *BCR-ABL1*-like B-ALL (Ph-Like ALL)

[Chromosome FISH, Interphase 2002298](#)

- Use to order individual or multiple FISH probes if standard FISH panels are not desired
- Specific FISH probes must be requested
 - *BCR-ABL1*
 - *KMT2A (MLL)*
 - *TCF3 (E2A)*
 - *IGH*
 - *MYC*

[BCR-ABL1, Qualitative with Reflex to BCR-ABL1 Quantitative 2005010](#)

- Recommended when submitting initial diagnostic sample for chronic myelogenous leukemia (CML) or Ph+ ALL (no previous *BCR-ABL1* testing)
- If qualitative test is positive, the appropriate corresponding quantitative test is performed

Disease Overview

Incidence

B-ALL occurs in 1.6/100,000 individuals per year

Treatment issues

- Treatment protocols are stratified by risk factors including the presence of t(9;22) (ie, Philadelphia chromosome status) and age
- Identification of recurrent genetic alterations helps refine individual prognosis and guide management

Prognosis	Good	Poor
Age	Younger age <ul style="list-style-type: none"> Especially <25 years when treated with a pediatric protocol 	Older age <ul style="list-style-type: none"> Individuals >60 years have a particularly poor prognosis High WBC >30 x 10⁹/L for B-ALL
Genetic abnormalities		<ul style="list-style-type: none"> <i>BCR-ABL1</i> t(9;22) positive <i>KMT2A (MLL)</i> rearrangements Complex karyotype (>5 chromosomal abnormalities) Low hypodiploidy Near triploidy

Genetics

Genes – *BCR-ABL1*, *KMT2A (MLL)*, *TCF3 (E2A)*, *IGH*, *MYC*

Structure/function

- *BCR-ABL1* t(9;22)
 - Results in chimeric constitutively active tyrosine kinase
 - Present in 25% of adult B-ALL
- *KMT2A (MLL)* t(v;11q23)
 - Present in 10% of adult ALL
- *TCF3 (E2A)-PBX1* t(1;19)
 - Present in 3% of adult ALL
- *IGH* rearrangement
- *c-MYC* rearrangement

Test Interpretation

Results

- Normal – no evidence of *BCR-ABL1* t(9;22), *KMT2A (MLL)* rearrangement, *TCF3 (E2A)* rearrangement, *IGH* rearrangement, or *MYC* rearrangement
- Abnormal – one of the above rearrangements or translocations detected

Limitations

- Panel detects only the specific aberrations targeted by the probes
- Chromosome alterations outside the regions complementary to these FISH probes will not be detected