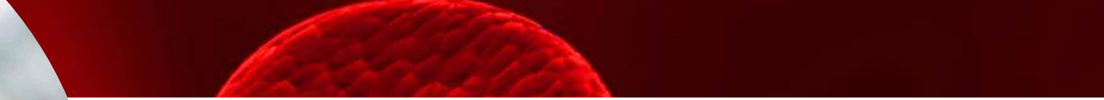
GOPATH®
LABORATORIES
Global Pathology Services

HEMATOPATHOLOGY SERVICES




"Driven by patient care, GoPath Laboratories has set a new standard for hematologic cancer testing."



Why GoPath?

GoPath Laboratories is a full-service molecular genetics and anatomic pathology diagnostic reference laboratory providing cutting-edge testing technologies including next generation sequencing (NGS), microarray, and digital PCR platforms. We also offer lab partnerships, consultative support and interactive pathology education with a focus on cancer. Our goal is to provide our clients with premier pathology services through outstanding diagnosis and prognosis, results-driven research, education, and strong consultative support.

We strive to be a leader in hematologic pathology based on the superiority of our people, our patient-driven research and science. Our scientists work rigorously to develop the most cutting edge hematologic tests to ensure our hematopathologists make the most definitive diagnosis and provide clinicians with in-depth information on a patient's prognosis and treatment options.

Sample Report & Requisition

GOPATH LABORATORIES

Molecular Oncology Report
CLIA ID# 14D2037930

TOLL FREE
1-855-GOPATH9

Doe, John GM15-001234

DOB: 01-25-1939 **Age:** 75 **Gender:** Male
Collected: 01-01-2015 **Received:** 01-02-2015
Tissue: Bone Marrow Aspirate **Location**:
Order ID: S14-1111, GF14-1111, 5490)

Test Ordered: Bone Marrow Analysis

Referring Doctor, MD
Medical Center
800 Medical Road
Dept of Pathology
Chicago, IL 60610
Phone: 847-XXX-XXXX **Fax:** 847-XXX-XXXX
CC: Other Physician, MD

Clinical History:

BONE MARROW REPORT

DIAGNOSIS:
BONE MARROW CORE BIOPSY, CLOT SECTION, ASPIRATE SMEARS, TOUCH IMPRINTS AND PERIPHERAL BLOOD SMEAR:
-HYPERCELLULAR BONE MARROW WITH INCREASED MYELOBLASTS (~11-12%) AND DYSPOIESIS
-POSITIVE FOR 5q DELETION, TRISOMY 8 AND TRISOMY 13 BY FISH
-CONSISTENT WITH INVOLVEMENT BY A HIGH GRADE MYELODYSPLASTIC SYNDROME BEST CLASSIFIED AS REFRACTORY ANEMIA WITH EXCESS BLASTS-2 (RAEB-2)
-PLEASE SEE COMMENT

COMMENT
The bone marrow is hypercellular for age with trilineal hematopoiesis and an increase in the number of blasts (~11-12%) based on CD34 stain of the core biopsy. The blasts have a myeloid phenotype by flow cytometry. In addition, dyserythropoiesis, dysgranulopoiesis and dysmegakaryopoiesis is noted with a slight increase in the number of monocytes in the bone marrow. Iron stains show increased storage iron with occasional ringed sideroblasts (<15%). FISH studies are positive for 5q deletion, trisomy 8 and trisomy 13 which portend an unfavorable prognosis. These findings are consistent with involvement by a high grade myelodysplastic syndrome best classified as refractory anemia with excess blasts-2 (RAEB-2). Clinical correlation and close follow-up are recommended.
Case discussed with Dr. Nice on 4-9-2010.

Dyserythropoiesis

Cytochemical and Immunohistochemical Stains:
CD34: increased blasts (~11-12%) with small cluster formation
CD117: increased immature myeloid cells
MPO: positive in blasts
CD68: slight increase in monocytes
CD3 and CD20: mixed B and T-cells with no lymphoid aggregates
Iron: increased storage iron with occasional ringed sideroblasts (<15%)

Increased blasts

Gross Description:
A. Received specimen in formalin labeled with patient's name. It consists of three core biopsies measuring 1.2, 0.6 and 0.4 cm in length. The specimen is submitted in cassette A after decalcification.

GoPath Laboratories, LLC
1351 Barclay Blvd, Buffalo Grove, IL 60089 | Tel: 855.467.2849 | Fax: 224.588.9941
www.gopathlabs.com
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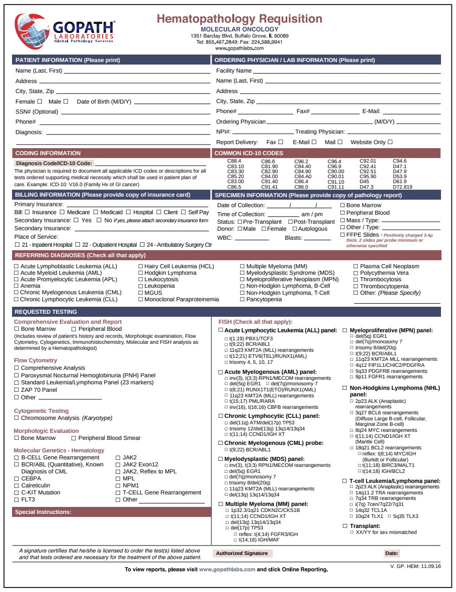


GOPATH LABORATORIES Global Pathology Services

Hematopathology Requisition
MOLECULAR ONCOLOGY
1351 Barclay Blvd, Buffalo Grove, IL 60089
Tel: 855.467.2849; Fax: 224.588.9941
www.gopathlabs.com

PATIENT INFORMATION (Please print)
ORDERING PHYSICIAN / LAB INFORMATION (Please print)
CODING INFORMATION
COMMON ICD-10 CODES
BILLING INFORMATION (Please provide copy of insurance card)
SPECIMEN INFORMATION (Please provide copy of pathology report)
REFERRING DIAGNOSES (Check all that apply)
REQUESTED TESTING
Special Instructions:
Authorized Signature
Date:
To view reports, please visit www.gopathlabs.com and click Online Reporting.

What GoPath offers:

- Physician-Owned, Full-Service Laboratory
- Quick Turnaround (TAT)
- Local Pickup Service
- Streamlined Workflow
- Flexible Revenue-Sharing
- Dedicated Team of Hematopathologists
- Web Portal and Online Results Reporting
- Variety of Connectivity Solutions
- Ongoing Research and Hematologic Test Development
- Customized Billing Options

Cytogenetic Testing

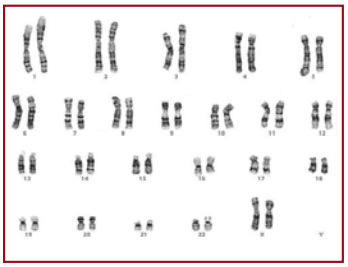
Testing for chromosomal abnormalities is essential for determining an accurate diagnosis and prognosis for hematologic cancers. Cytogenetic testing can be a valuable tool for helping physicians create individualized treatment plans by predicting cancer's responsiveness to specific treatment regimens.

We are constantly researching and implementing the latest cytogenetic technologies to help our clients make informed decisions by providing them with the most accurate results possible. Our commitment to research and development, our exceptional customer service and unparalleled turnaround time are just a few of the reasons why GoPath Laboratories is a leader in cytogenetic testing.

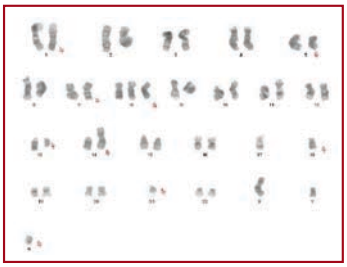
Chromosome Analysis

Chromosome analysis (or karyotyping) is the most common type of testing for hematologic cancers. It evaluates the number and structure of a person's chromosomes in order to detect abnormalities. A cell sample is taken and cultured to promote cell division. Chromosomes are then isolated from the nucleus, placed on a slide and stained. Then they are mapped and examined for mutations that could indicate the presence of cancer such as changes in arrangement, size, or number.

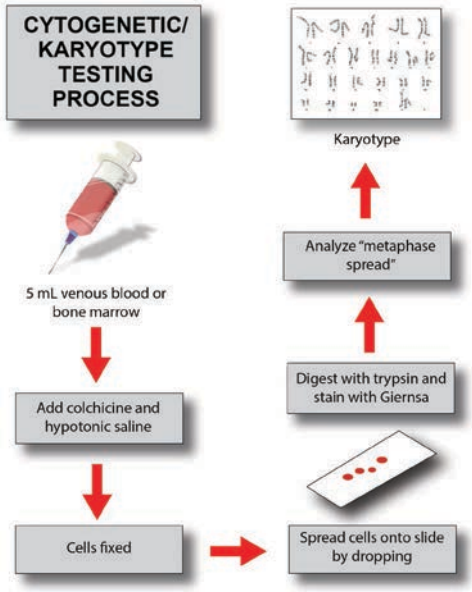
Karyotyping can help diagnose and differentiate leukemias by identifying specific translocations for certain acute leukemias, acute promyelocytic leukemias, chronic myelocytic leukemias, and acute lymphoblastic leukemias. Karyotyping is a good starting point for diagnosis and prognosis, as well as for determining what course of action to take when creating a treatment plan.



Normal Karyotype



Abnormal Male Karyotype
with Multiple Complex Abnormalities



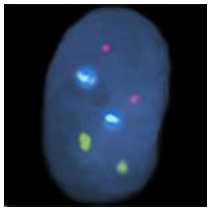
Fluorescence in Situ Hybridization (FISH) Testing

FISH testing is much more sensitive than karyotyping. With FISH, an abnormal gene segment is made to "light up" or fluoresce when bound by a special probe. This process allows us to detect the presence or absence of a specific chromosomal abnormality through a microscope. Both balanced and unbalanced chromosomal translocations and chromosome number changes can be observed using FISH. Diagnostic and prognostic information may be determined by the presence of such cytogenetic abnormalities. FISH is often ordered following a cancer diagnosis to identify prognostic chromosomal abnormalities to better determine the cancer's stage and to predict its course. FISH also helps diagnose different cancers that may look similar but that have different genetic abnormalities that could require different treatments. FISH panels may be ordered along with standard cytogenetics for diagnosis, prognosis, and to monitor minimal residual disease. In addition, FISH testing delivers results more quickly than conventional cytogenetic testing, since FISH does not need to be performed on actively dividing cells.

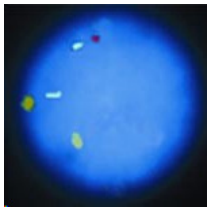
FISH Image Samples

Normal pattern/aberration comparisons

Deletions of the long arm of chromosome 13 (13q-) are observed in patients with multiple myeloma.

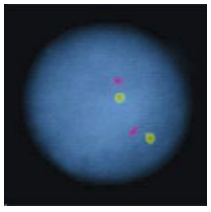


Normal Pattern 13q14.3, 13q34 and 12p11.1q11

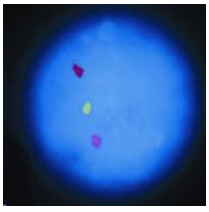


13q Deletions (13q14.3- and 13q34)

The image on the right shows a 11q22.3 deletion often found in patients with chronic lymphocytic leukemia, the most common type of leukemia found in adults.



Normal 17p13.1 and 11q22.3



11q22.3 Deletion (ATM-)

GoPath FISH Test Panel Descriptions

FISH Test Panel	Disease	Probe Targets/Genes
ALL Panel	Acute Lymphoblastic Leukemia	t(1;19) PBX1/TCF3, t(9;22) BCR/ABL1, MLL, t(12;21) ETV6(TEL)/RUNX1(AML), trisomy 4, 5, 10, 17
AML Panel	Acute Myeloid Leukemia	inv(3), t(3;3) RPN1/MECOM, del(5q) EGR1, del(7q)/monosomy 7, t(8;21) RUNX1T1(ETO)/RUNX1(AML), MLL, t(15;17) PML/RARA, inv(16), t(16;16) CBFB
CLL Panel	Chronic Lymphocytic Leukemia	del(11q) ATM/del(17p) TP53, trisomy 12/del(13q) 13q14/13q34, t(11;14) CCND1/IGH XT
CML Probe	Chronic Myeloid Leukemia	t(9;22) BCR/ABL1
MDS Panel	Myelodysplastic Syndrome	inv(3), t(3;3) RPN1/MECOM, del(5q) EGR1, del(7q)/monosomy 7, trisomy 8/ del(20q), MLL, del(13q) 13q14/13q34
MM Panel	Multiple Myeloma	1p32.3/1q21 CDKN2C/CKS1B, t(11;14) CCND1/IGH XT, del(13q) 13q14/13q34, del(17p) TP53, reflex: t(4;14) FGFR3/IGH, t(14;16) IGH/MAF
MPN Panel	Myeloproliferative Neoplasia	del(5q) EGR1, del(7q)/monosomy 7, trisomy 8/del(20q), t(9;22) BCR/ABL1, MLL, 4q12 FIP1L1/CHIC2/PDGFRA, 5q33 PDGFRB, 8p11 FGFR1
NHL Panel	Non-Hodgkins Lymphoma	2p23 ALK, 3q27 BCL6, 8q24 MYC, t(11;14) CCND1/IGH XT, 18q21 BCL2, reflex: t(8;14) MYC/IGH, t(11;18) BIRC3/MALT1, t(14;18) IGH/BCL2
T-Cell Panel	Leukemia/Lymphoma	2p23 ALK, 14q11.2 TRA, 7q34 TRB, i(7q) 7cen/7q22/7q31, 14q32 TCL1A, 10q24 TLX1, 5q35 TLX3
Transplant		XX/XY for Sex Mismatched Transplants

Microarray Analysis

Chromosomal microarray analysis (CMA) takes cytogenetic testing one step further by helping to identify genetic changes that are not detected by conventional chromosome analysis or FISH studies. Microarray analysis complements both chromosome analysis and FISH testing by helping to establish an accurate diagnosis and prognosis to better assist in managing hematologic malignancies.

Although many chromosomal abnormalities are large enough to be detected with conventional chromosome analysis, many others are below its limits of resolution. Microarray analysis can detect copy-neutral loss of heterozygosity, something that karyotyping and FISH testing cannot do.

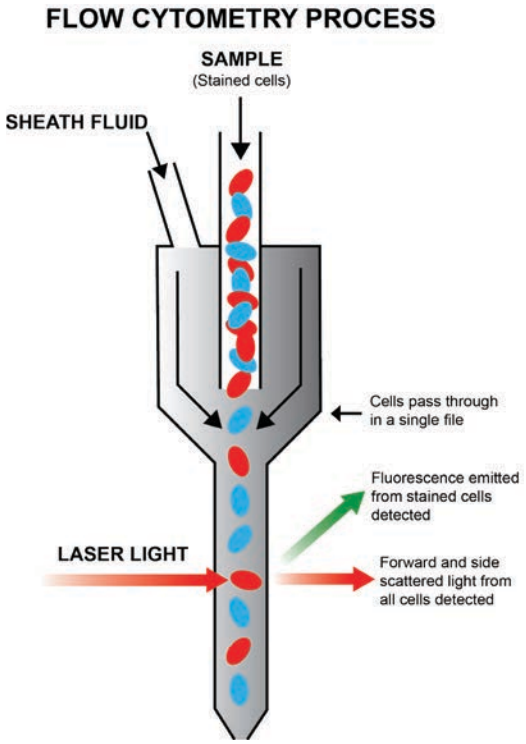
Liquid Biopsy

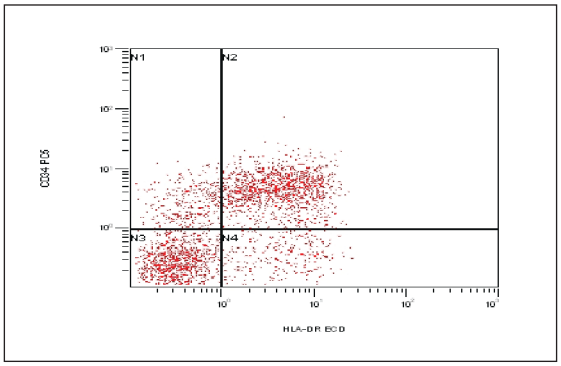
Liquid biopsy examines DNA mutations and other changes in genetic material found in fragments that detach from tumors and circulate in the blood of patients with cancer. These tests can help physicians better monitor disease progression without having to take traditional tumor biopsies, which can cause complications depending on the location of the tumor and the condition of the patient. Liquid biopsy could be a surrogate for tissue biopsy in early cancer diagnosis, assessment of prognosis, monitoring relapse and predicting drug responsiveness. By detecting mutations found in tumor DNA, these tests can also assist doctors in predicting how a cancer will respond to certain treatments and which drug therapies will be most effective for the patient.

Flow Cytometry (Immunophenotyping)

Flow cytometry is often ordered in addition to other cytogenetic tests to help establish a prognosis and to monitor the progression of certain cancers. It also can be used to help differentiate between cancers. Cells from the blood or bone marrow are incubated with commercially generated antibodies that selectively bind to antigens on the surface of leukemia cells or in their cytoplasm. The antigens act like markers and are detected by flow cytometry, which uses a laser beam to identify cell types based on the antigens present.

Flow cytometry determines the number of cells in a sample, the size and shape of the cell, and the presence of tumor markers. It is a highly-sensitive test that can detect minimal residual disease after cancer treatment when other tests show no signs of malignancy. Since flow cytometry analyzes thousands of cells per second, the results are gathered very quickly.





Blasts expressing CD34 and HLA-DR

Testing Process	Specimen Required	TAT
Chromosome Analysis	Peripheral blood or bone marrow aspirate stored at room temperature in sodium heparin (green top) anticoagulant	5-7 days
FISH		3-5 days
Flow Cytometry / Molecular Testing	Peripheral blood or bone marrow aspirate refrigerated in an EDTA (purple top) anticoagulant	24-48 hours

GoPath Laboratories Connectivity Solutions

GoPath Connect™

- Virtual Pathology Resources
- EMR Bi-Directional Interface
- LIS Interface
- In-Office Color Reporting
- Auto-Fax Solution
- Multiple Copy Option
- Patient-Friendly Report Interpretation
- Online Convenient Access to Results (24/7)
- Real-Time Report Status
- Order Management and Tracking Capabilities
- Additional Time Saving Functions

Office Pickup Options

- Local Courier Services
- FedEx Express
- FedEx Same Day City

Visit Us at GoPathLabs.com and Get Access to:

- List of All Tests Offered
- Requisitions
- Current Services Provided
- Research Collaborations
- Licenses and Accreditations
- FISH/IHC/LIS Reporting
- Test Supply Order Forms
- Information About Our Pathologists, Scientific and Executive Team Members

Account Set Ups

- Immediate
- Customized Requisitions
- Personalized In-Service and Training
- Convenient Supply Ordering
- Specialized Account Set Up Team

Billing Capabilities

Billing shouldn't frustrate your patients or distract your staff. We offer the following billing solutions:

- In-Network Lab Accepting All Government Insurances
- Work With Most Insurances & Customized Billing Options Available
- Convenient Client Billing
- Dedicated Billing Support
- Technical and Professional Model Billing also Available
- Tech-Only Services

Let Us Help You Get Started

Providing appropriate information saves valuable time, eliminates confusion, limits phone calls & shortens turnaround time.

- Indicate Billing
- Patient's Legal Name
- Patient's DOB and Gender
- Date of Service / Collection
- Patient's Address and Phone Number
- Ordering Physician's Name, Facility and NPI
- ICD10-CM Codes

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