



National Cancer Institute

Hematopoietic and Lymphoid Neoplasm Project





Acknowledgments

- American College of Surgeons (ACOS) Commission on Cancer (COC)
- Canadian Cancer Registries (CCR)
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- National Program of Cancer Registries (NPCR) of the Centers for Disease Control (CDC)
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With Special Thanks to

- Graca Dores, MD
- Charles Platz, MD
- Amy Blum, RHIT, CTR





Disease Presentations and Diagnostic Process

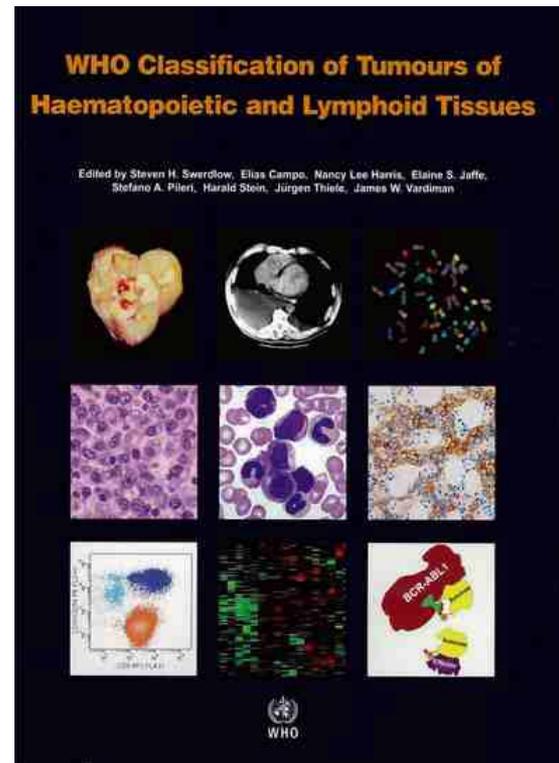
Carol Hahn Johnson, BS, CTR

NCI-SEER

October 2009

Classification of Tumors

2008 – *WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues*, 4th edition, October 2008





Objectives

Understand the basis of the WHO
Classification

Understand the presentation and workup for
hematopoietic and lymphoid neoplasms

Recognize provisional diagnoses

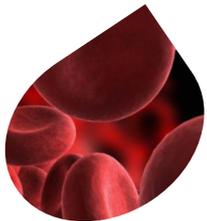




Objectives

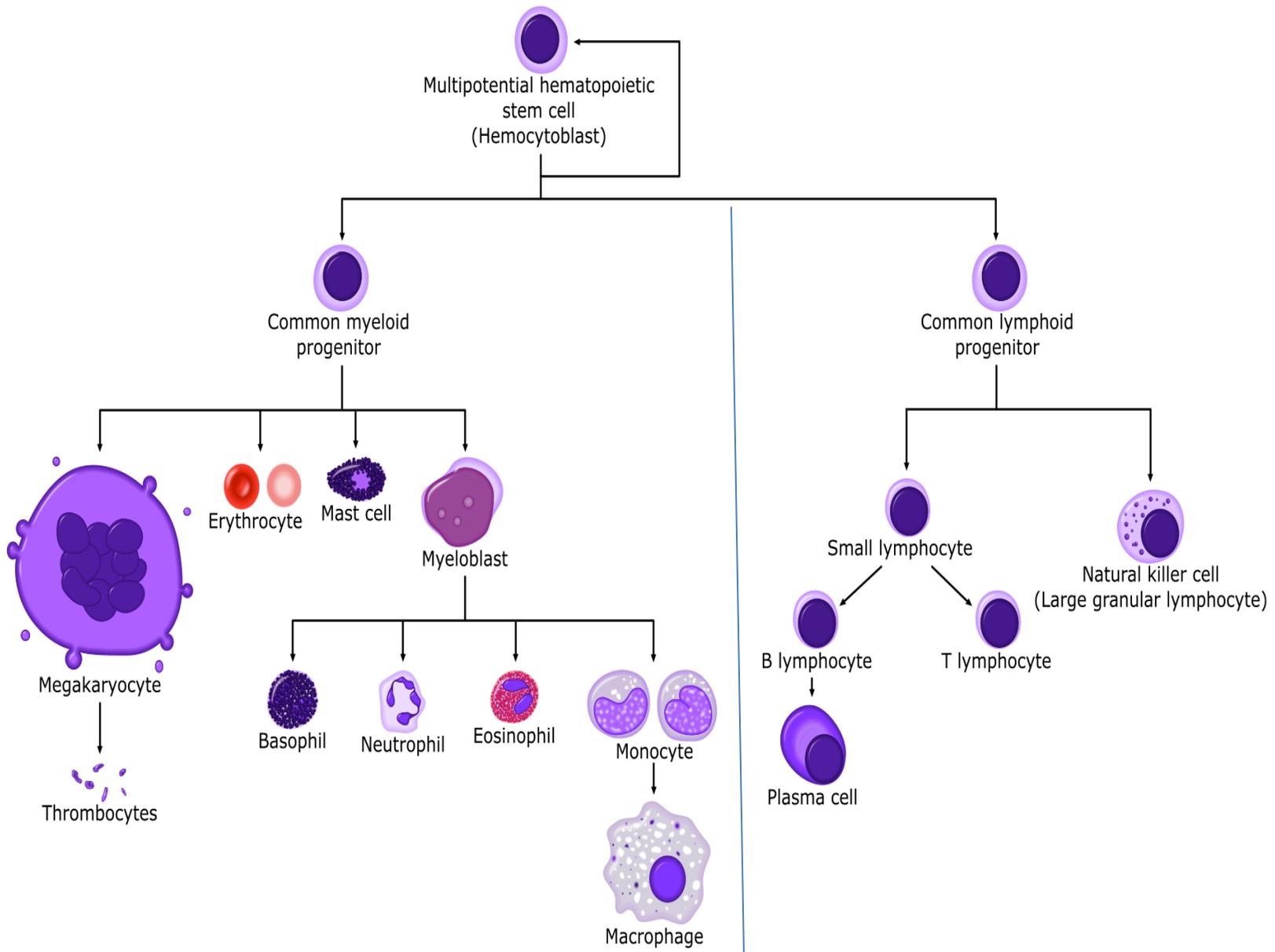
Recognize the significance of
immunophenotyping and genetic testing

Understand the terminology used in
immunophenotyping and genetic testing





New Classifications of Hematopoietic and Lymphoid Neoplasms





2008 WHO Classification of Tumors of Haematopoietic and Lymphoid Tissues

Basic principle: Classification for all neoplasms based on:

- Morphology and biologic features
- Genetic
- Immunophenotype
- Clinical features





Disease Definitions and Symptoms

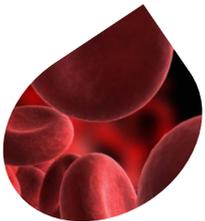


Tumors Primary in Tissue

Lymphoma: Malignant tumor in lymph nodes or lymphoid tissue

Myeloid sarcoma: Solid tumor of immature white blood cells

Plasma cell tumor (MM, extraosseous, osseous): Tumors comprised of plasma cells





Lymphoma Presentation

Not specific to disease

Swollen lymph nodes

Chest pain/breathing problems

Unexplained weight lost

Recurring fevers/night sweats

Rashes

Lower back pain

Sore LN after alcohol consumption





Leukemia

Presentation/Symptoms

Leukemia limited to BM involvement

Chronic leukemia

Usually asymptomatic

Acute leukemia

Symptomatic

Symptoms vary with type of leukemia





Acute Leukemia Symptoms

Anemia

Shortage of red blood cells

Symptoms: SOB, tiredness, pallor

Leukopenia

Shortage of normal white blood cells; too few mature granulocytes

White blood cells do not protect against infection





Acute Leukemia Symptoms

Thrombocytopenia

Low blood platelets

Platelets control blood clotting by closing “holes”
in damaged blood vessels

Symptoms: excessive bruising, bleeding,
nosebleeds, and bleeding from gums





Initial Diagnostic Procedures



Lymphoma, Myeloid Sarcoma, Plasma Cell Tumor

Tissue biopsy

Lymph node

Organ

Skin

Bone

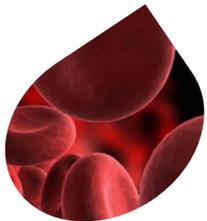
Bone marrow

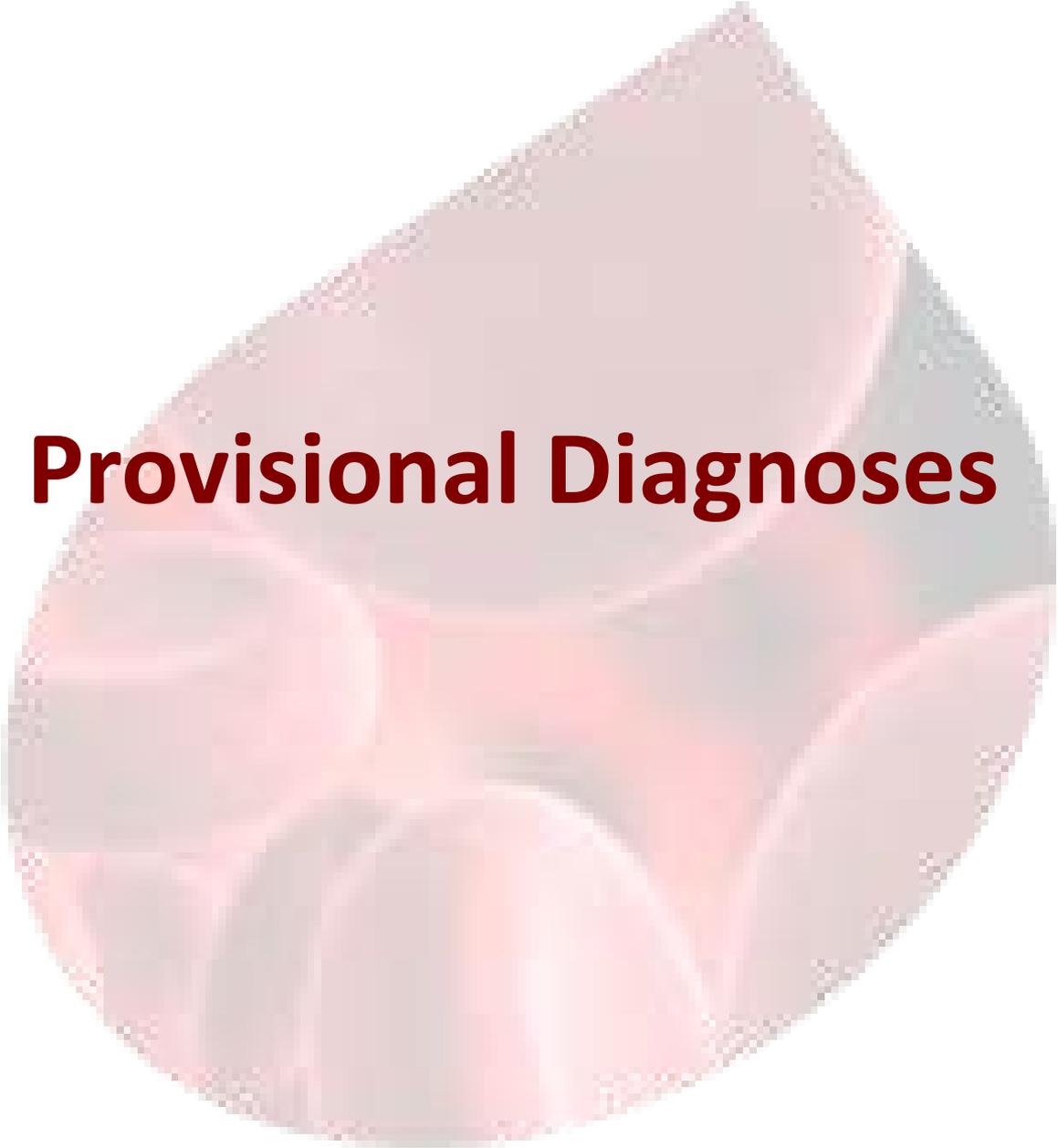




Leukemia

1. Blood counts (CBC; peripheral smear)
2. Bone marrow aspiration/biopsy





Provisional Diagnoses



Types of Diagnoses

NOS histology only

NOS with a “possible/probable” specific histology





Provisional Diagnoses

NOS histology only

NOS with a “possible/probable” specific histology





NOS Diagnosis

NOS histology

Provisional –awaiting test results

Only diagnosis available now

Use Appendix E to identify NOS





Example:

NOS DX Only Option Available

Chronic myeloproliferative neoplasm (MPN),
NOS

Clinical, lab, and morphologic features +

Does not meet criteria for specific MPN OR

Features overlap two or more MPD categories

Initial stage

Late stage

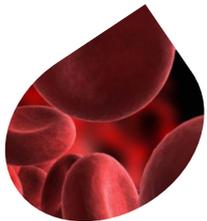




Provisional Diagnoses

NOS histology only

NOS with a “possible/probable” specific histology





NOS with Probable Specific

1. MPN (9960/3), probably PV (9950/3)





Tests That Identify Specific Hematopoietic and Lymphoid Histologies



2008 WHO Classification of Tumors of Haematopoietic and Lymphoid Tissues

Basic principle: Classification for all neoplasms based on:

- Morphology and biologic features
- Genetic
- Immunophenotype
- Clinical features





Genetic Testing

Laboratory studies of blood, bone marrow, or tissue to analyze DNA to identify chromosome abnormalities which diagnose specific neoplasms





Normal Chromosomes

46 in each cell

Each chromosome has a specific number

Example: (1;2)

Short arm “p” and a long arm “q”

Example: (p13;q22)



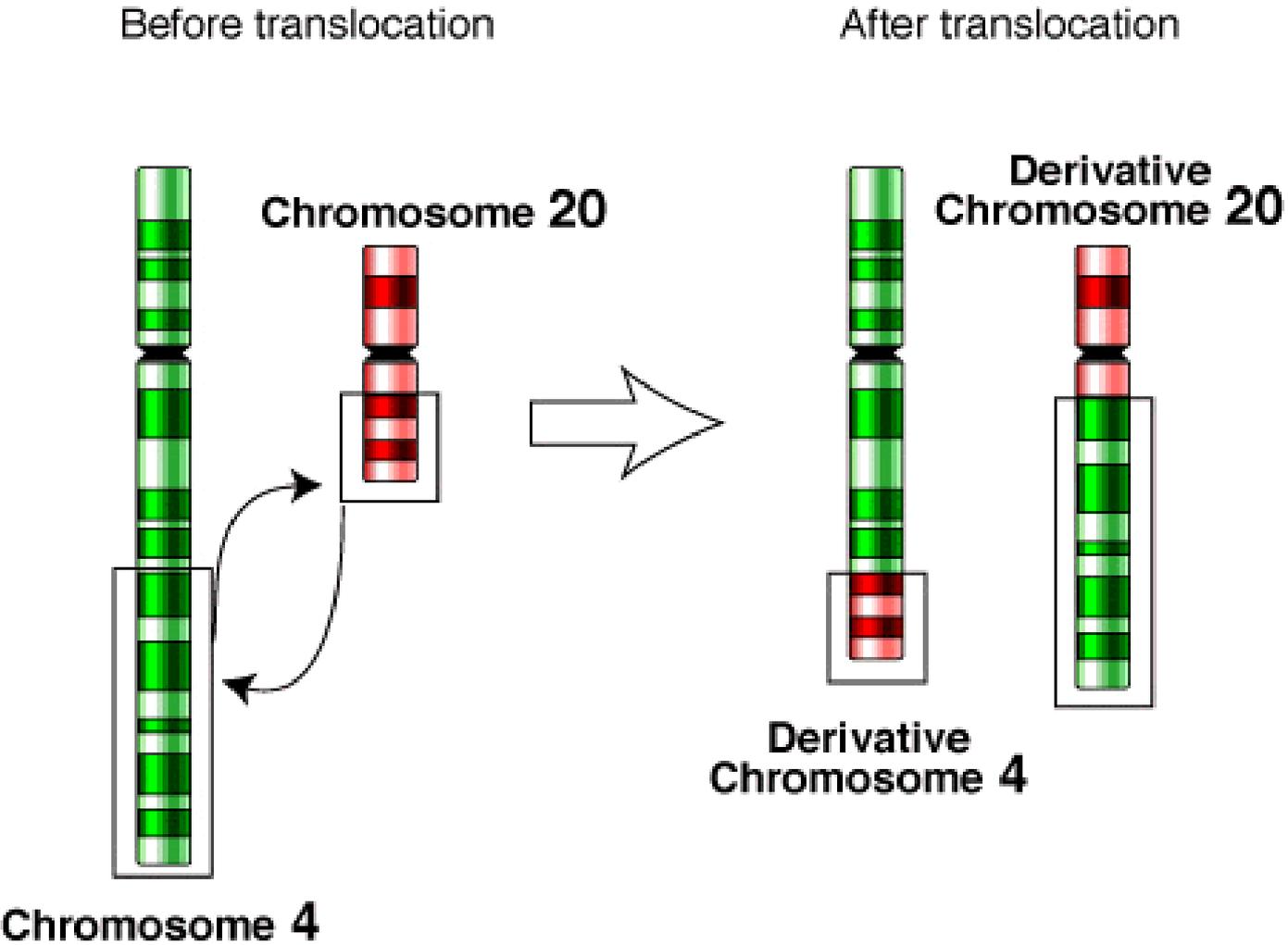


Genetic Abnormalities

- 1. Translocation: t(1;2)**
- 2. Inversion: inv16**
- 3. Deletion: -7 or 7-**
- 4. Addition: +8 or 8+**

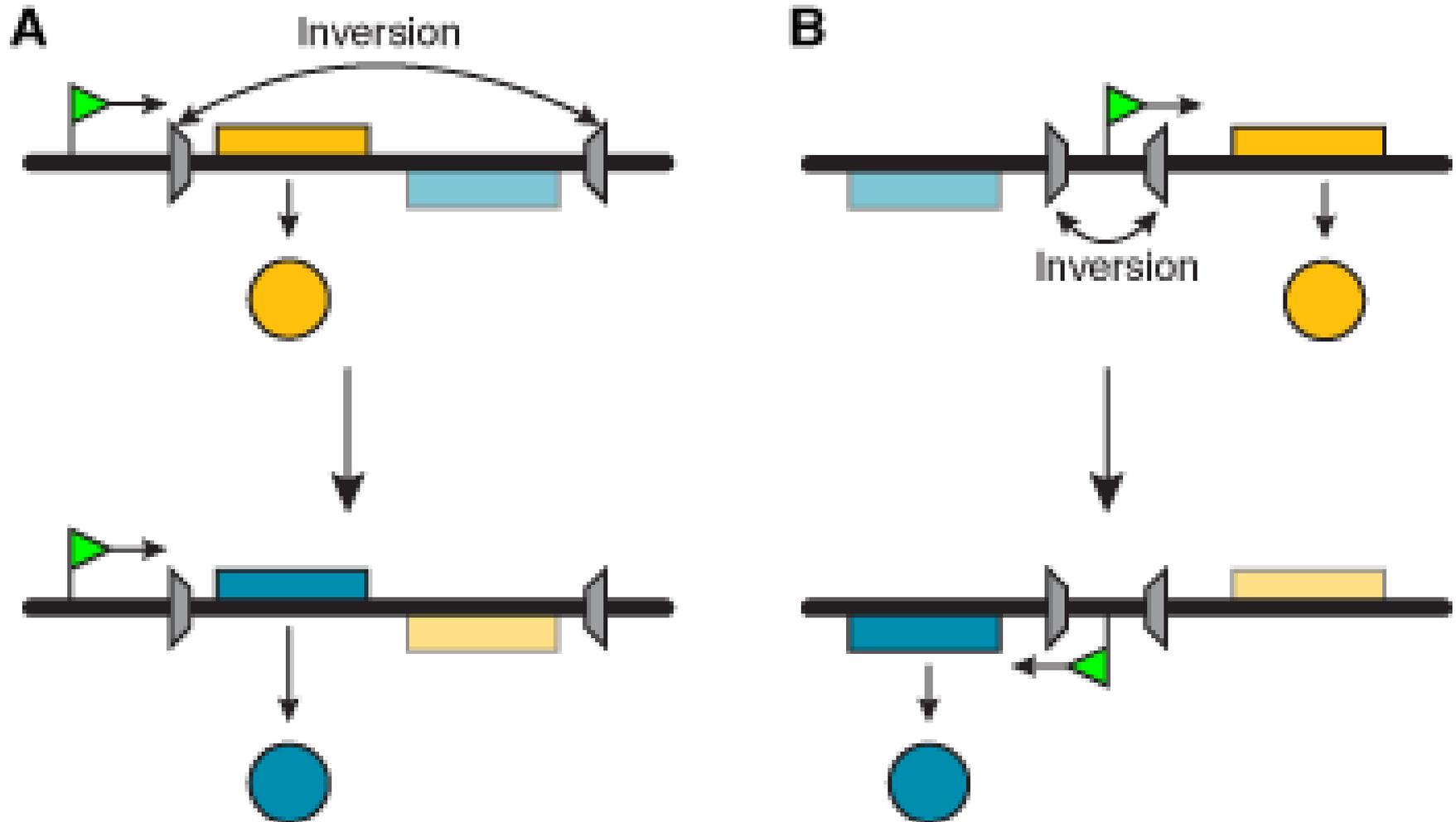


Gene Translocation

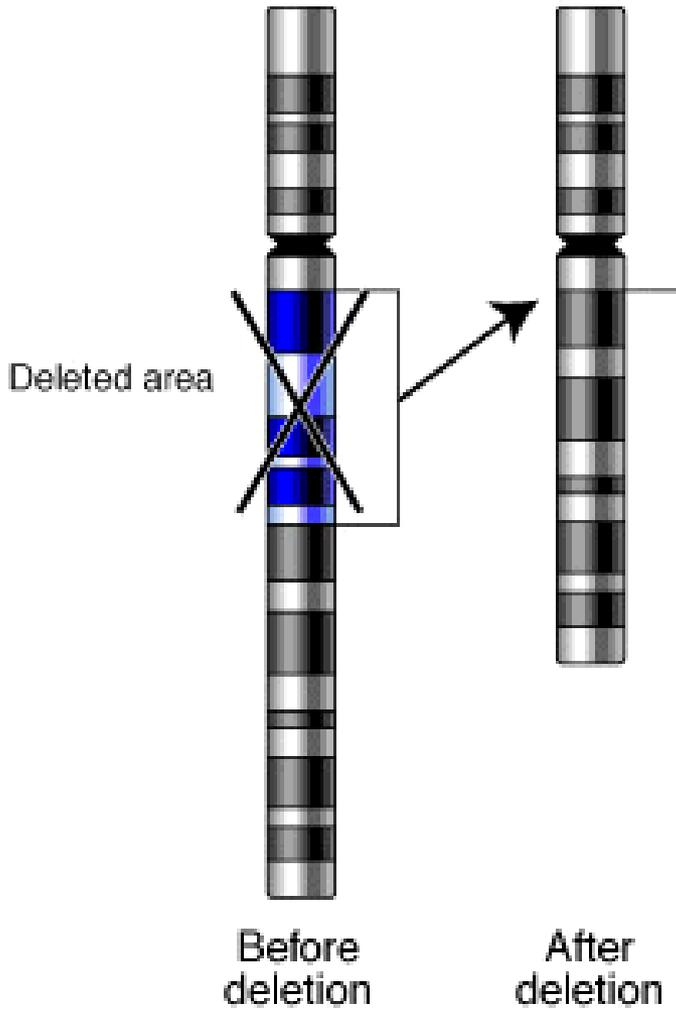


Courtesy: National Human Genome Research Institute

Gene Inversion

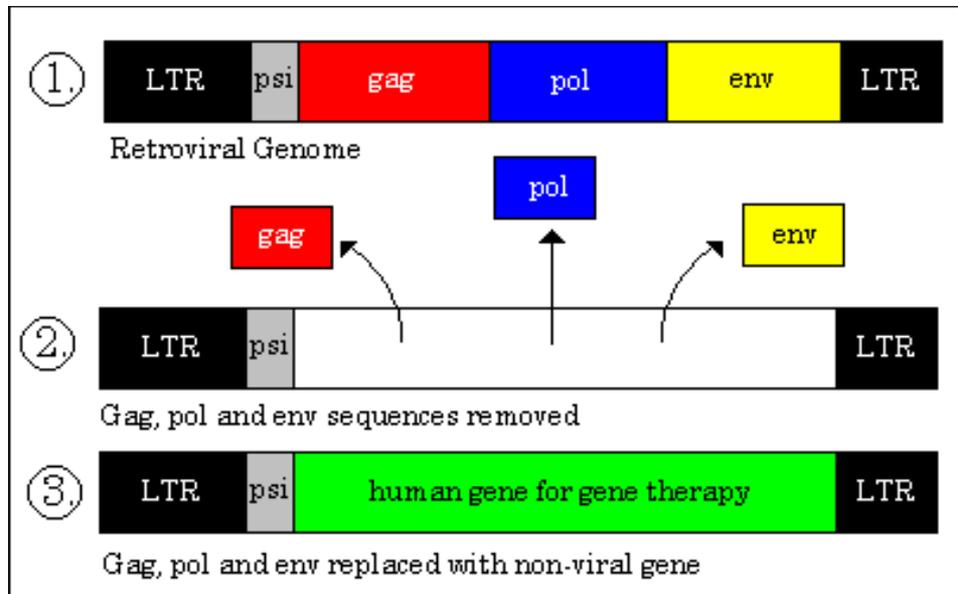


Gene Deletion



Courtesy: National Human Genome Research Institute

Gene Addition



Walters L, Palmer JG. "The Ethics of Human Gene Therapy." Oxford University Press. 1997.

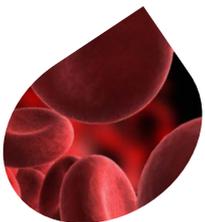


Genetic Testing

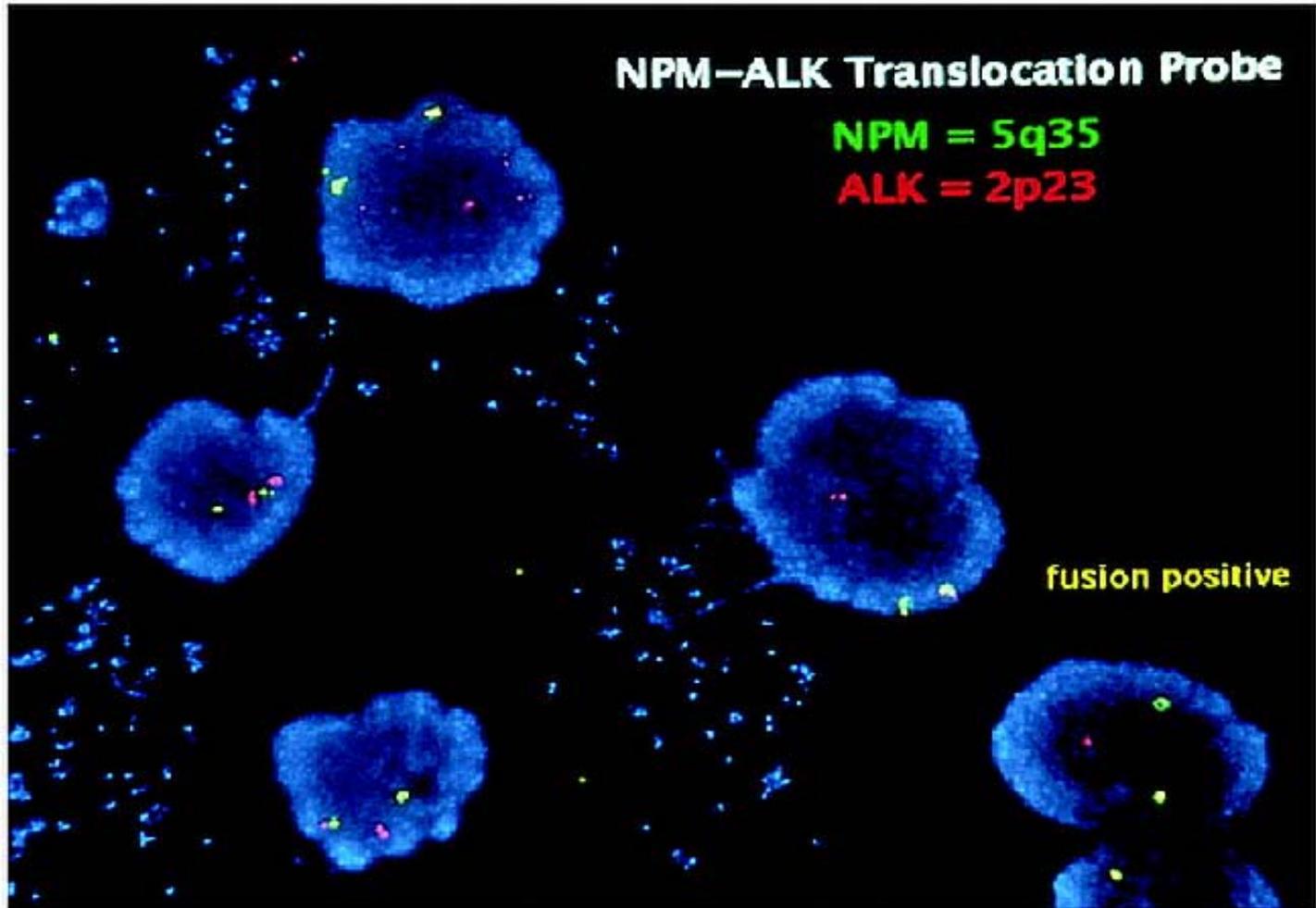
FISH: Identifies genetic changes and translocations.

Polymerase chain reaction (PCR): Measures cancer cells that cannot be detected by FISH.

Karyotyping: To arrange and classify chromosomes based on number, size, shape, and other characteristics.

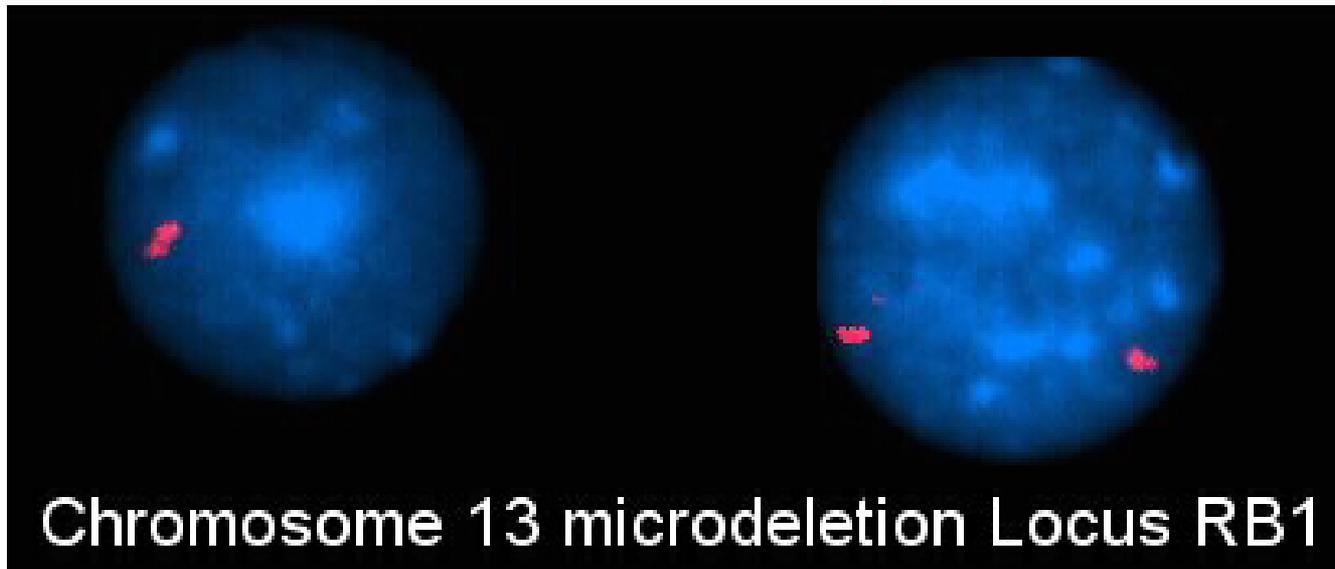
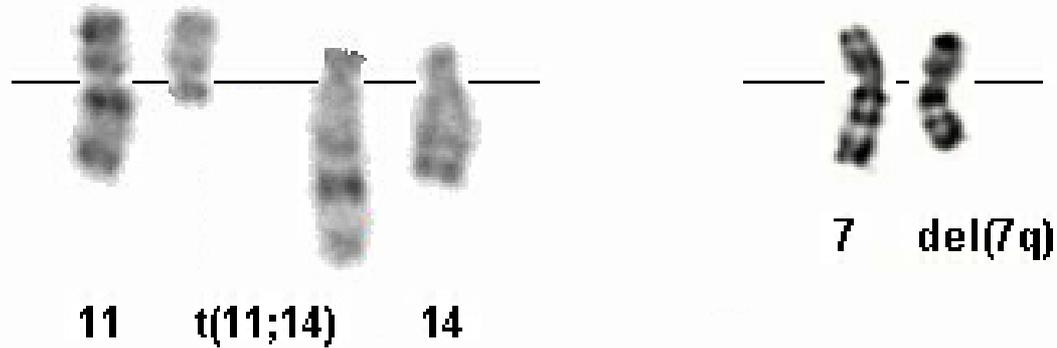


FISH to Identify NPM/ALK Fusion Gene





Karyotype



<http://www.pathologyoutlines.com>



Immunophenotyping

Cells from blood, BM, tissue used to determine types of antigens or markers on surface of cell. Referred to as CD

CD; cluster of differentiation: Used to define the findings in immunophenotyping .





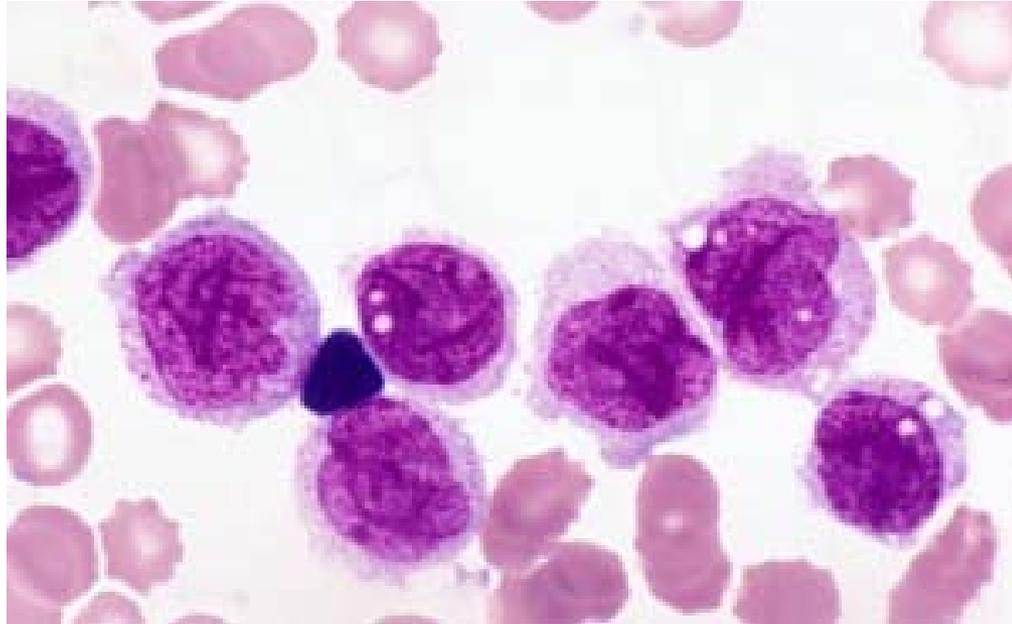
Additional Immunophenotyping

Flow cytometry: Cells from blood, BM, tissue are treated with antibodies and passed in front of a laser beam.

Immunocytochemistry (IHC): Shows specific antigens in cells from blood, BM, by using either fluorescent dyes or enzymes as markers



Immunohistochemistry



<http://www.pathologystudent.com/?tag=acute-myeloid-leukemia>





Genetic Studies and Immunophenotyping

Cytogenetics: The study of the DNA to identify antigen receptors and translocations.



Genetic Testing/Cytogenetics



46,XY,del(5)(q15q33)



Identifying Definitive Diagnosis



Required to Identify Specific Histology

Use Hematopoietic DB to identify definitive
diagnostic method(s)



ICD-0-3 Code:

Preferred Term

9866/3

Acute promyelocytic leukemia (AML with t(15;17)(q22;q12)) PML/RARA

Alternate Names

APL
Acute myeloid leukemia, PML/RAR-alpha
Acute myeloid leukemia, t(15/17)(q22;q11-12)
Acute promyelocytic leukemia

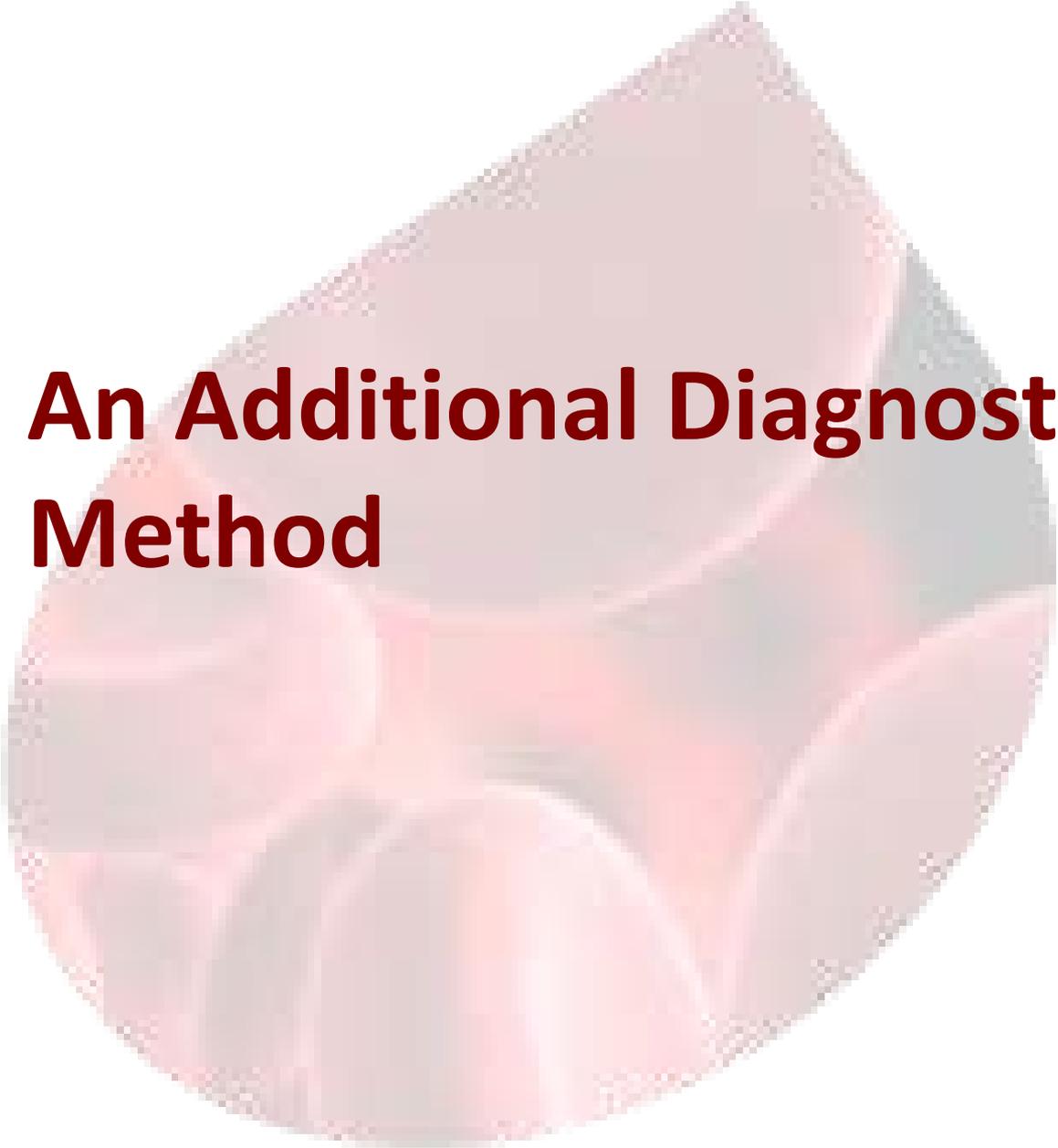
Definitions

Acute myeloid leukemia in which abnormal promyelocytes predominate

Definitive Diagnostic Methods

Bone Marrow biopsy (and)

Cytochemistry



An Additional Diagnostic Method



Types of Diagnoses

NOS histology only

NOS with a “possible/probable” specific histology

Diagnosis of exclusion (clinical)





Diagnosis of Exclusion (Clinical)

Tests are equivocal

Diagnosis based on equivocal tests and clinical presentation

Examples: myelodysplastic syndrome, unclassifiable ; refractory thrombocytopenia



Alternate Names

MDS
Myelodysplastic syndrome, NOS
Preleukemia
Preleukemic syndrome

Definitions

Blood: Cytopenias, no blasts
Bone marrow: <5% blasts, dysplasia in granulocytes or megakaryocytes
granulocytes or megakaryocytes
Myelodysplastic syndromes (MDS, formerly known as "preleukemia") are a diverse collection of hematological conditions united by ineffective

Definitive Diagnostic Methods

Clinical diagnosis

Disease Genetics Data

No Genetics Data Found

Disease Immunophenotyping

No Disease Immunophenotyping Found

[Back to Results](#)

[Display Abstractor Notes](#)



Get Information on Tests

Check with laboratory to get samples of tests

Ask HIM dept

- Where tests are filed

- How tests that arrive after MR is complete are filed

Follow-back with physician if tests have been ordered





Major Points

- Diagnostic/work-up process different
 - Genetic data and immunophenotyping
- Do NOT use ambiguous terminology
- Do NOT code to higher ICD-O-3 code
- Histology code updated to more specific
- Use Hematopoietic DB to identify Definitive Diagnostic Procedures





Conclusion

- The new hematopoietic and lymphoid neoplasm rules go into effect for cases diagnosed **January 1, 2010, and after**
- Email address for questions
askseerctr@imsweb.com

