

Hematopoietic and Lymphoid Neoplasm Project





Introduction to the WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues 4th edition



Hematopoietic and Lymphoid Lineages, Part I

Steven Peace, CTR

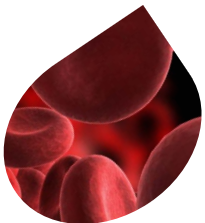
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September 2009



Objectives

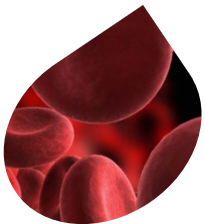
- Understand stem cell hematopoiesis
- Understand proliferation
- Understand differentiation
- Provide a History of Classification of Tumors of Hematopoietic and Lymphoid Tissues
- Understand the delineation of cell lines (lineage) in relation to the WHO Classification





Objectives (2)

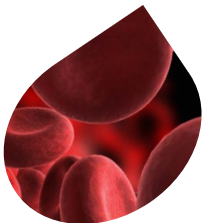
- Introduce WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues, 4th ed.
- Introduce NEW ICD-O histology codes
- Introduce NEW reportable conditions

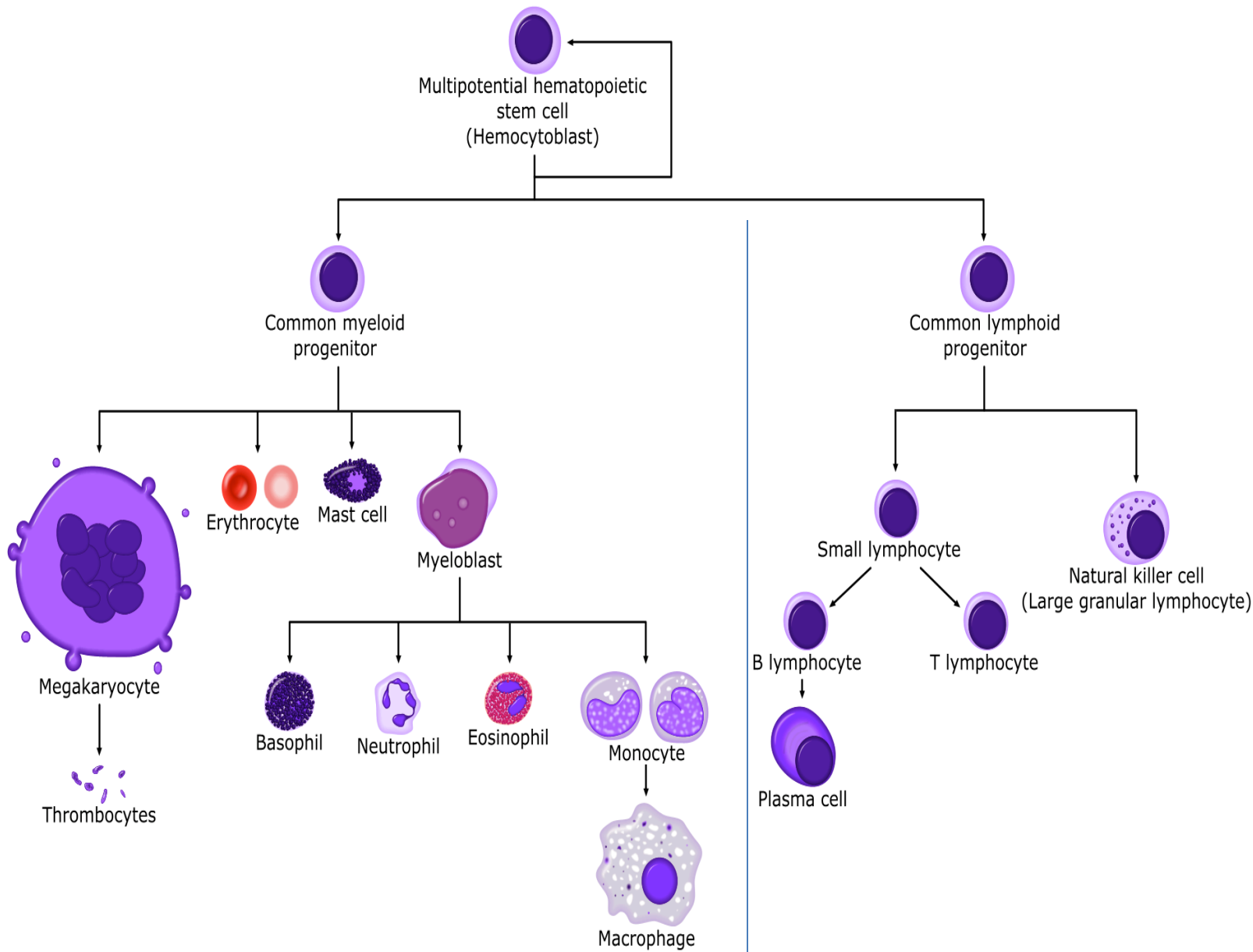




Stem Cell Hematopoiesis

- What is a hematopoietic stem cell?
- Where are hematopoietic stem cells found?
- What is Hematopoiesis?
- Hematopoietic stem cells give rise to ALL blood cell types including;
 - Myeloid lineages
 - Lymphoid lineages



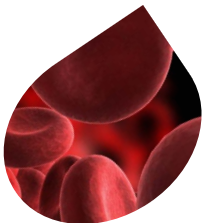


Hematopoietic stem cells give rise to two major progenitor cell lineages, myeloid and lymphoid progenitors
 Regenerative Medicine, 2006. <http://www.dentalarticles.com/images/hematopoiesis.png>



Proliferation and Differentiation

- Regulation of proliferation
- Regulation of differentiation
- Both affect development along cell line
- Turn on/Turn off
 - Growth factors
 - Genes (including mutations)
 - Proteins
- Oncogenesis – becoming malignant



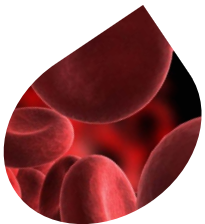


Blood Lines – Donald Metcalf, AlphaMED Press, 2005
Figure 3.2 The eight major hematopoietic lineages generated by self-renewing multipotential stem cells
Copyright © 2008 by AlphaMed Press <http://www.alphamedpress.org>



Cell Line Differentiation

- Cellular differentiation is the process by which an immature cell becomes a more mature cell
- Differentiation changes a cell's size, shape, membrane potential, metabolic activity, and responsiveness to signals or signal pathways



B-cell Differentiation

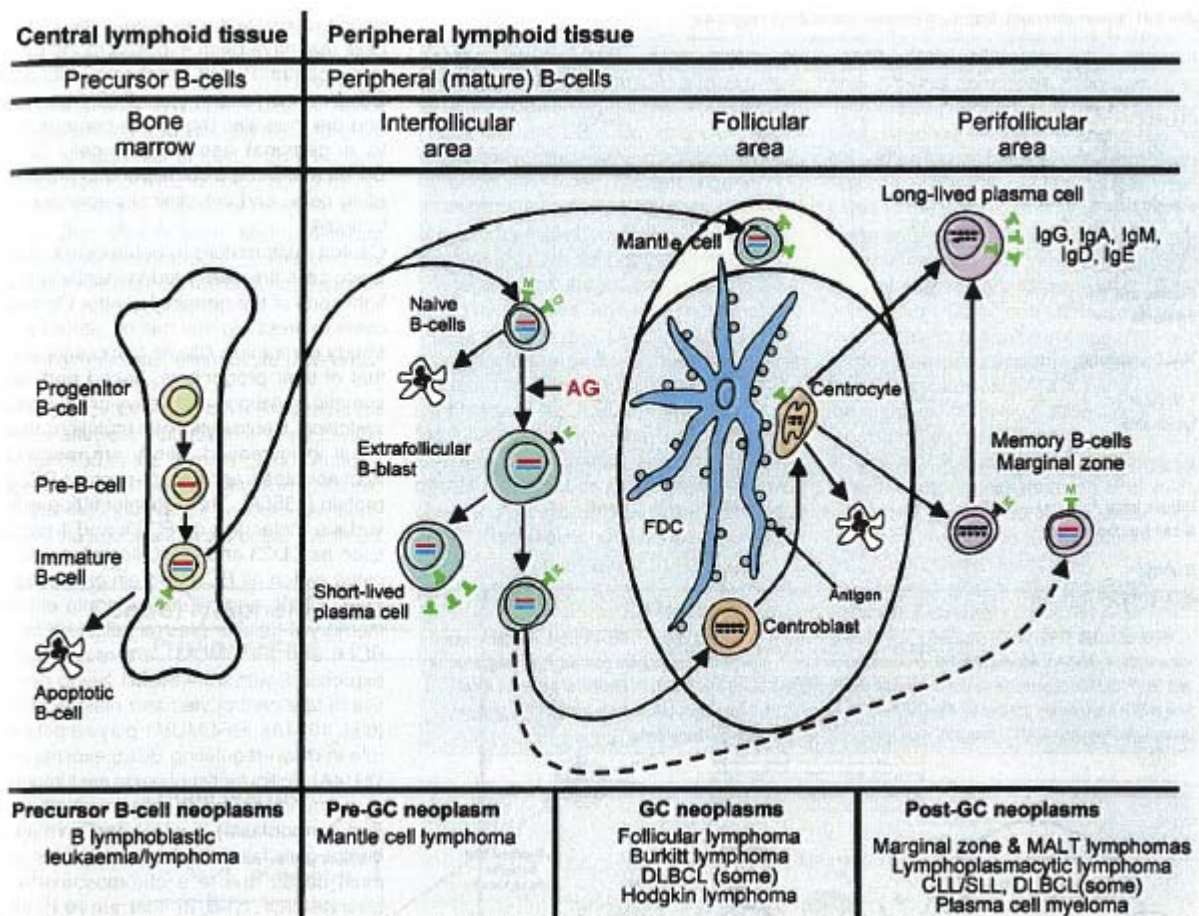
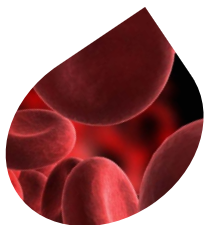


Fig. 8.02 Diagrammatic representation of B-cell differentiation and relationship to major B-cell neoplasms. B-cell neoplasms correspond to stages of B-cell maturation, even though



T-cell Differentiation

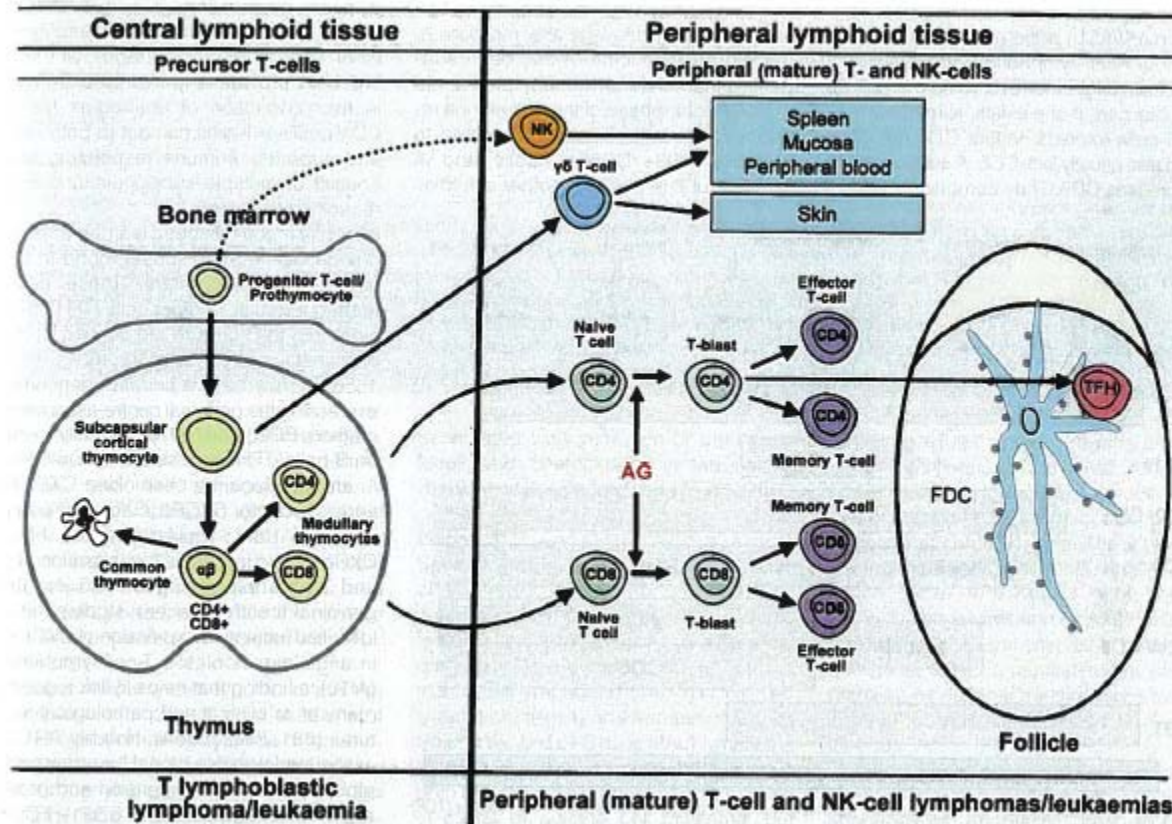
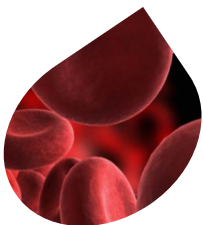


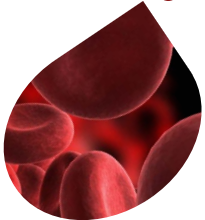
Fig. 8.04 Diagrammatic representation of T-cell differentiation. T-cell neoplasms correspond to different stages of maturation. Lymphoid progenitors enter the thymus where precu-





Classification of Tumors

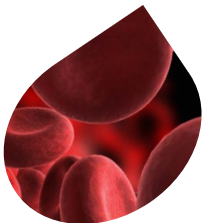
- Development of a World Standard
 - 1951 – Dameshek – clinical phenotype
 - 1960 – Philadelphia (Ph1) chromosome
 - 1966 – Rappaport Classification
 - 1974 – Kiel Classification System
 - 1974 – Lukes and Collins System
 - 1976 – Revised Rappaport Classification
 - 1976 – French – American – British Classification





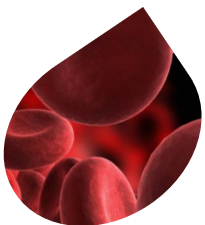
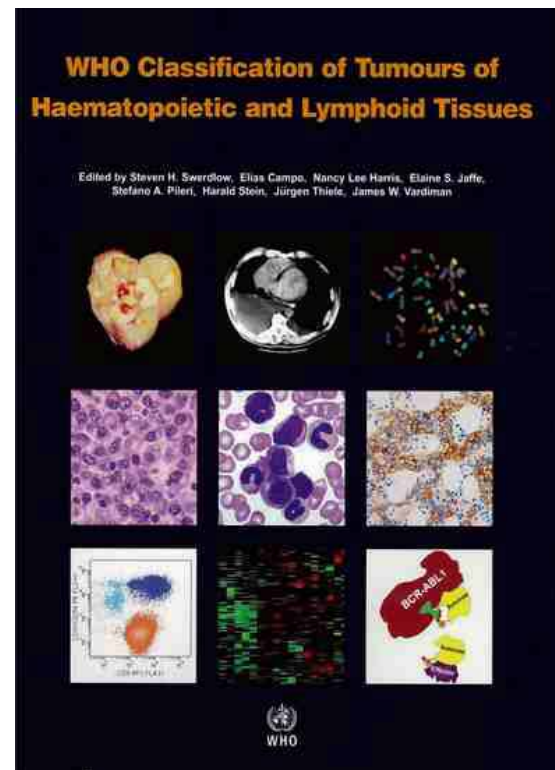
Classification of Tumors (2)

- Development of a World Standard
 - 1982 – Working Formulation
 - 1994 – REAL – Revised European-American Classification of Lymphoid Neoplasms
 - 2001 – WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues, 3rd edition, 2001



Classification of Tumors (3)

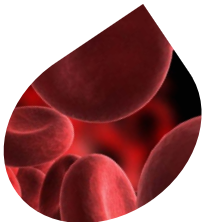
- 2008 – WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues, 4th edition, October 2008





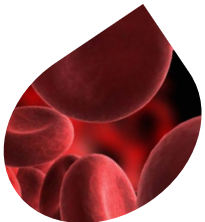
2008 WHO Classification

- 12 Classification Groups
 - 6 myeloid
 - 6 lymphoid
- WHO Tables include borderline conditions not of immediate interest as reportable diseases
- WHO Classification of Tumors Tables and 2010 Hematopoietic and Lymphoid Tissue Lineage Tables are IDENTICAL for malignant conditions



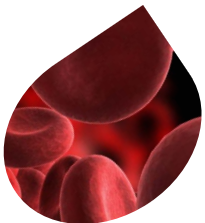
2008 WHO Classification - Myeloid

- Myeloproliferative Neoplasms
- Myeloid and Lymphoid Neoplasms with Eosinophilia and Abnormalities of PDGFRA, PDGFRB or FGFR1
- Myelodysplastic/Myeloproliferative Neoplasms
- Myelodysplastic Syndromes
- Acute Myeloid Leukemia and Related Precursor Neoplasms
- Acute Leukemias of Ambiguous Lineage



2008 WHO Classification - Lymphoid

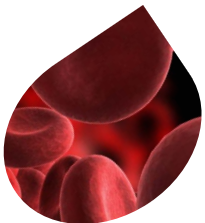
- Precursor Lymphoid Neoplasms
- Mature B-Cell Neoplasms
- Mature T-Cell and NK-Cell Neoplasms
- Hodgkin Lymphoma
- Histiocytic and Dendritic Cell Neoplasms
- Post-Transplant Lymphoproliferative Disorders



New Histology Term	ICD-O-Code
Acute myeloid leukemia (megakaryoblastic) with t(1;22)(p13;q13); RBM15-MKL1	9911/3
Acute myeloid leukemia with inv(3)(q21q26.2) or t(3;3)(q21;q26.2); RPN1EVI1	9869/3
Acute myeloid leukemia with t(6;9)(p23;q34) DEK-NUP214	9865/3
ALK positive large B-cell lymphoma	9737/3
B lymphoblastic leukemia/lymphoma with t(12;21)(p13;q22); TEL-AML1 (ETV6-RUNX1)	9814/3
B lymphoblastic leukemia/lymphoma with t(9;22)(q34;q11.2); BCR-ABL1	9812/3
B lymphoblastic leukemia/lymphoma with t(v;11q23); MLL rearranged	9813/3
B lymphoblastic leukemia/lymphoma, NOS	9811/3
B lymphoblastic leukemia/lymphoma with hyperdiploidy	9815/3
B lymphoblastic leukemia/lymphoma with hypodiploidy (hypodiploid ALL)	9816/3
B lymphoblastic leukemia/lymphoma with t(1;19)(q23;p13.3); E2A PBX1 (TCF3 PBX1)	9818/3
B lymphoblastic leukemia/lymphoma with t(5;14)(q31;q32); IL3-IGH	9817/3
Fibroblastic reticular cell tumor	9759/3
Hydroa vacciniforme-like lymphoma	9752/3
Intravascular large B-cell lymphoma	9712/3
Large B-cell lymphoma arising in HHV8-associated multicentric Castleman disease	9738/3
Mixed phenotype acute leukemia with t(9;22)(q34;q11.2); BCR-ABL1	9806/3
Mixed phenotype acute leukemia with t(v;11q23); MLL rearranged	9807/3
Mixed phenotype acute leukemia, B/myeloid, NOS	9808/3
Mixed phenotype acute leukemia, T/myeloid, NOS	9809/3
Myeloid and lymphoid neoplasm with FGFR1 abnormalities	9967/3
Myeloid and lymphoid neoplasms with PDGFRB rearrangement	9965/3
Myeloid leukemia associated with Down Syndrome	9898/3
Myeloid and lymphoid neoplasms with PDGFRB arrangement	9966/3
Plasmablastic lymphoma	9735/3
Polymorphic PTLD	9971/3

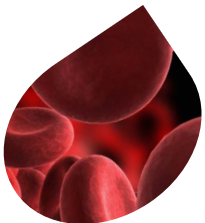
New ICD-O Codes

New Histology Term	ICD-O-Code
Primary cutaneous gamma-delta T-cell lymphoma	9726/3
Primary cutaneous follicle centre lymphoma	9597/3
Refractory neutropenia	9991/3
Refractory thrombocytopenia	9992/3
Systemic EBV positive T-cell lymphoproliferative disease of childhood	9724/3
T lymphoblastic leukemia/lymphoma	9837/3
T-cell/histiocyte rich large B-cell lymphoma	9688/3



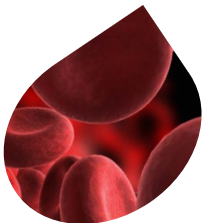
Newly Reportable (new /3)

Histology Term	ICD-O Code
Langerhans cell histiocytosis, NOS	9751/3
Myeloproliferative neoplasm, unclassifiable / Myelodysplastic/Myeloproliferative neoplasm, unclassifiable	9975/3
T-cell large granular lymphocytic leukemia/ Chronic lymphoproliferative disorder of NK- cells	9831/3



References & More Information

- **WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues , 4th edition**, S. Swerdlow, E. Campo, N. Lee Harris, E. Jaffe, S. Pileri, H. Stein, J. Thiele, J. Vardiman, IARC, Lyon, France, 2008
- **2010 Hematopoietic and Lymphoid Neoplasm Case Reportability and Coding Manual**, C. Hahn Johnson, M. Adamo, S. Peace, NCI SEER, 2009
- **Advances in Understanding and Management of Myeloproliferative Neoplasms**, Alessandro M. Vannucchi, Paola Guglielmelli and Ayalew Tefferi, *CA Cancer J Clin* 2009;59;171-191; Apr 15, 2009
- **Proposed Classification of Lymphoid Neoplasms for Epidemiologic Research from the International Lymphoma Epidemiology Consortium (Inter-Lymph)**, L. Morton, J. Turner, J. Cernan, *Blood*, DOI 10.1182/2006-11-0515672; Mar 27, 2007





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

