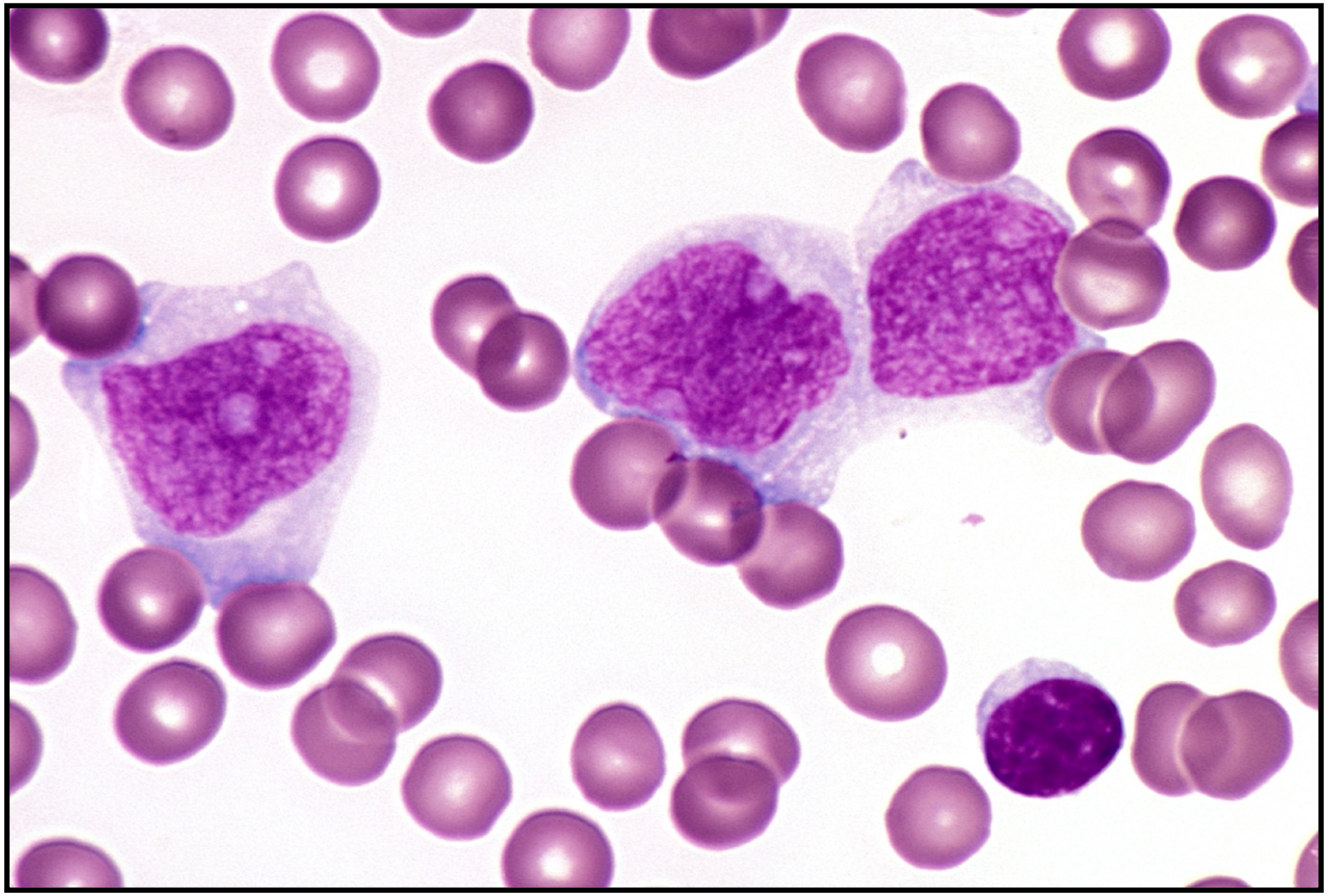


Acute Leukemia

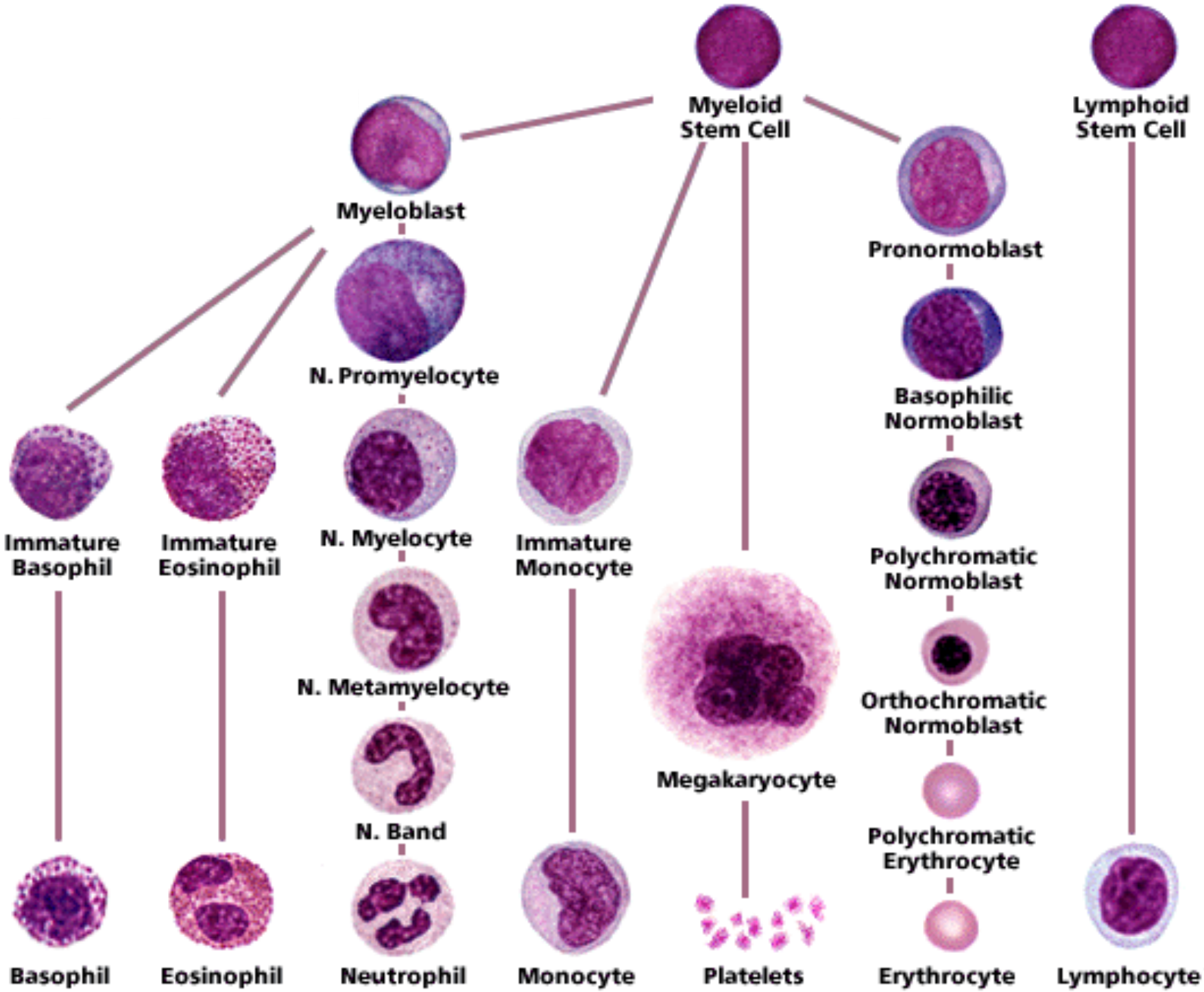
Kristine Krafts, M.D.

Acute Leukemia Outline

- Big-picture look at hematologic malignancies
- What is acute leukemia?
- Acute myeloid leukemia
- Acute lymphoblastic leukemia

Acute Leukemia Outline

- Big-picture look at hematologic malignancies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Megakaryocyte
N. Band
Polychromatic Erythrocyte
Basophil
Eosinophil
Neutrophil
Monocyte
Platelets
Erythrocyte
Lymphocyte

Three Groups of Hematologic Malignancies

Most heme malignancies fall into these two groups

Leukemias

- Acute leukemias
- Chronic leukemias

Lymphomas

- Hodgkin lymphoma
- Non-Hodgkin lymphoma

Plasma cell disorders

- Multiple myeloma

Leukemia vs. Lymphoma

Leukemias and lymphomas are both malignancies of hematopoietic cells. What's the difference?

Leukemia

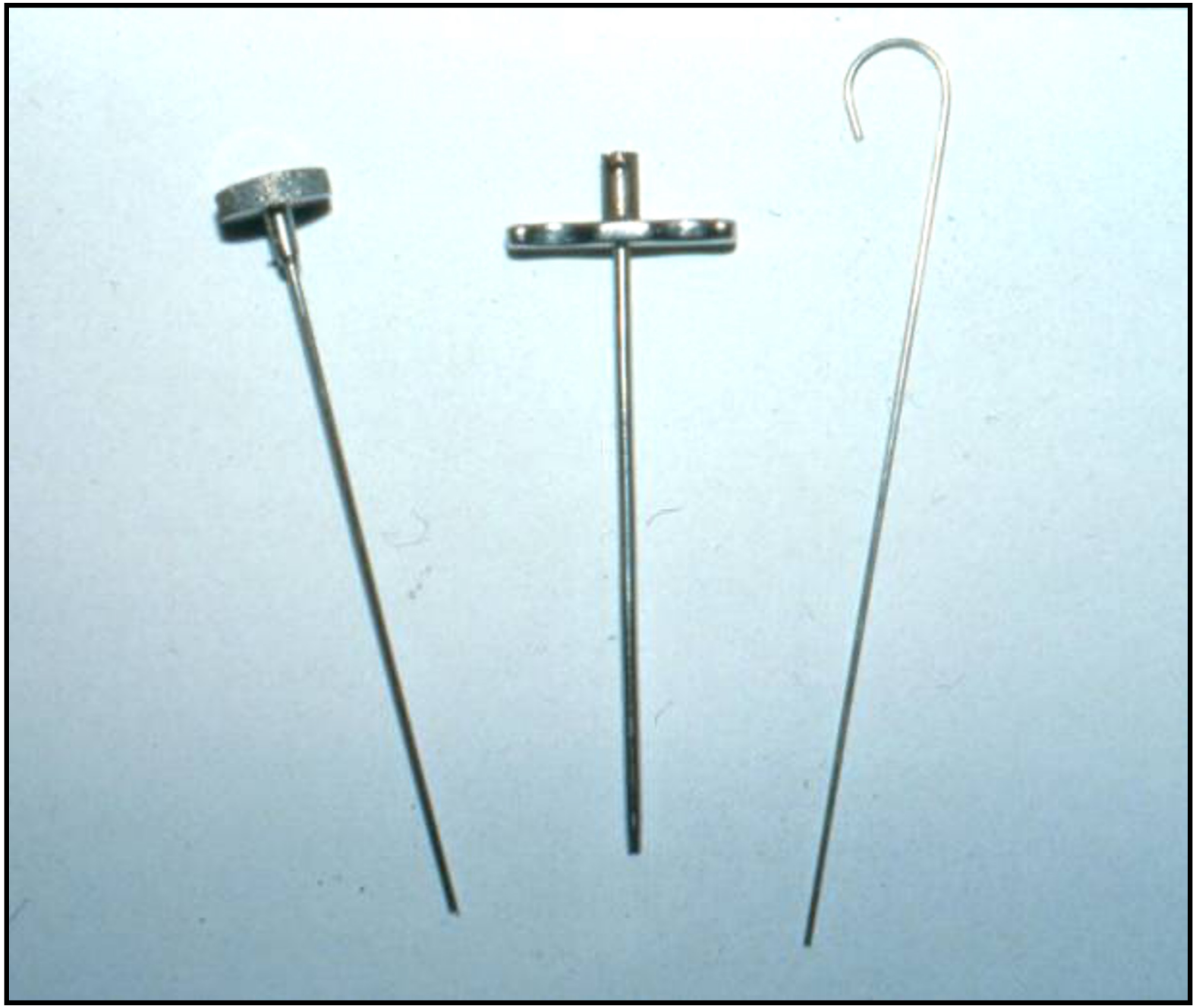
- Starts in bone marrow, spills into blood
- Can spread to other places
- Myeloid or lymphoid
- Acute or chronic

Lymphoma

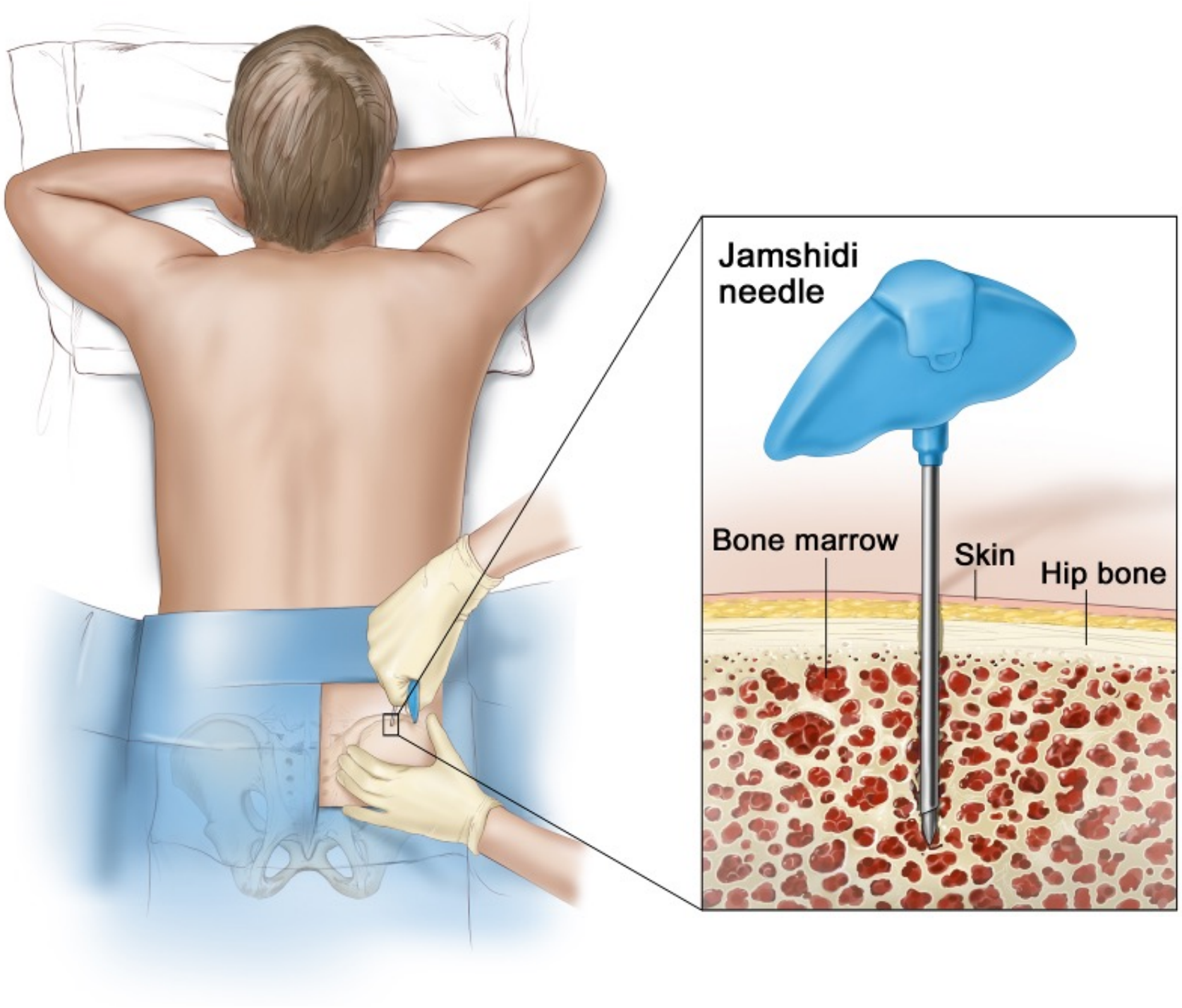
- Starts in lymph nodes
- Can spread to other places
- Lymphoid only
- Hodgkin or non-Hodgkin

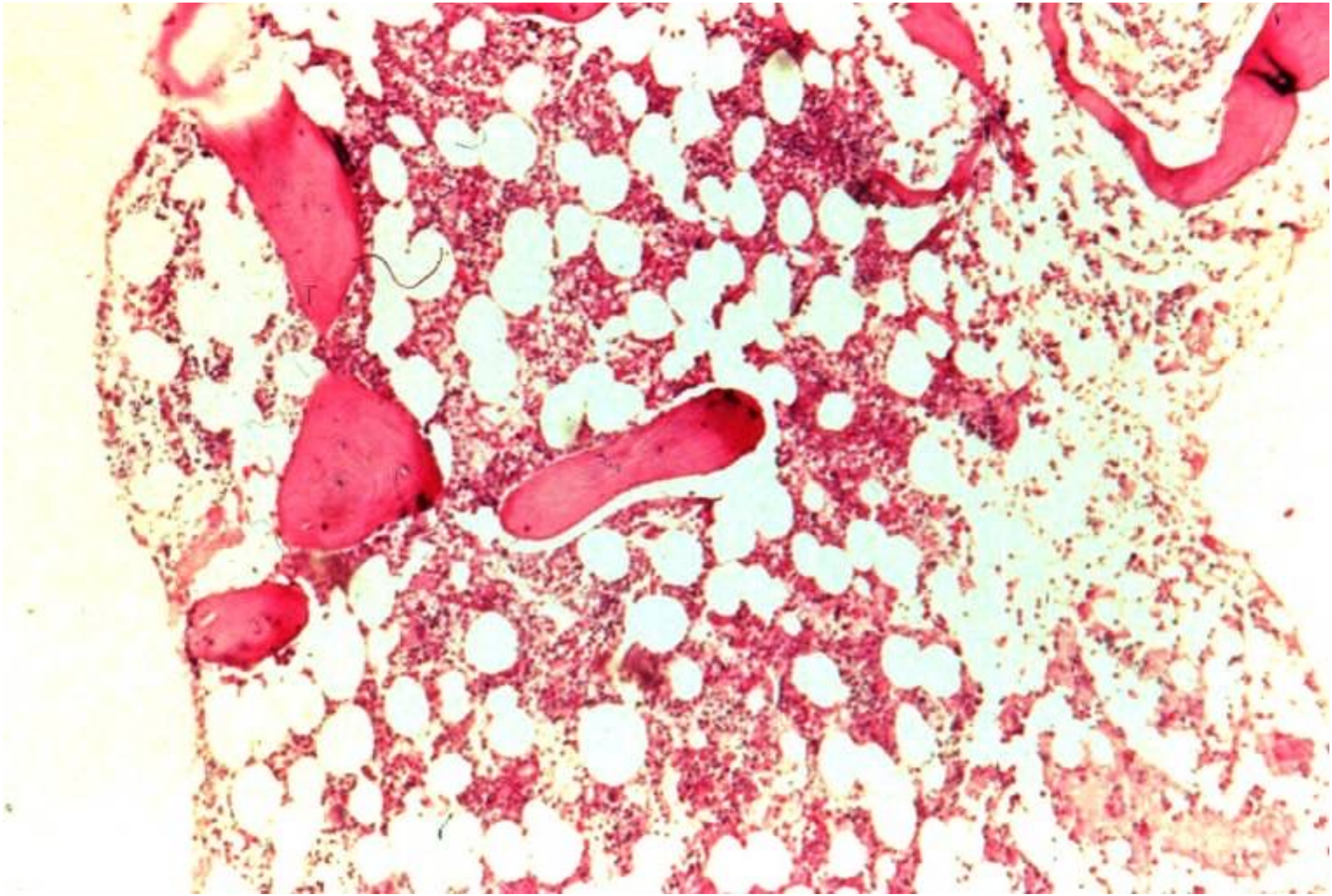
How is a diagnosis made?

- Clinical setting
- Morphology
- Immunophenotyping
- Molecular studies
- Cytogenetics

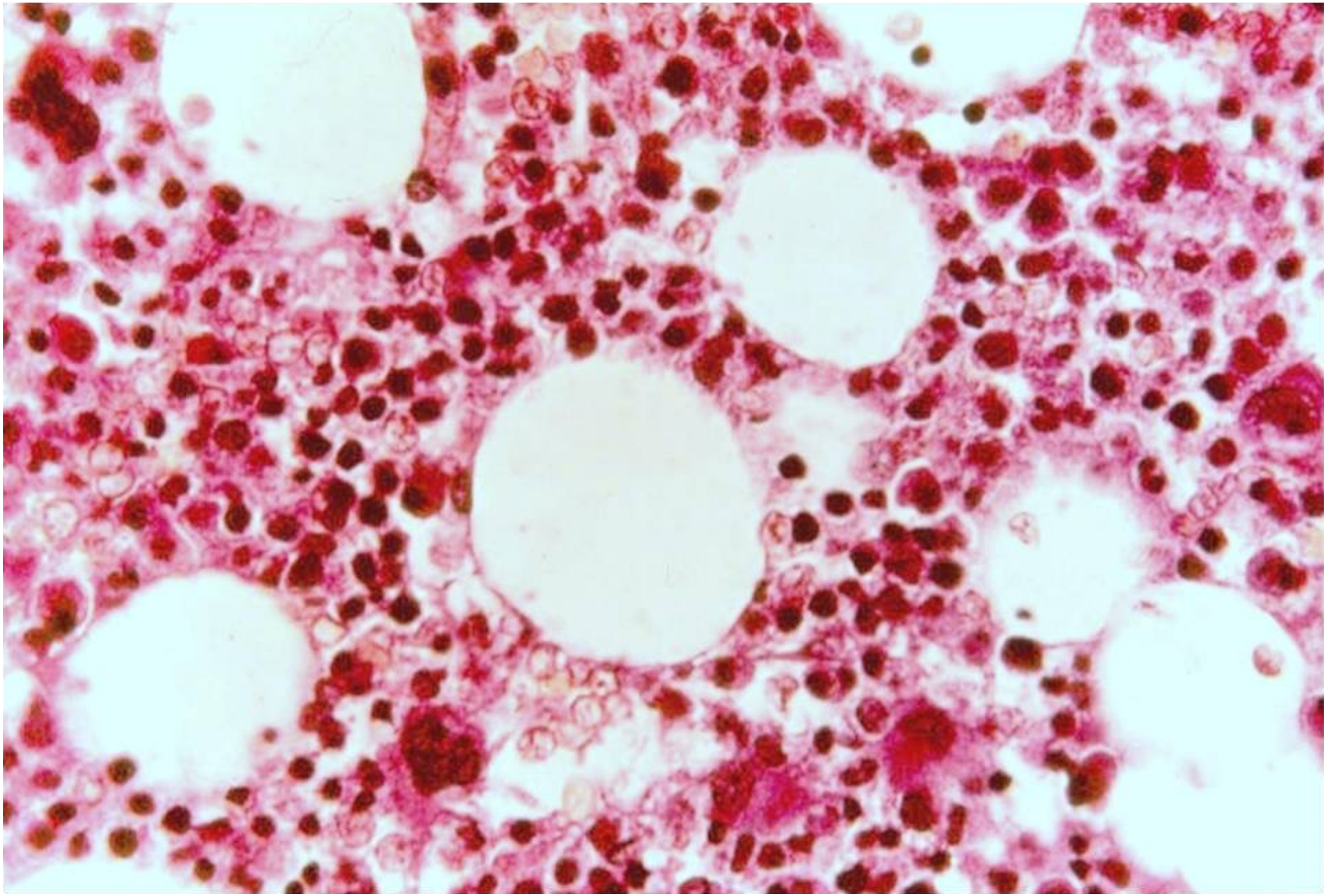


Bone marrow biopsy needle

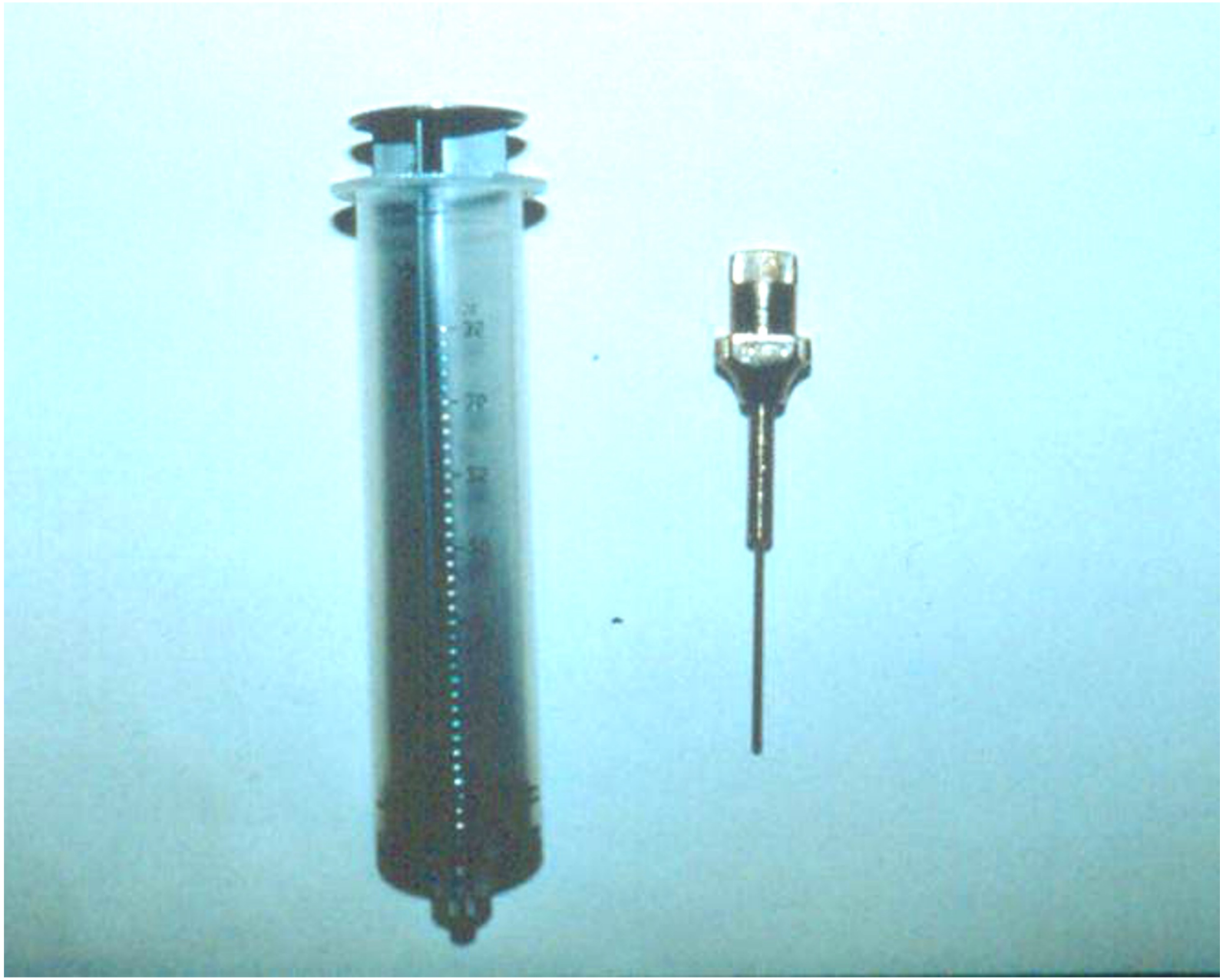

Jamshidi needle
Bone marrow
Skin
Hip bone



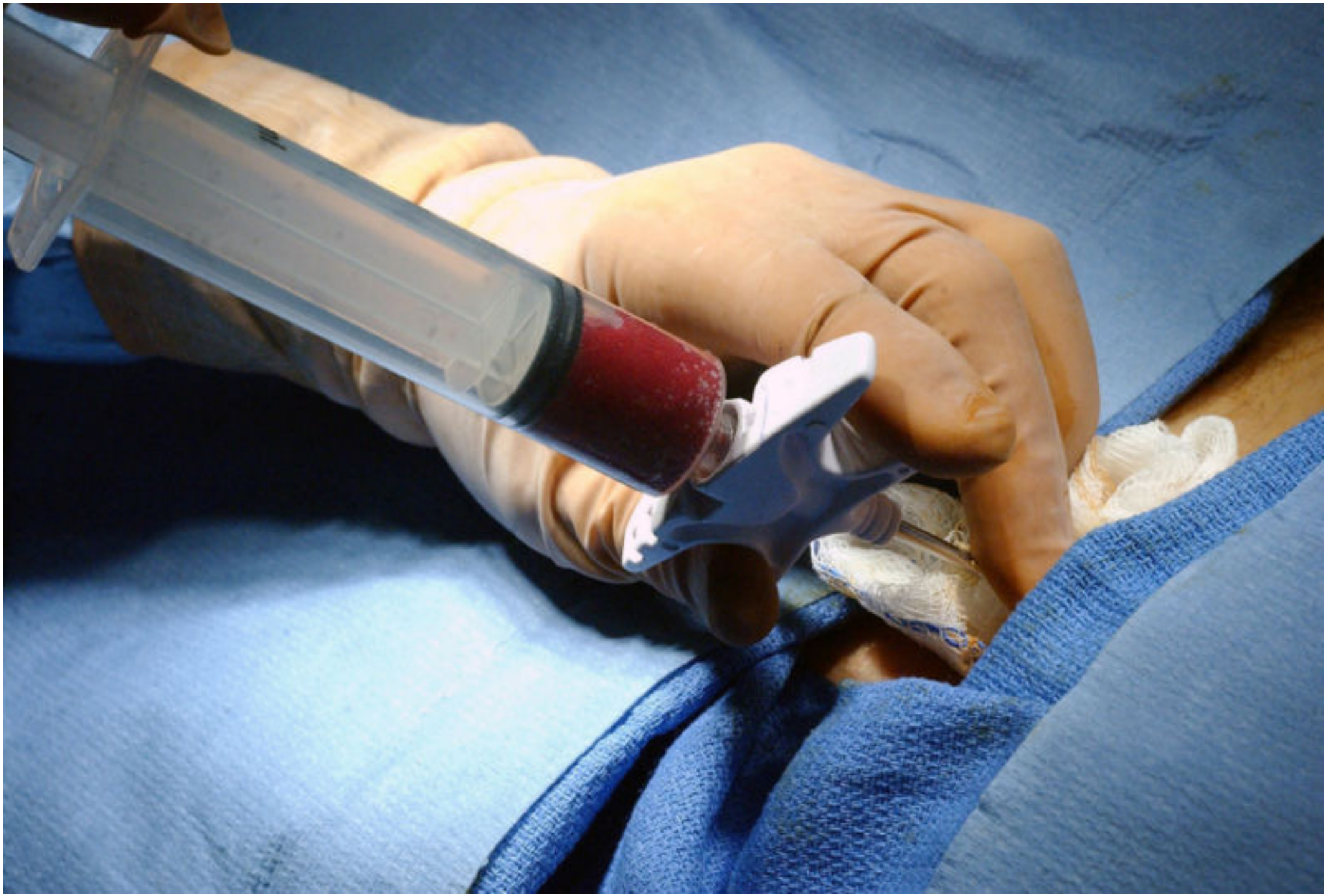
Normal bone marrow biopsy



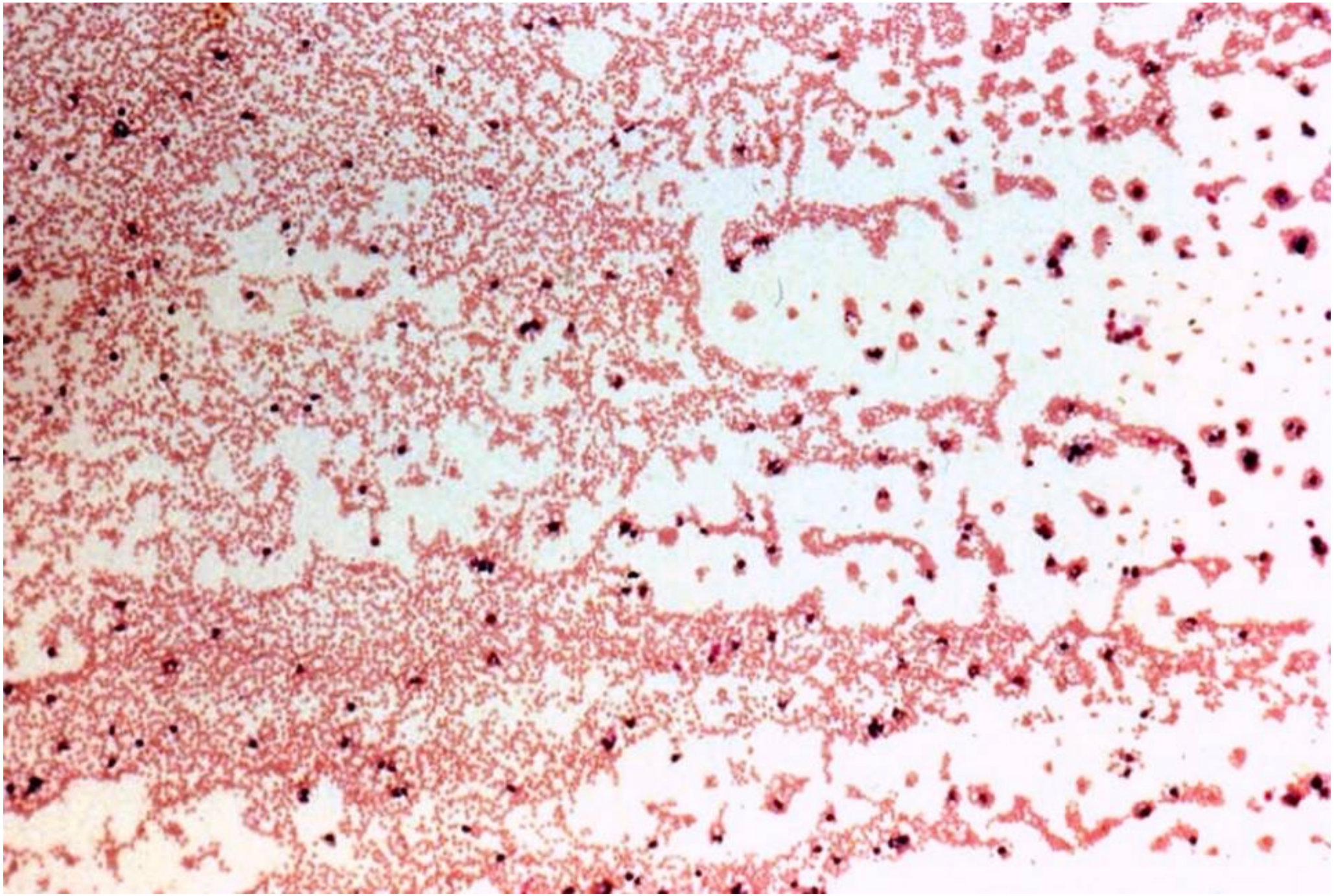
Normal bone marrow biopsy



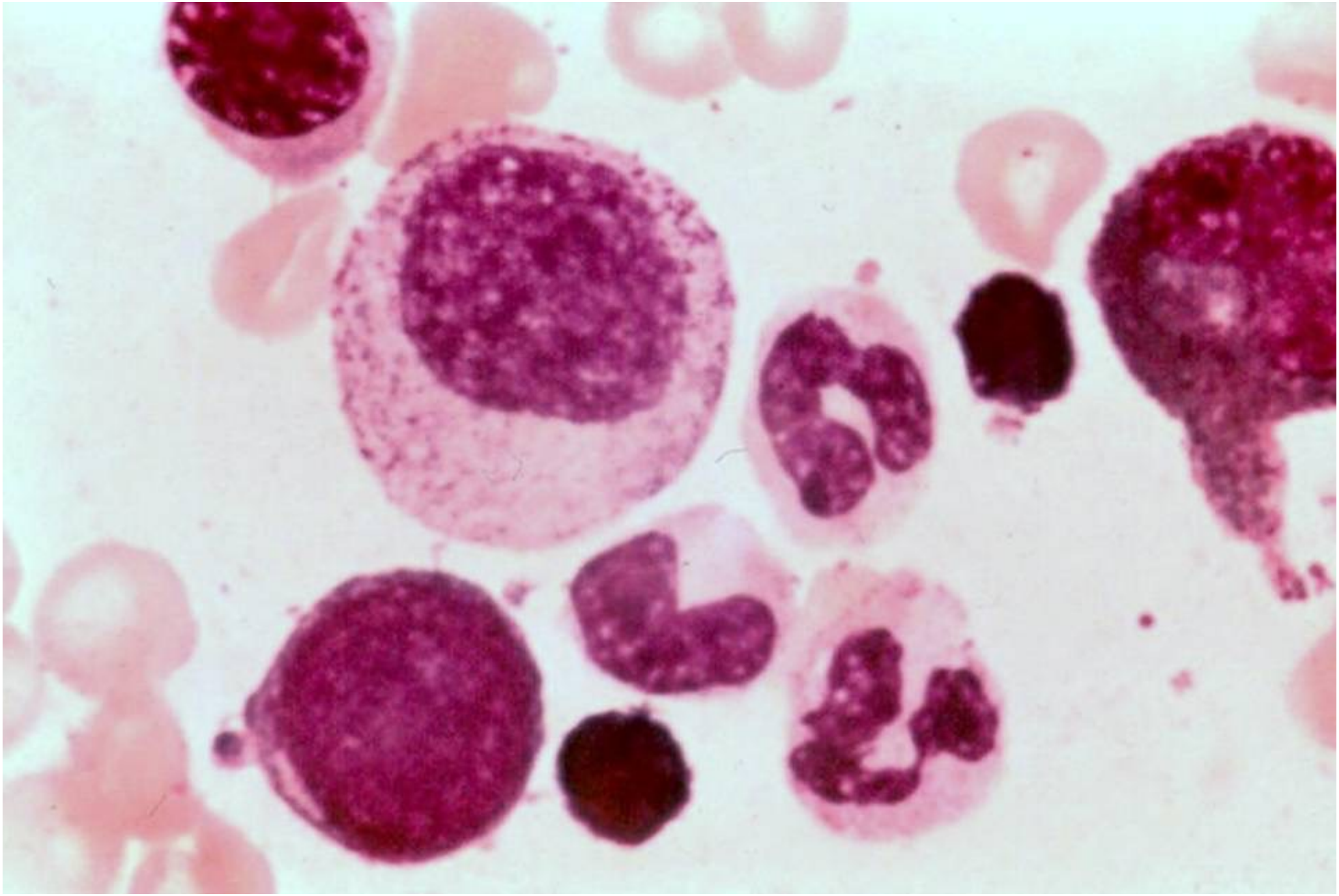
Bone marrow aspiration needle



Bone marrow aspiration

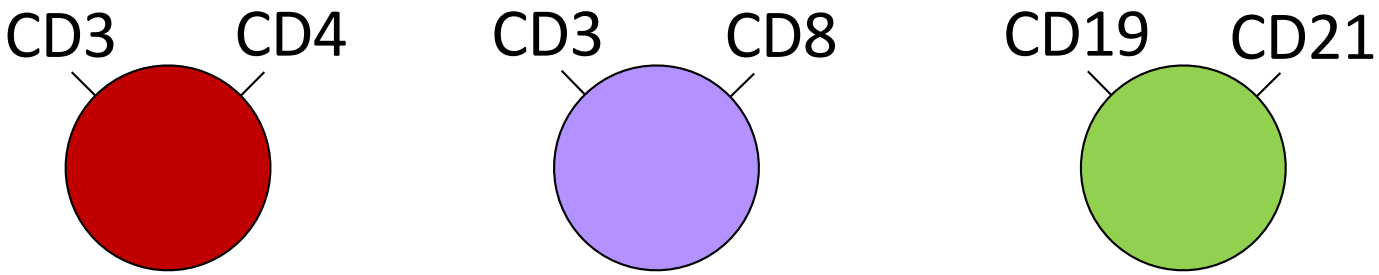


Normal bone marrow aspirate



Normal bone marrow aspirate

Immunophenotyping

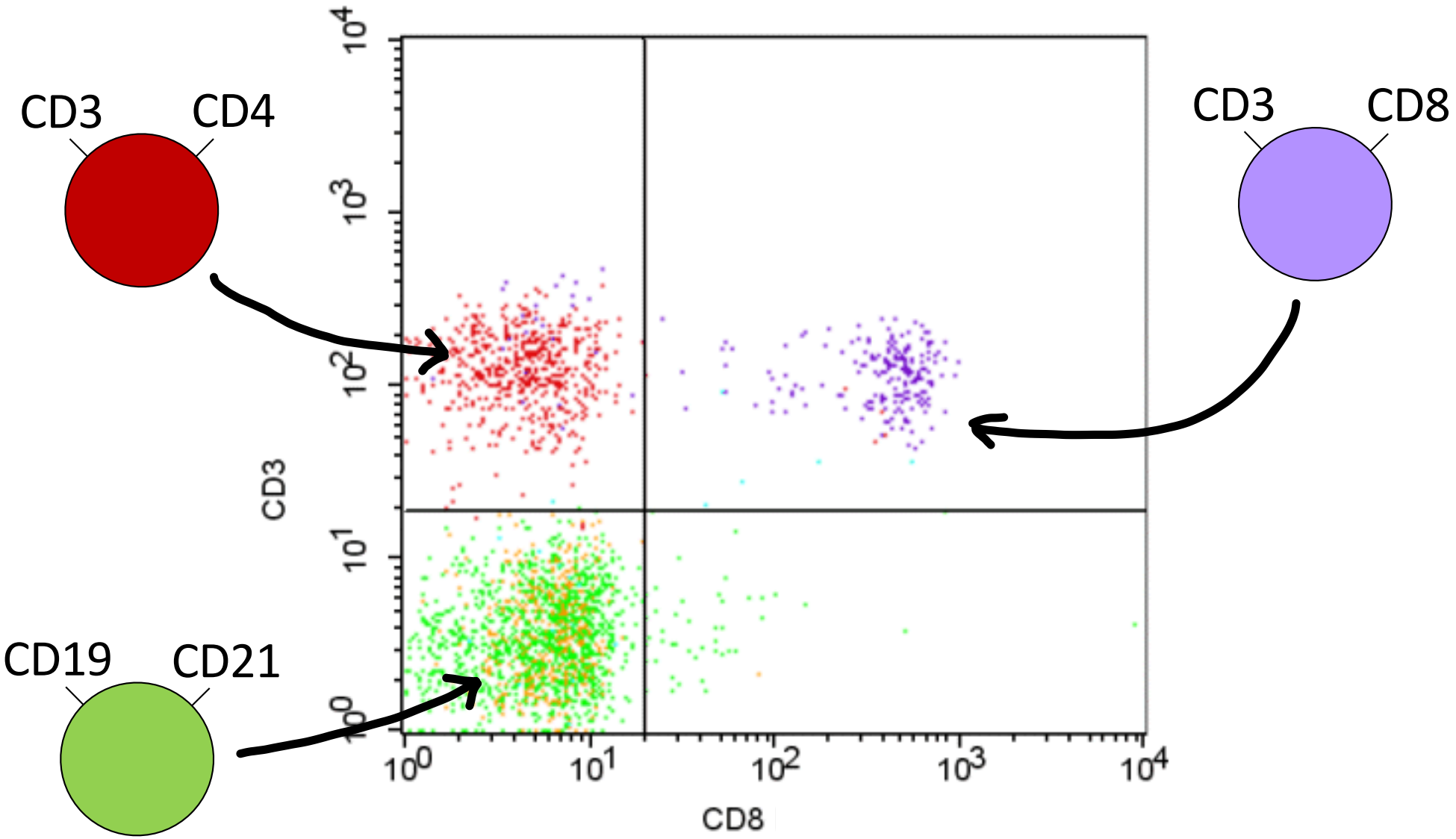


Helper T cell

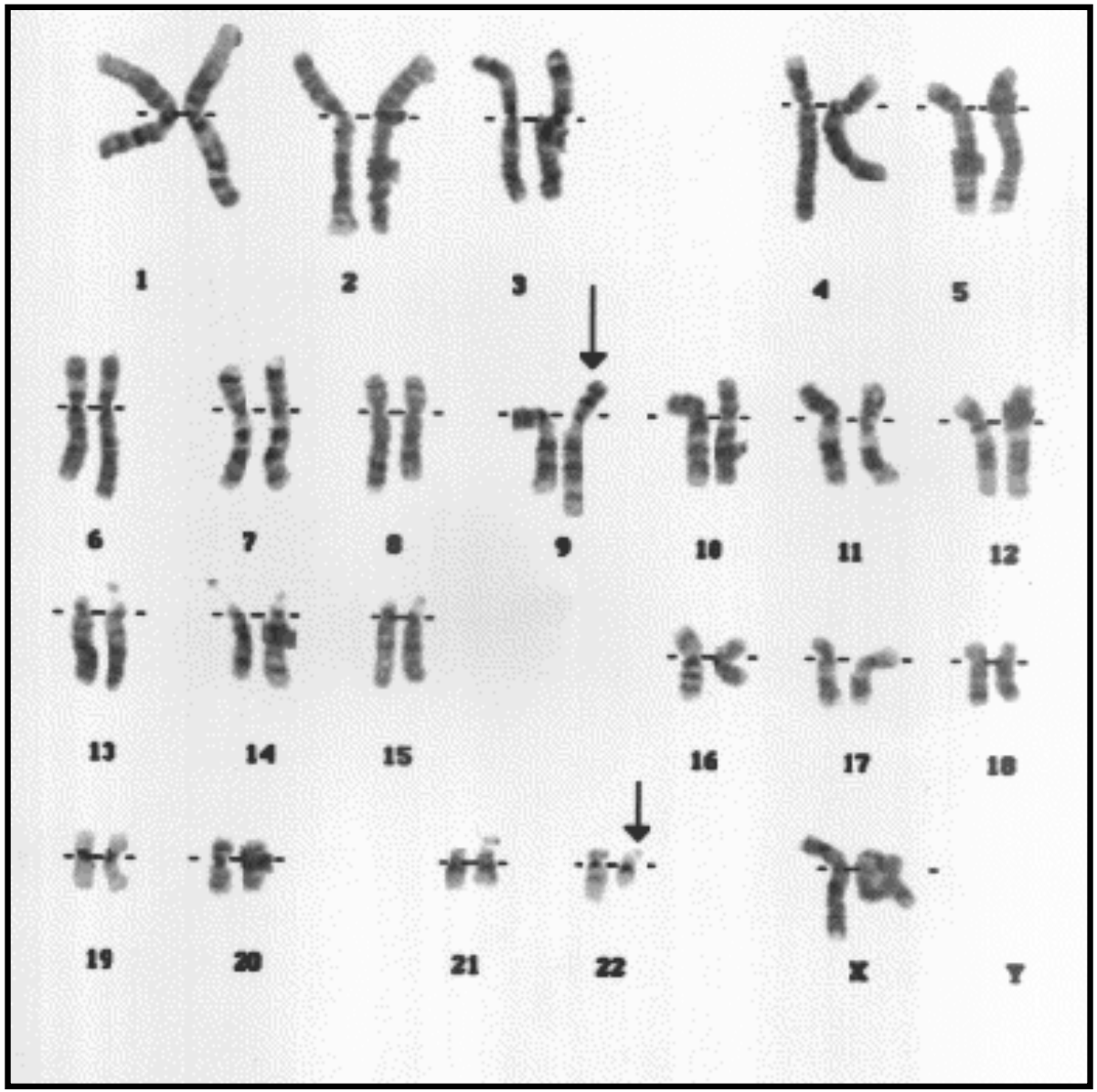
Cytotoxic T cell

B cell

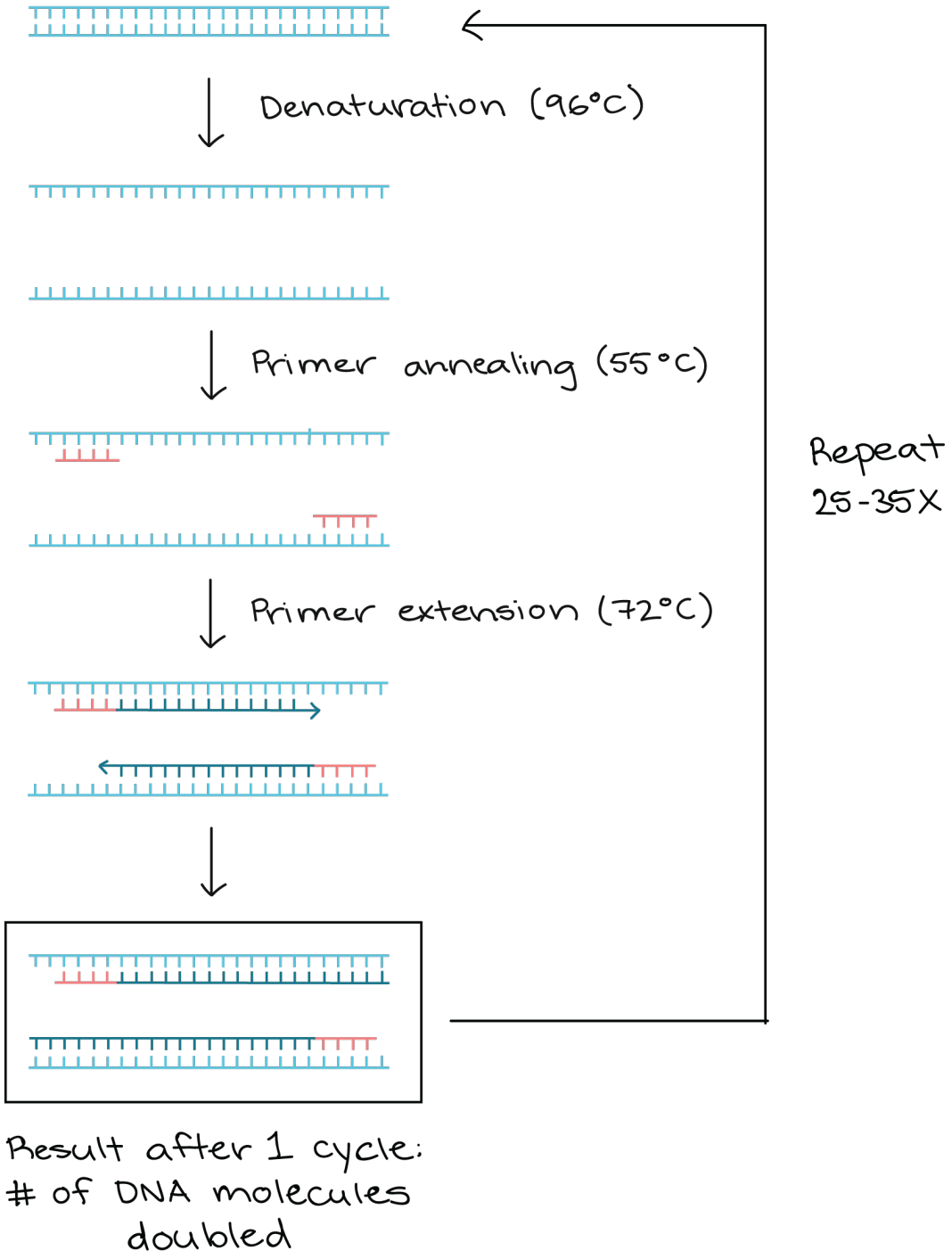
Immunophenotyping



Cytogenetics



One Type of Molecular Study: Polymerase Chain Reaction

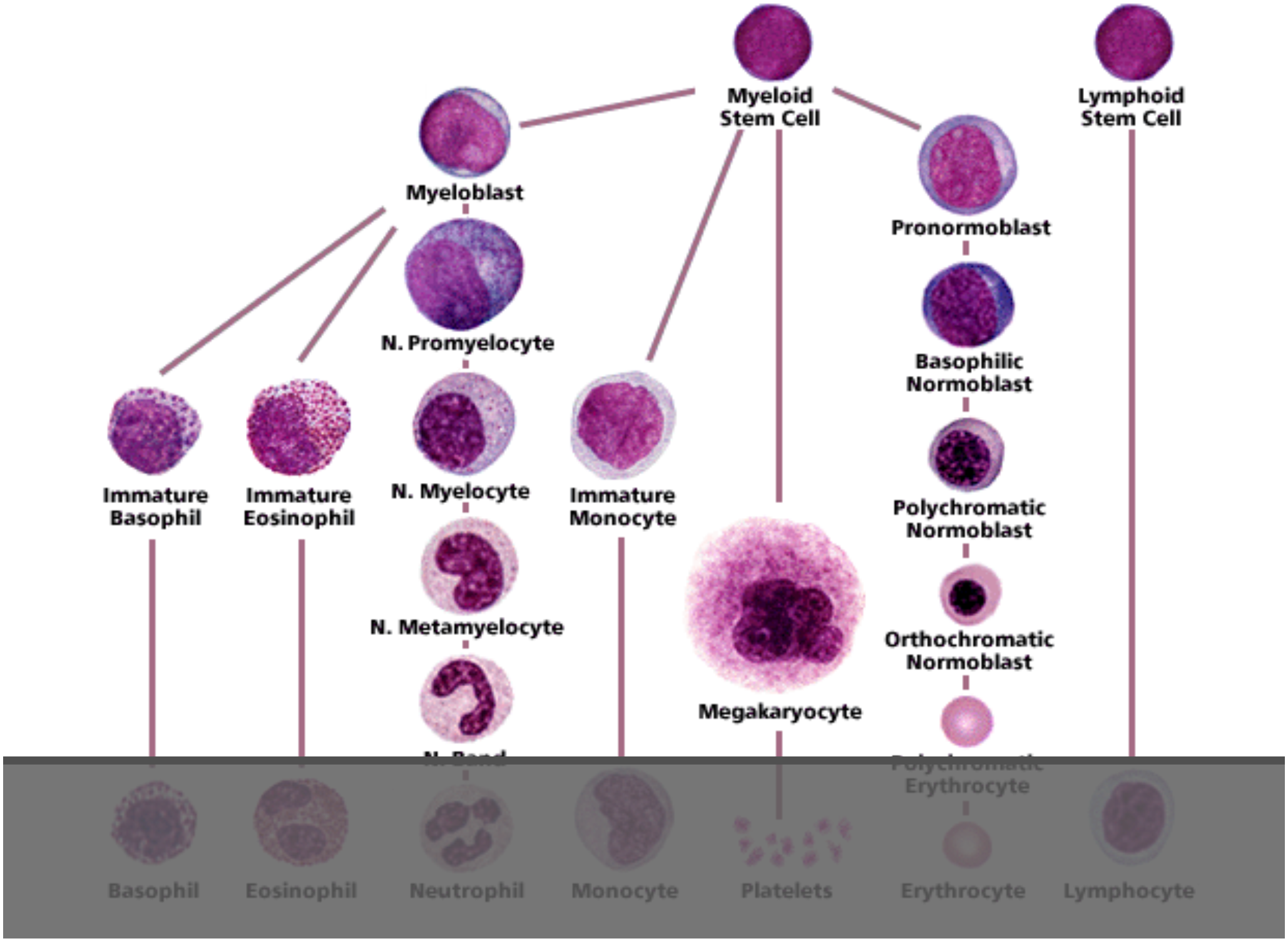


Acute Leukemia Outline

- Big-picture look at hematologic malignancies
- What is acute leukemia?

Acute Leukemia

- Malignant proliferation of immature myeloid or lymphoid cells in the bone marrow
- Cause
  - Clonal expansion
  - Maturation failure
- Why is it so bad to have these malignant cells filling up the bone marrow?
  - Crowd out normal cells
  - Inhibit normal cell function
  - May leave and infiltrate other organs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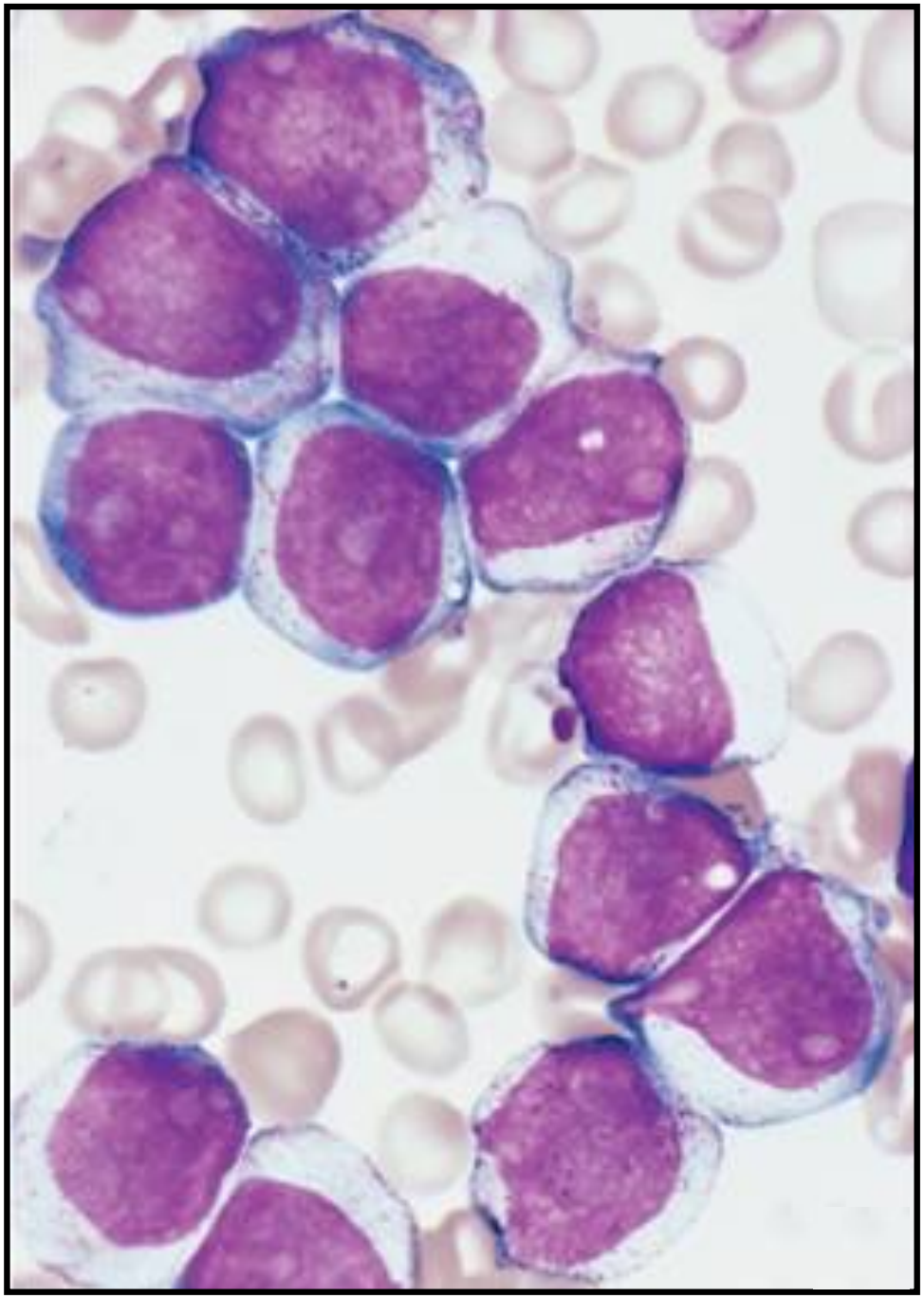
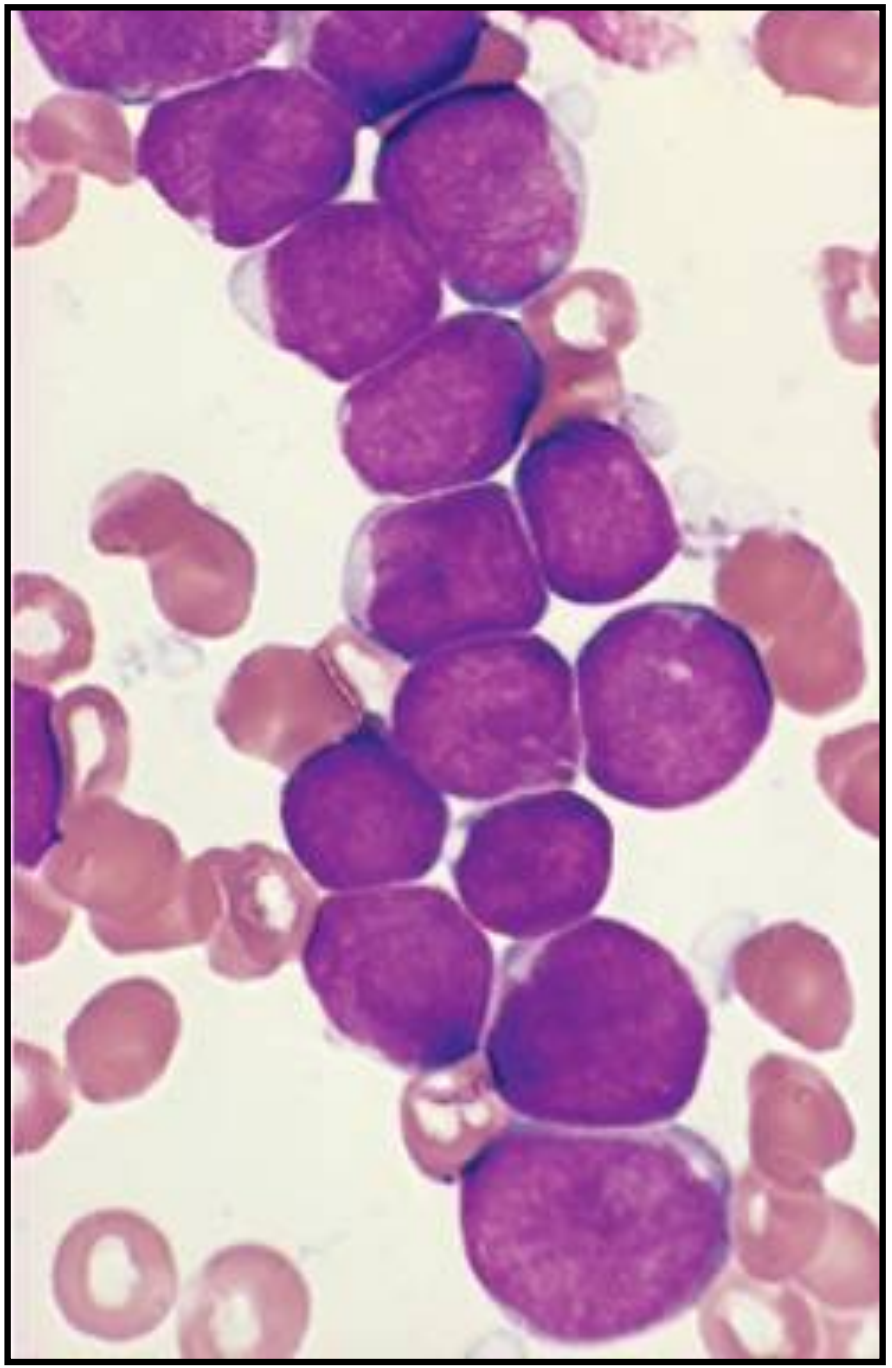
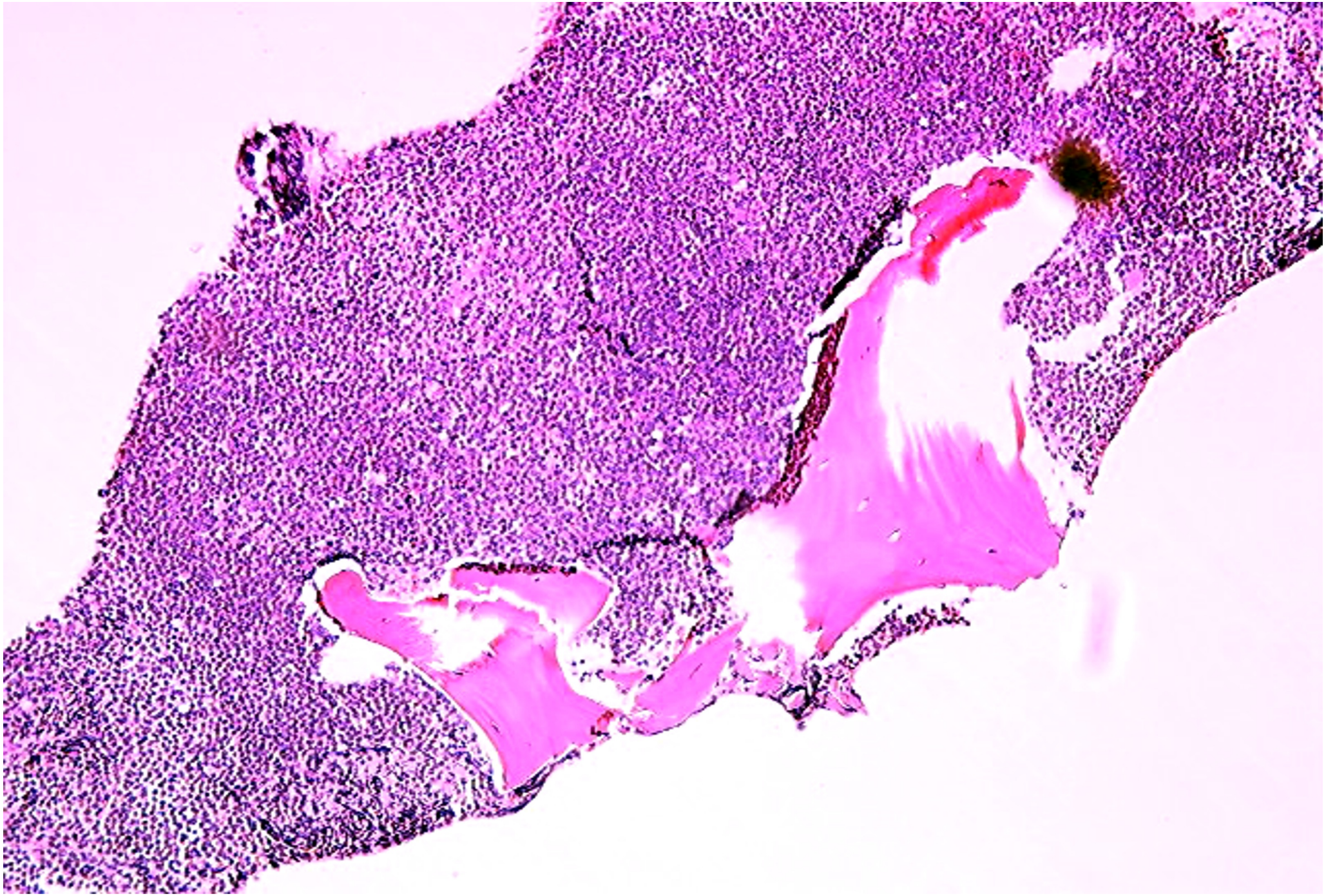


Acute myeloid leukemia



Acute lymphoblastic leukemia



Acute leukemia: bone marrow biopsy

Clinical Features of Acute Leukemia

- Sudden onset (days)
- Symptoms of “bone marrow failure”
  - Fatigue
  - Infections
  - Bleeding
- Bone pain (expanding marrow)
- Organ infiltration (liver, spleen, brain)

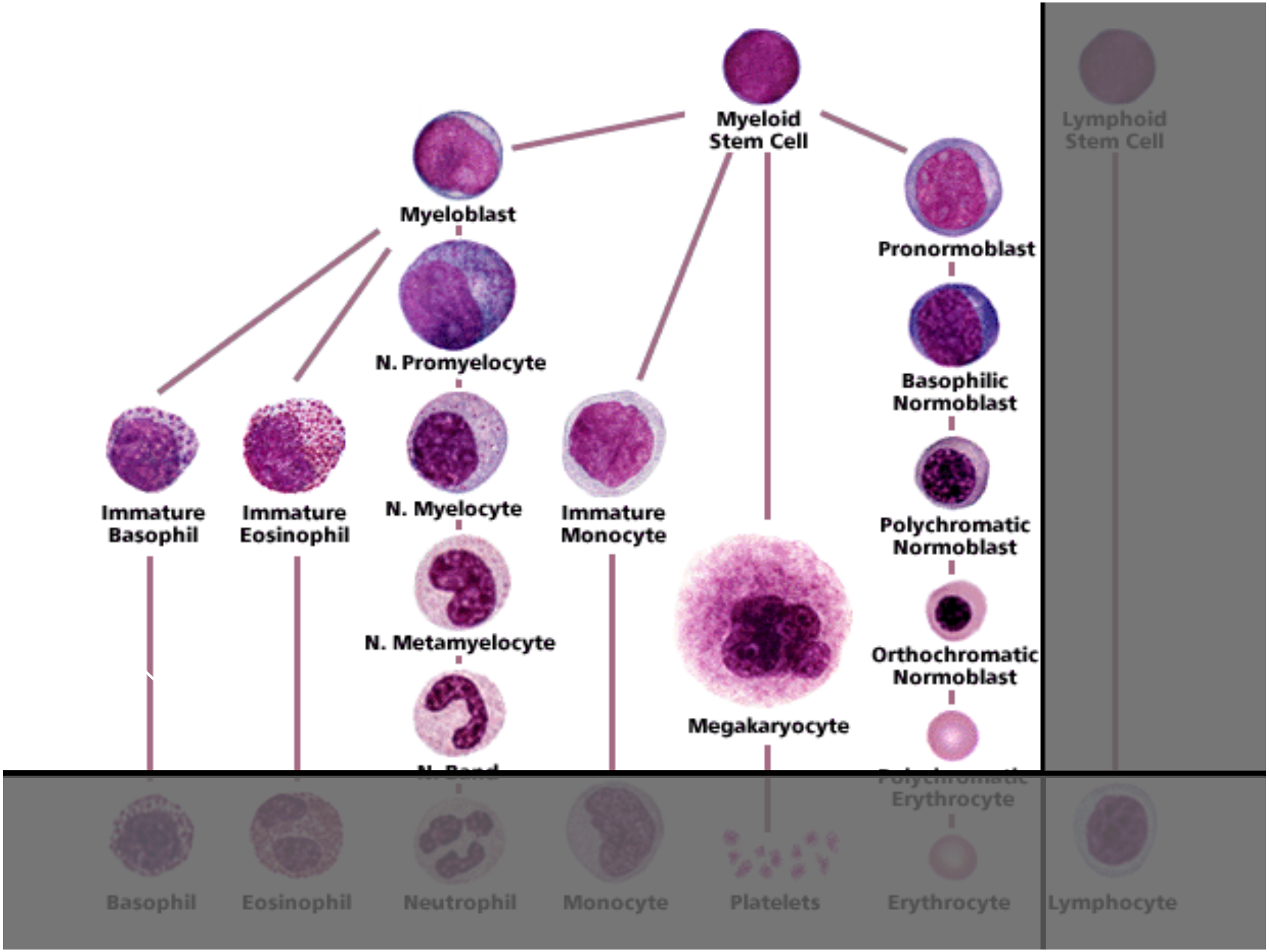
Acute Leukemia Outline

- Big-picture look at hematologic malignancies
- What is acute leukemia?
- Acute myeloid leukemia

Acute Myeloid Leukemia

Things you must know

- Malignant proliferation of myeloblasts (or other early myeloid precursor cells) in blood and bone marrow
- 20% cutoff for diagnosis
- Many subtypes
- Bad prognosis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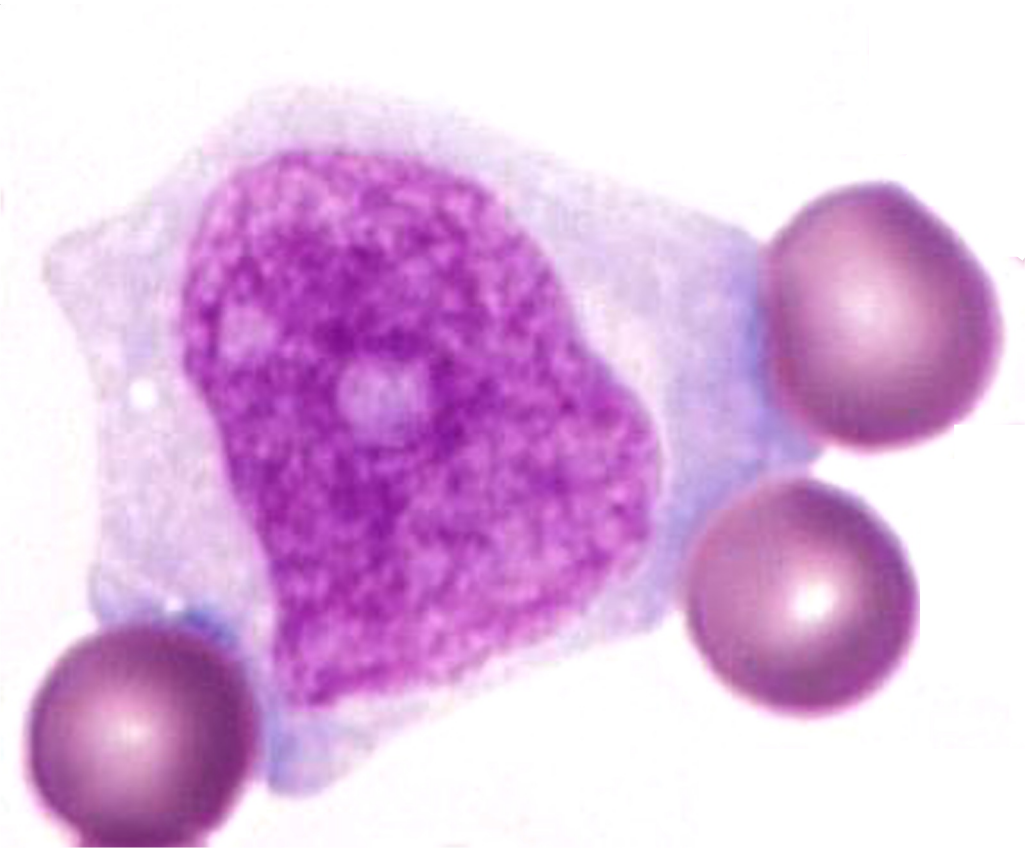
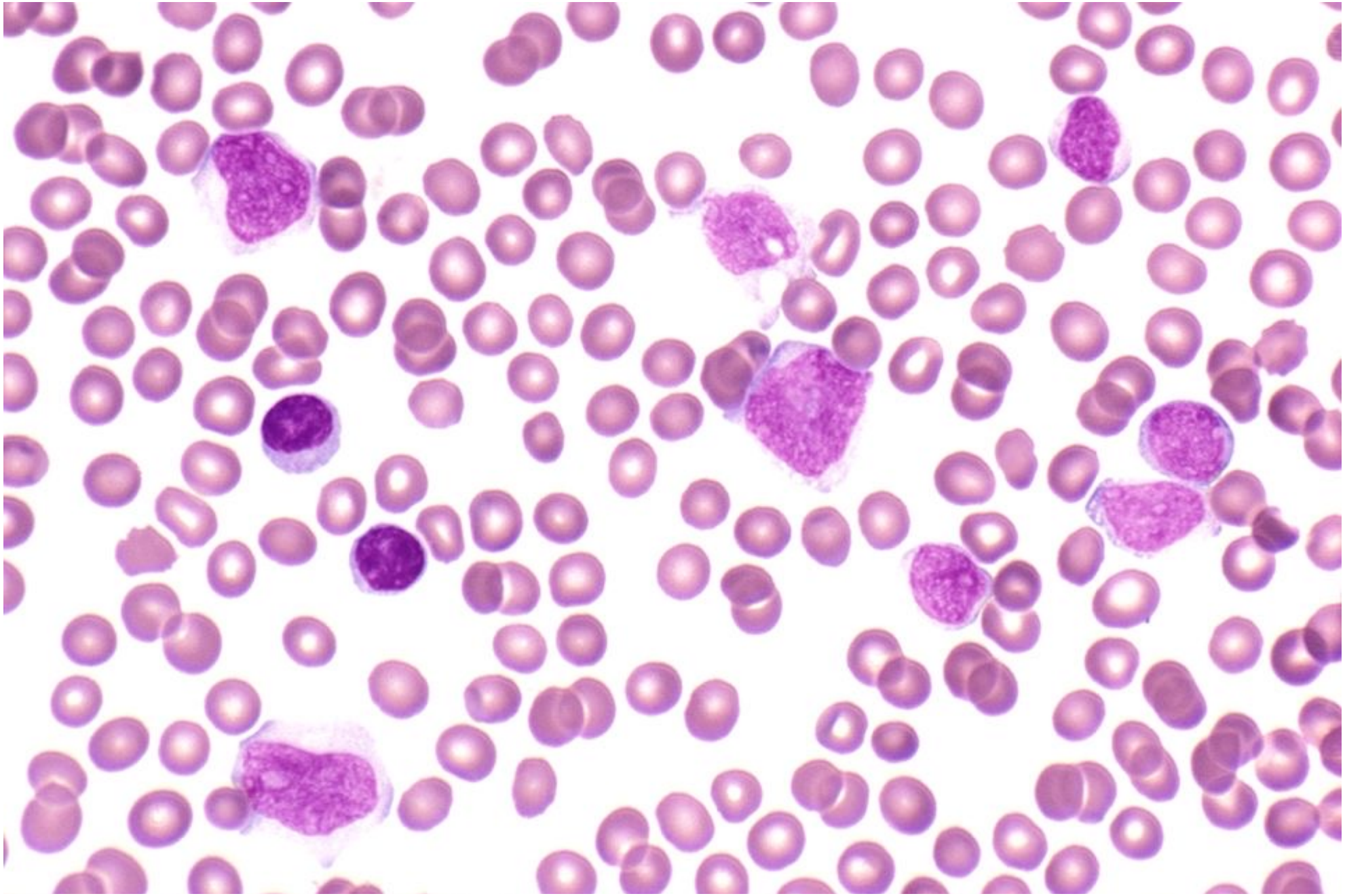
Erythrocyte
Lymphocyte

need at least 20% blasts





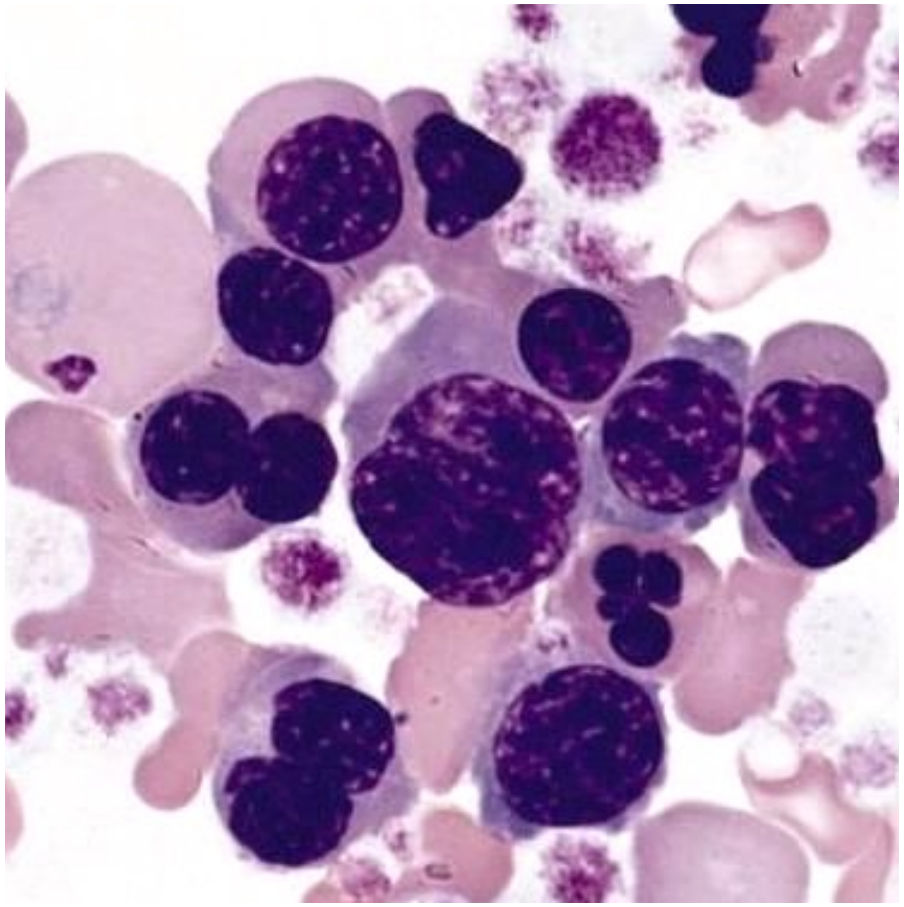
Acute myeloid leukemia with >20% blasts

Q. Why do you need 20% blasts to call it AML?

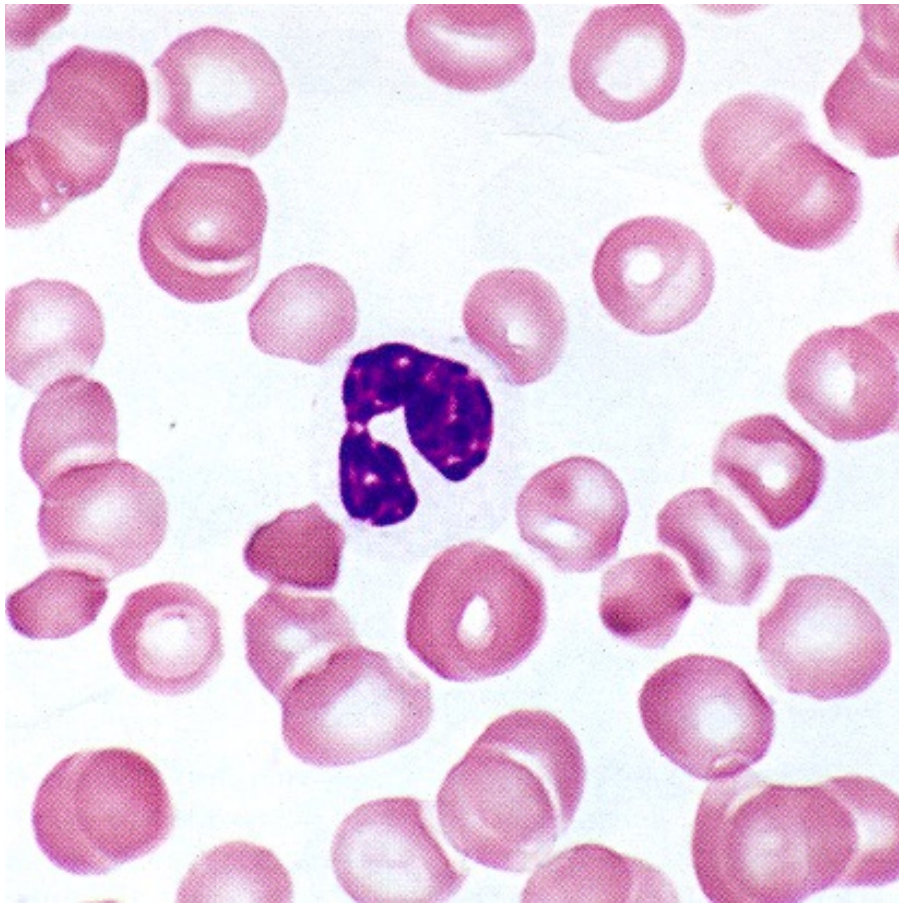
A. To make sure it’s really AML, and not MDS.

Myelodysplasia (MDS)

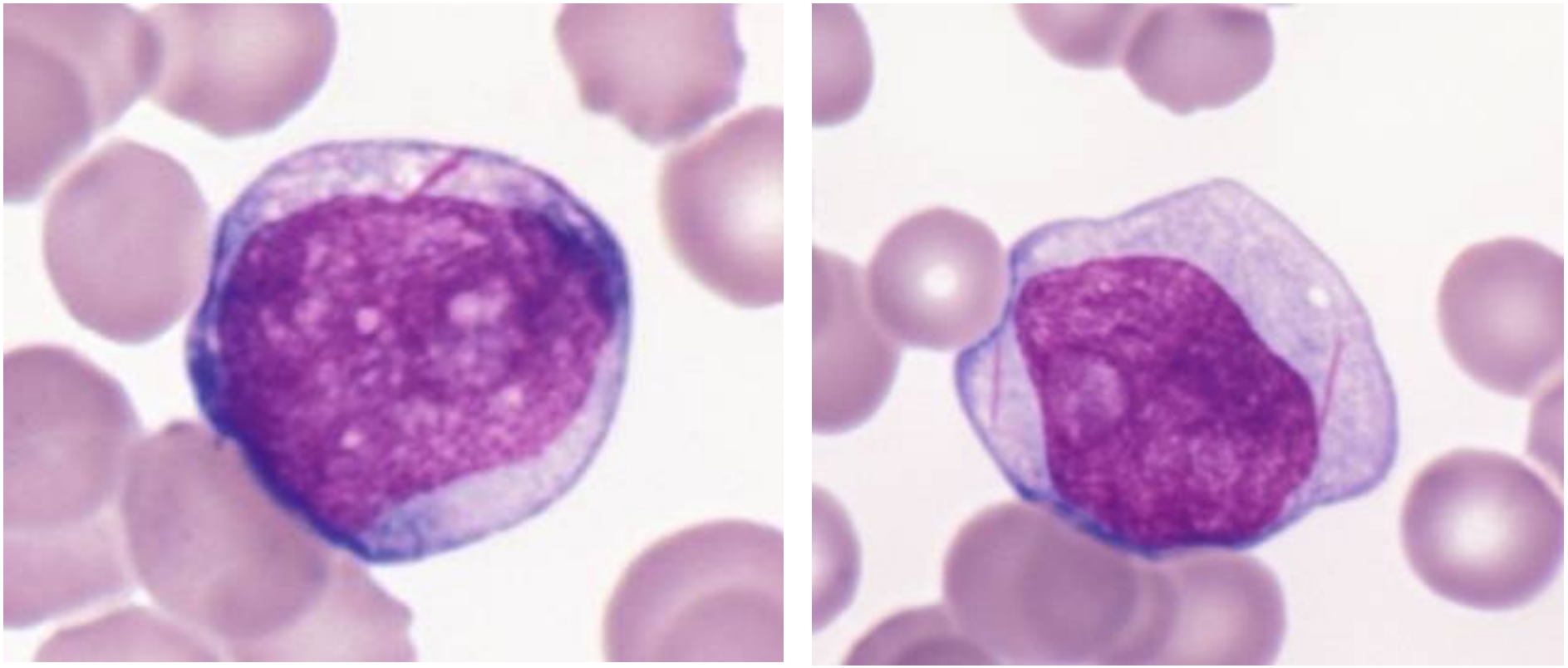
- Group of disorders characterized by defective ("dysplastic") maturation of hematopoietic cells
- Myeloblasts may be increased in number (but not over 20%!)
- Typically affects older patients
- May transform into AML - or may not!
- Treatment way less aggressive than AML treatment



Dyserythropoiesis
(weird changes in red cells)



Dysmyelopoiesis
(weird changes in neutrophils)



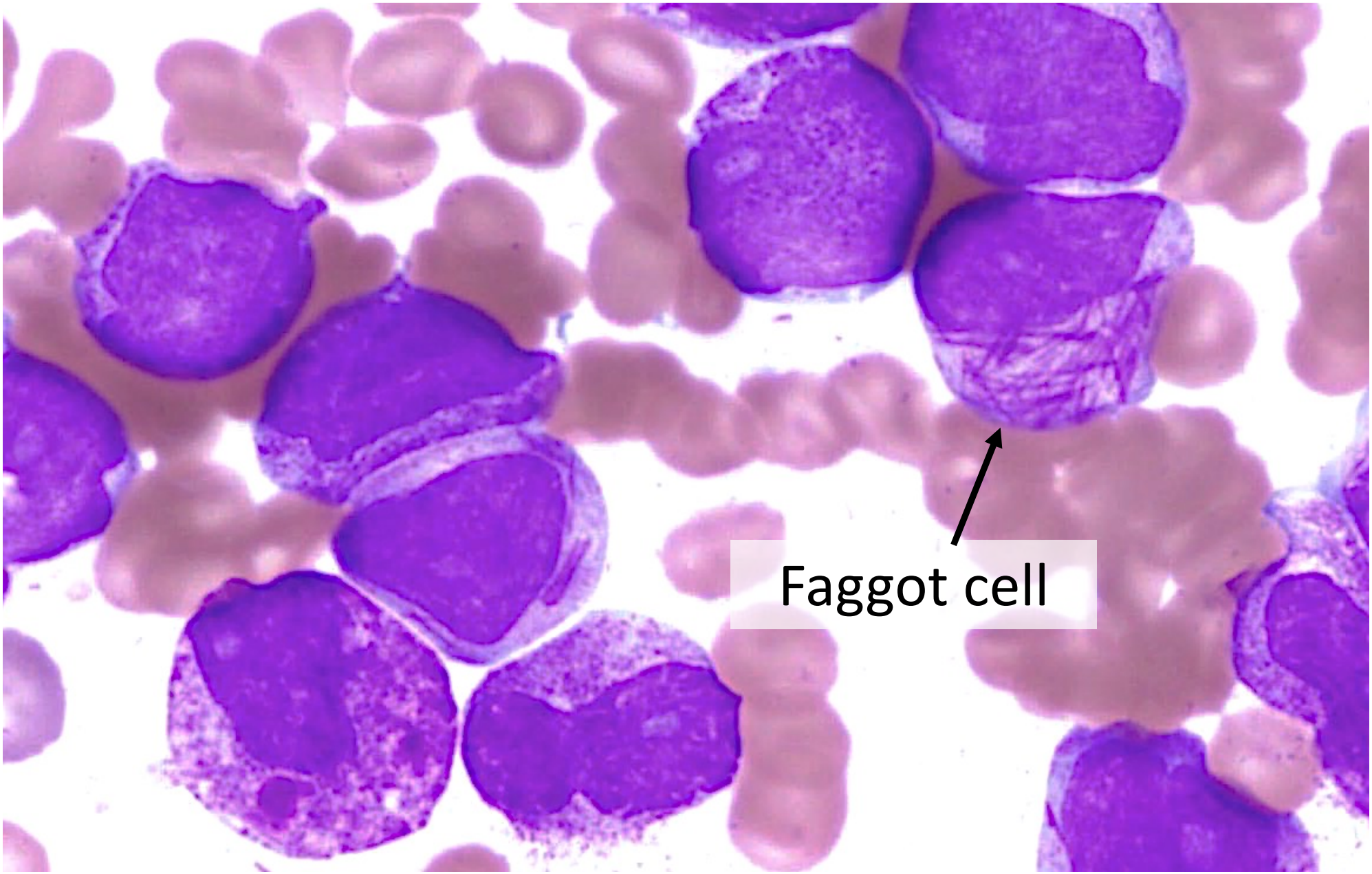
Auer rods

Subtypes of AML

- There are LOTS!
- Classified using morphology + genetics
- We'll just talk about two:
  - Acute promyelocytic leukemia
  - Acute monoblastic leukemia

Acute Promyelocytic Leukemia

- Malignant proliferation of promyelocytes
- Promyelocyte granules contain stuff that stimulates coagulation (BAD!)
- t(15;17) results in a new fusion protein that blocks maturation at the promyelocyte stage
- ATRA (all trans-retinoic acid) degrades the fusion protein, allowing cells to mature!



Acute promyelocytic leukemia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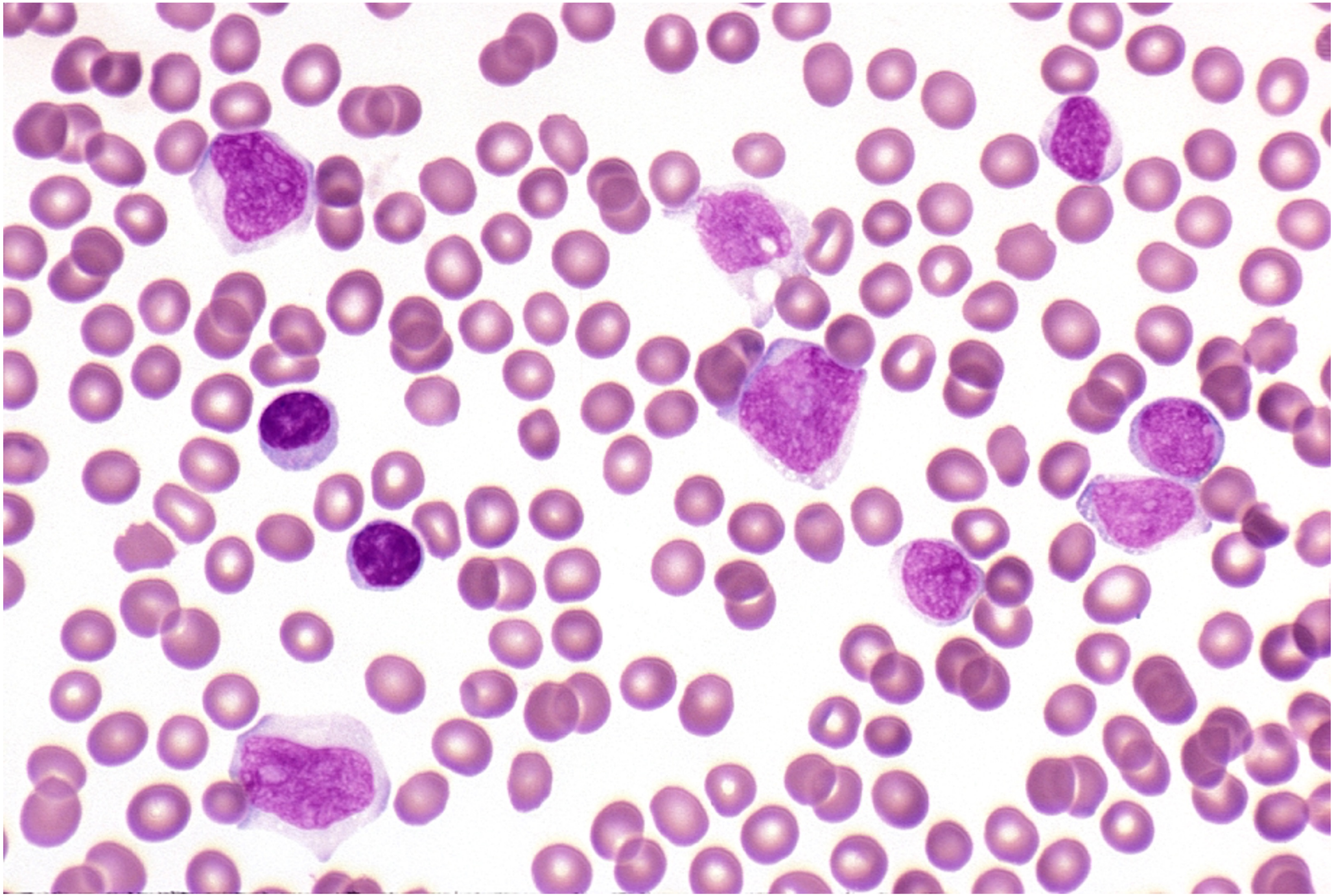
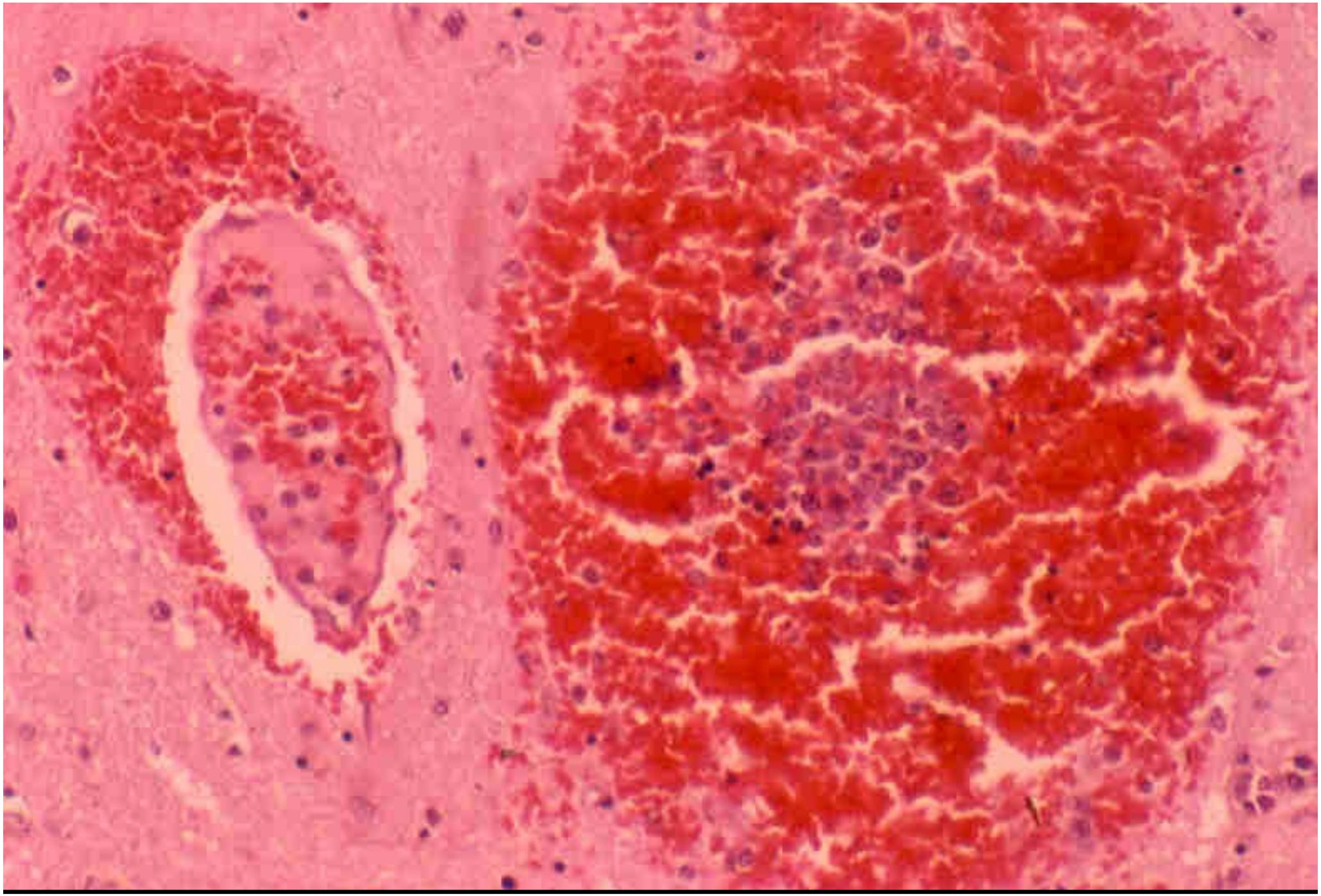
Acute Monoblastic Leukemia

- Malignant proliferation of monoblasts
- Extramedullary involvement (gums, CNS) is common



Acute monoblastic leukemia



Acute monoblastic leukemia: brain involvement

Acute monoblastic leukemia: gum involvement

Treatment and Prognosis of AML

Treatment

- Chemo
- Bone marrow transplant

Prognosis

- Dismal
- Except AMLs with certain genetic abnormalities (e.g., APL)

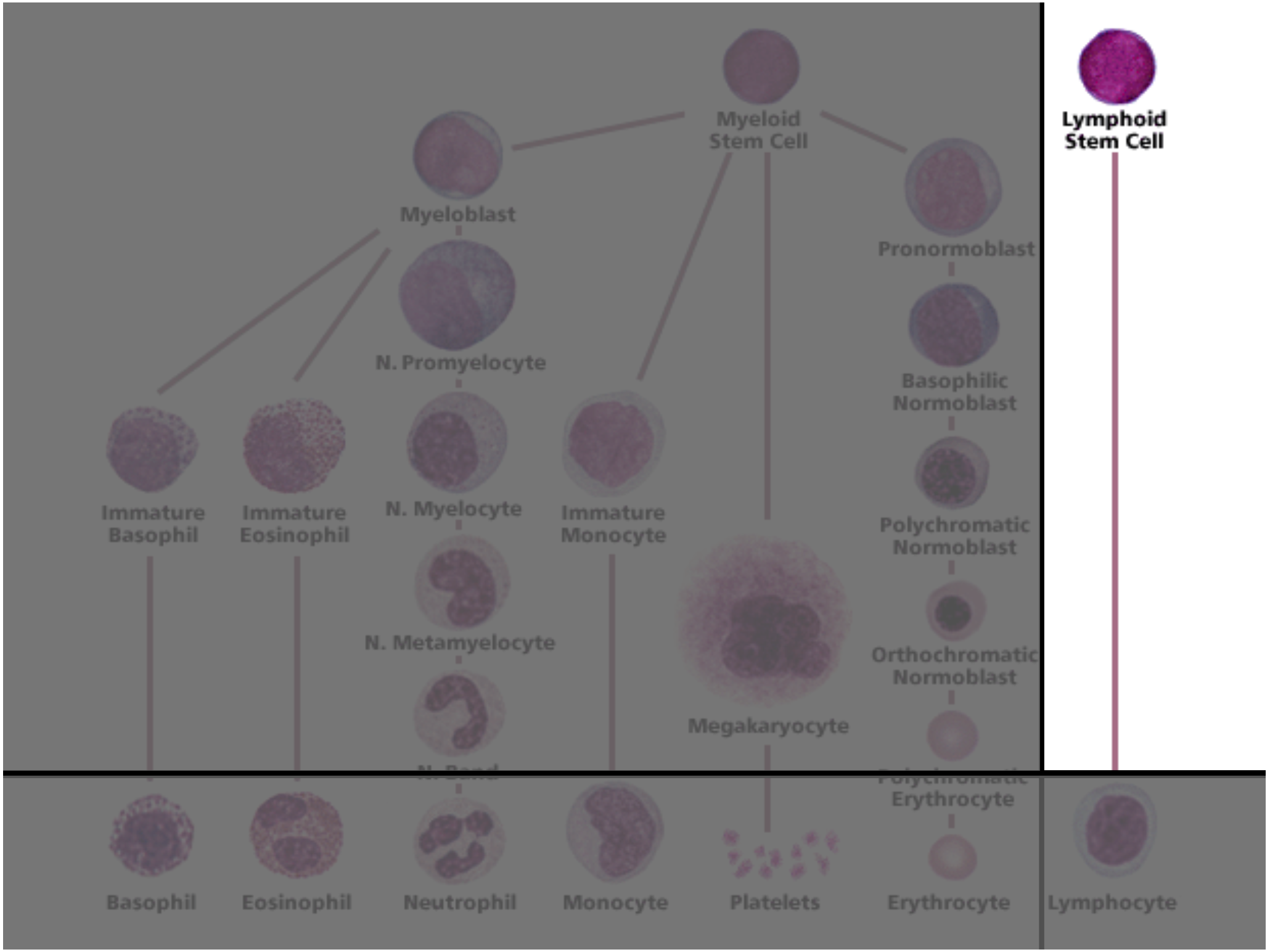
Acute Leukemia Outline

- Big-picture look at hematologic malignancies
- What is acute leukemia?
- Acute myeloid leukemia
- Acute lymphoblastic leukemia

Acute Lymphoblastic Leukemia

Things You Must Know

- Malignant proliferation of lymphoid blasts in blood, bone marrow
- Classified by immunophenotype (B vs. T)
- More common in children
- Prognosis often good!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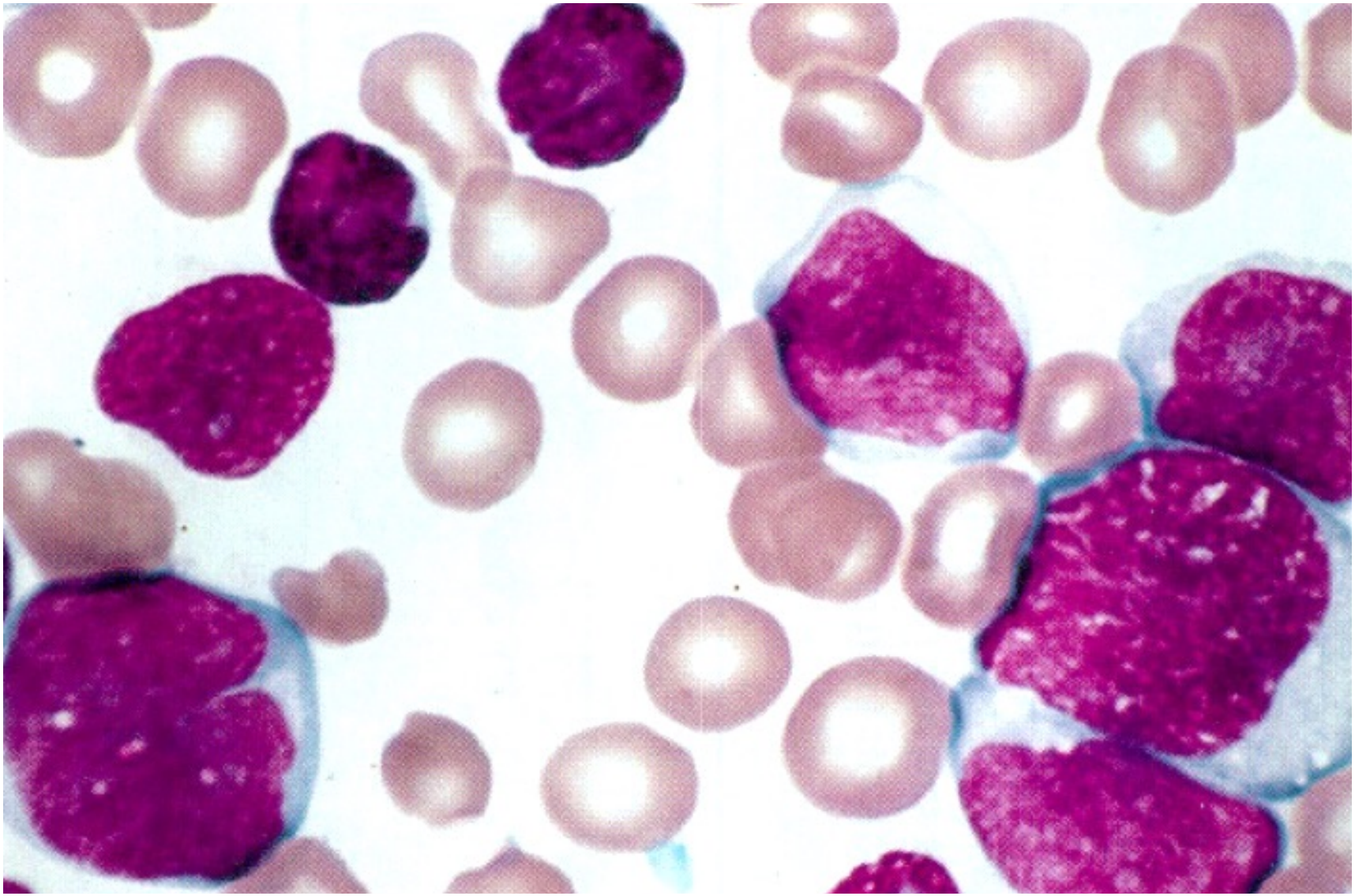
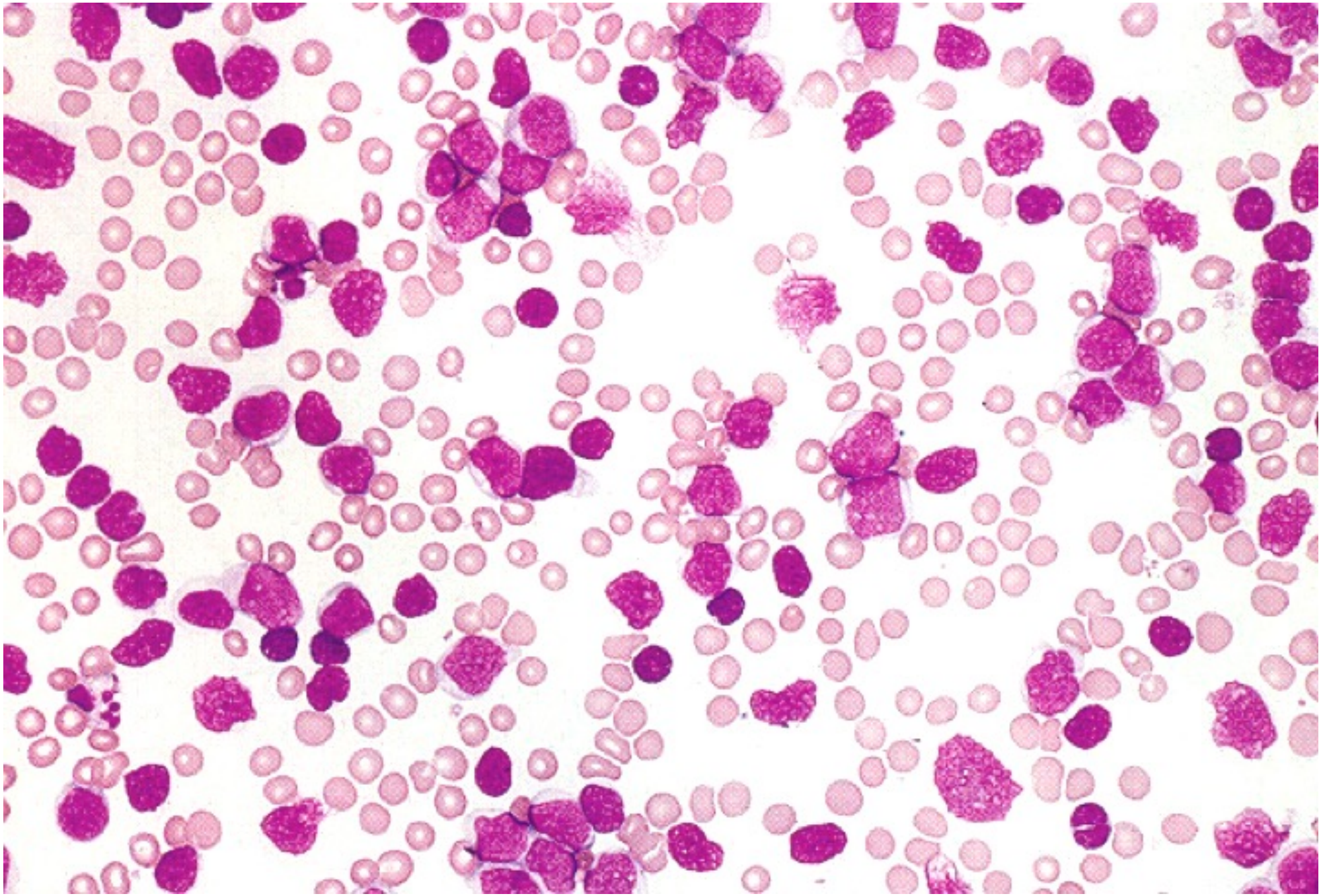


Acute lymphoblastic leukemia



Acute lymphoblastic leukemia

Treatment and Prognosis of ALL

Treatment

- Chemo ± bone marrow transplant
- Many children are cured!

Prognosis

- Immunophenotype (B is better)
- Age (1-10 better)
- WBC (<10,000 better)
- Cytogenetics (hyperdiploidy better!)