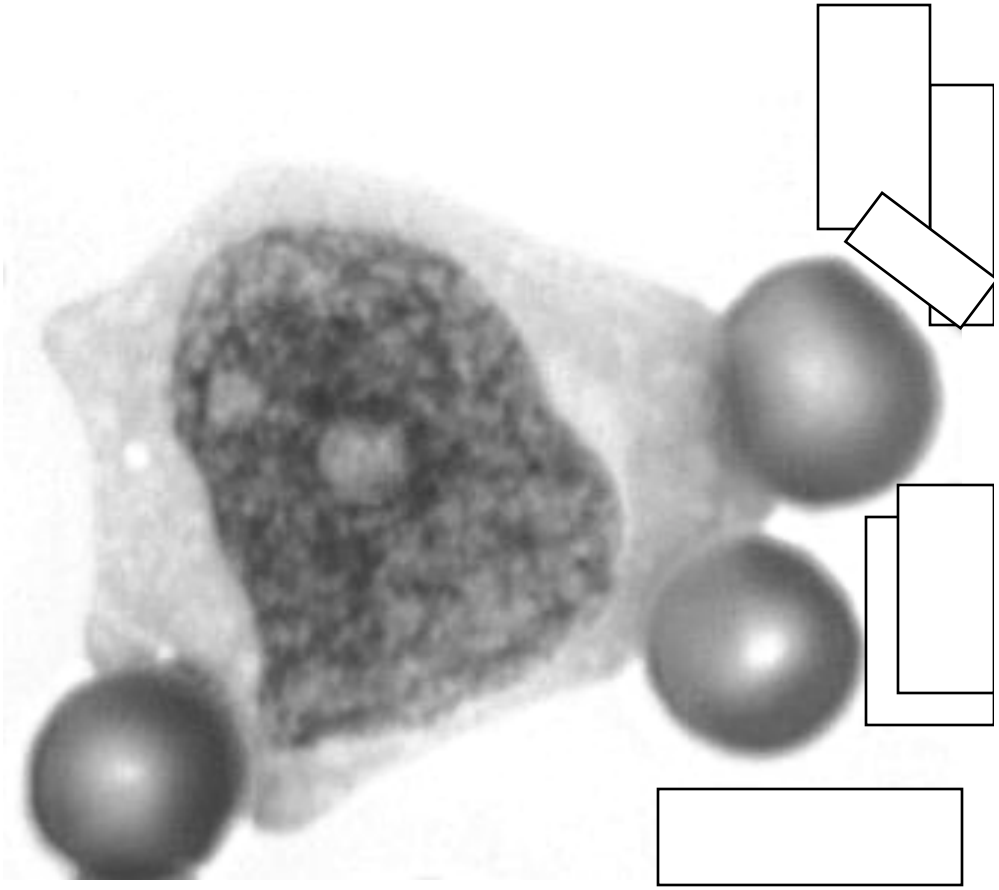
Exam 3
review



Three Ways to Get Anemic

Lose blood

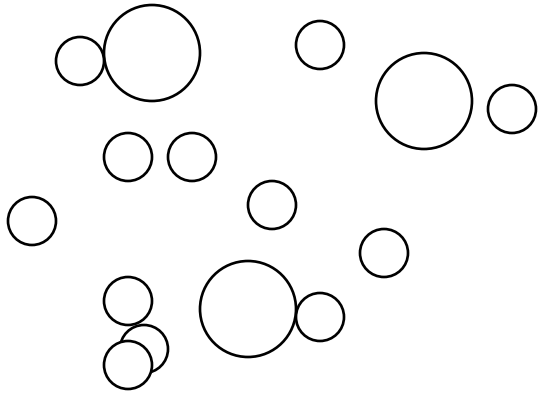
Destroy too much blood

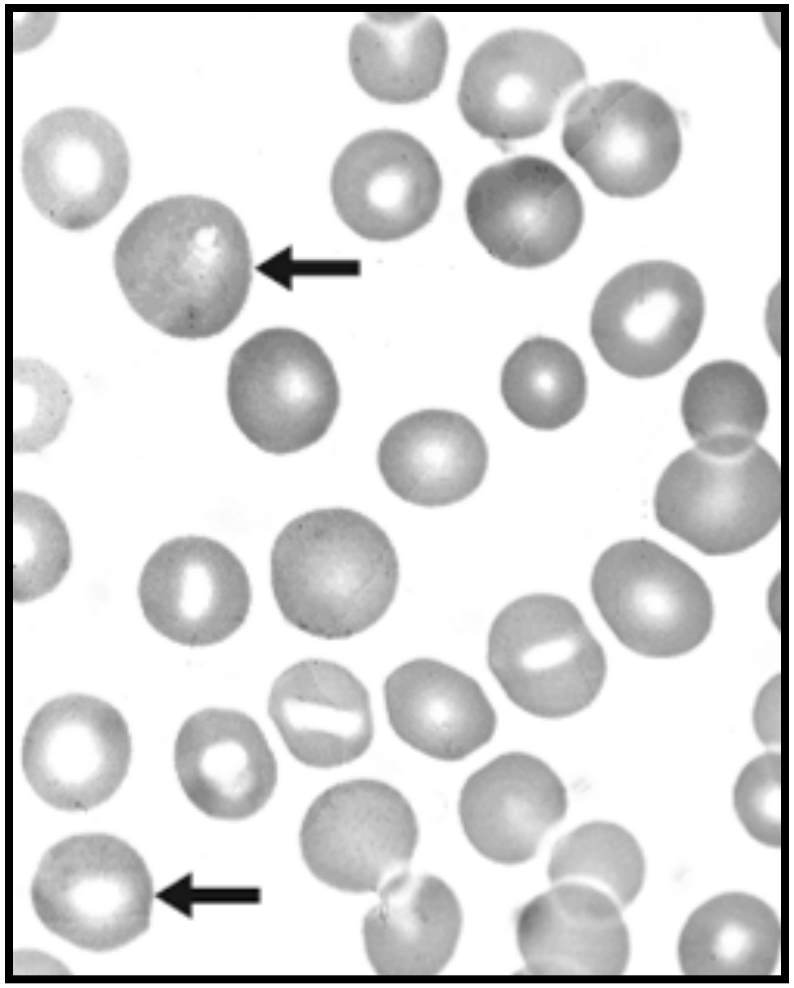
- Extracorpuscular reasons
- Intracorpuscular reasons

Make too little blood

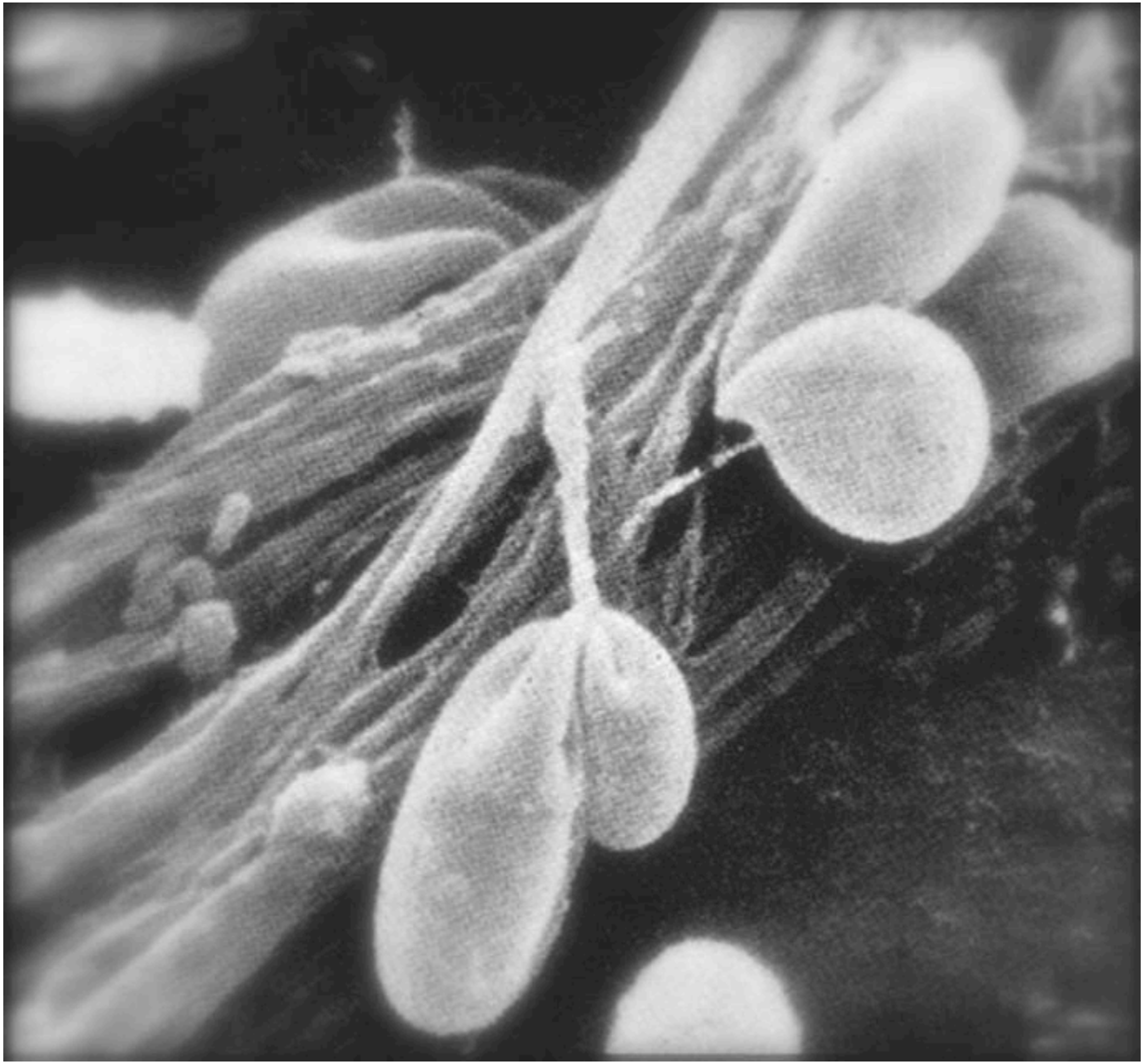
- Too few building blocks
- Too few erythroblasts
- Not enough room

We went through 10 anemias (11 if you count warm and cold autoimmune hemolytic anemia separately). The next 11 slides are representative slides for each anemia, one slide per anemia. You might use them to jog your memory to see how much you remember about each type.

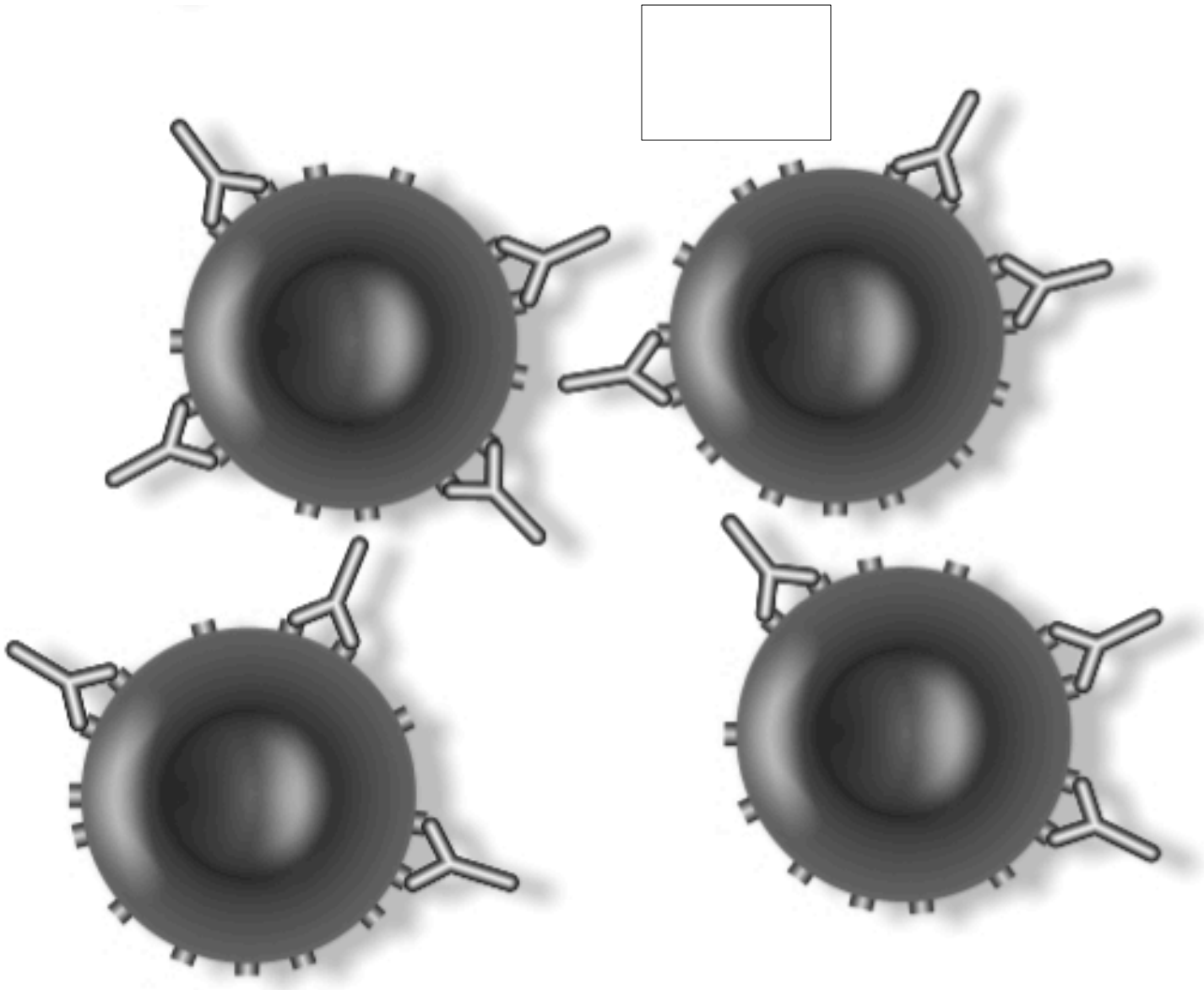




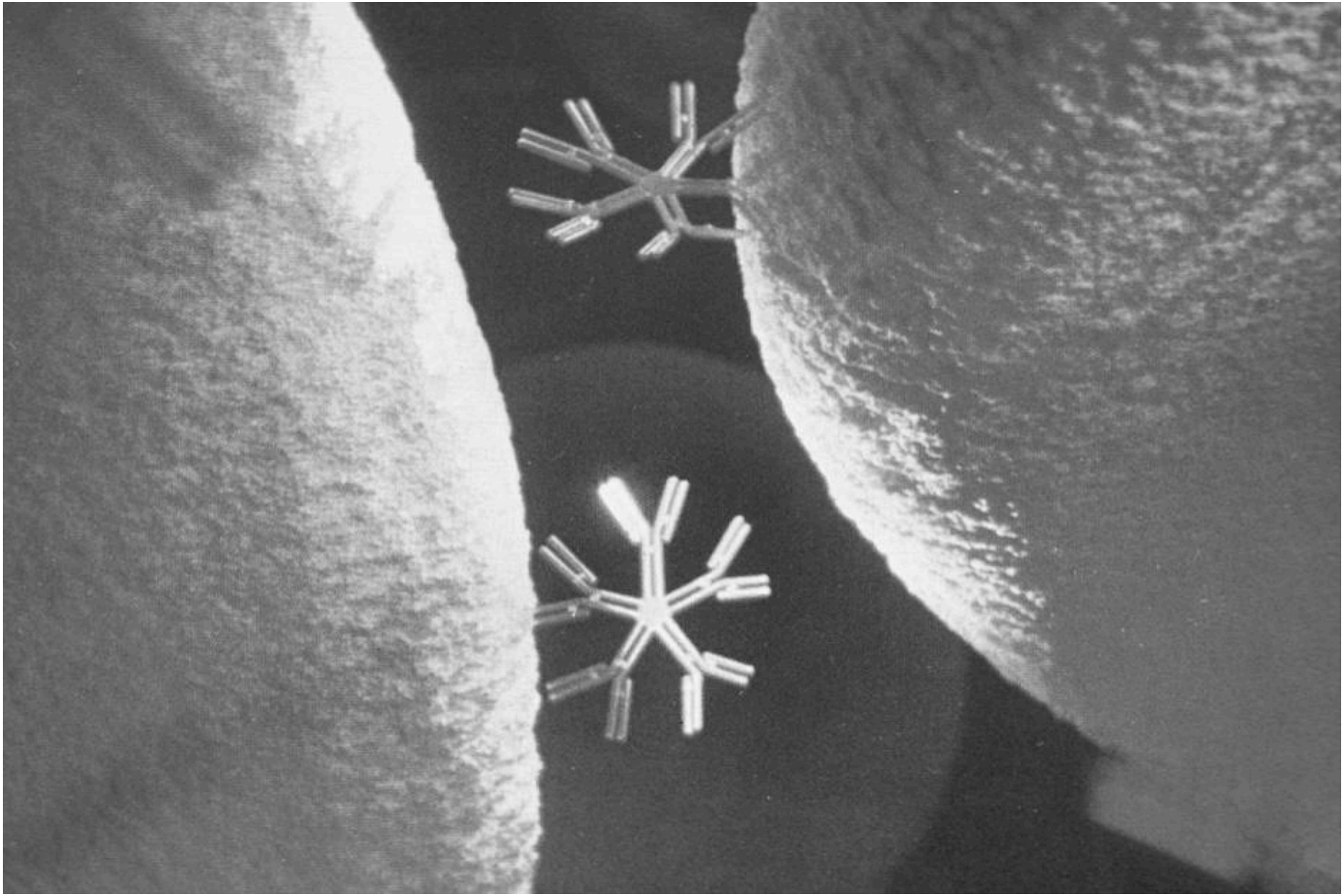
Reticulocytes



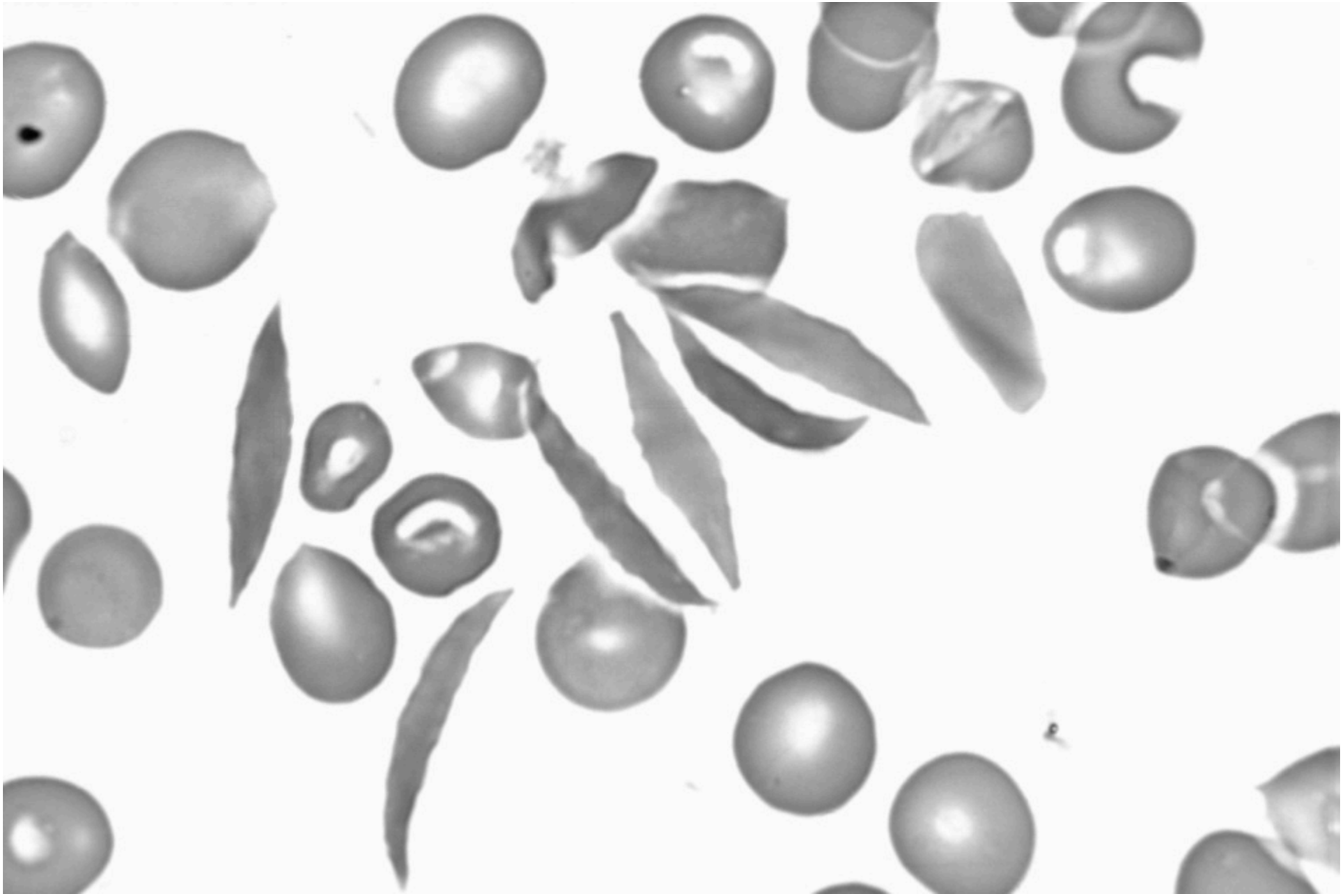
Red cells snagged on fibrin strand



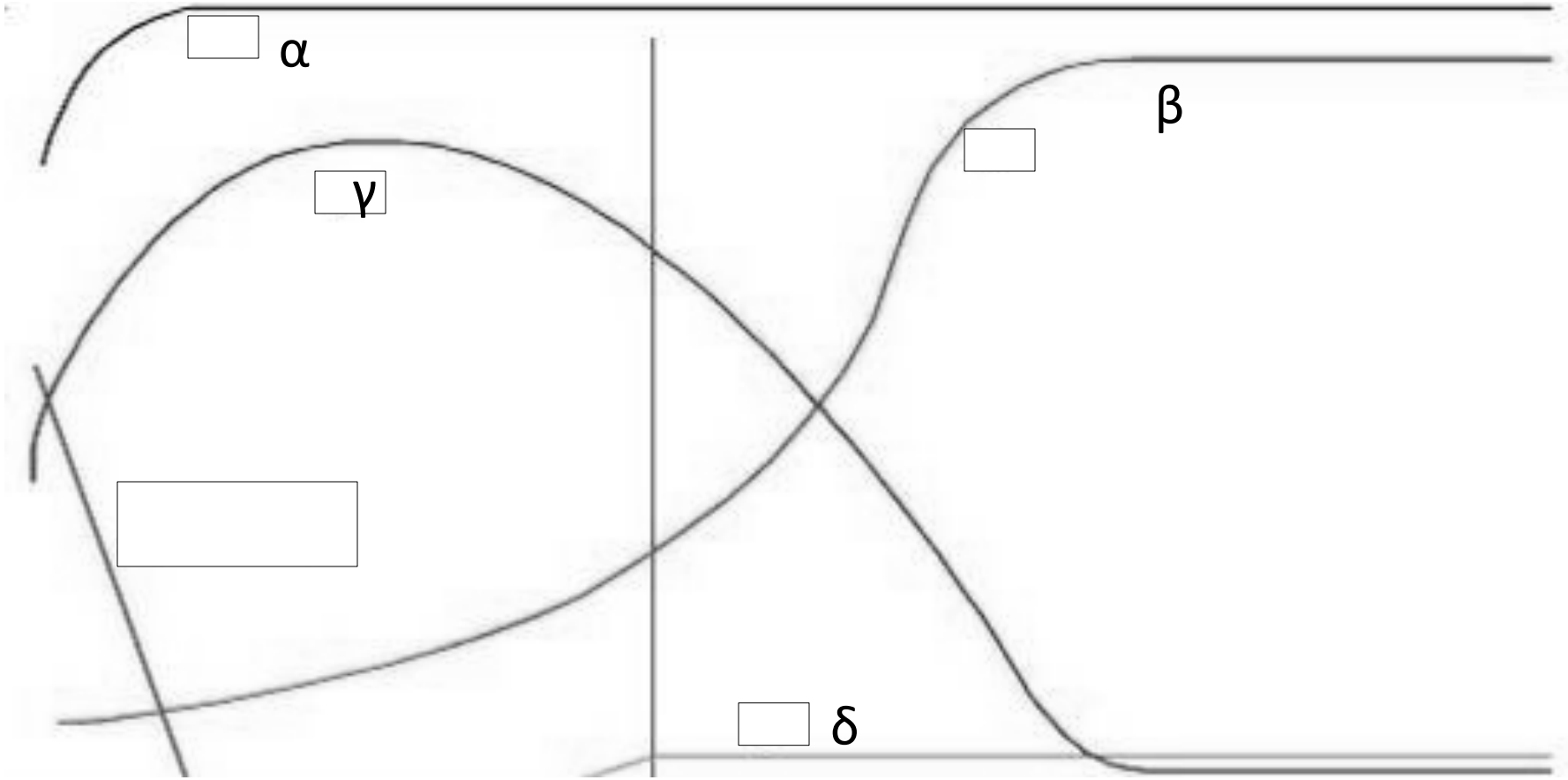
Warm AIHA



Cold AIHA

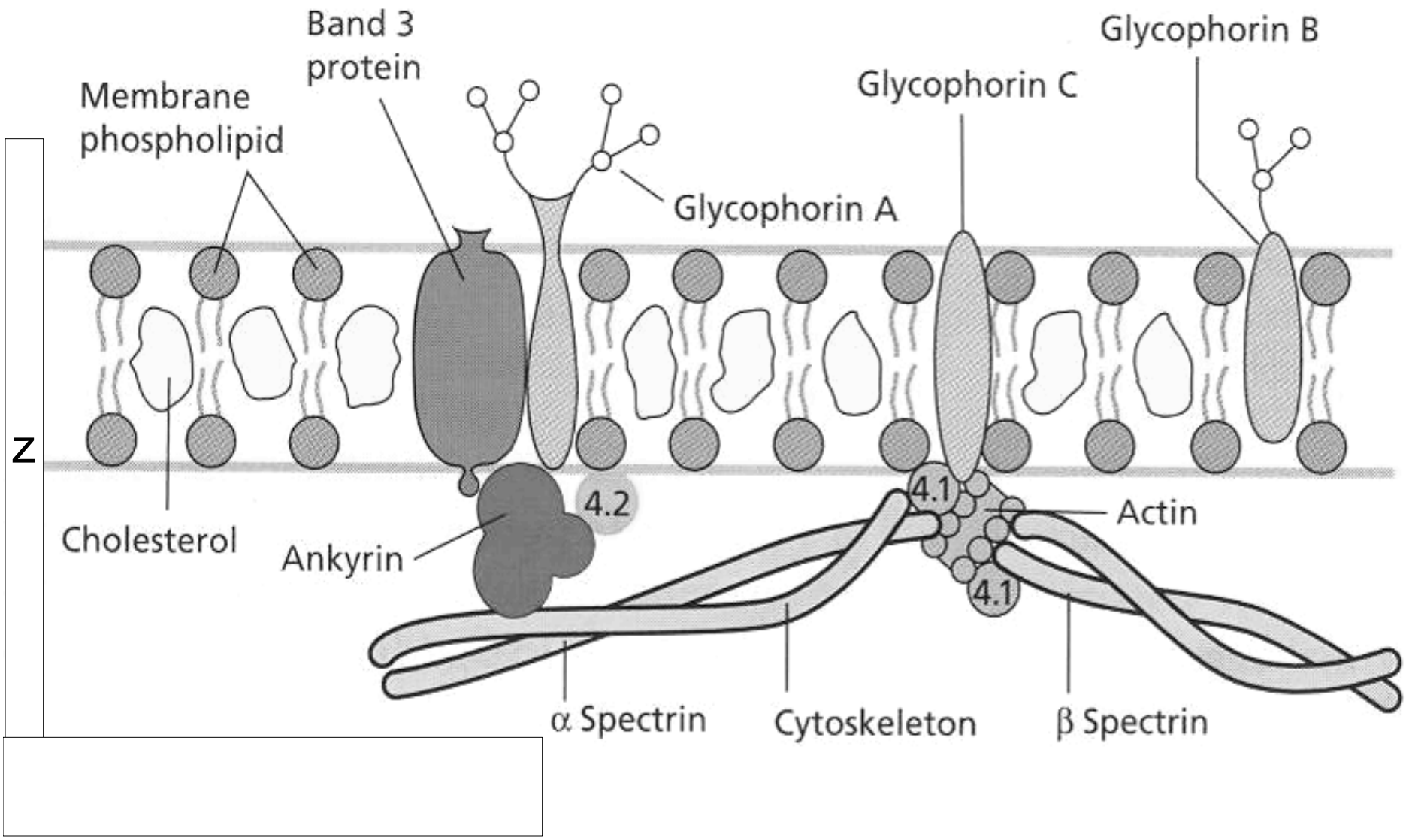


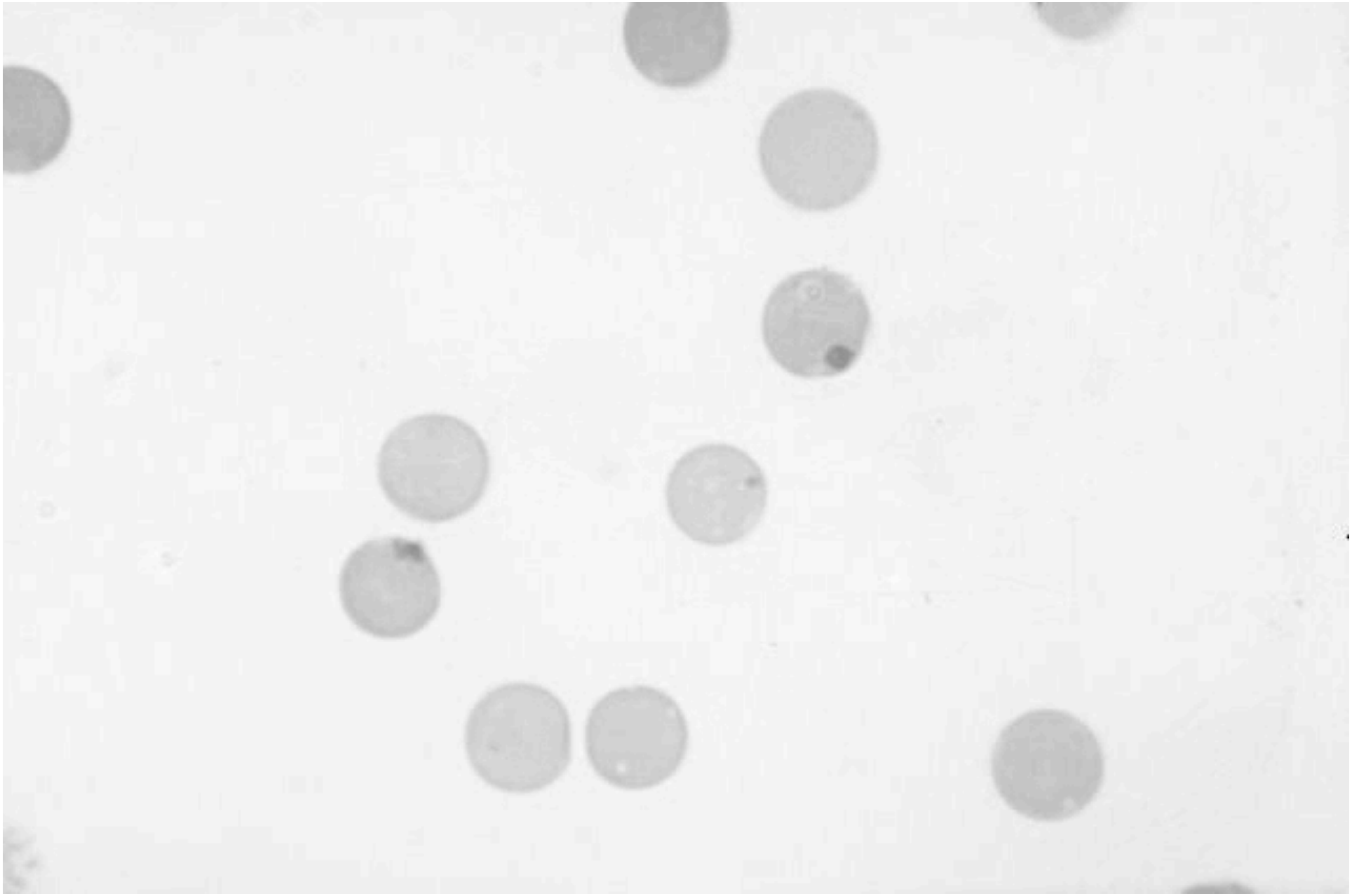
Sickle cell anemia



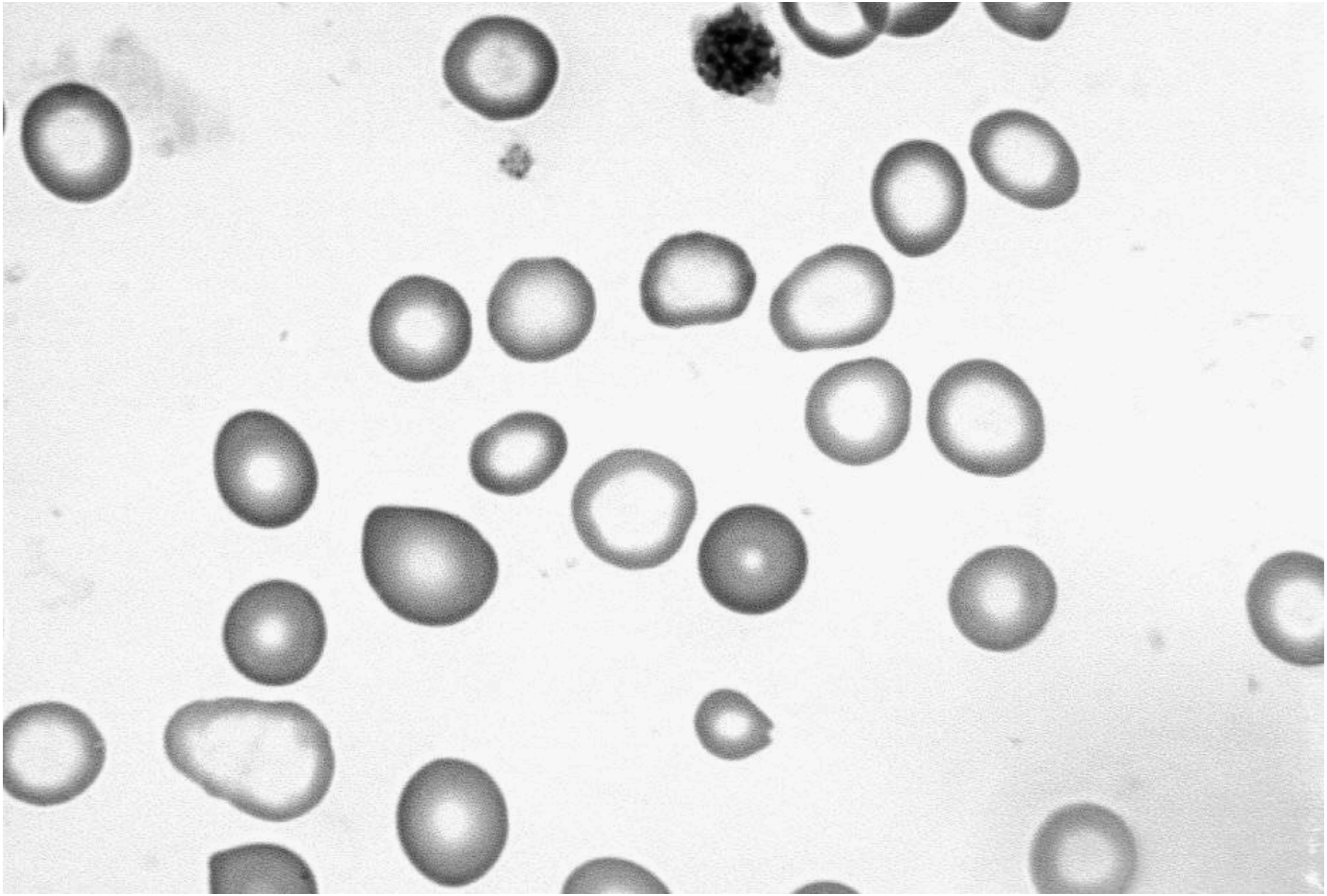
Hgb F = $\alpha_2\gamma_2$ Hgb A_2 = $\alpha_2\delta_2$ Hgb A = $\alpha_2\beta_2$

Hemoglobin chain development

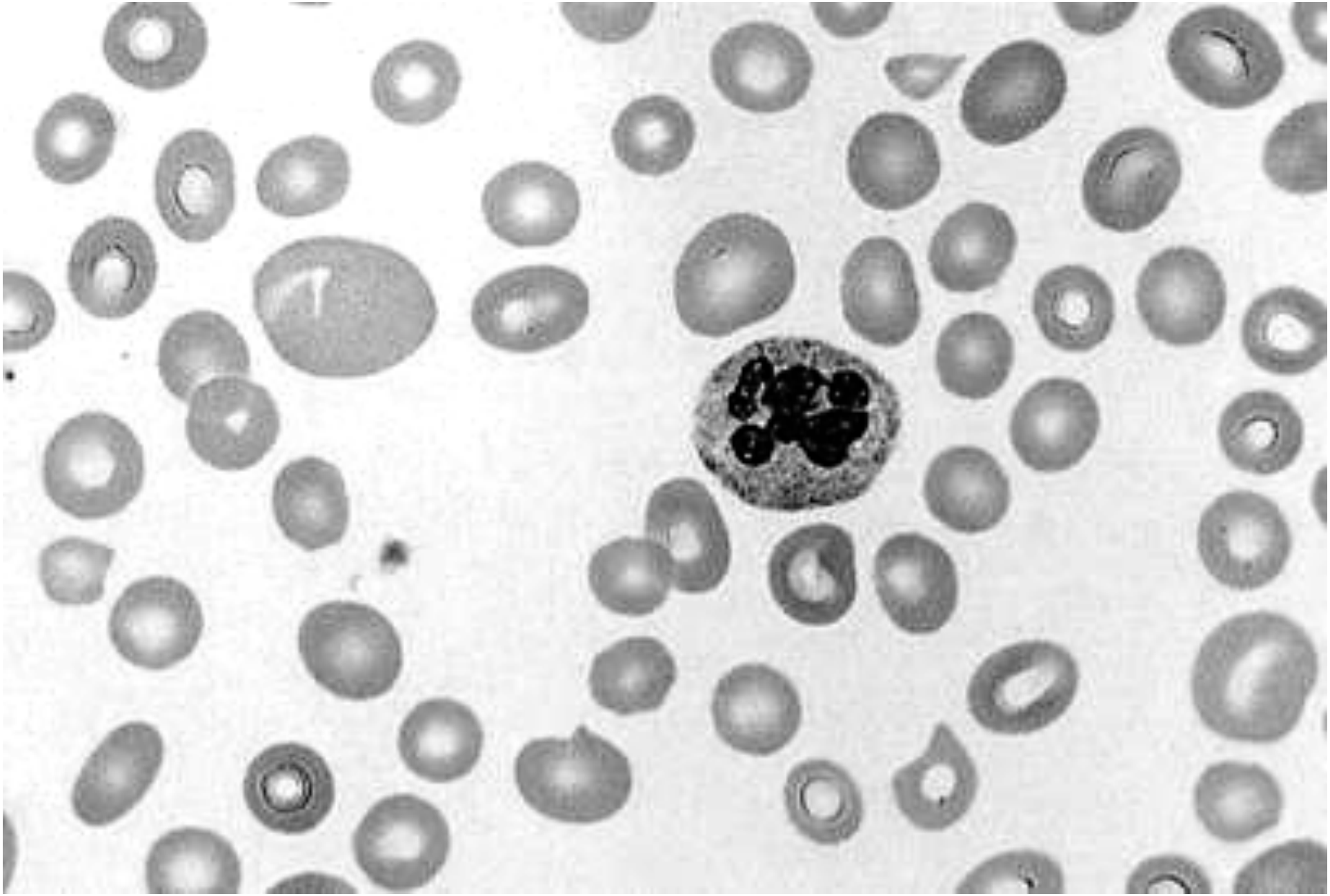

Band 3
protein
Glycophorin B
Membrane
phospholipid
Glycophorin C
Glycophorin A
Z
4.2
4.1
Actin
Cholesterol
Ankyrin
4.1
α Spectrin
Cytoskeleton
β Spectrin



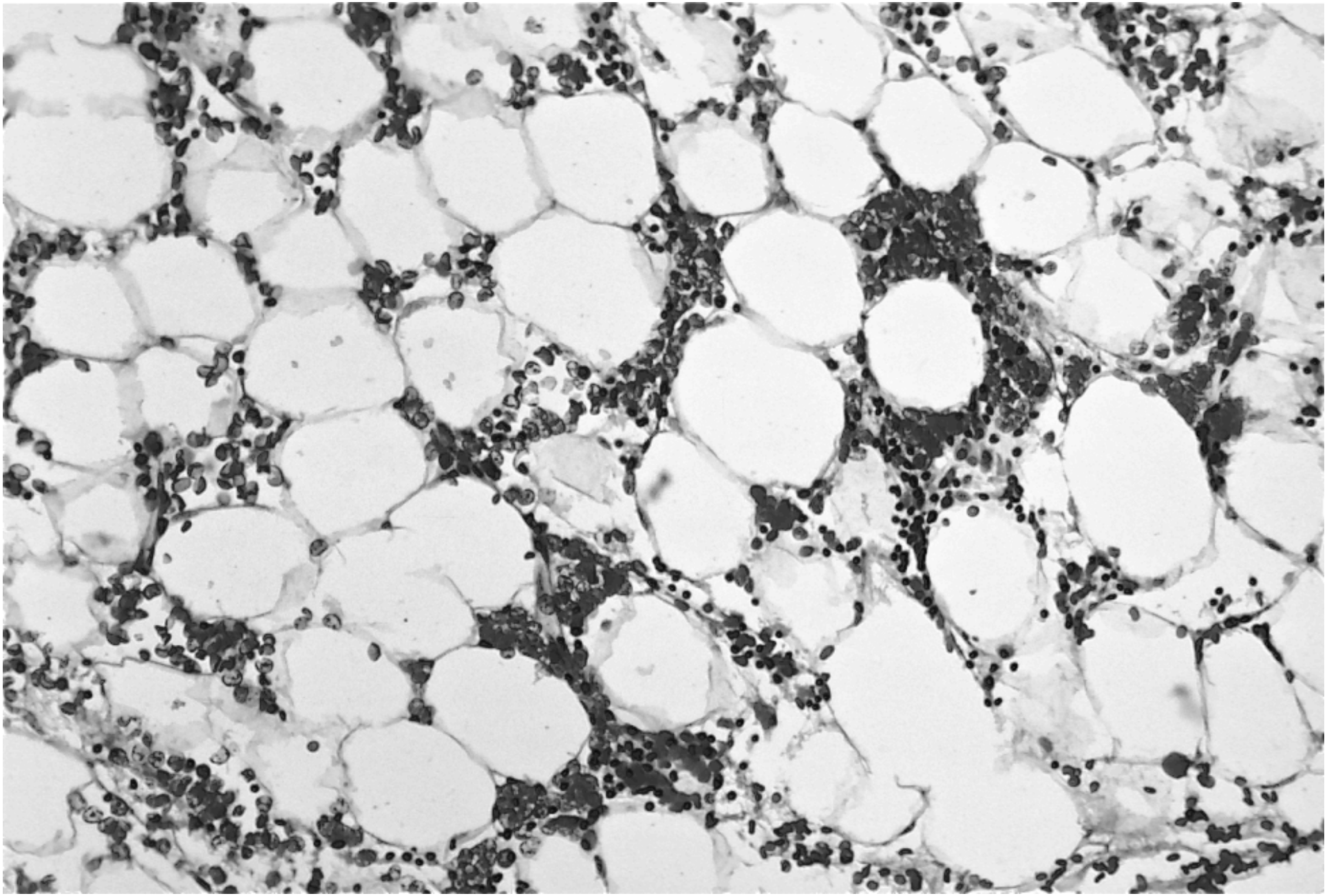
G6PD deficiency: Heinz bodies



Iron-deficiency anemia



Megaloblastic anemia



Empty bone marrow in aplastic anemia

Which of the following red cell indices tells you how much hemoglobin is in an average red cell?

A. RBC

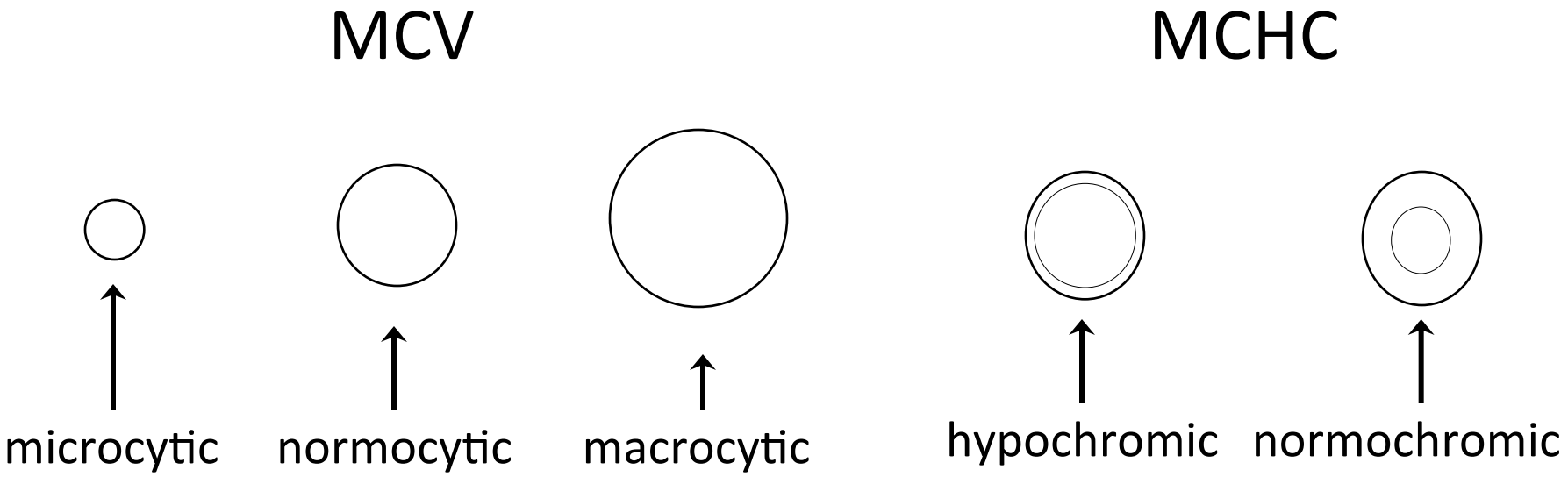
B. Hgb

C. MCHC

D. Hct (hematocrit)

E. MCV

Complete Blood Count (CBC)



What does it mean if a patient's red cells have a lot of poikilocytosis?

A. They vary a lot in size

B. They have Heinz bodies

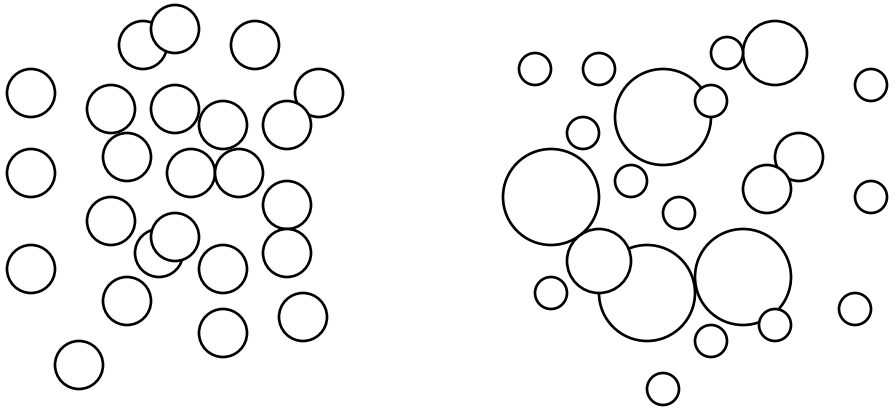
C. They vary a lot in shape

D. They have a lot of hemoglobin

E. They are very immature

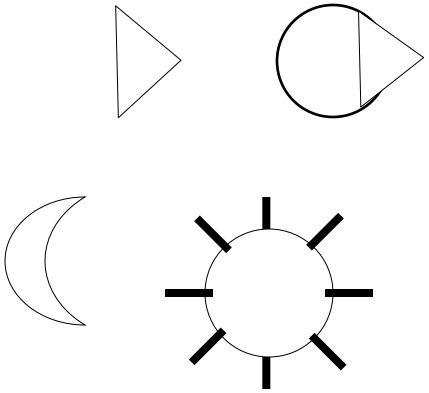
Additional Red Blood Cell Properties

Size variation

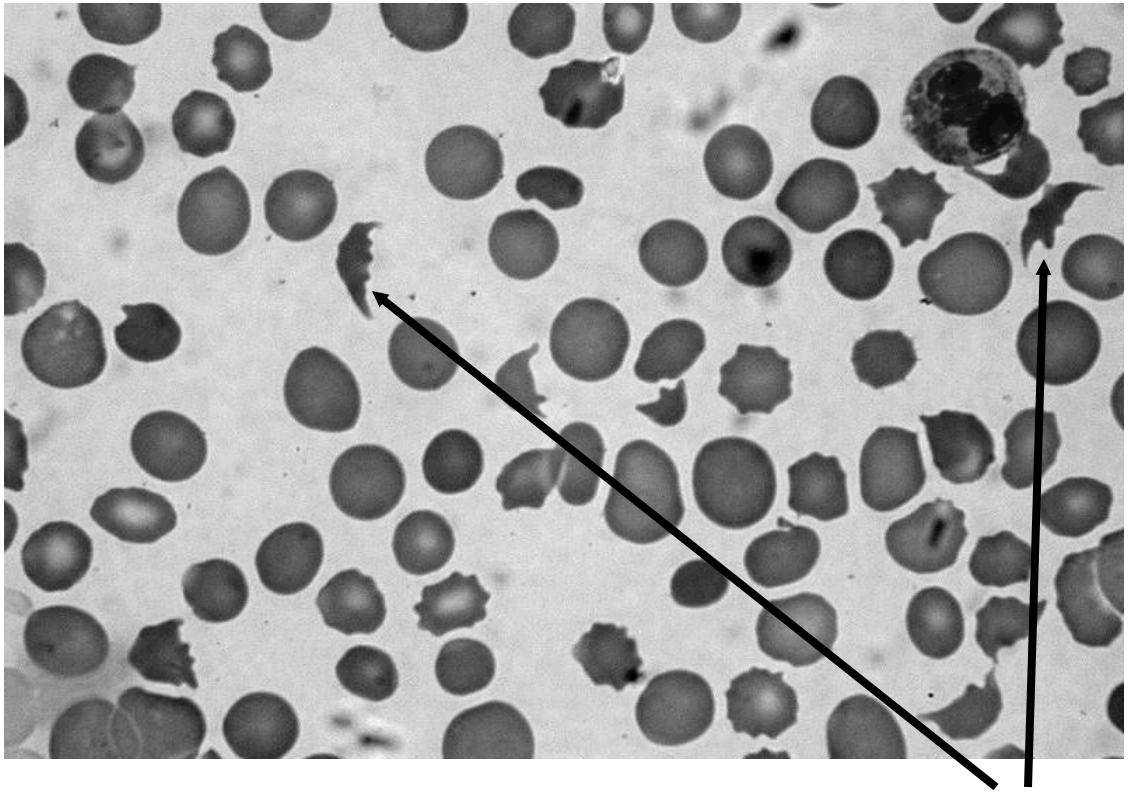


anisocytosis

Shape

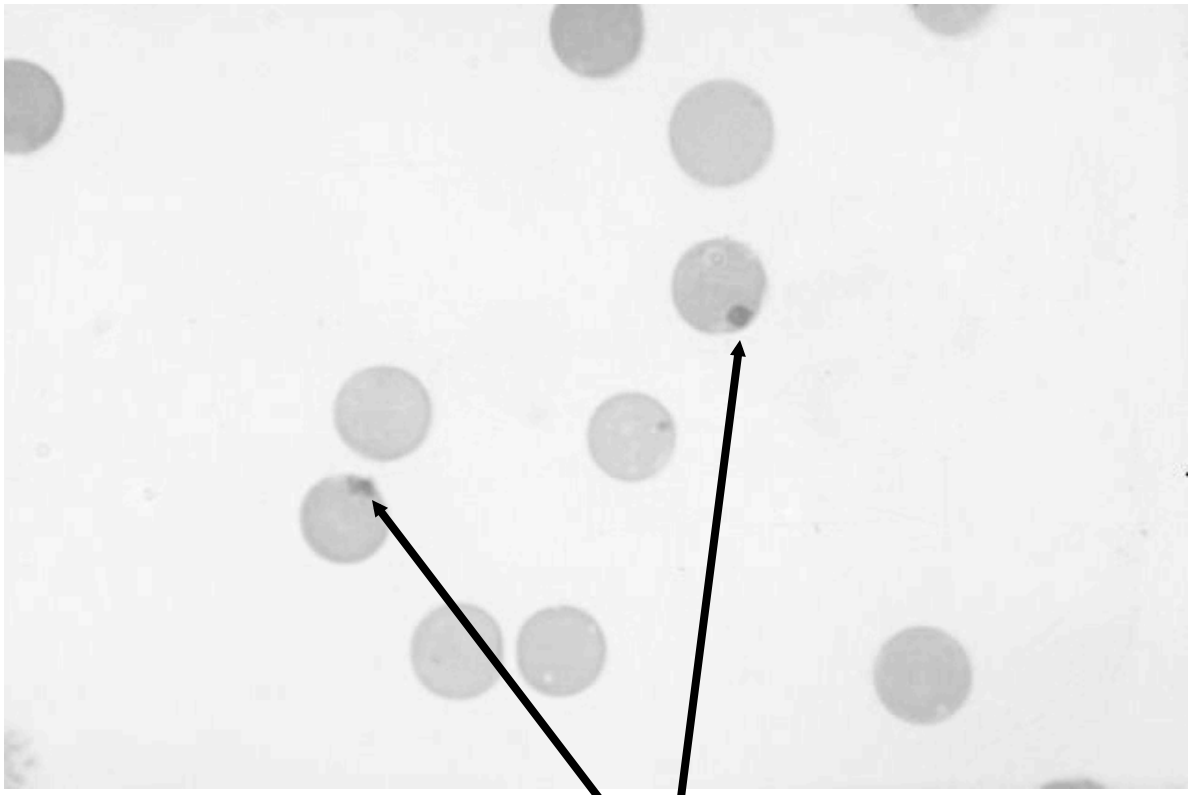


poikilocytosis



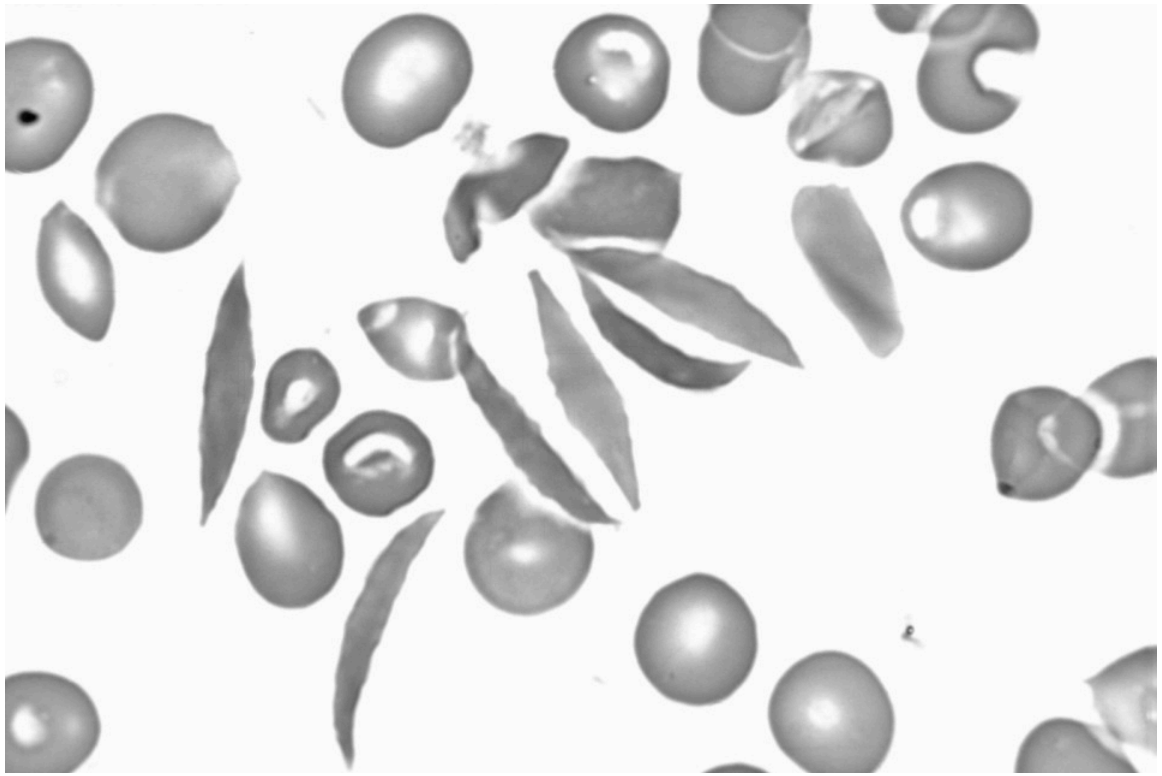
Which anemia is characterized by the presence of these cells, called schistocytes?

A. Microangiopathic hemolytic anemia
B. G6PD deficiency
C. Thalassemia
D. Sickle cell anemia



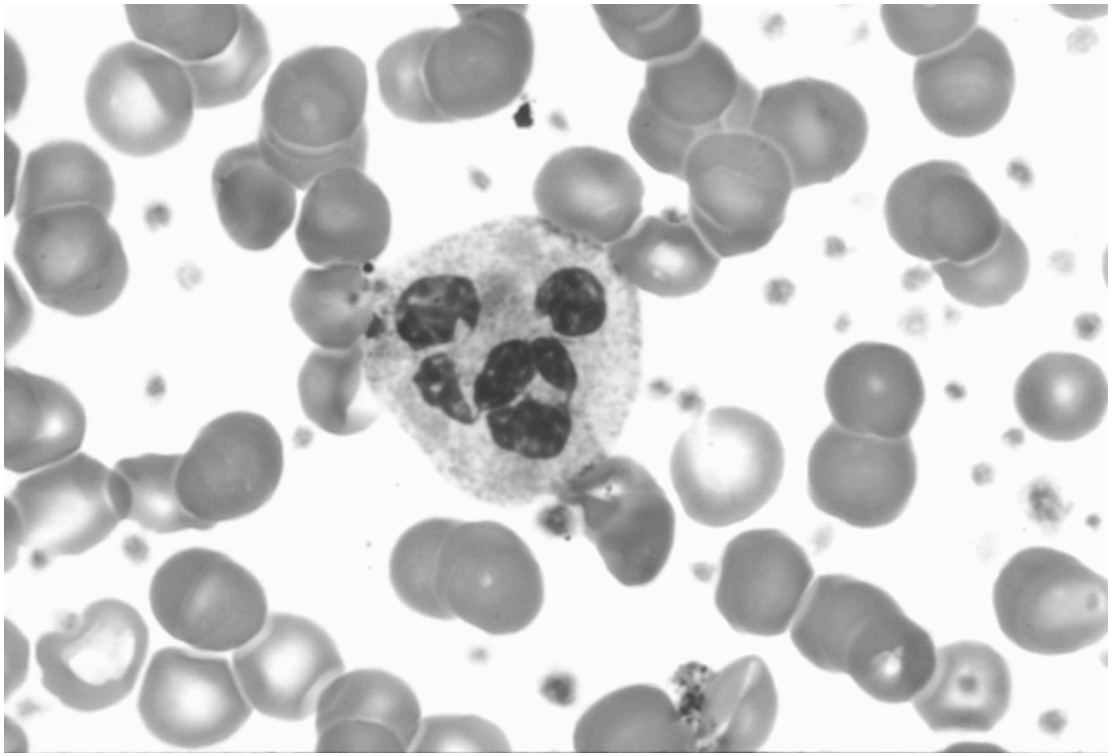
Which anemia is characterized by these inclusions, called Heinz bodies?

A. Microangiopathic hemolytic anemia
B. G6PD deficiency
C. Thalassemia
D. Sickle cell anemia



What is the defect in this disorder?

A. A point mutation in a beta chain gene
B. A translocation between chromosomes 9 and 22
C. Absence of one or more beta chain genes
D. A membrane defect that renders the cells fragile and non pliable



What is the diagnosis?

A. Iron-deficiency anemia
B. Megaloblastic anemia
C. Hereditary spherocytosis
D. Warm autoimmune hemolytic anemia
E. G6PD deficiency

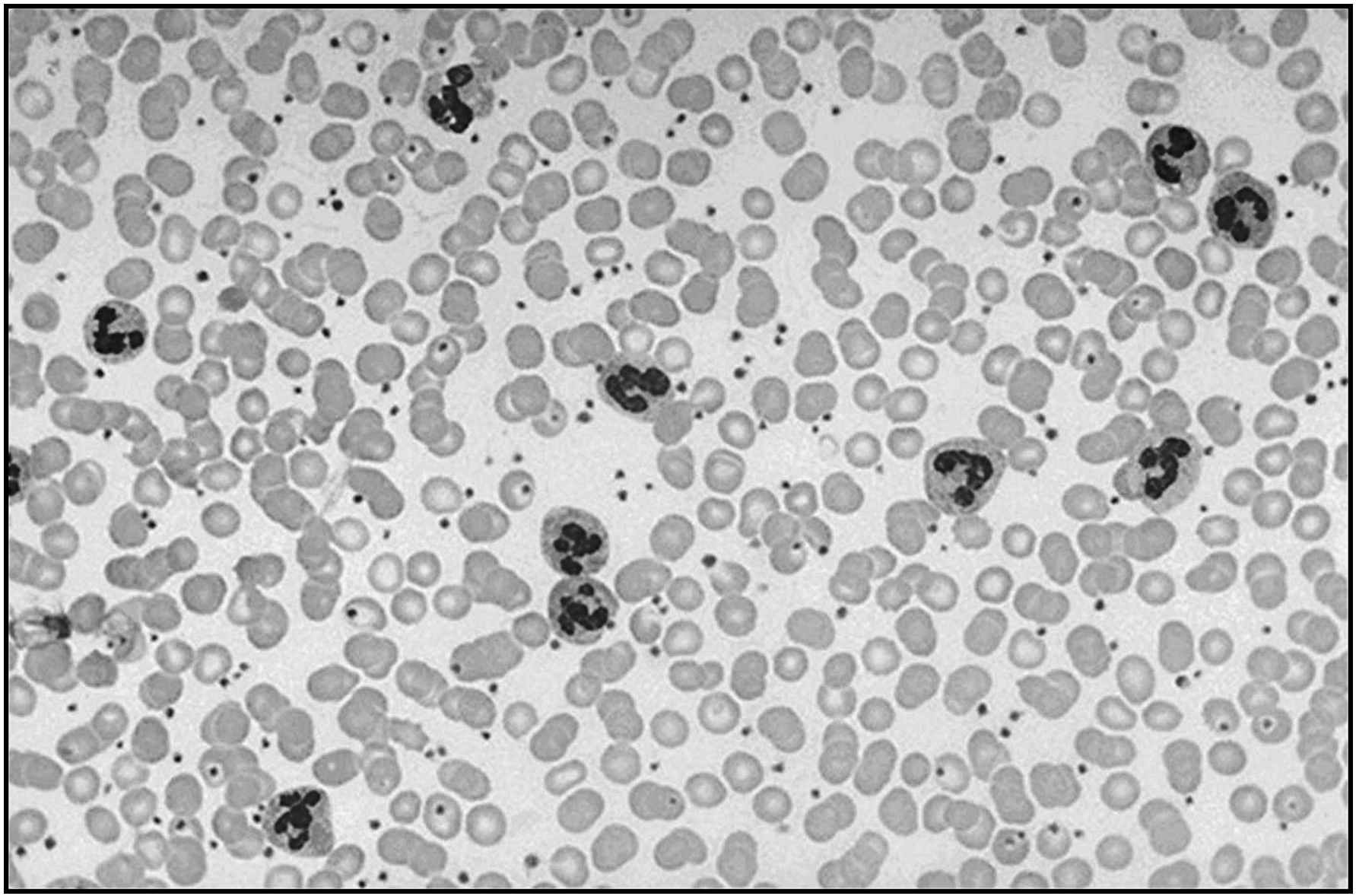
Your healthy, 15-year-old brother was found to have an abnormality on his blood smear during a routine sports physical for school. His indices are as follows:

Hgb 10 g/dL (12-16)
MCV 75 fL(80-100)

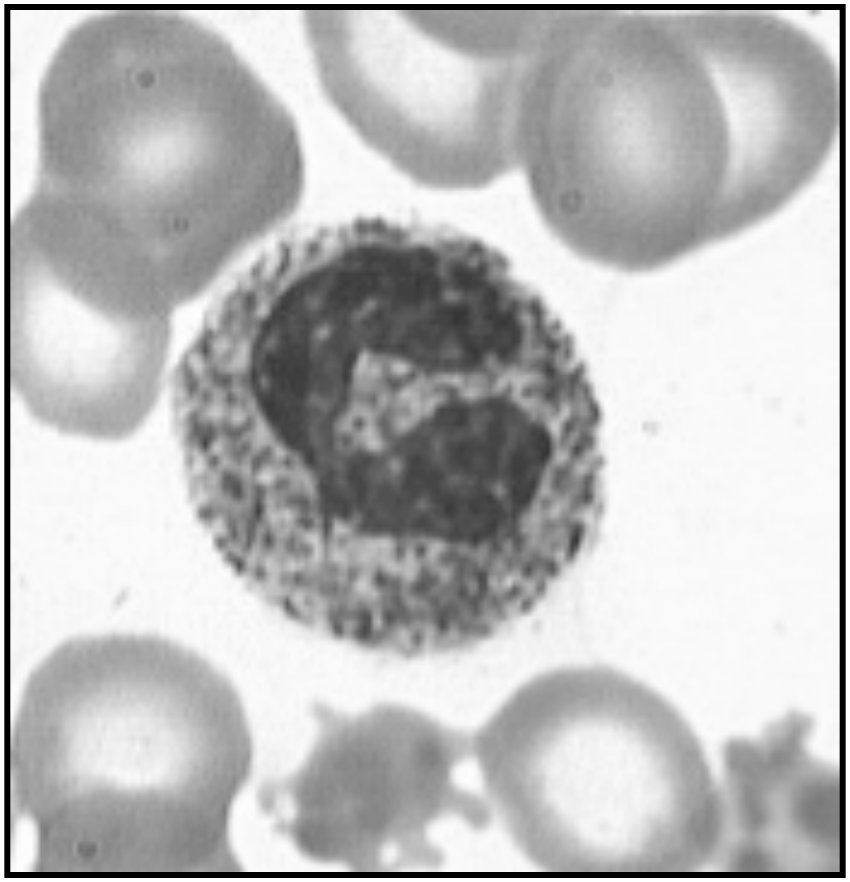
RBC 7.0 x 10^{12}/L (4.5-6.0)
WBC 10 x 10^{9}/L (4-11)
Plt 300 x 10^{9}/L (150-450)

The most likely diagnosis is:

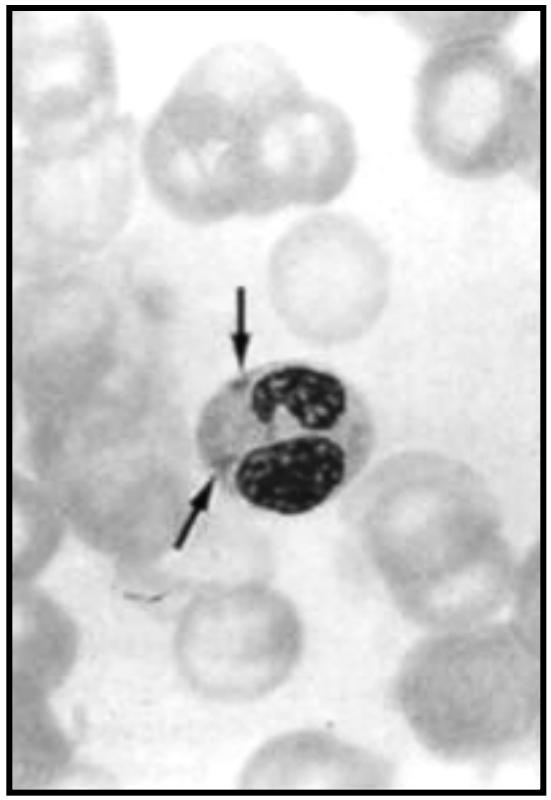
A. Iron-deficiency anemia
B. Thalassemia
C. Megaloblastic anemia
D. Aplastic anemia
E. Acute myeloid leukemia



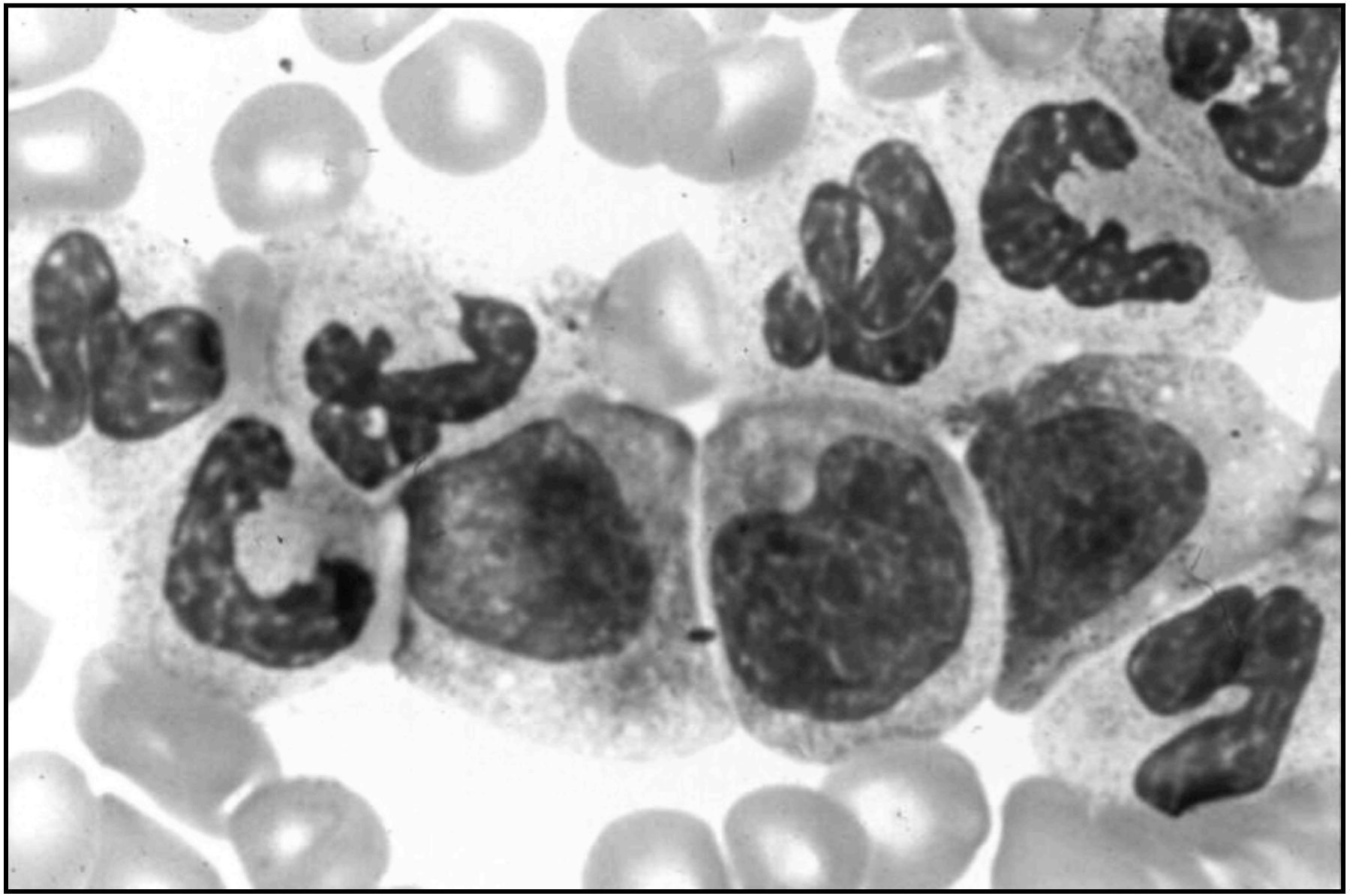
What's this called?



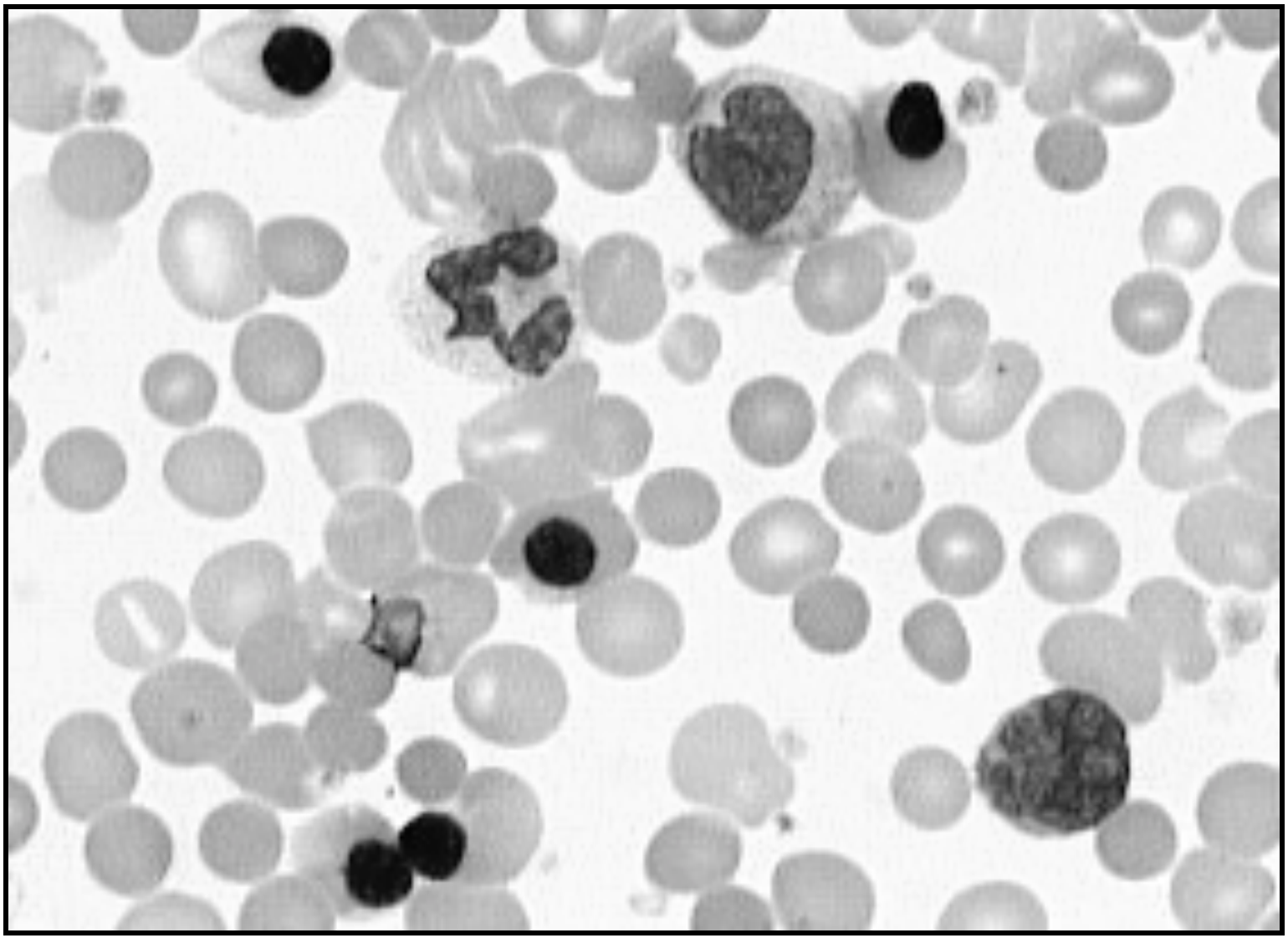
What's wrong with this cell?
What's wrong with the patient?



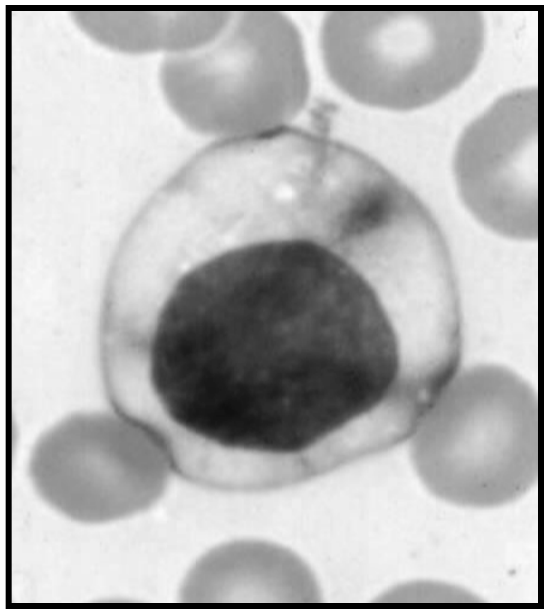
What do these things signify?



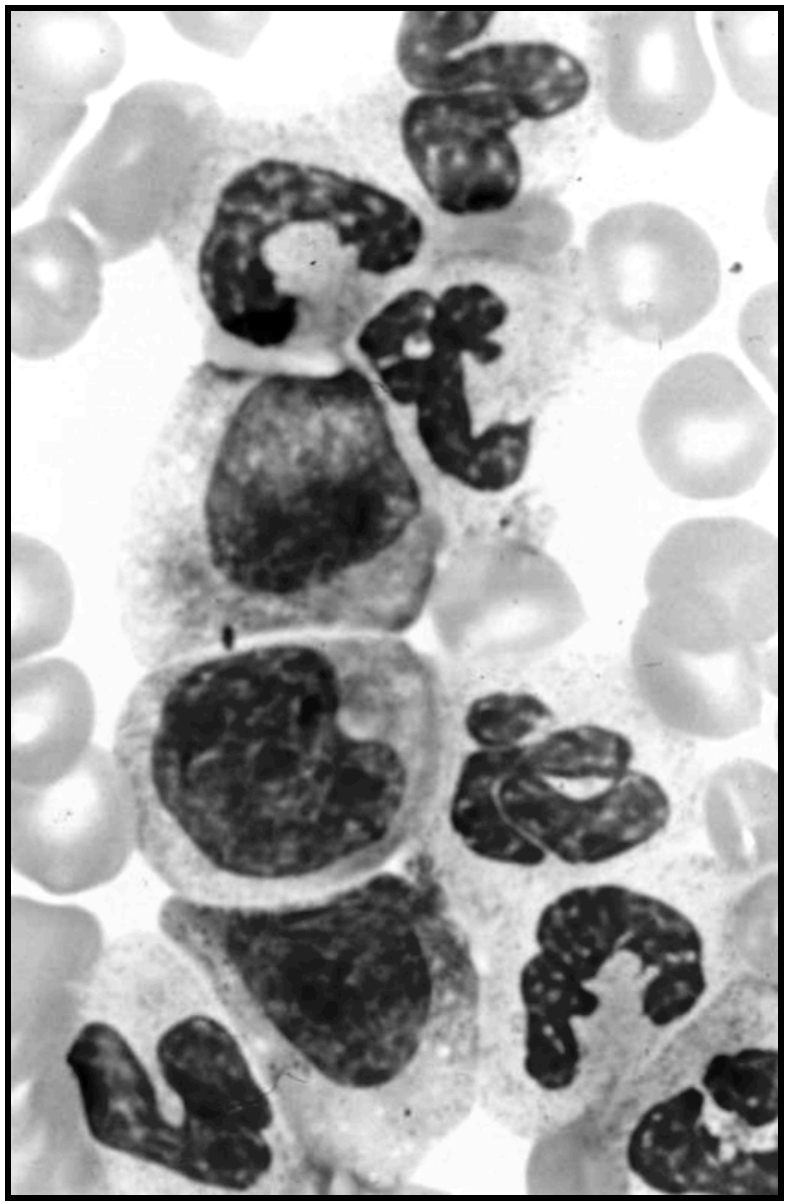
What’s this called?

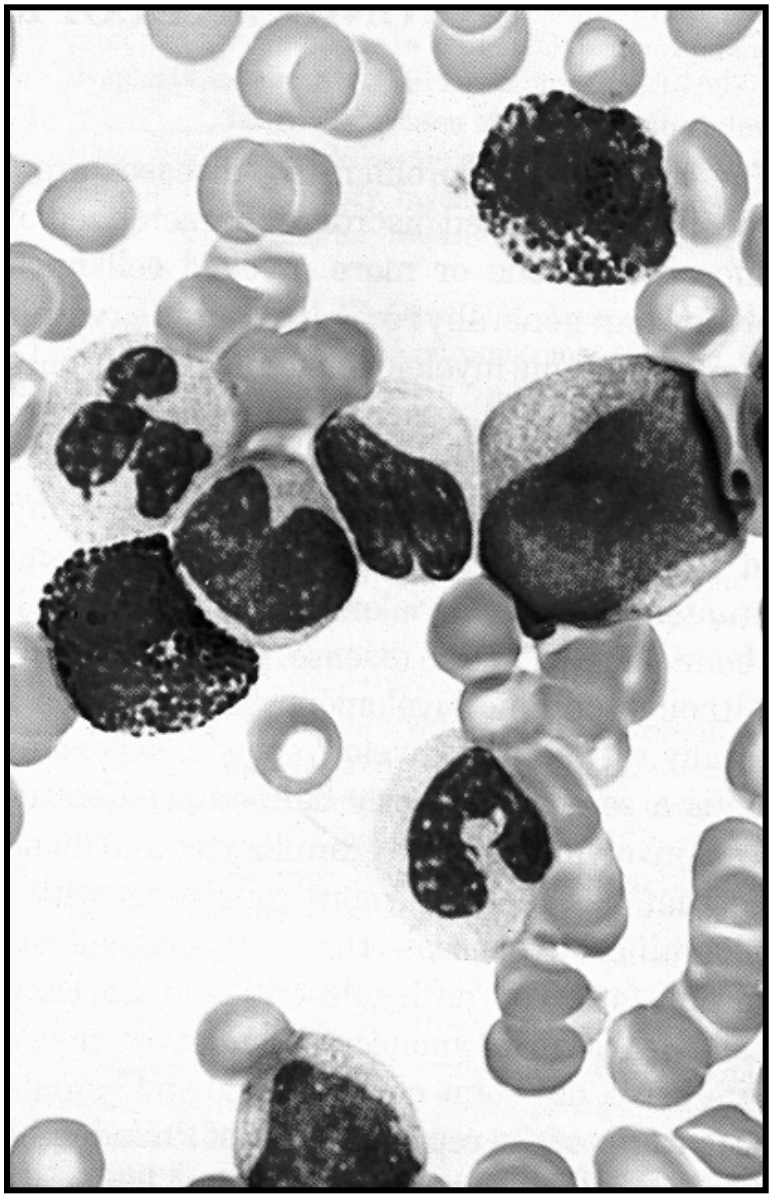


What is this called?

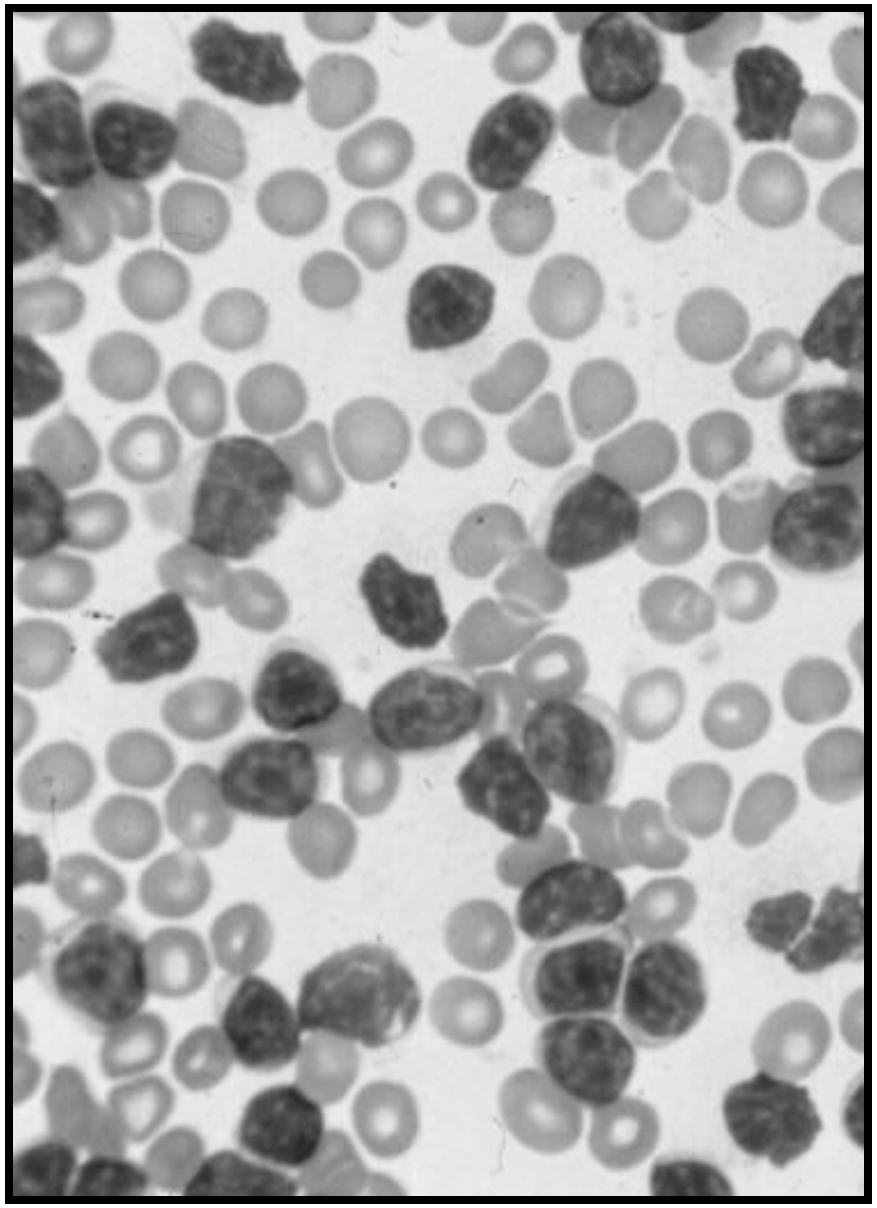


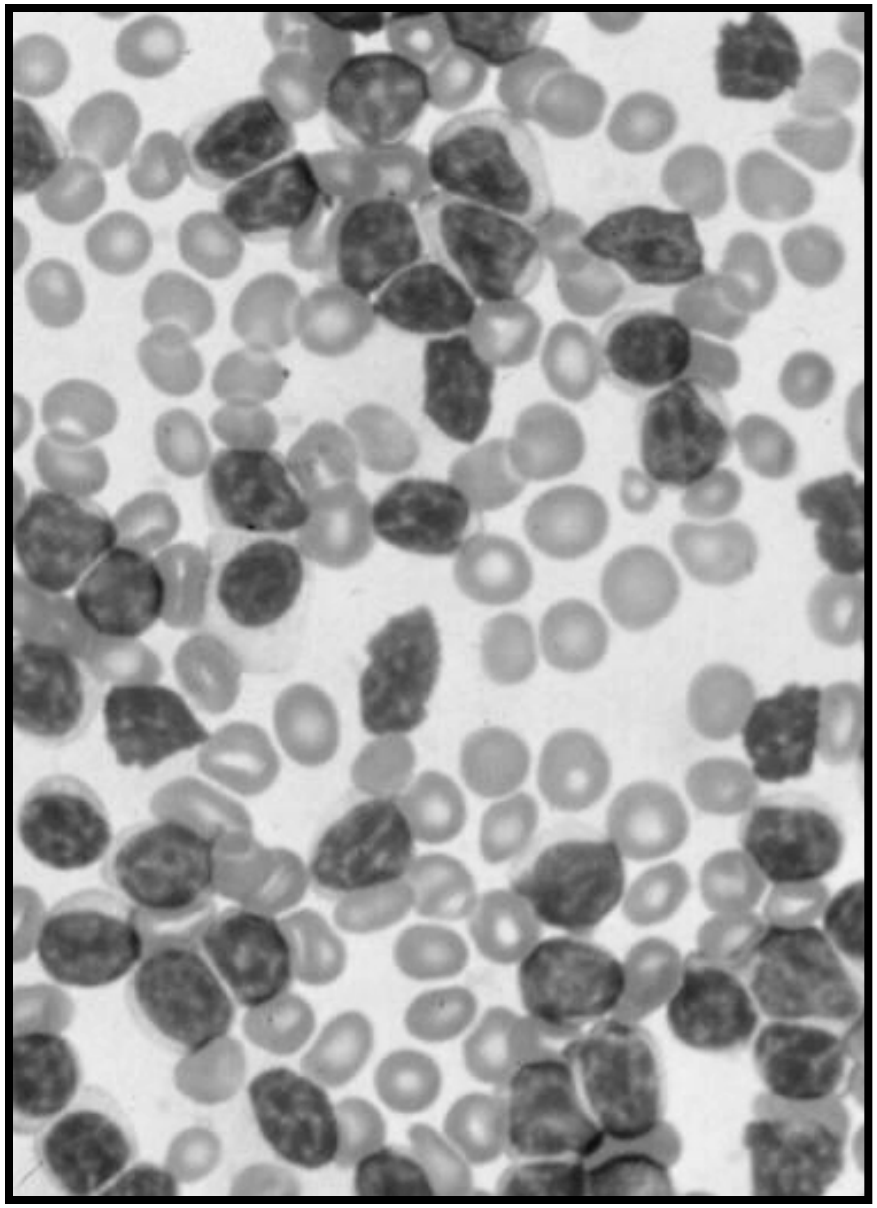
What kind of cell is this?
What is most likely wrong with this patient?





How would you tell which one is benign?





How could you tell which one was malignant?

Hematologic Malignancies

Leukemias

- Acute leukemias
- Chronic leukemias

Lymphomas

- Hodgkin lymphoma
- Non-Hodgkin lymphoma

Plasma cell disorders

- Multiple myeloma

Hematologic Malignancies

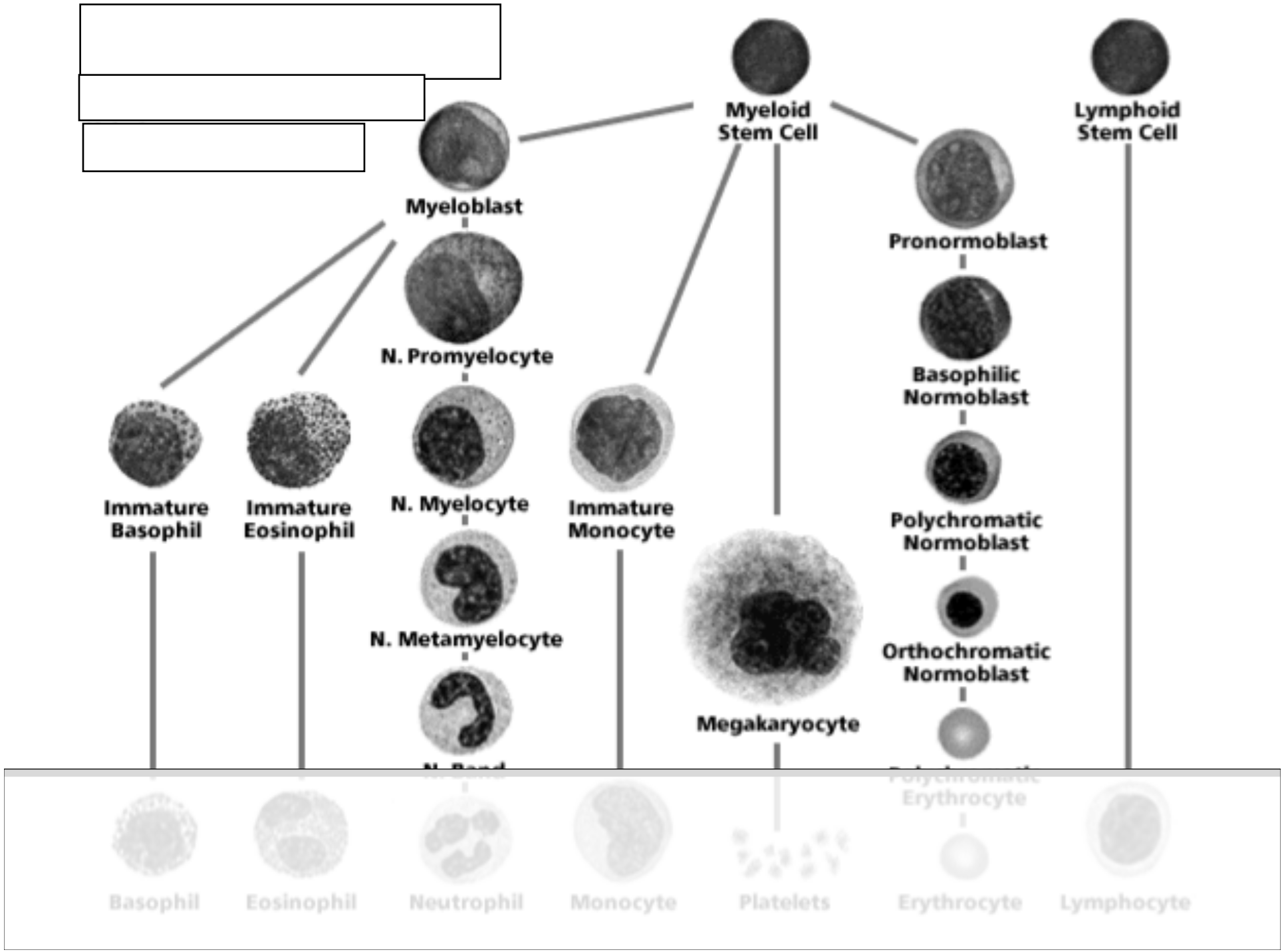
Leukemias

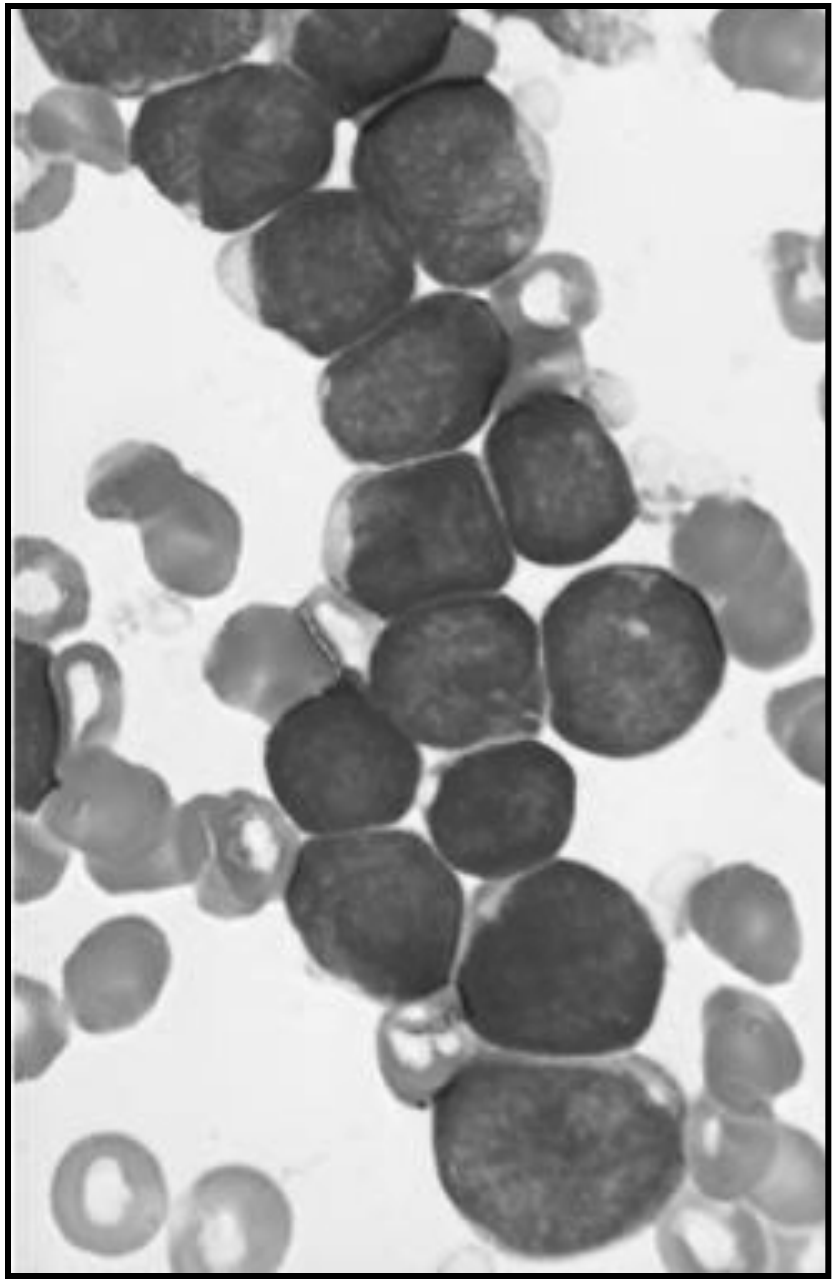
- Acute leukemias
- Chronic leukemias

Hematologic Malignancies

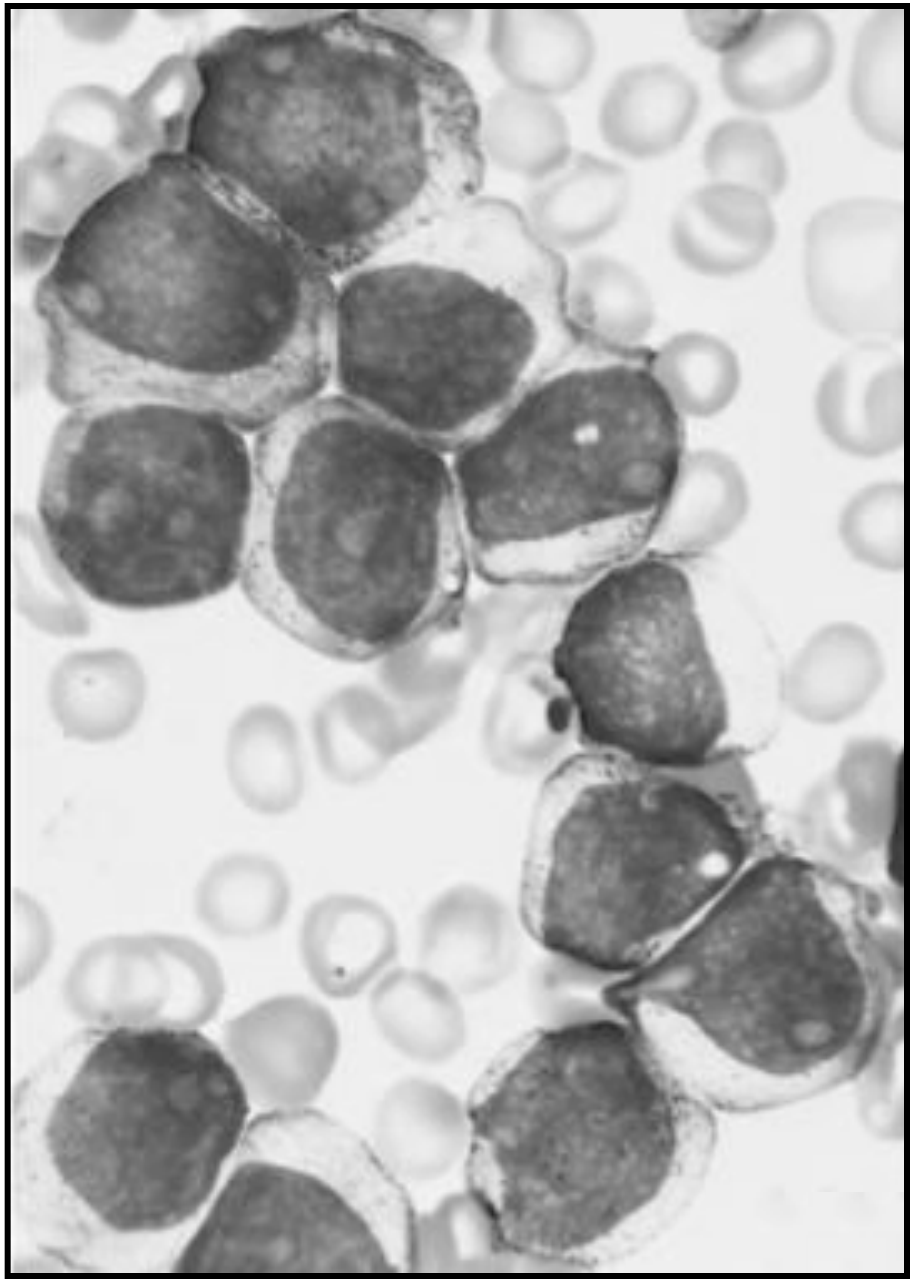
Leukemias

- Acute leukemias

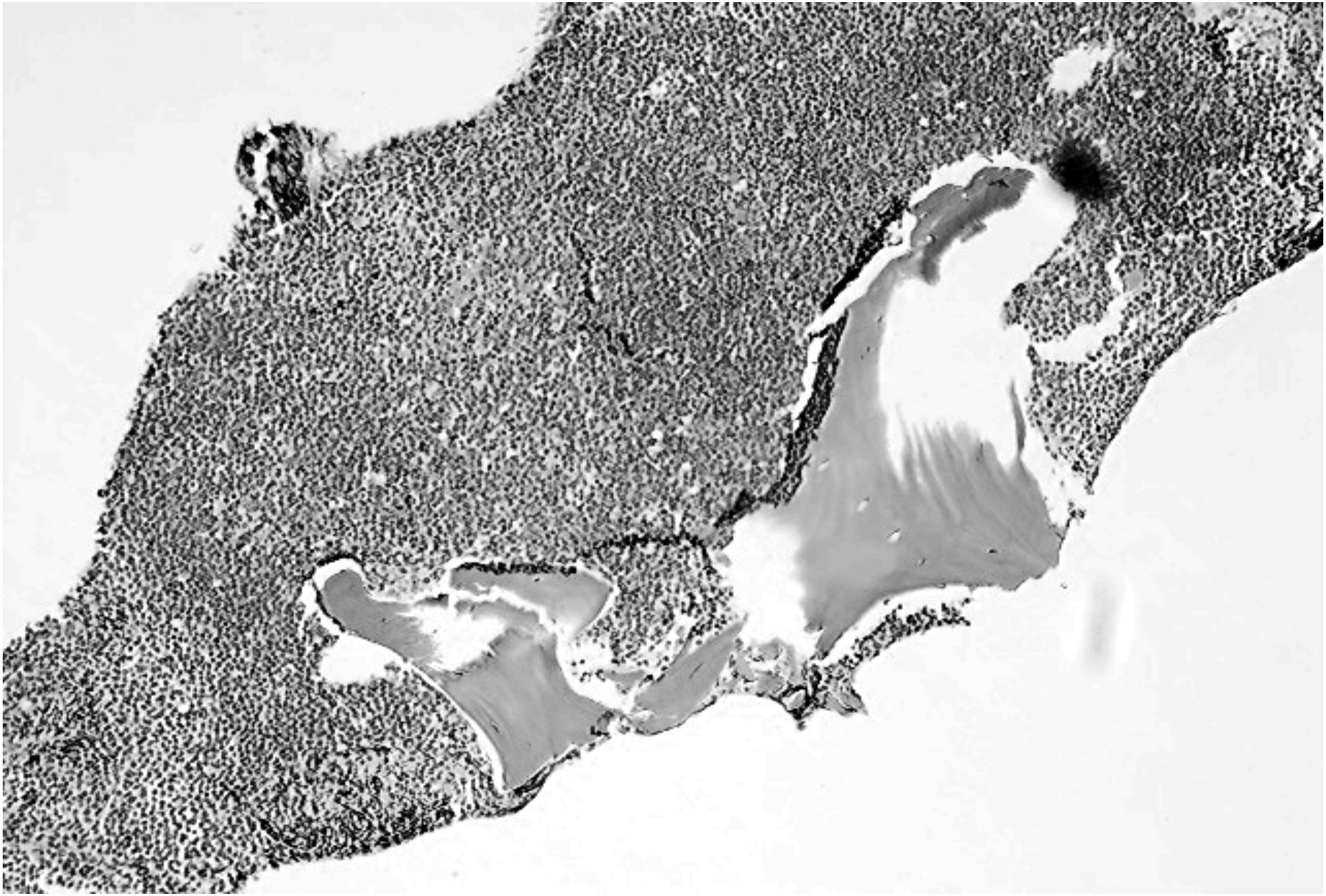

Myeloid Stem Cell
Lymphoid Stem Cell
Myeloblast
Pronormoblast
N. Promyelocyte
Basophilic Normoblast
Immature Basophil
Immature Eosinophil
N. Myelocyte
Immature Monocyte
Polychromatic Normoblast
N. Metamyelocyte
Megakaryocyte
Orthochromatic Normoblast
Polychromatic Erythrocyte
Basophil
Eosinophil
Neutrophil
Monocyte
Platelets
Erythrocyte
Lymphocyte



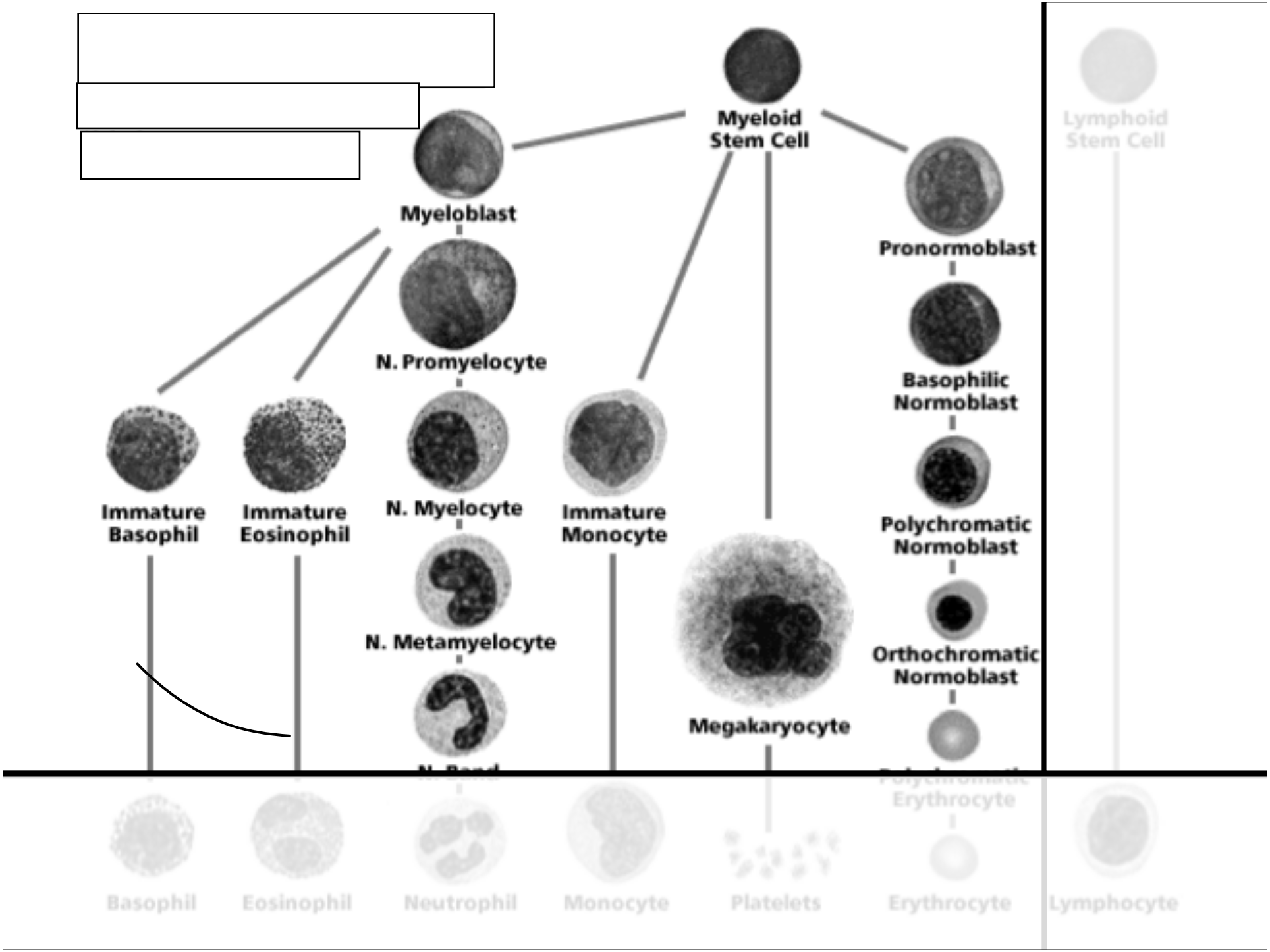
Acute lymphoblastic leukemia



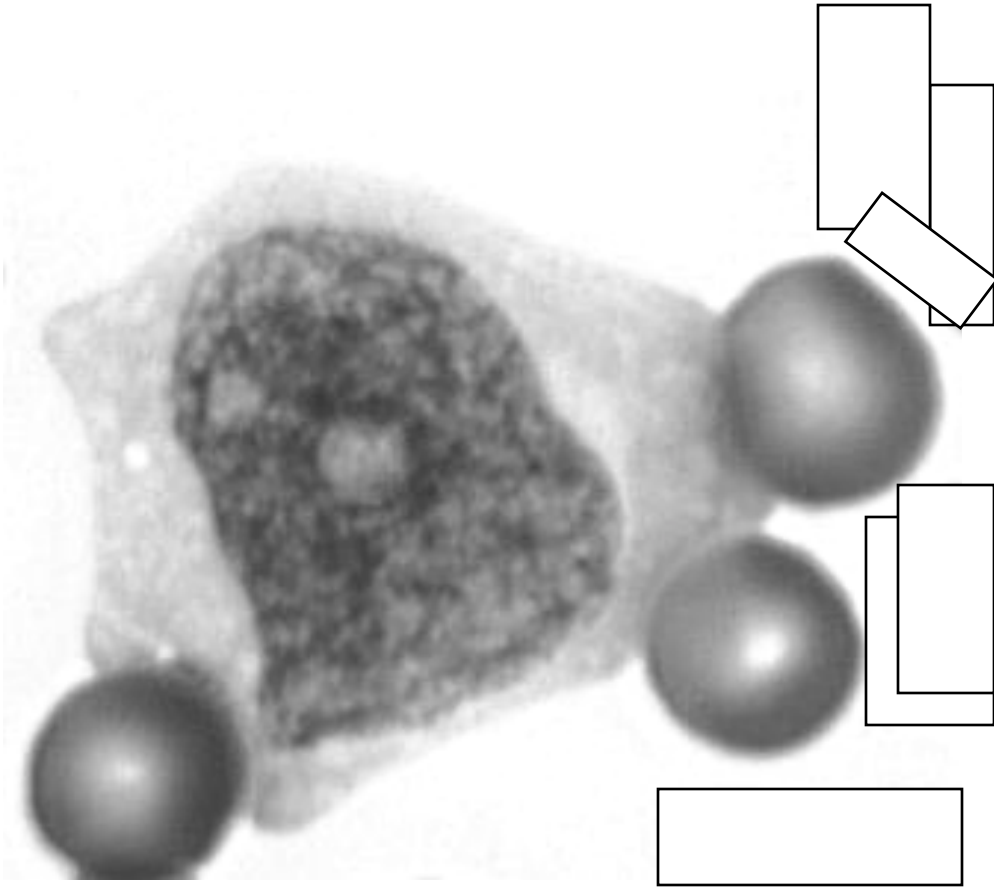
Acute myeloid leukemia

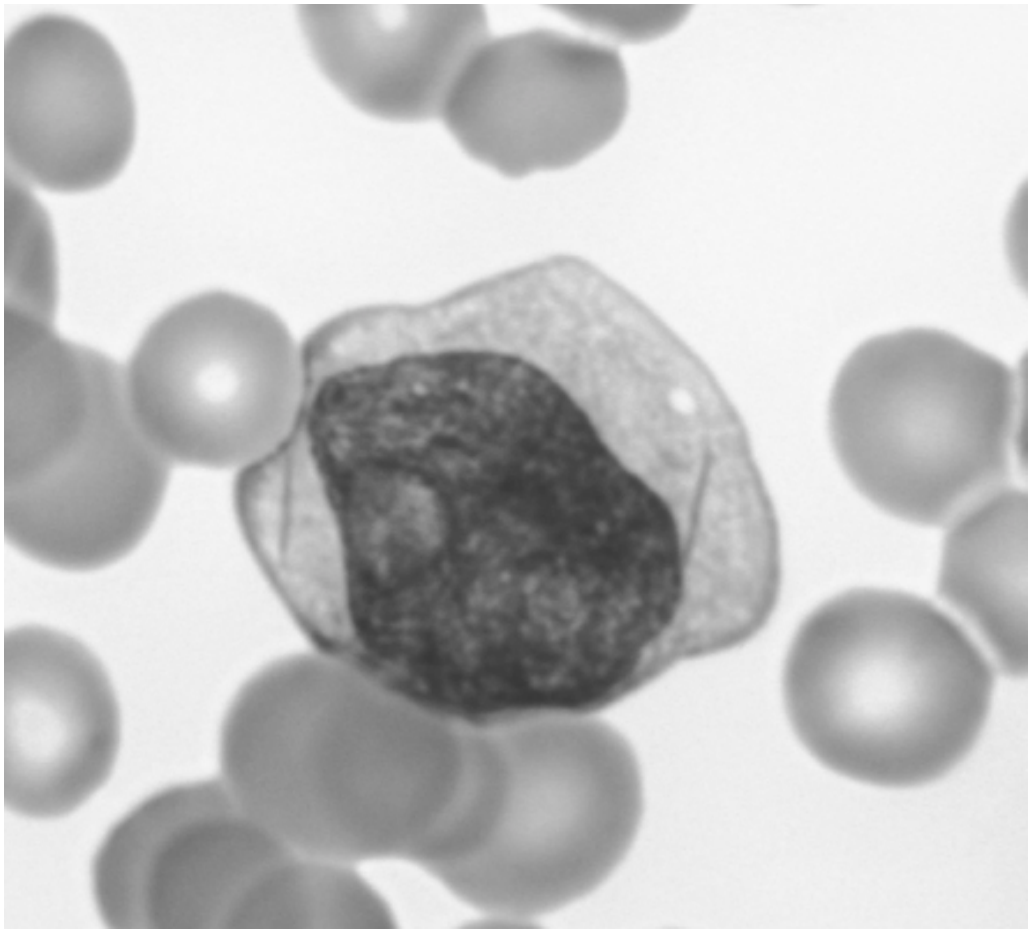


Acute leukemia: bone marrow biopsy

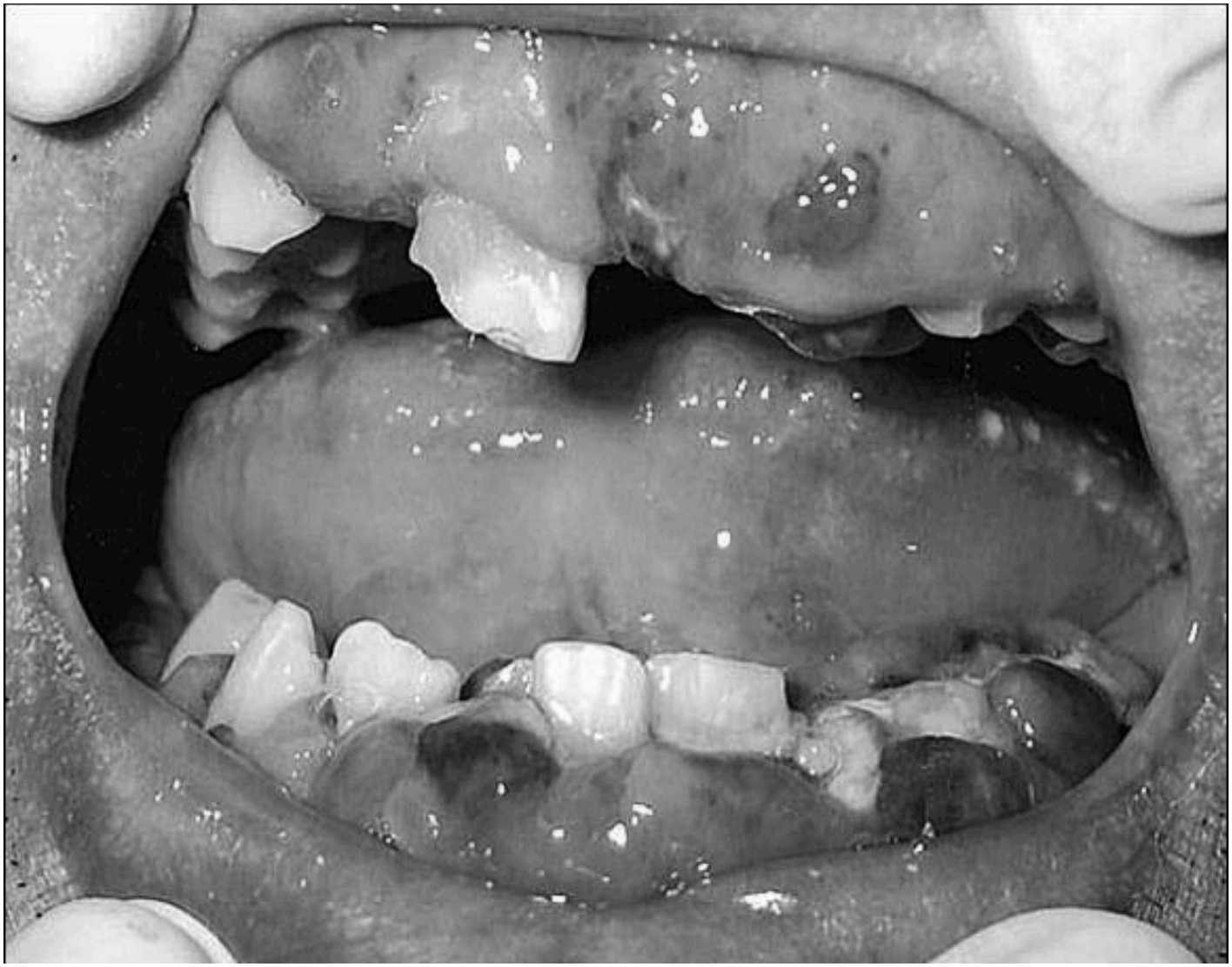

Myeloid Stem Cell
Lymphoid Stem Cell
Myeloblast
Pronormoblast
N. Promyelocyte
Basophilic Normoblast
Immature Basophil
Immature Eosinophil
N. Myelocyte
Immature Monocyte
Polychromatic Normoblast
N. Metamyelocyte
Megakaryocyte
Orthochromatic Normoblast
Polychromatic Erythrocyte
Basophil
Eosinophil
Neutrophil
Monocyte
Platelets
Erythrocyte
Lymphocyte

What is this cell?





What is this cell?

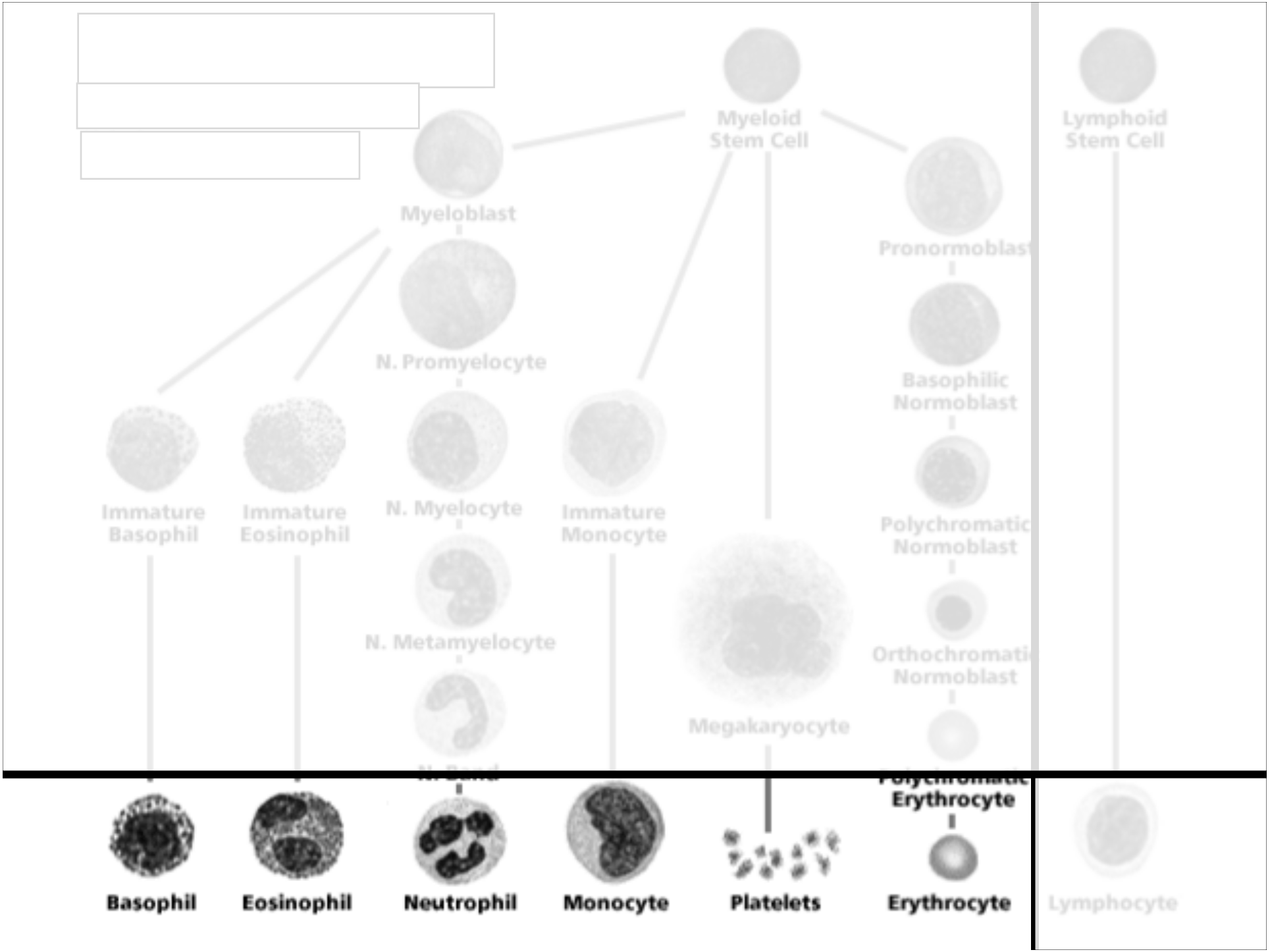


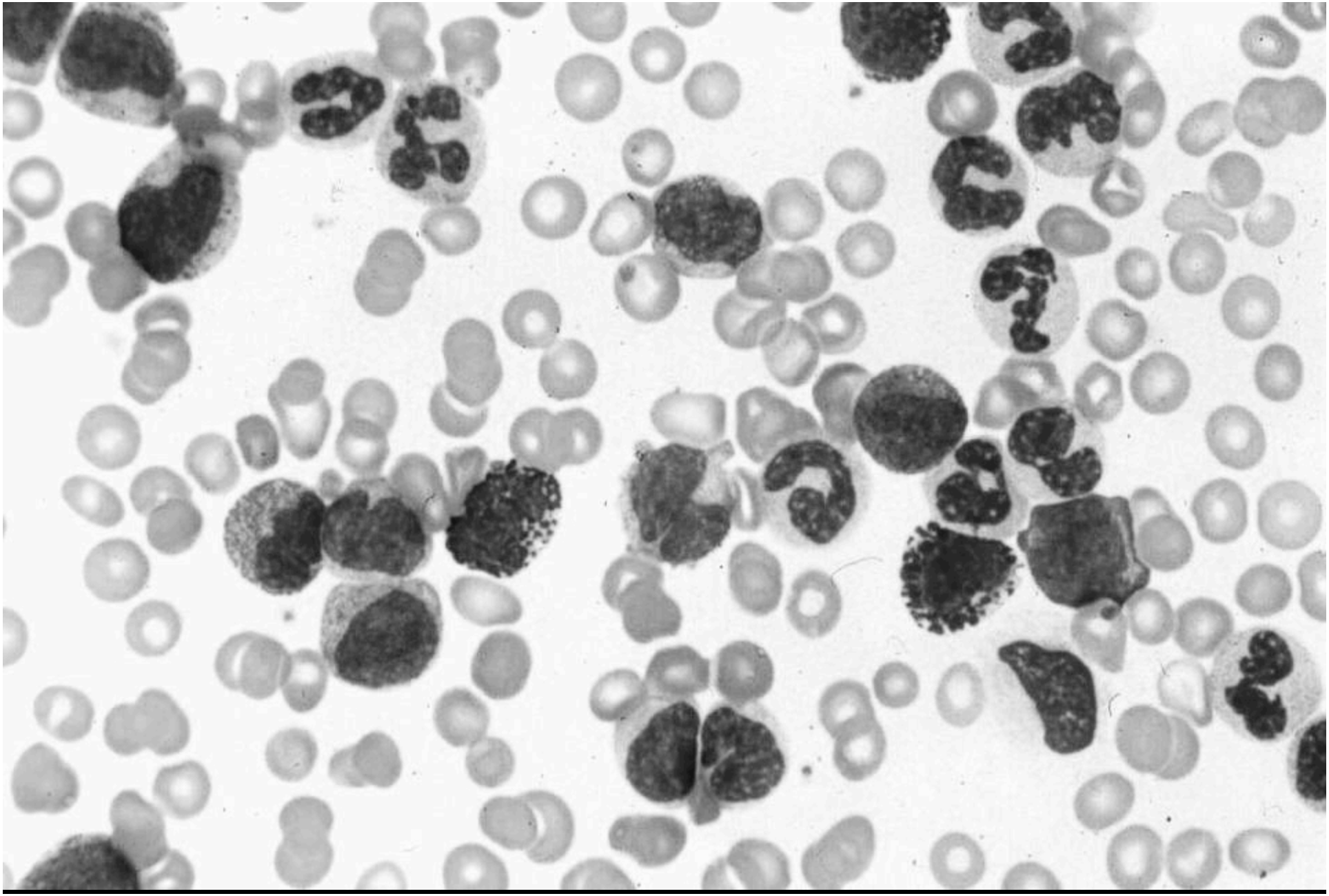
If this patient has an acute leukemia, what kind is it, most likely?

Hematologic Malignancies

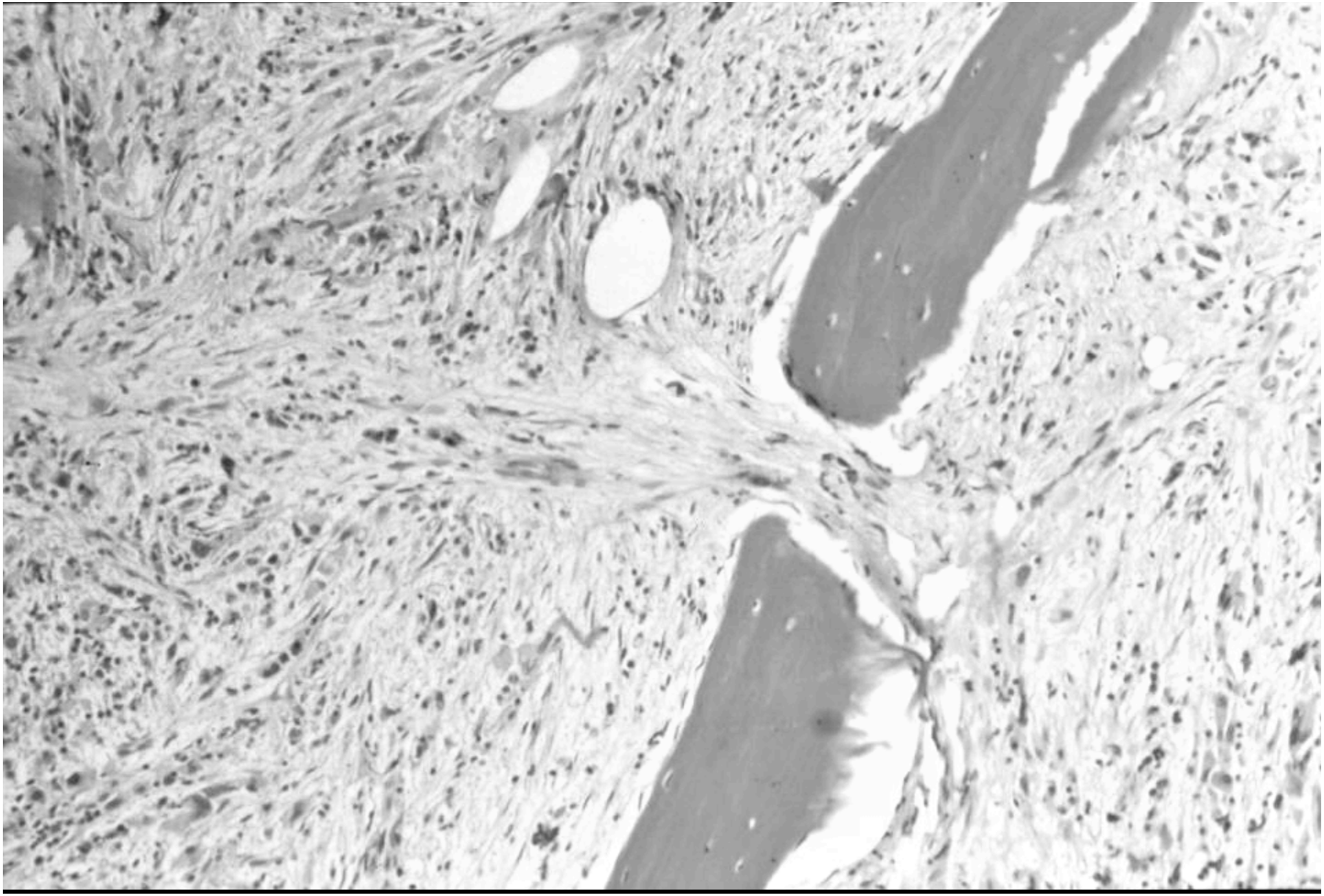
Leukemias

- Acute leukemias
- Chronic leukemias

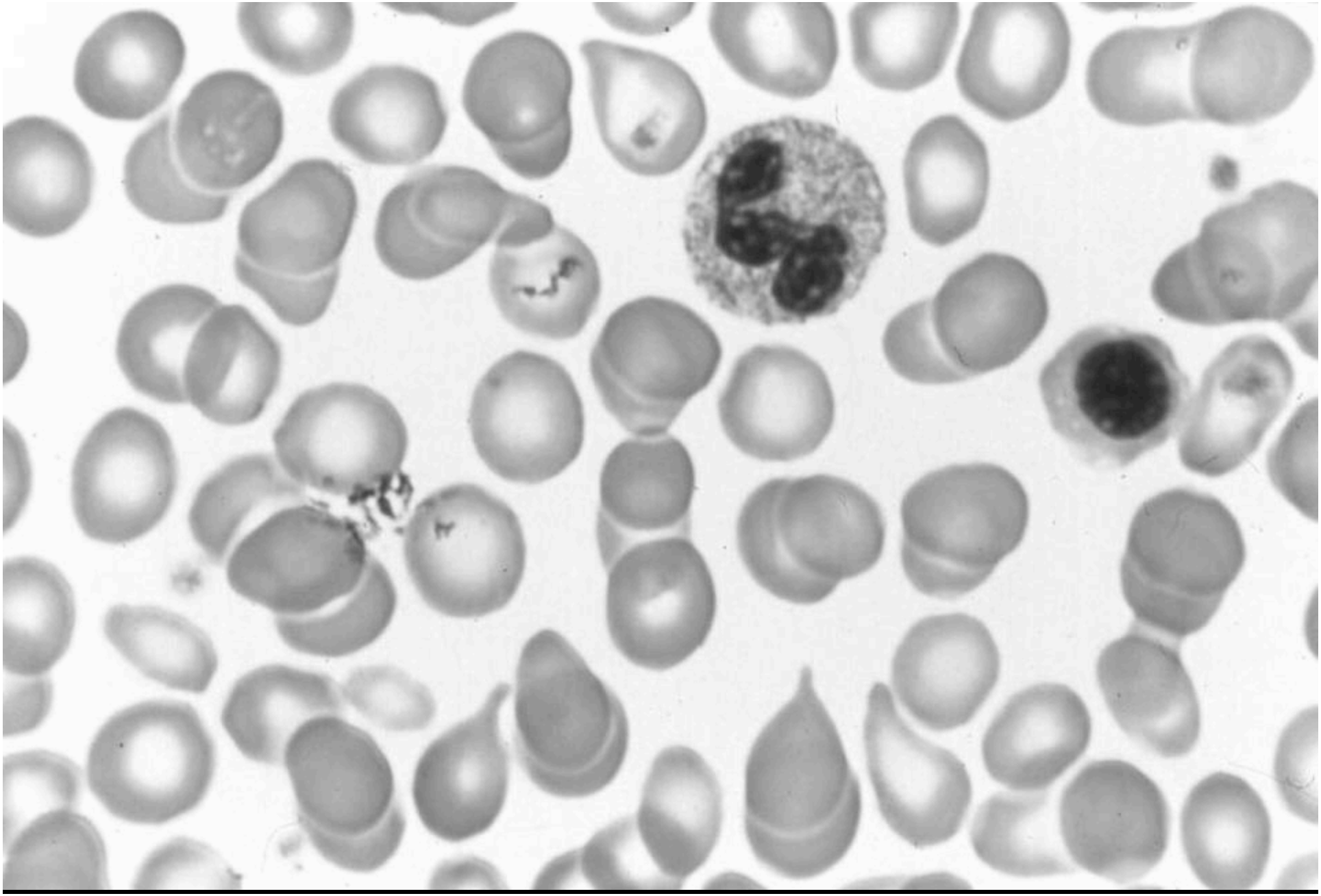

Myeloid Stem Cell
Lymphoid Stem Cell
Myeloblast
Pronormoblast
N. Promyelocyte
Basophilic Normoblast
Immature Basophil
Immature Eosinophil
N. Myelocyte
Immature Monocyte
Polychromatic Normoblast
N. Metamyelocyte
Orthochromatic Normoblast
Megakaryocyte
Polychromatic Erythrocyte
Basophil
Eosinophil
Neutrophil
Monocyte
Platelets
Erythrocyte
Lymphocyte



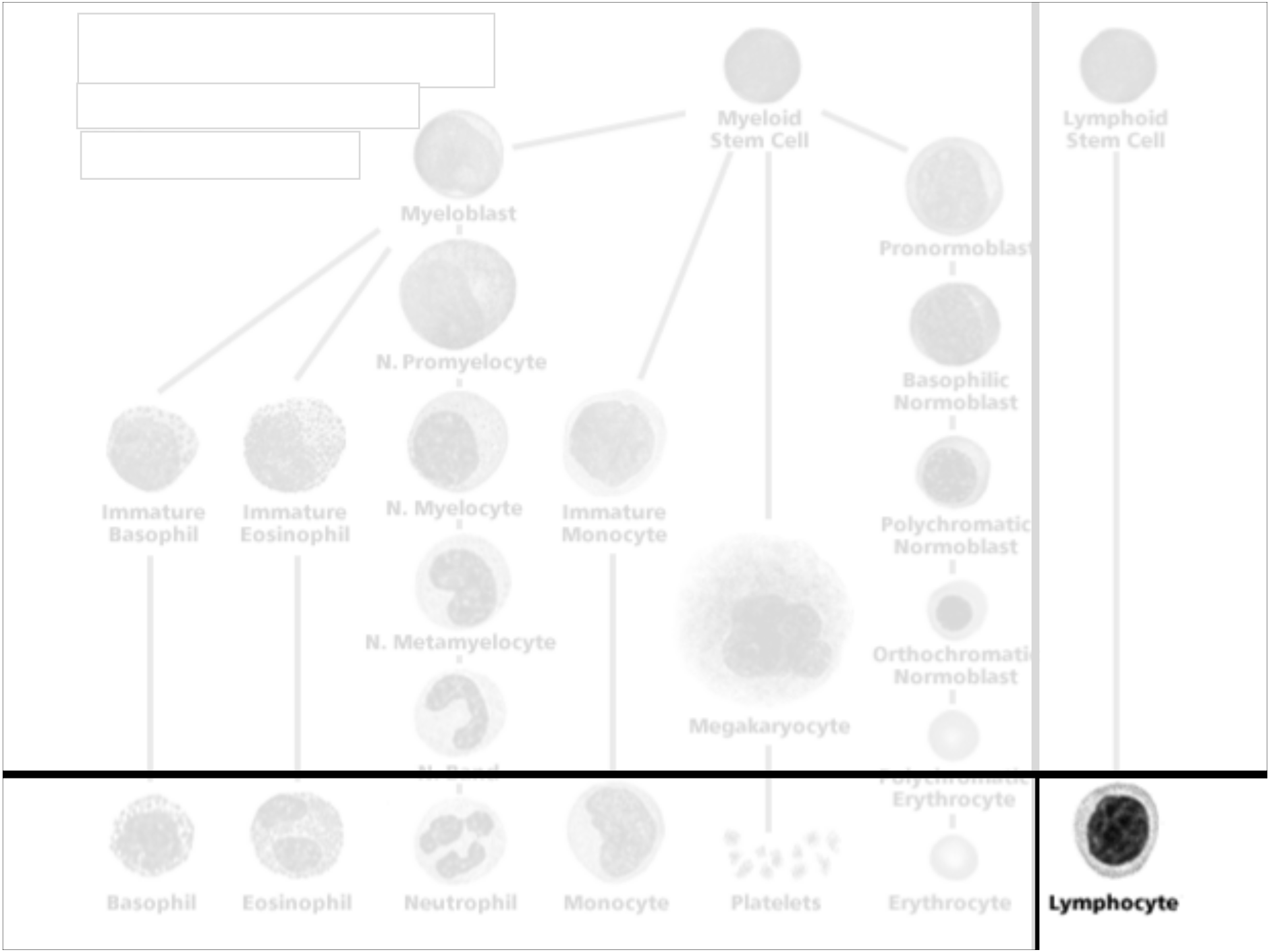
What's the translocation in this leukemia?

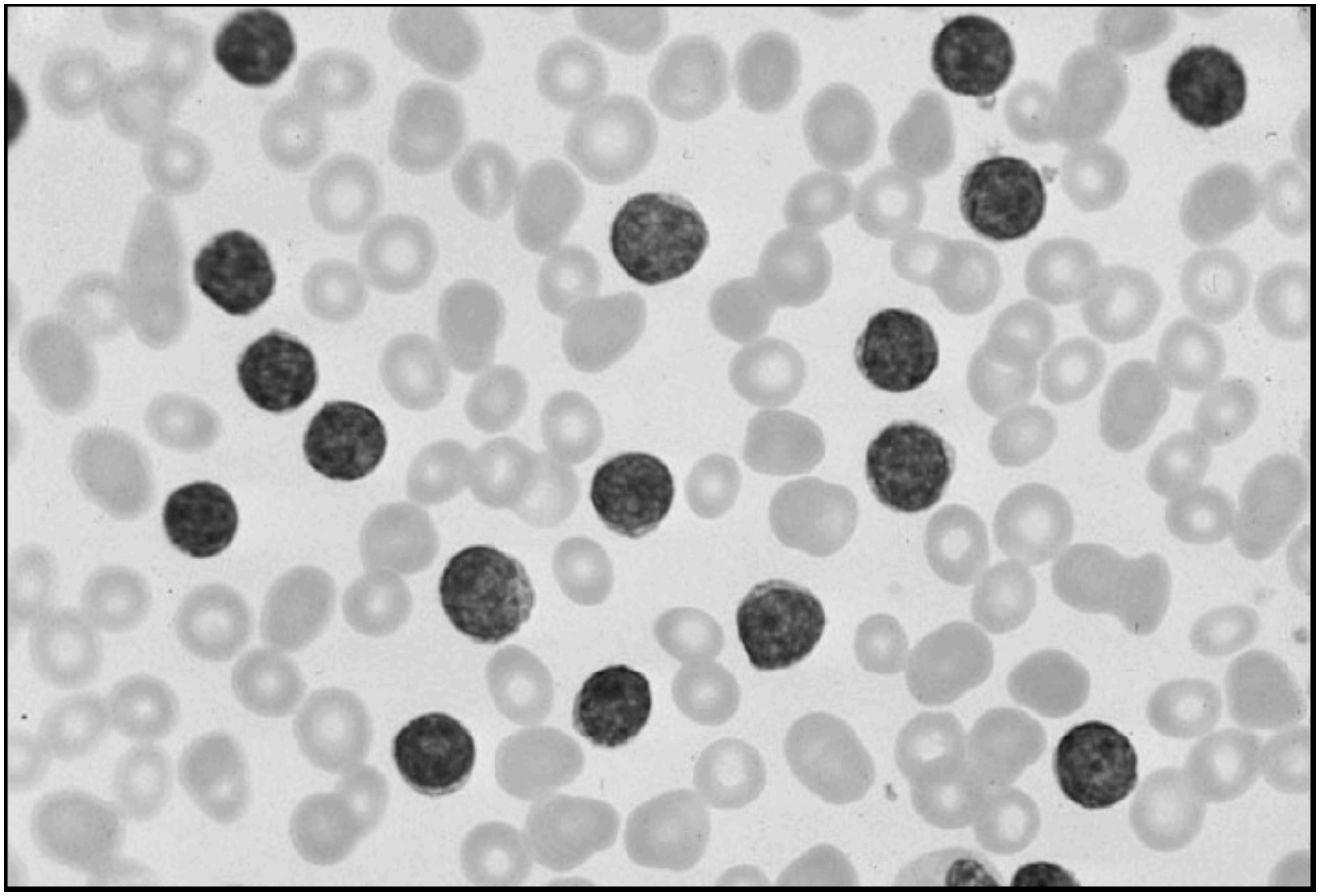


What’s this disorder?



What disorder is likely in this patient?


Myeloid Stem Cell
Lymphoid Stem Cell
Myeloblast
Pronormoblast
N. Promyelocyte
Basophilic Normoblast
Immature Basophil
Immature Eosinophil
N. Myelocyte
Immature Monocyte
Polychromatic Normoblast
N. Metamyelocyte
Megakaryocyte
Orthochromatic Normoblast
Erythrocyte
Basophil
Eosinophil
Neutrophil
Monocyte
Platelets
Erythrocyte
Lymphocyte



This 65 year old male is asymptomatic. On a routine CBC he was found to have a WBC of 60,000. His blood smear is shown here. The cells are CD19 positive and CD5 postive. What's the diagnosis?

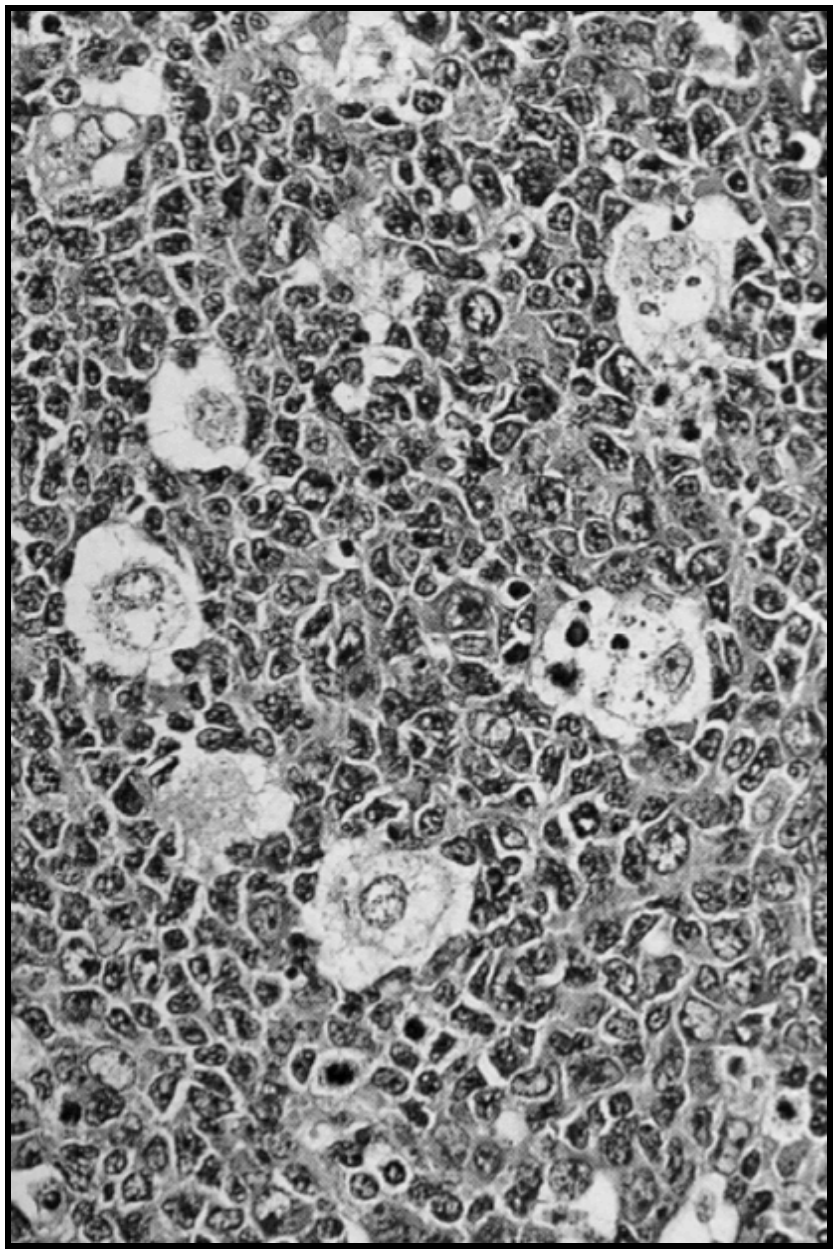
Hematologic Malignancies

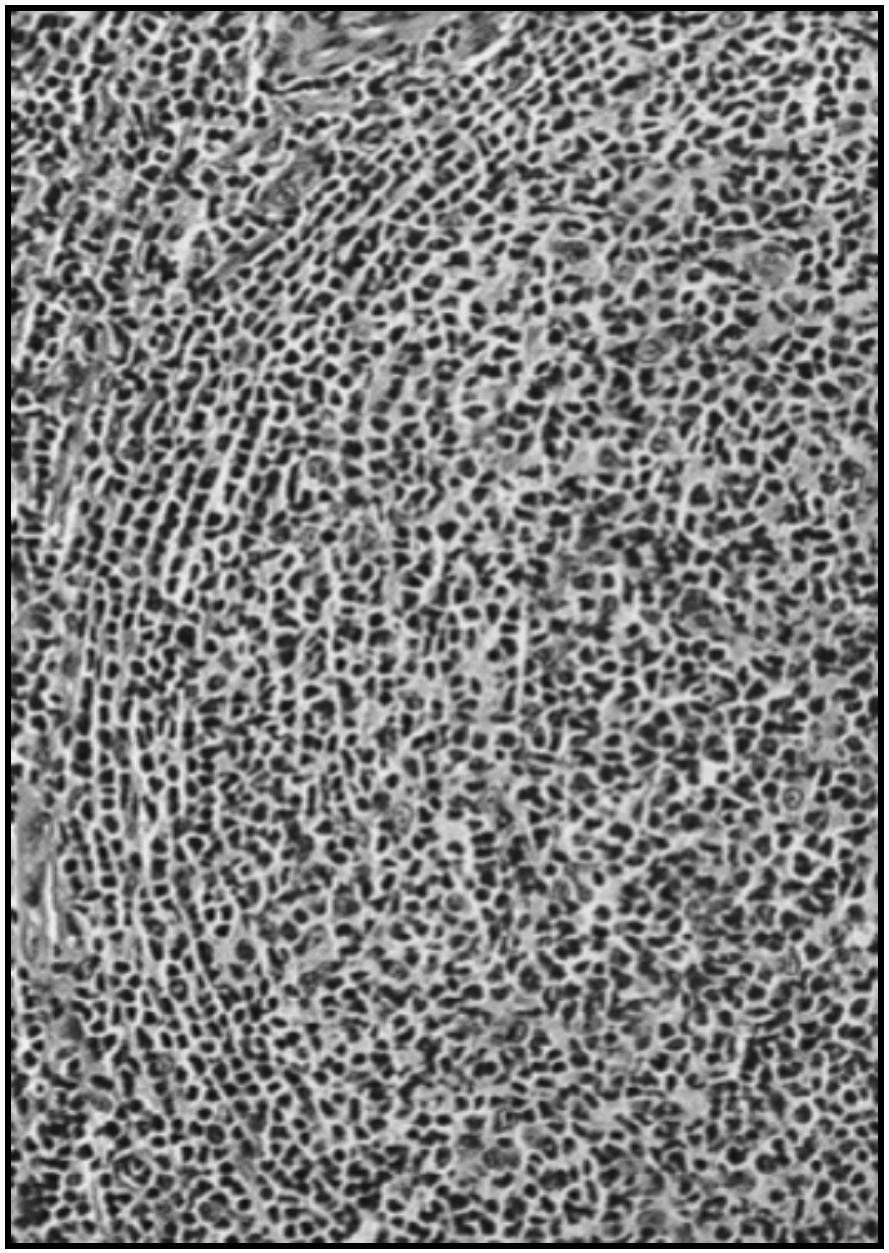
Leukemias

- Acute leukemias
- Chronic leukemias

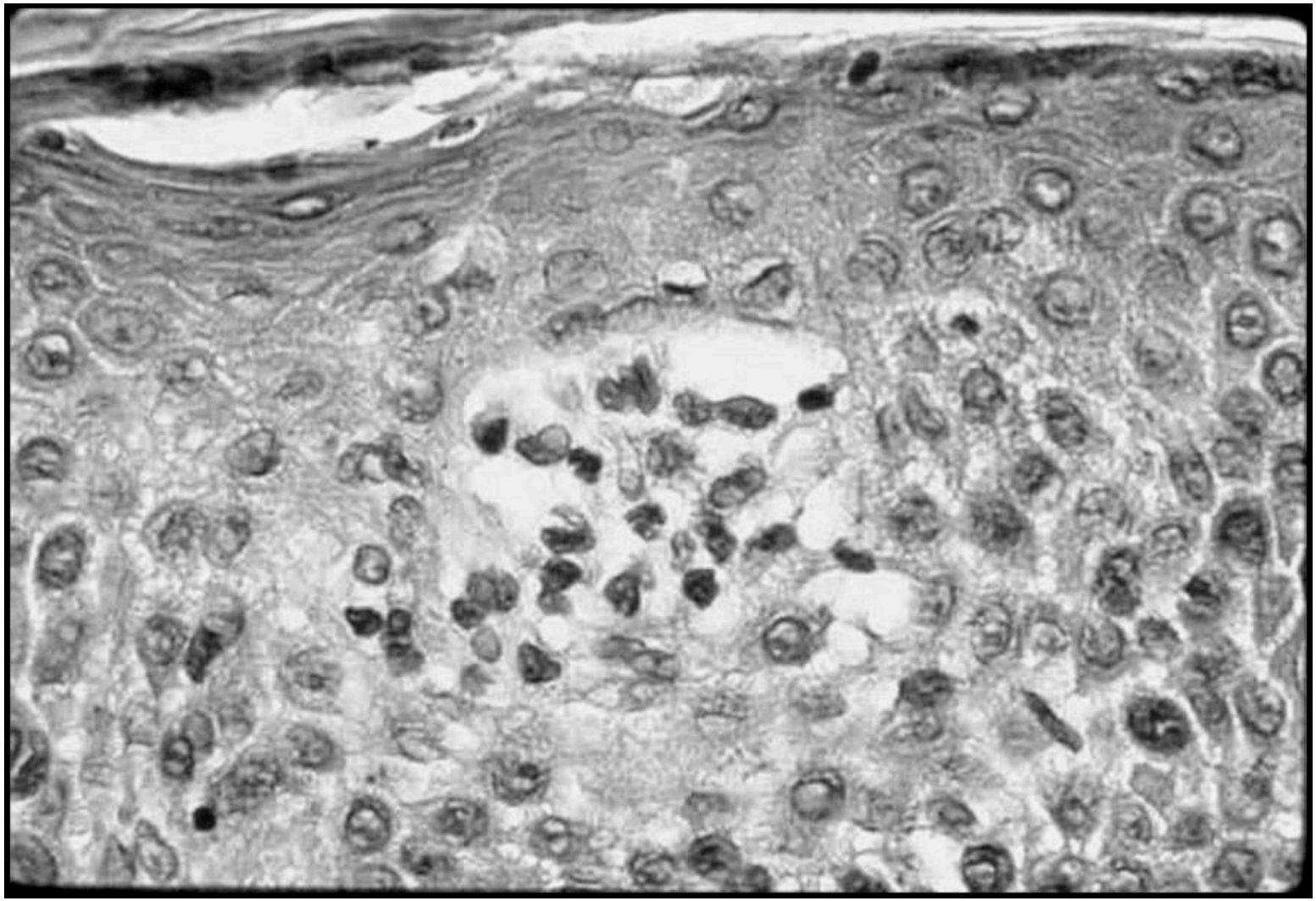
Lymphomas

- Non-Hodgkin lymphoma
- Hodgkin lymphoma

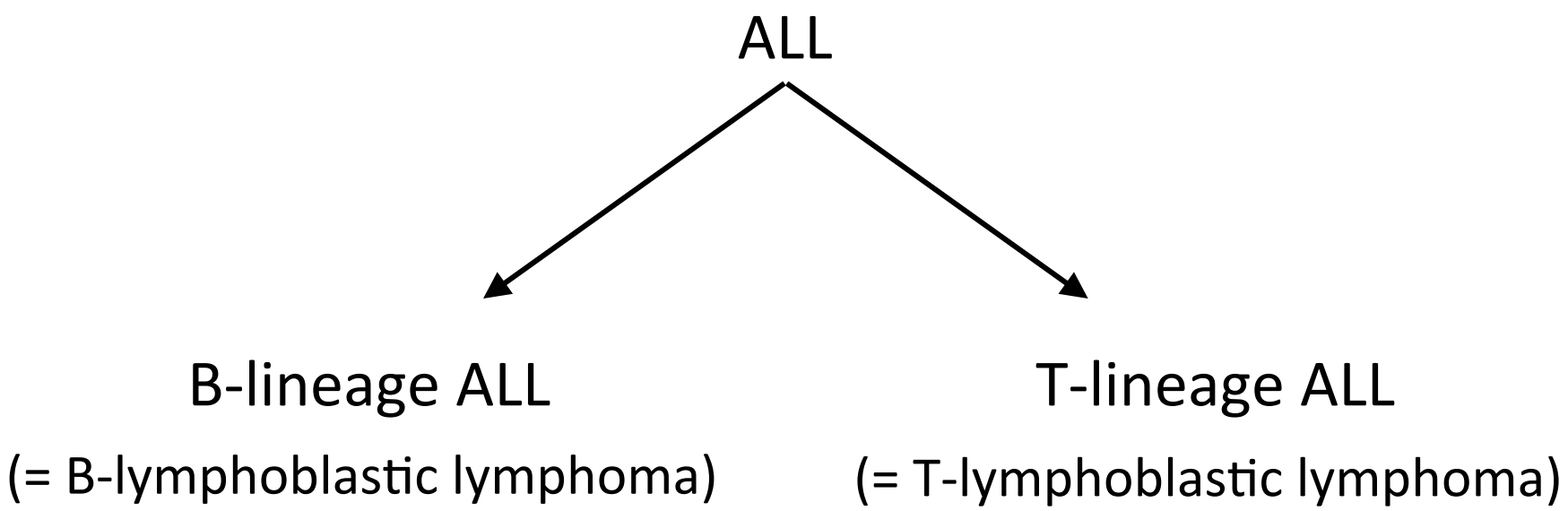


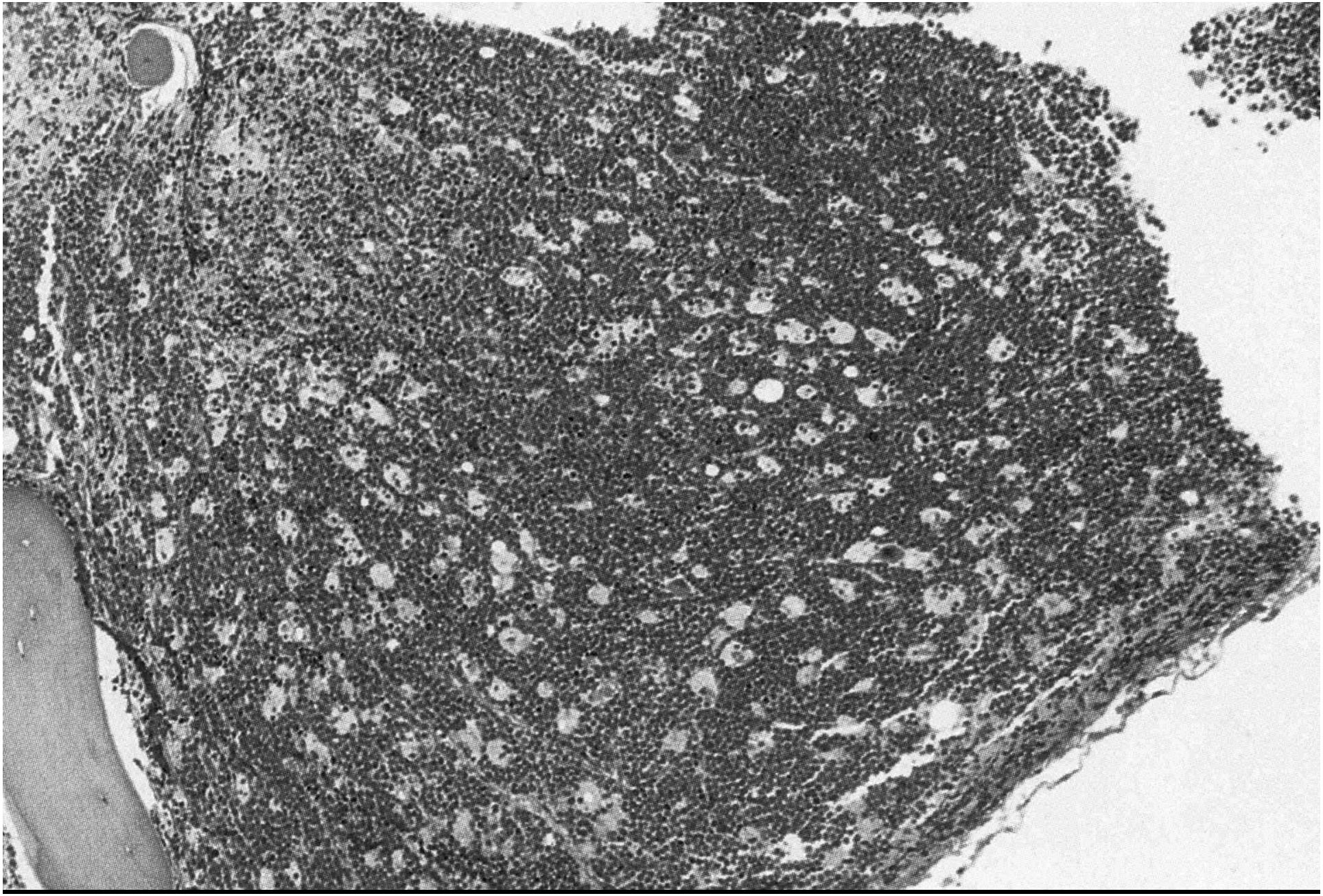


Which germinal center is benign?

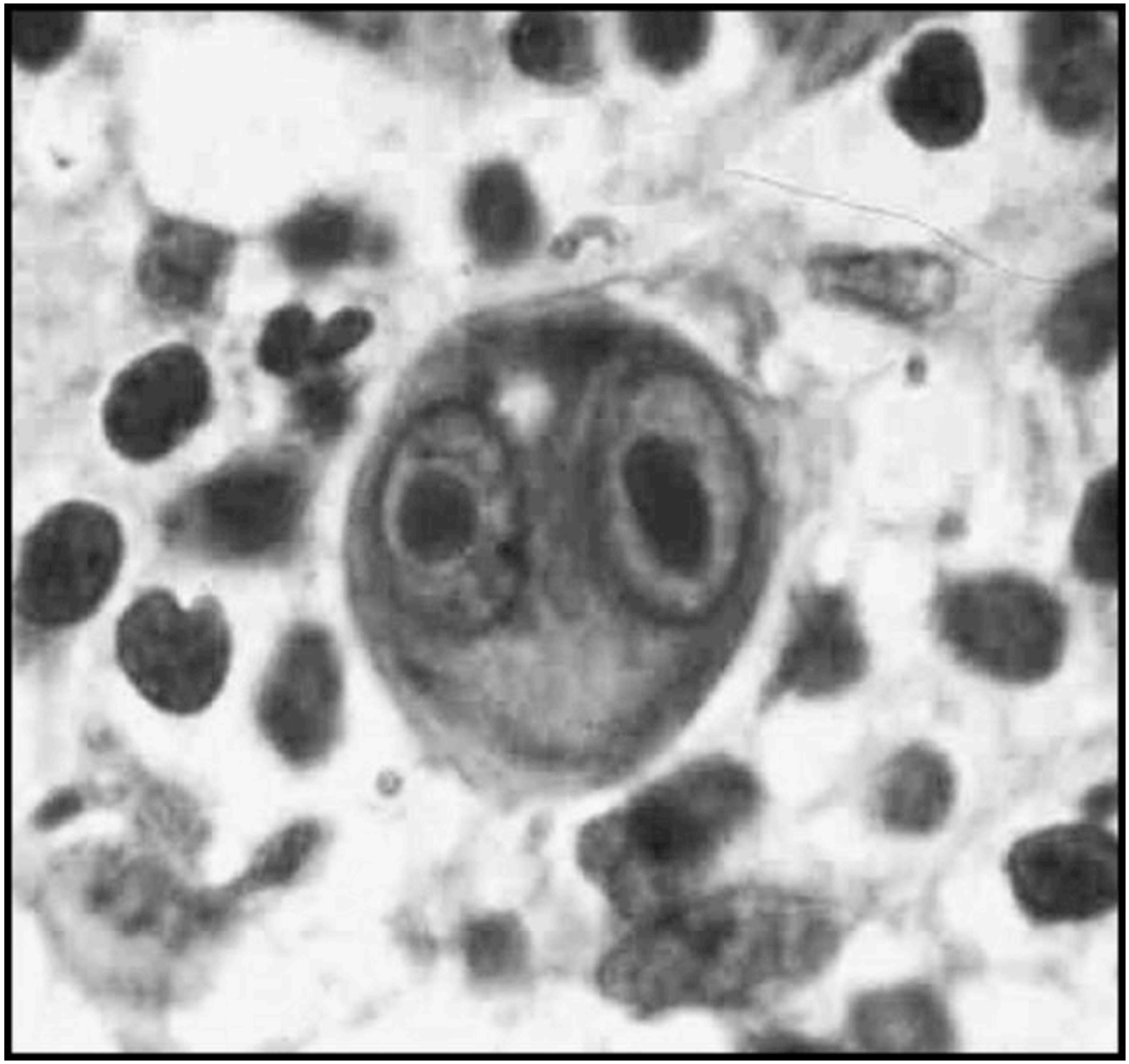


This skin biopsy is from a 65 year old male with red skin nodules and cerebriform cells in his blood. What is the diagnosis?

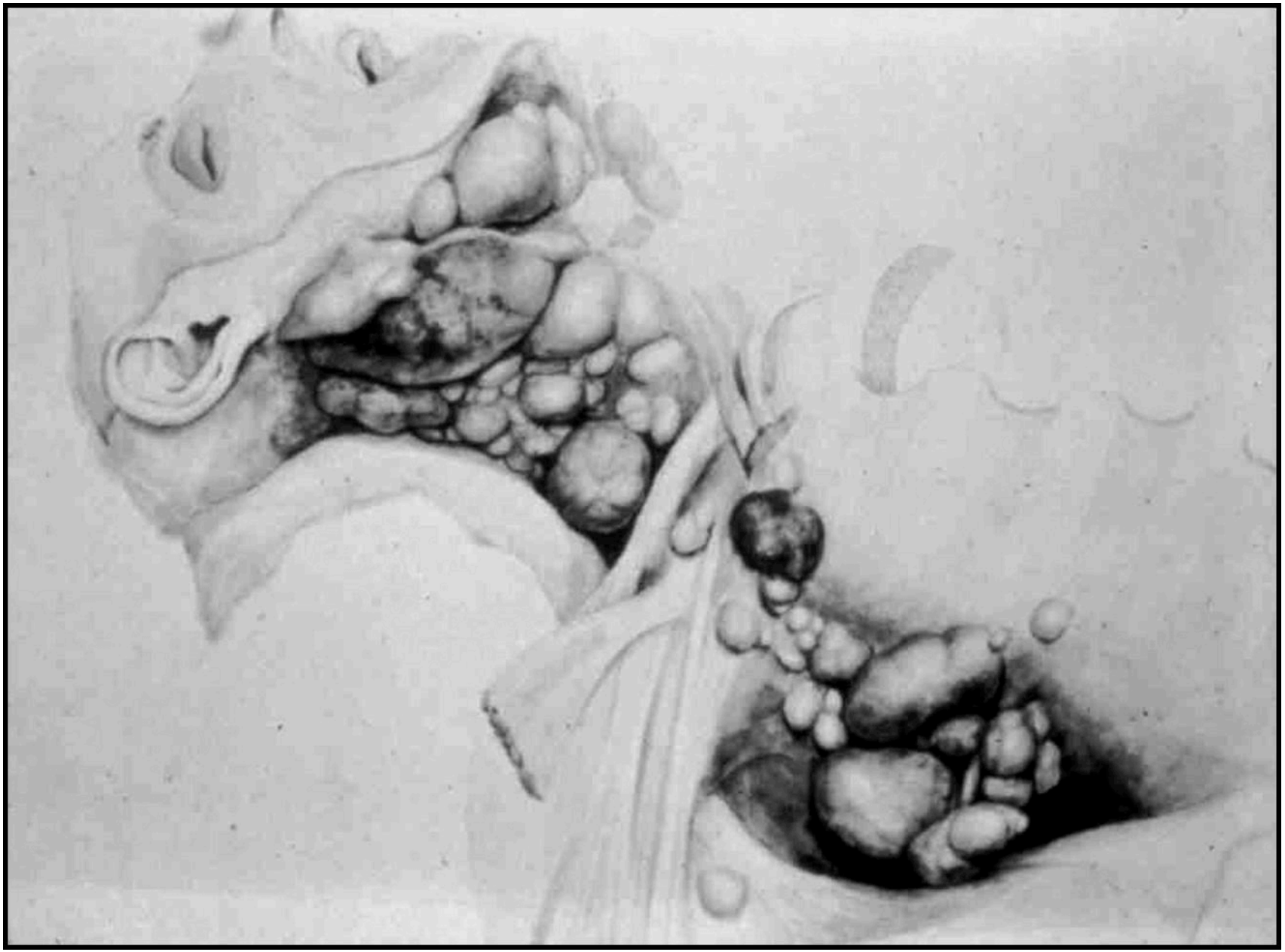

ALL
B-lineage ALL
(= B-lymphoblastic lymphoma)
T-lineage ALL
(= T-lymphoblastic lymphoma)



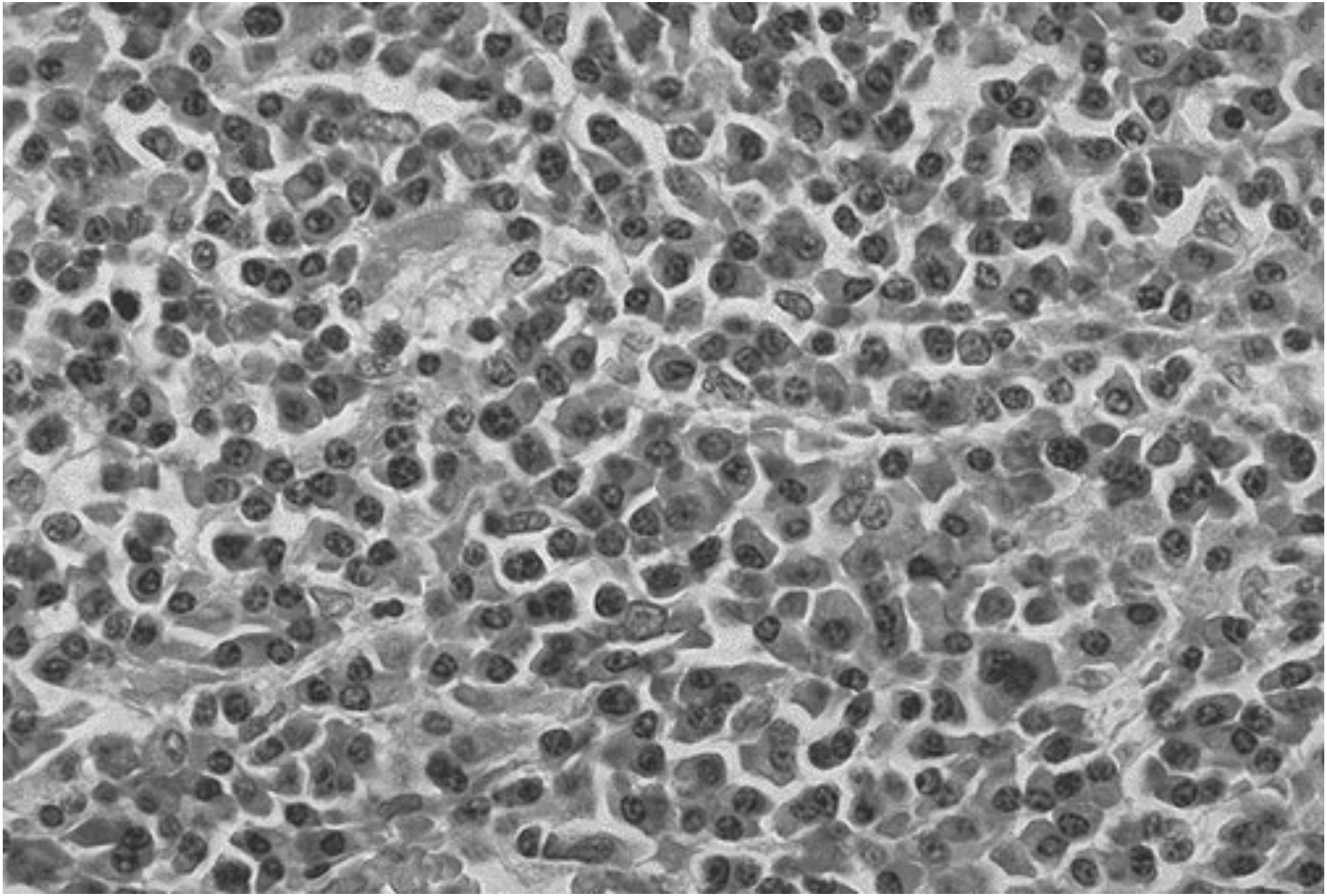
What's the translocation?



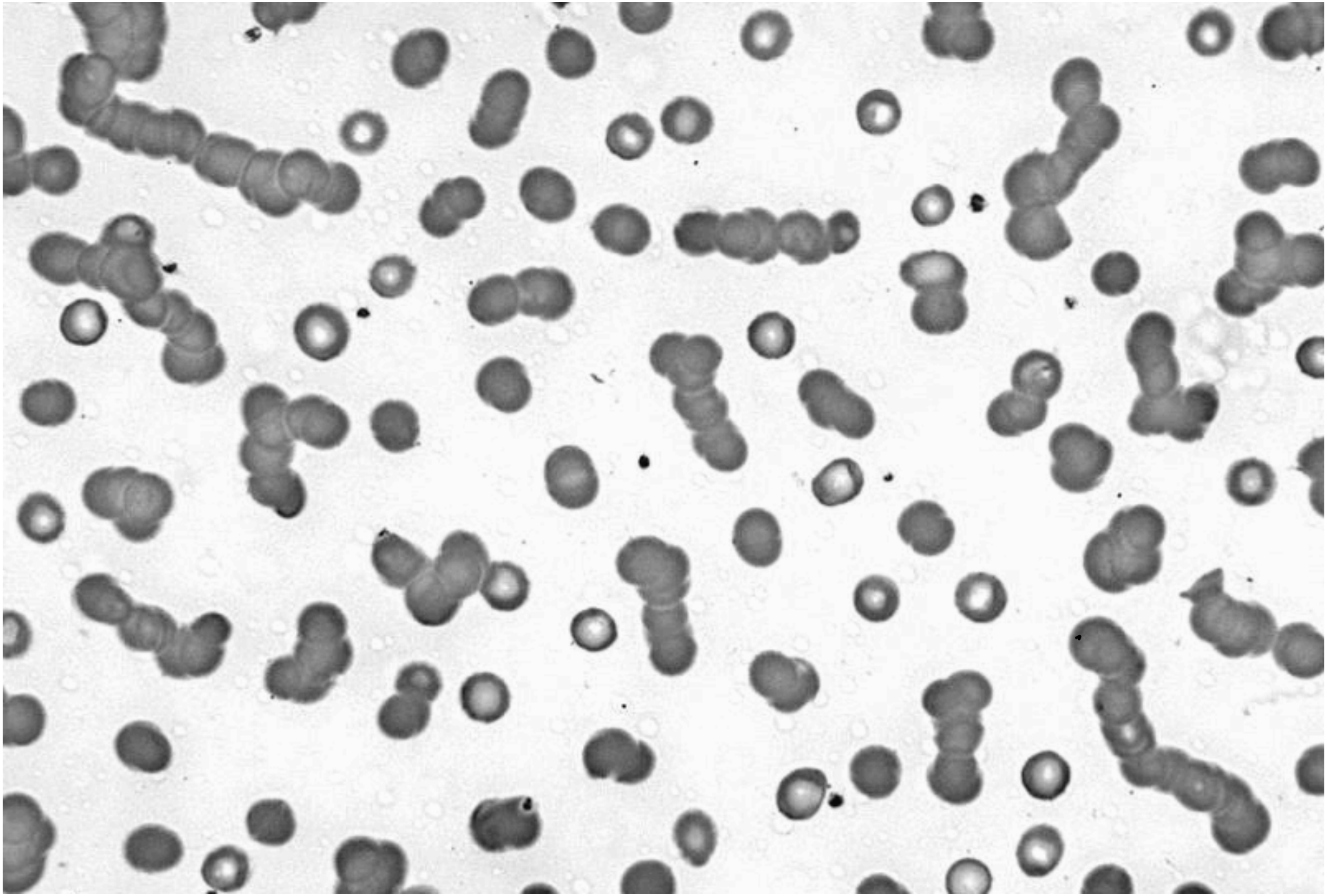
Name the cell and the disease.



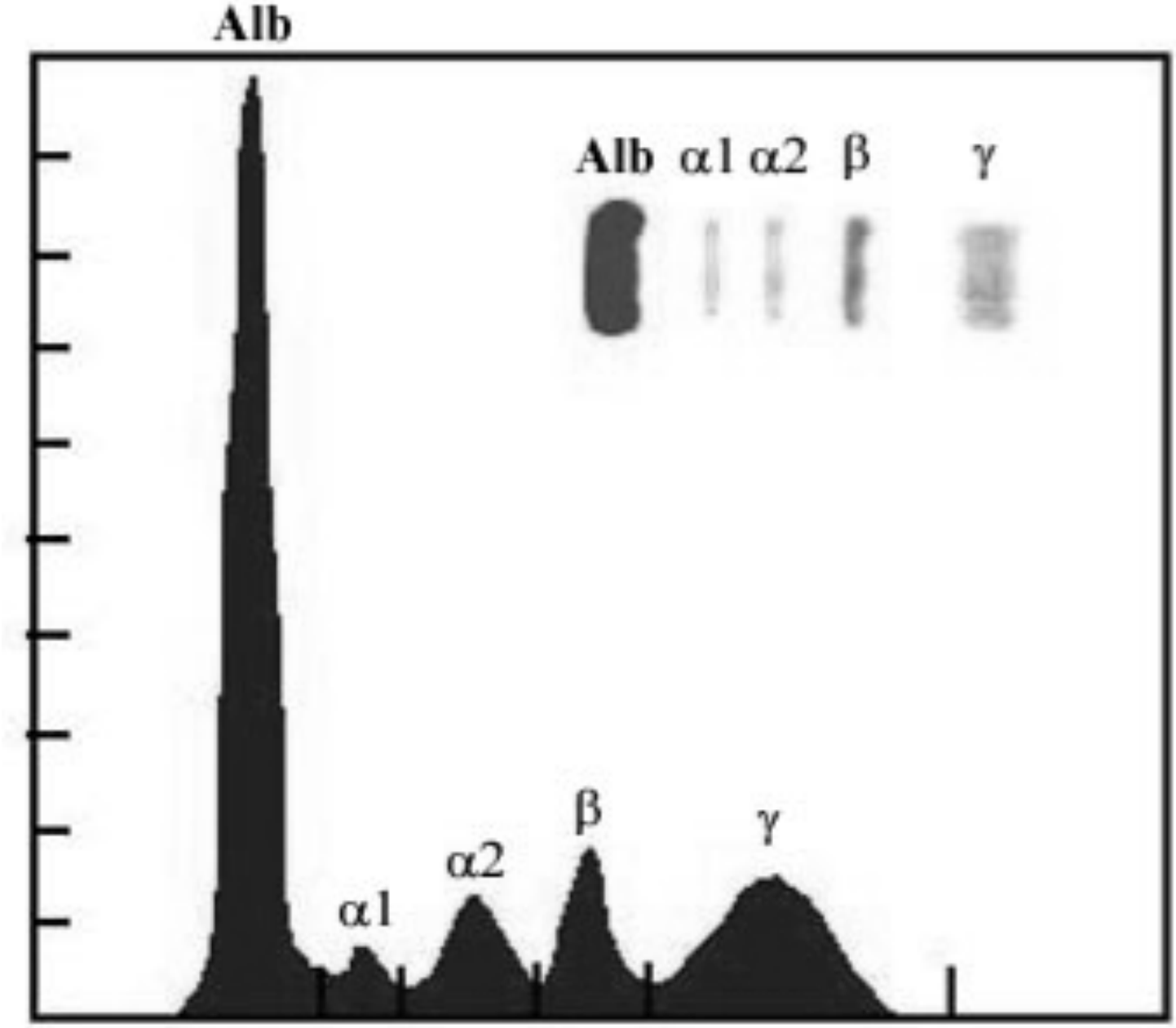
Hodgkin lymphoma



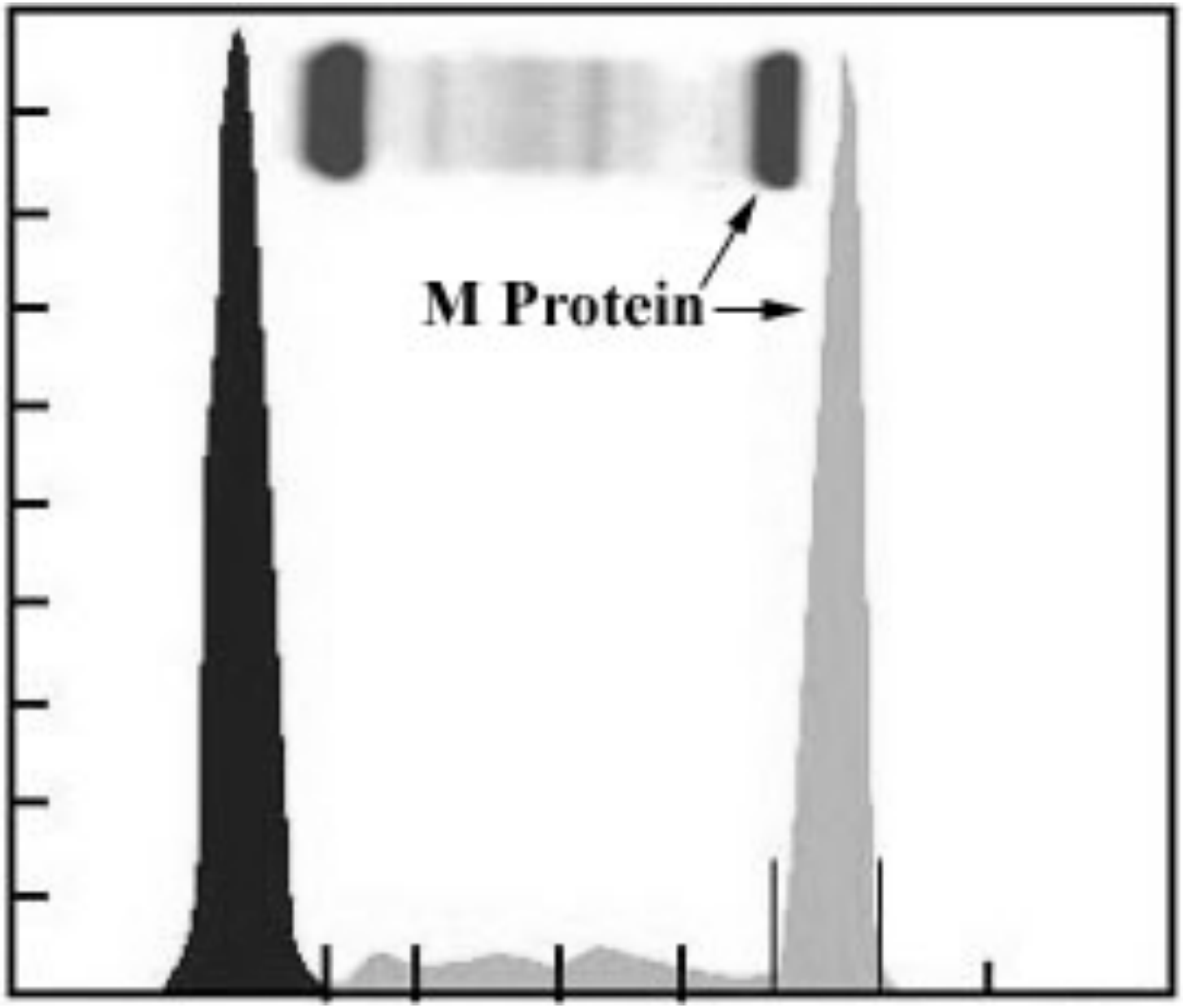
Multiple Myeloma



Multiple Myeloma

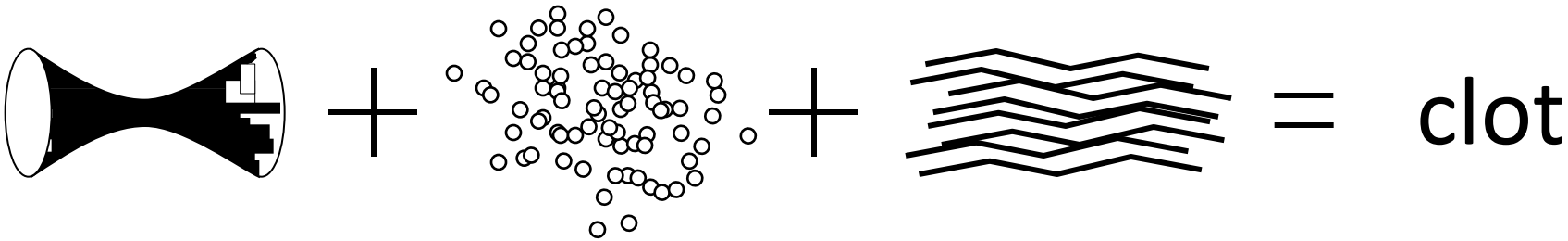


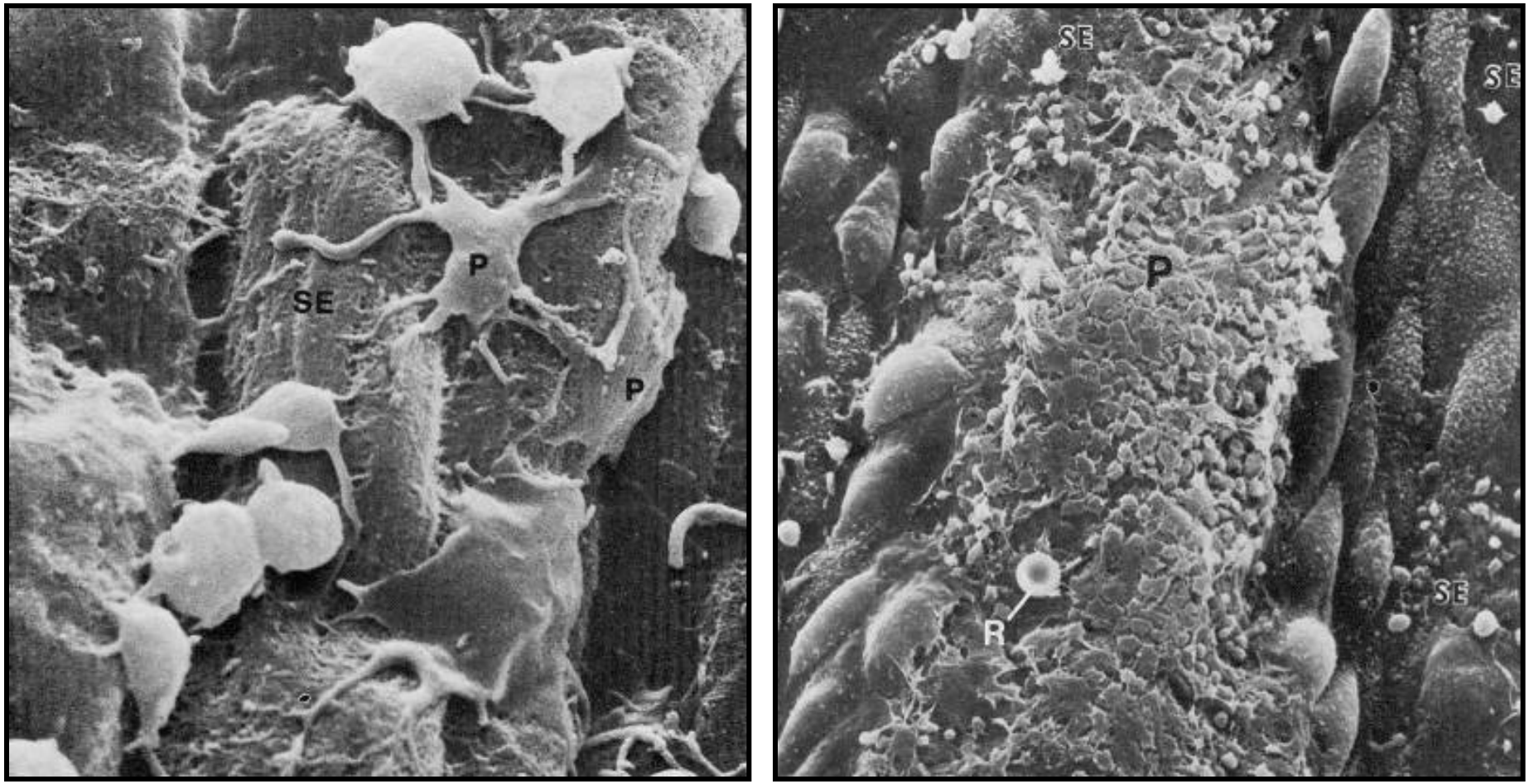
Serum protein electrophoresis



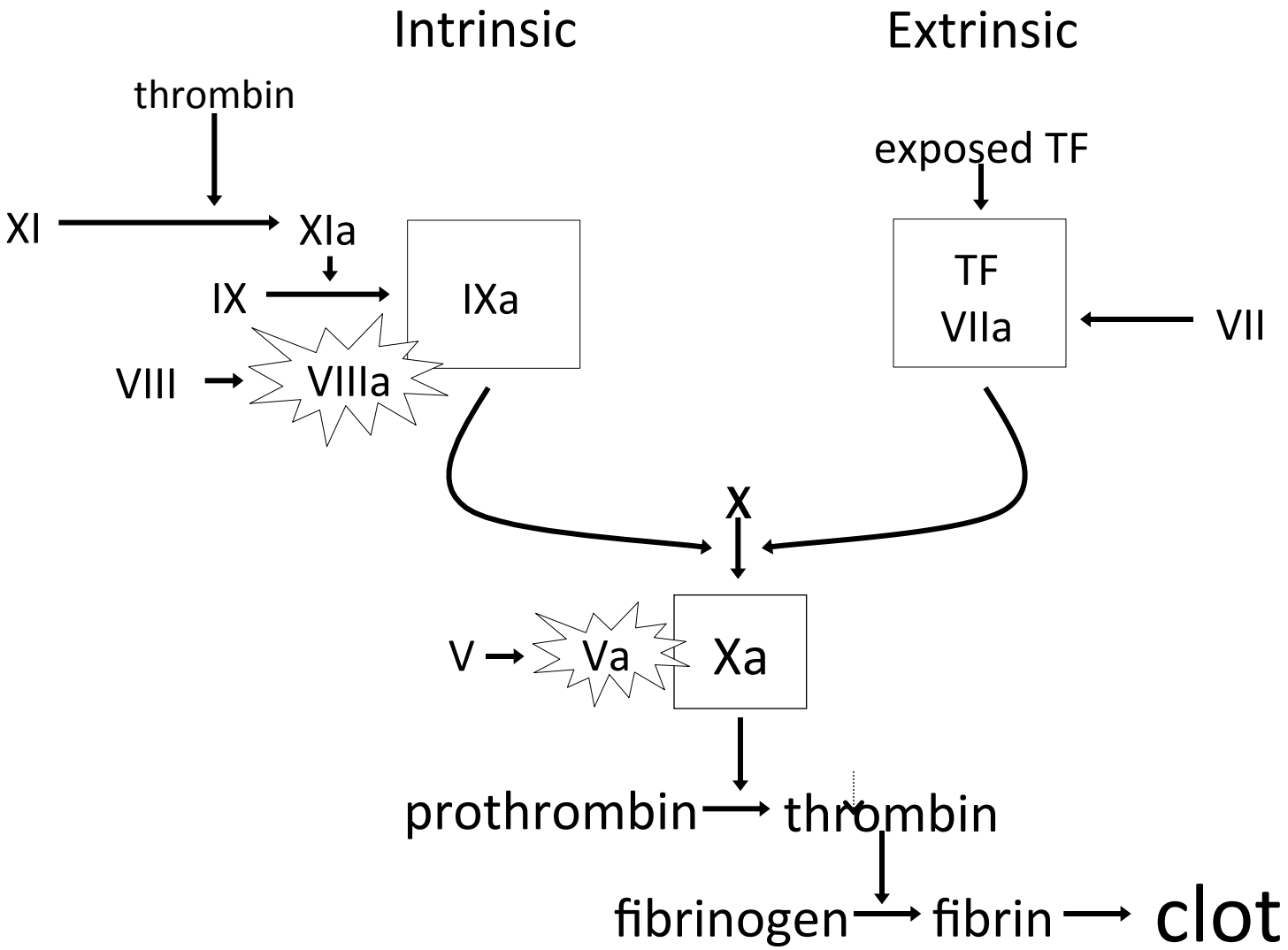
Serum protein electrophoresis

Pro-Clotting



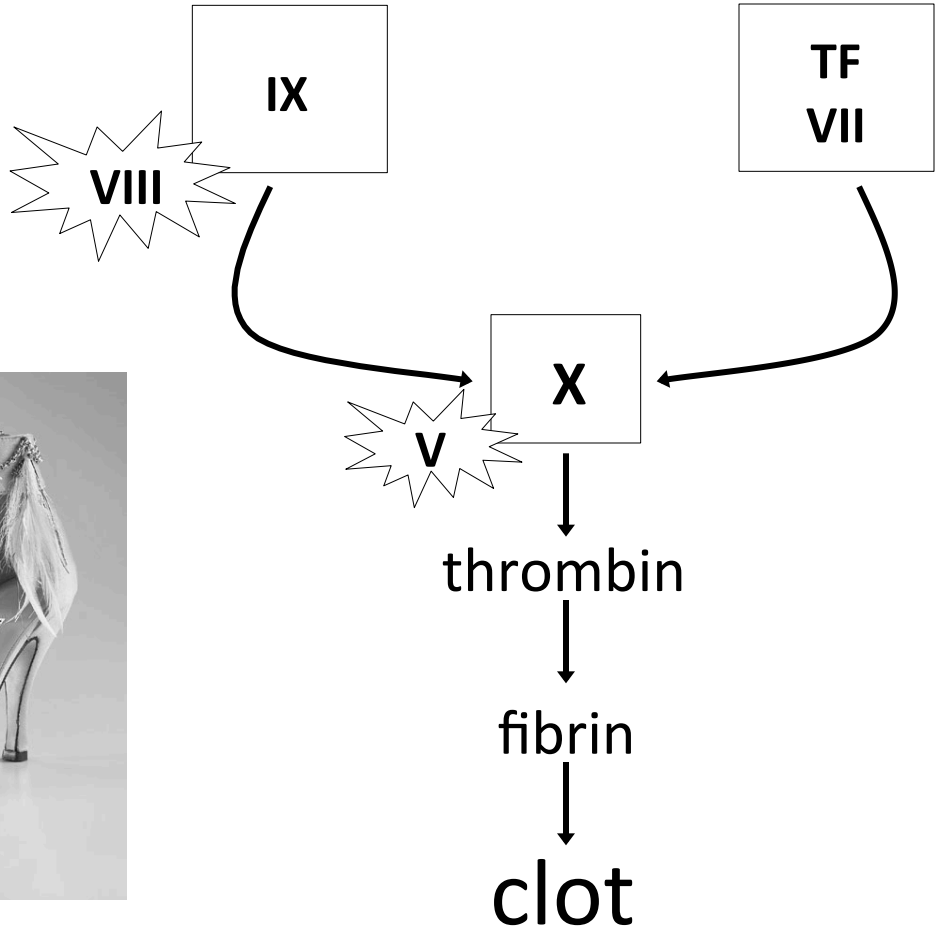


Platelet activation

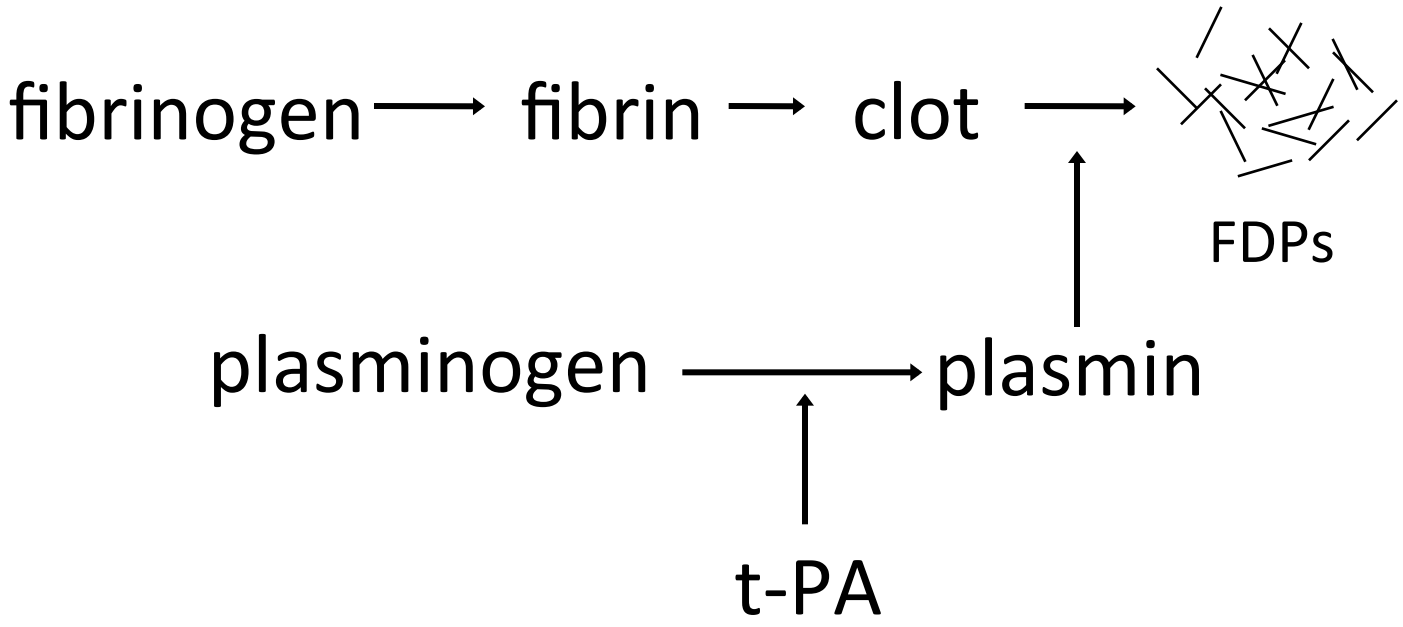

Intrinsic
Extrinsic
thrombin
exposed TF
XI
XIa
IX
IXa
TF
VIIa
VII
VIII
VIIIa
X
V
Va
Xa
prothrombin
thrombin
fibrinogen
fibrin
clot

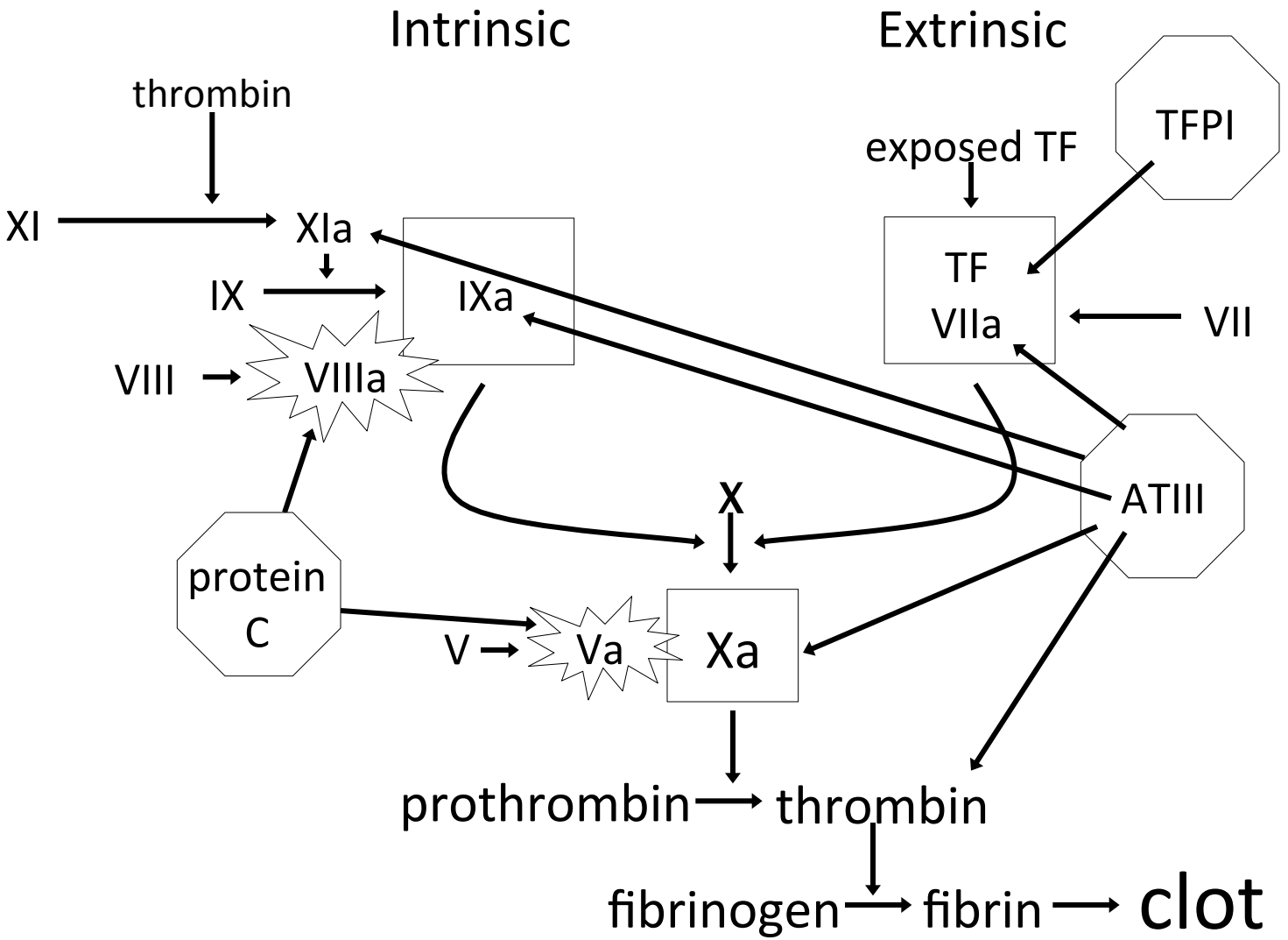
SIN trinsic

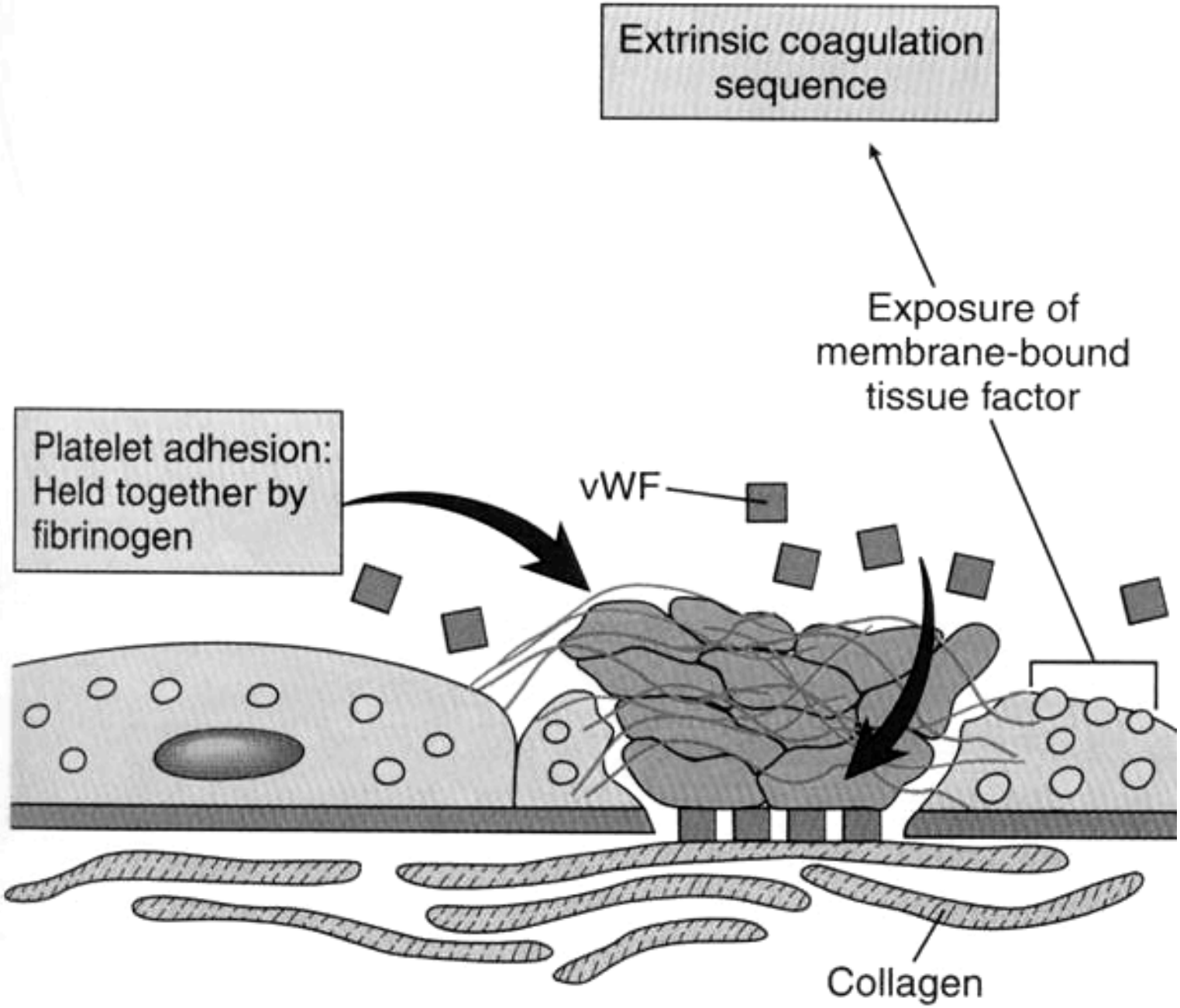
SEX trinsic



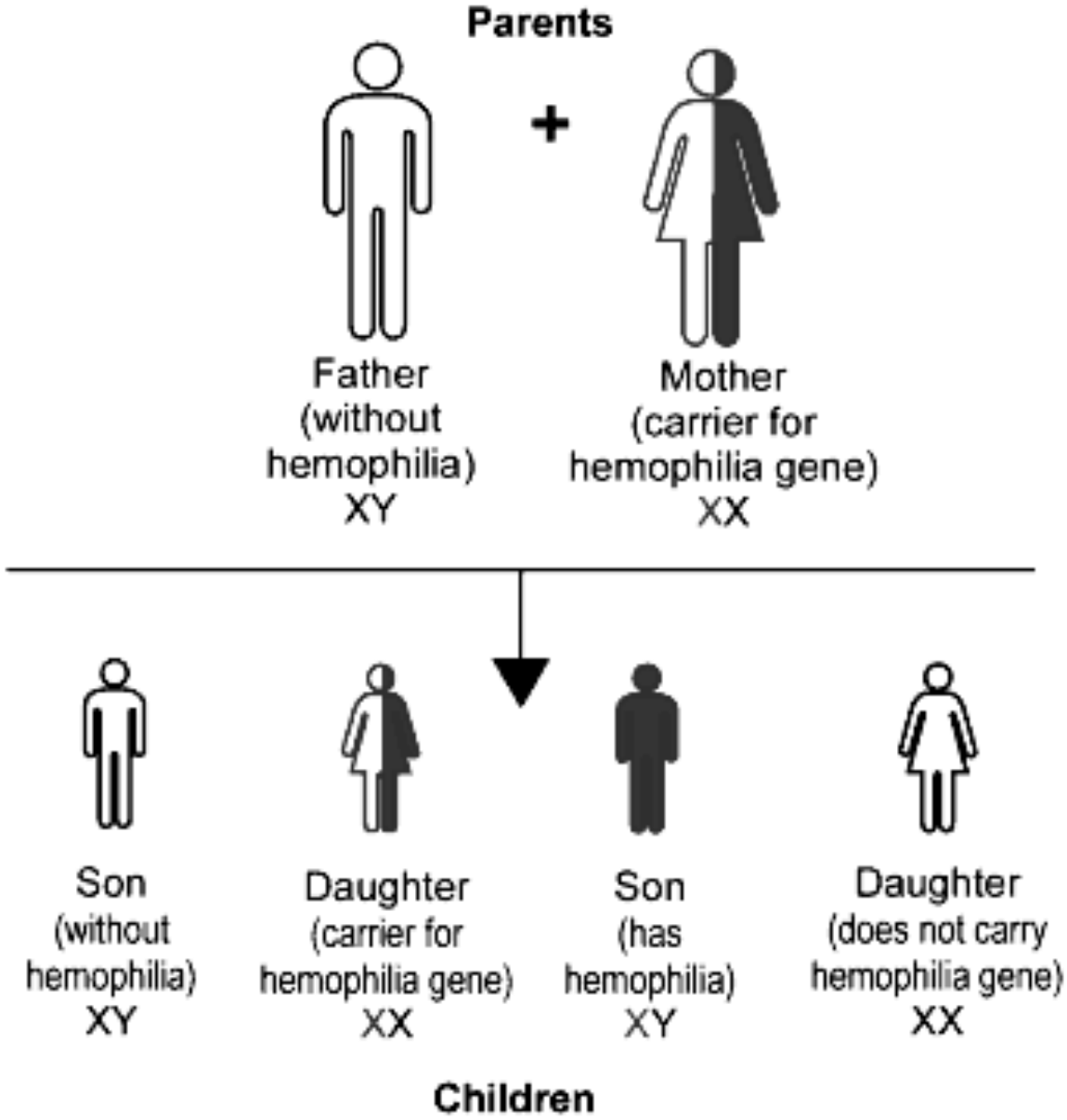
Anti-Clotting

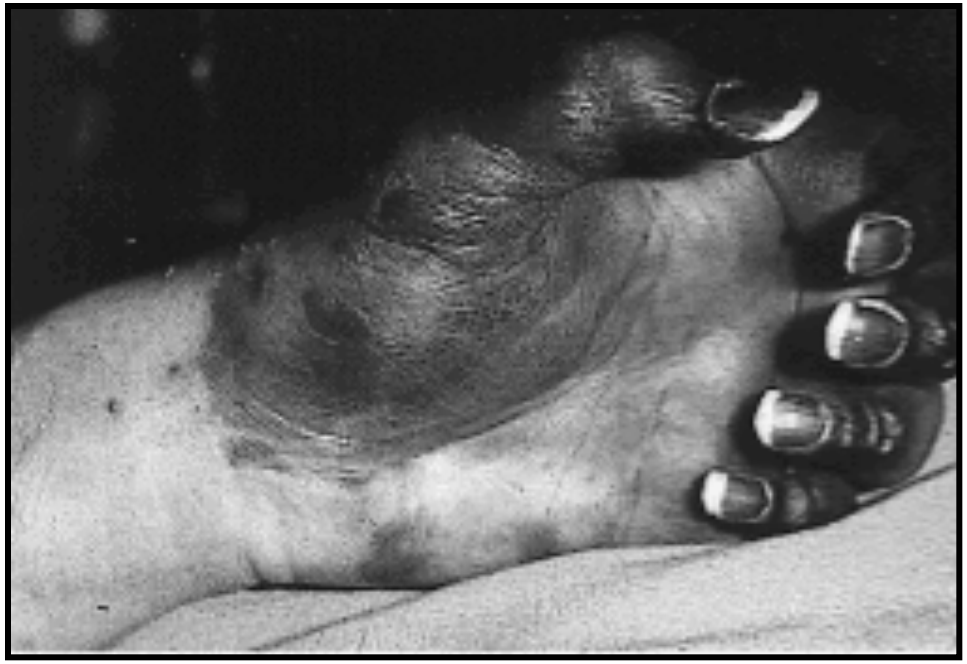



Intrinsic
Extrinsic
thrombin
TFPI
exposed TF
XI
XIa
IX
IXa
TF
VIIa
VII
VIII
VIIIa
X
ATIII
protein
C
V
Va
Xa
prothrombin
thrombin
fibrinogen
fibrin
clot

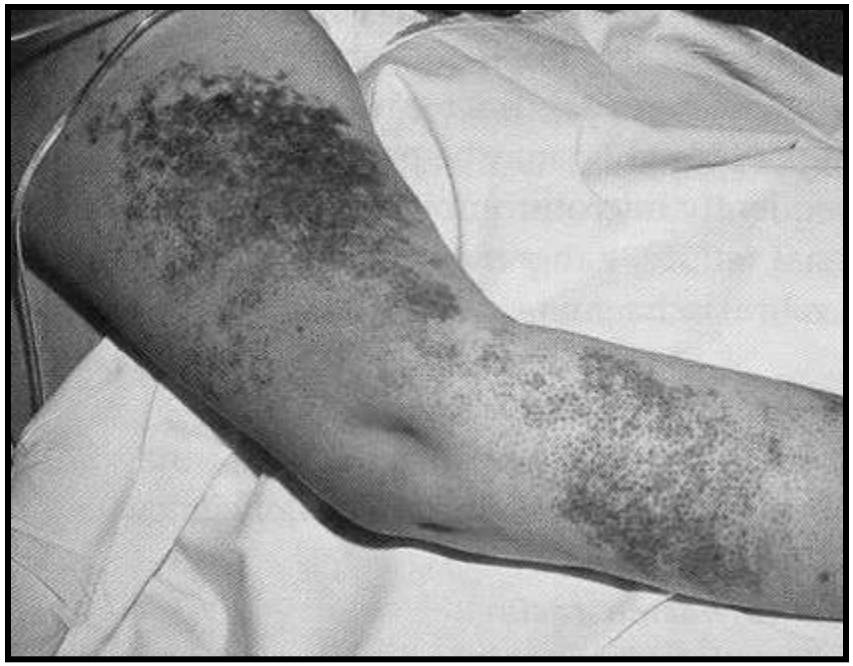

Extrinsic coagulation sequence
Exposure of membrane-bound tissue factor
Platelet adhesion: Held together by fibrinogen
vWF
Collagen

Inheritance of Hemophilia
"Carrier" Mother and Father Without Hemophilia

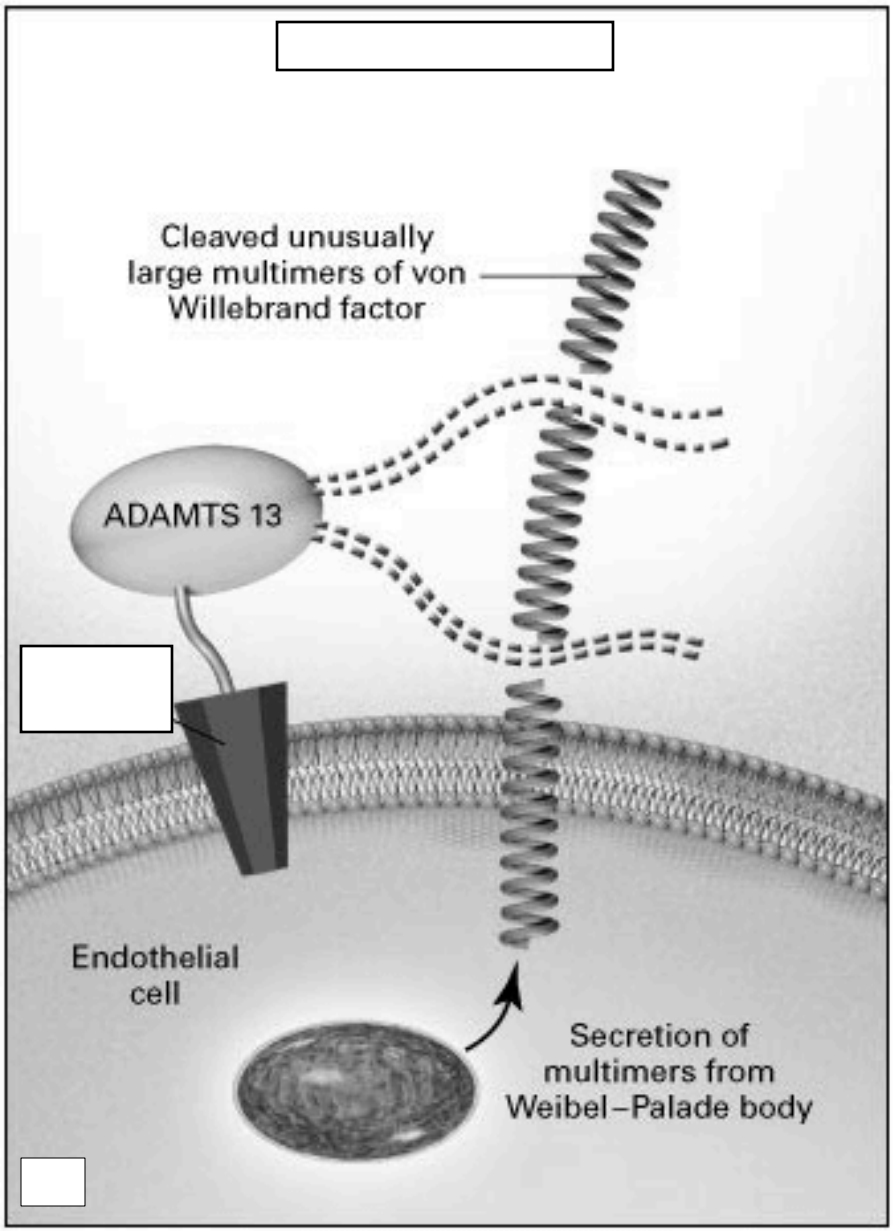


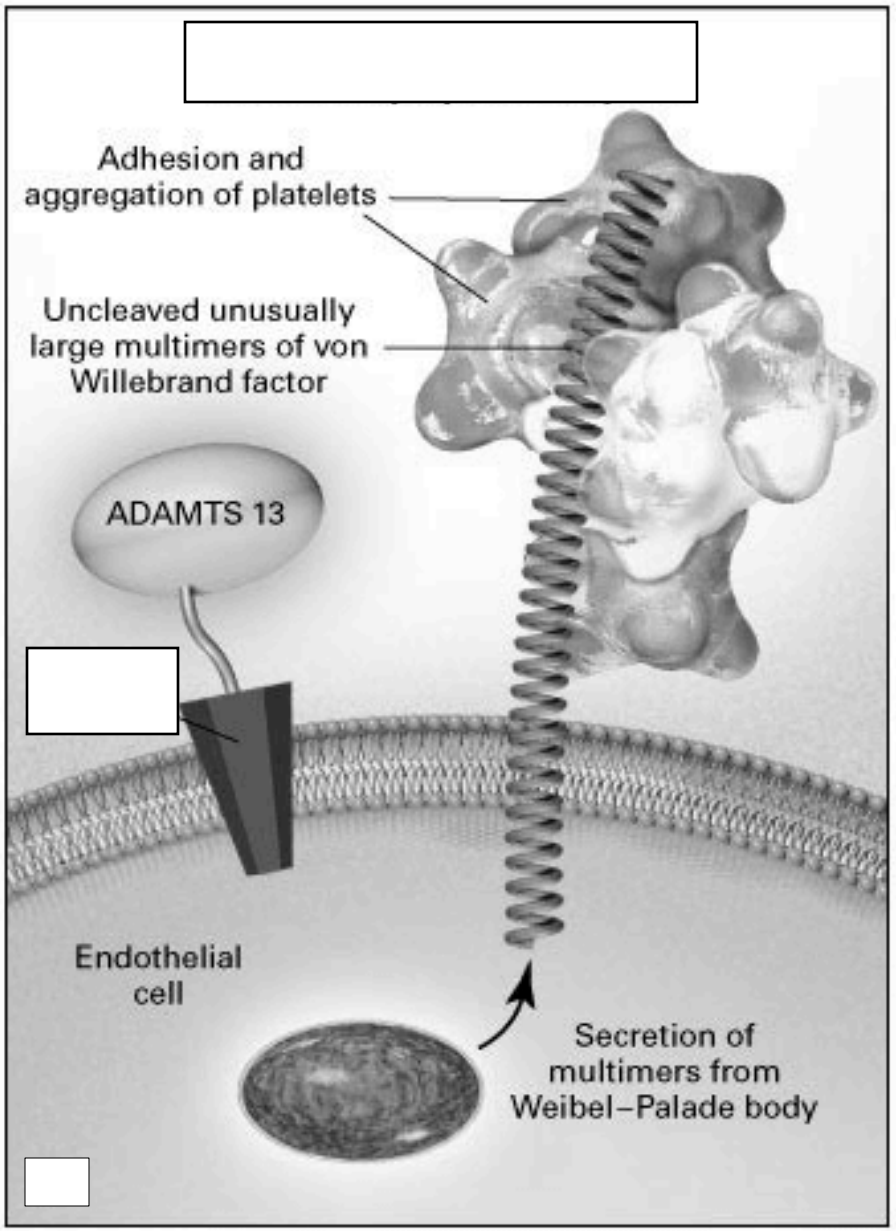


Thrombosis



Hemorrhage


Cleaved unusually large multimers of von Willebrand factor
ADAMTS 13
Endothelial cell
Secretion of multimers from Weibel–Palade body


Adhesion and aggregation of platelets
Uncleaved unusually large multimers of von Willebrand factor
ADAMTS 13
Endothelial cell
Secretion of multimers from Weibel–Palade body

Hemolytic Uremic Syndrome

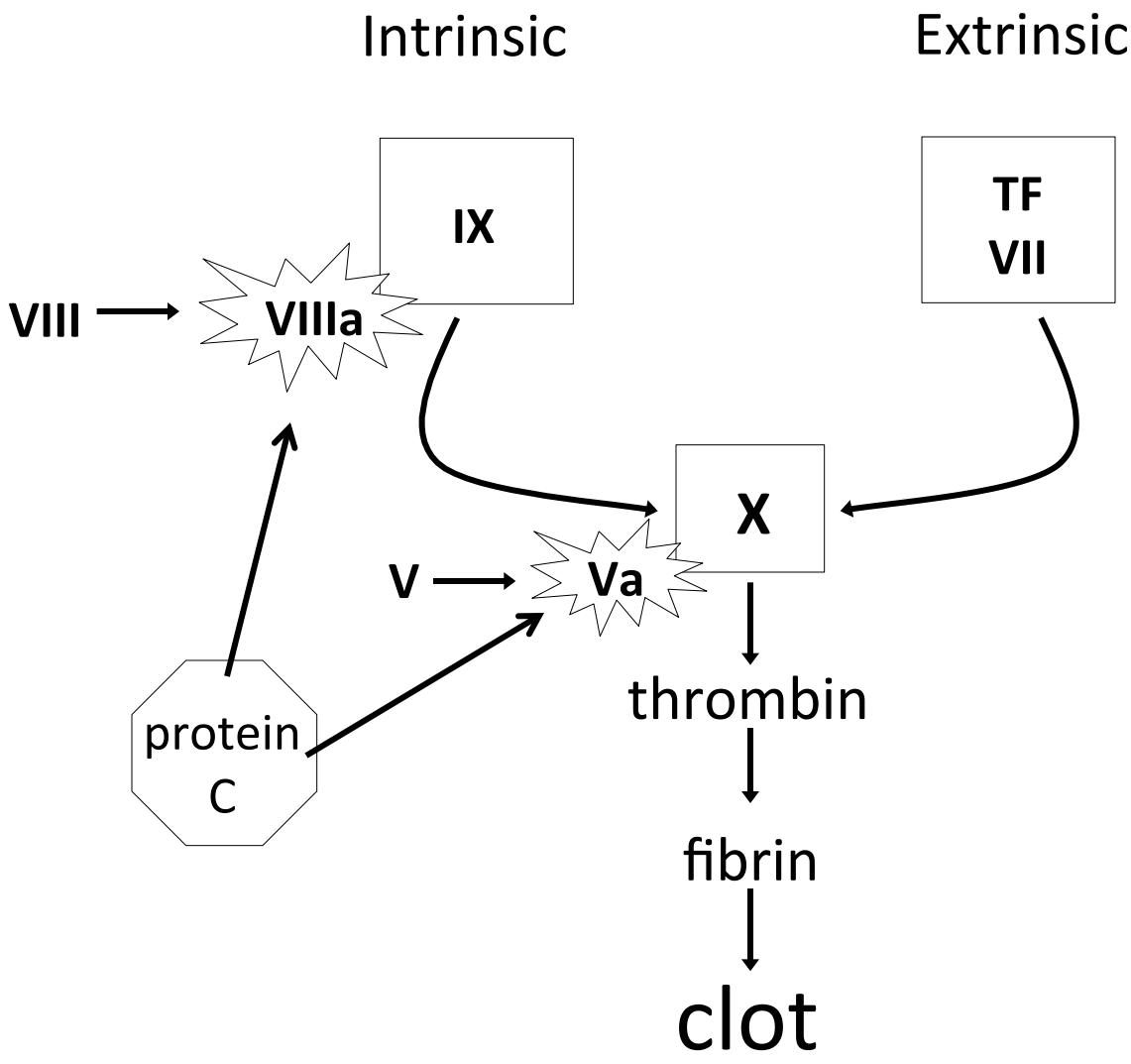
Things you must know

- MAHA and thrombocytopenia
- Most are related to E. coli infection
- Toxin damages endothelium
- Treat supportively

Idiopathic Thrombocytopenic Purpura

Things you must know

- Antiplatelet antibodies coat platelets
- Splenic macrophages eat platelets
- Diagnosis of exclusion
- Steroids or splenectomy


Intrinsic
Extrinsic
IX
TF
VII
VIII
VIIIa
X
V
Va
protein
C
thrombin
fibrin
clot