Hematology M+Ms:
Morphology and Mystery

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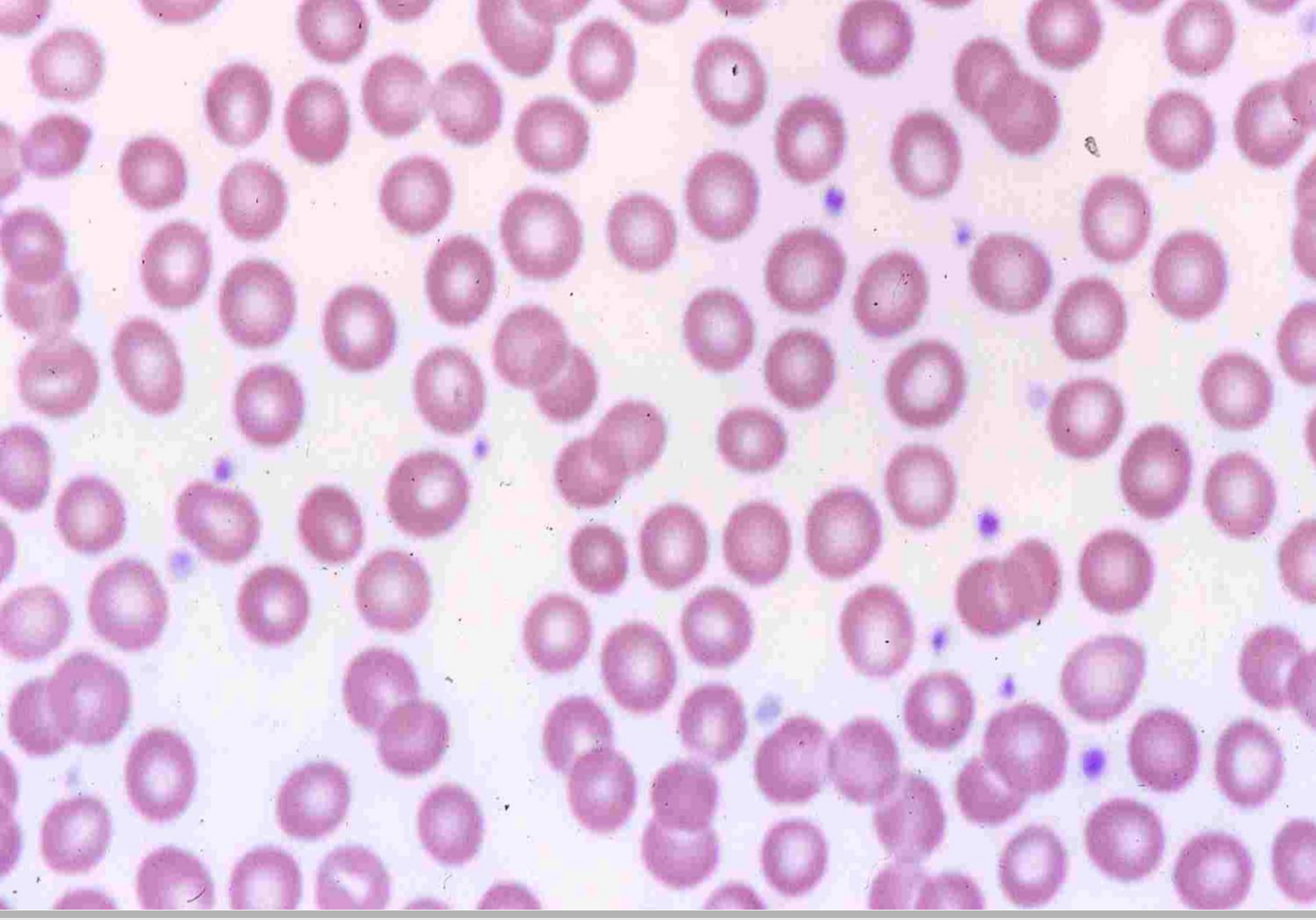
Workshop Objectives

At the conclusion of this workshop, participants will be able to:

- Morphologically differentiate abnormal variations in RBCs, WBCs, and platelets.
- Explain underlying physiological processes for abnormal RBC, WBC, and platelet morphology.
- Describe the morphologic basis for distinguishing benign from malignant WBC disorders.
- Correlate abnormal cellular morphologic variations with selected case studies.

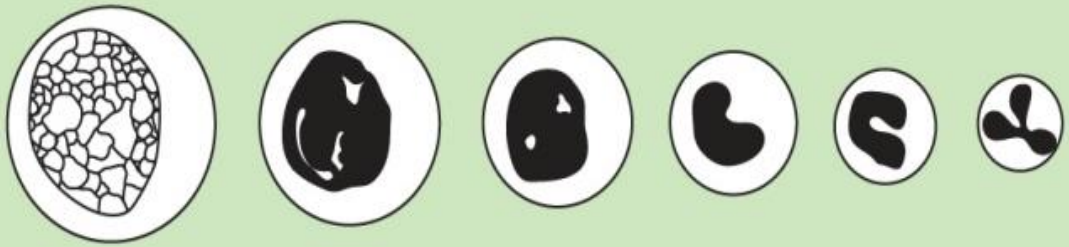
Morphologic Variations

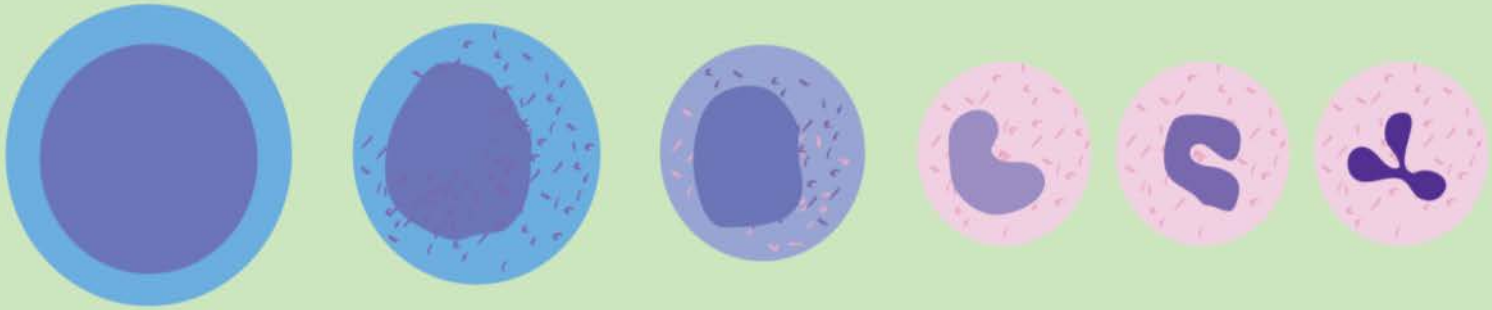
- Good RBC Distribution
- Good Stain
- Evaluate RBCs for:
  - Size
  - Shape
  - Hemoglobin content
  - Distribution
  - Inclusions

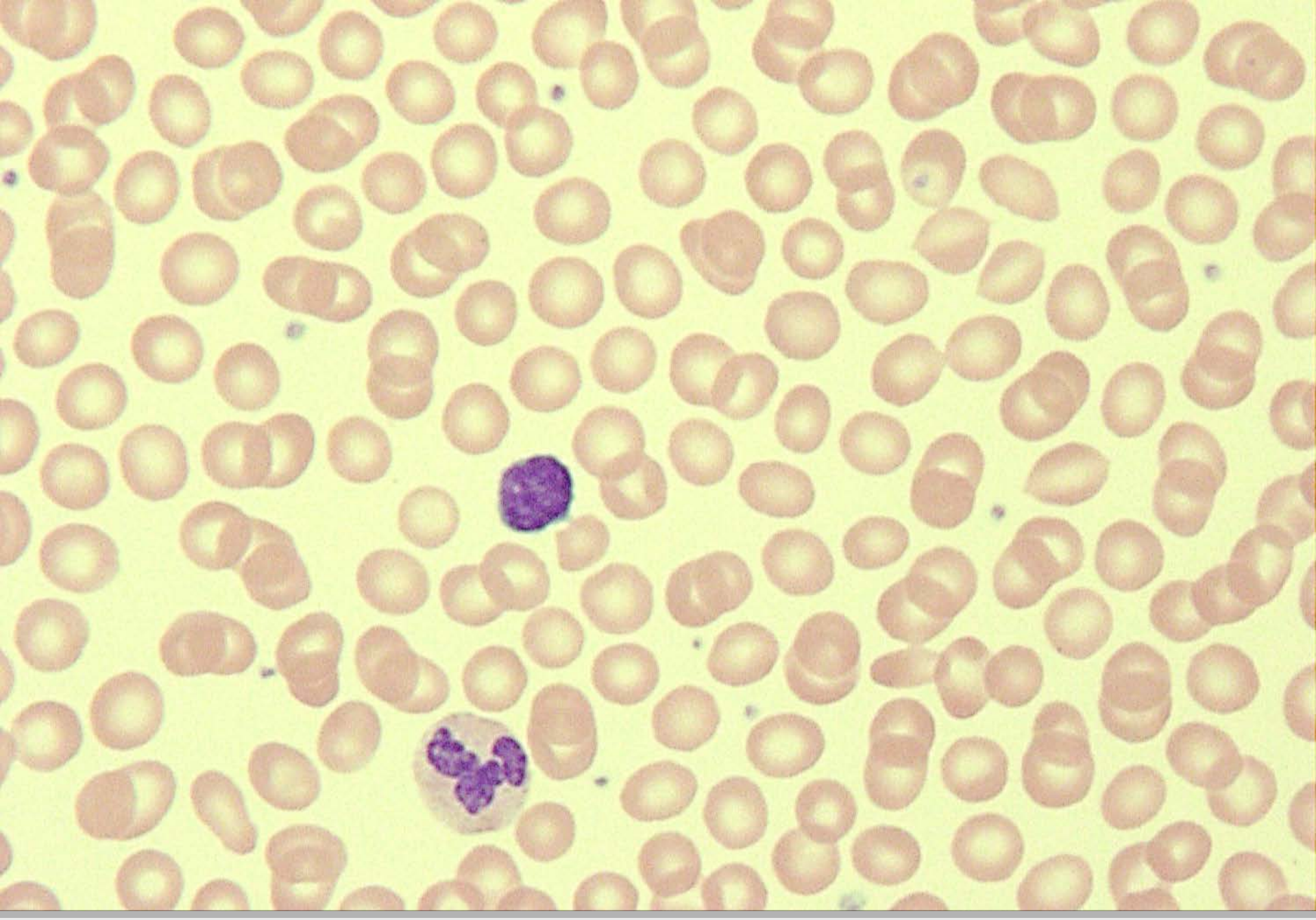


Leukocyte Identification Criteria

- Overall cell size
- Nuclear to cytoplasmic ratio
- Nuclear characteristics
- Cytoplasmic characteristics







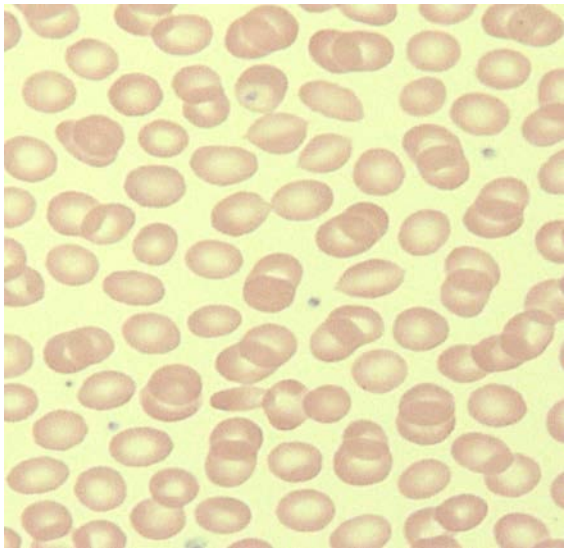
Malignancy Identification Criteria

- Cellular characteristics
  - Size
  - Clonality
- Nuclear characteristics
  - Shape
  - Size
  - Chromatin pattern
  - Nucleoli
  - Megaloblastoid features
  - Increase in mitotic figures
- Cytoplasmic characteristics
  - Granulation
  - Increased fragility

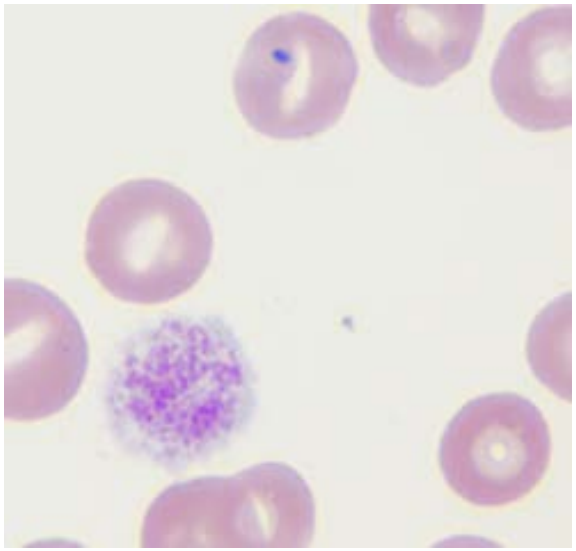
Platelet Morphology

Platelets are also evaluated for numbers and for size

Enlarged



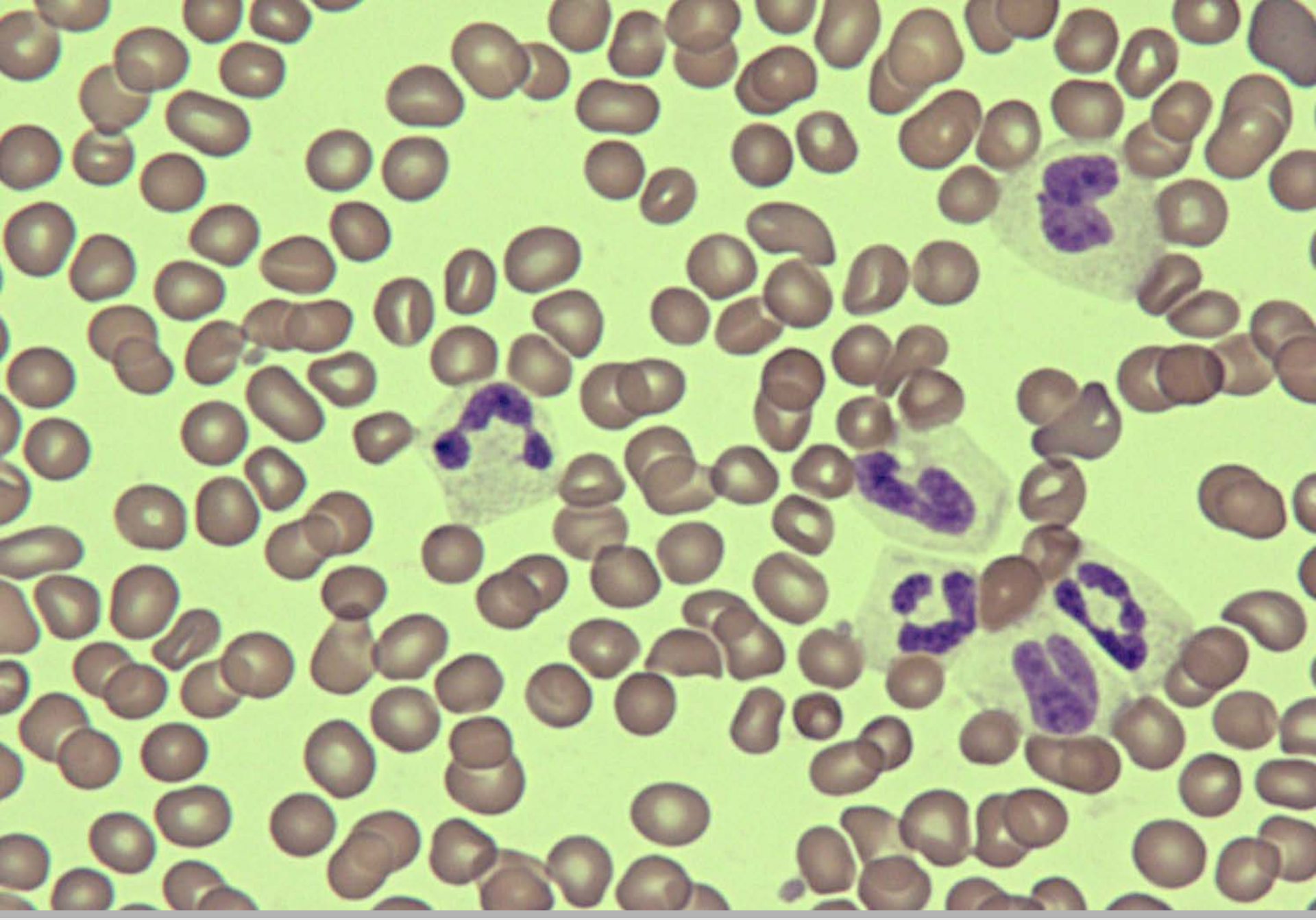
Giant

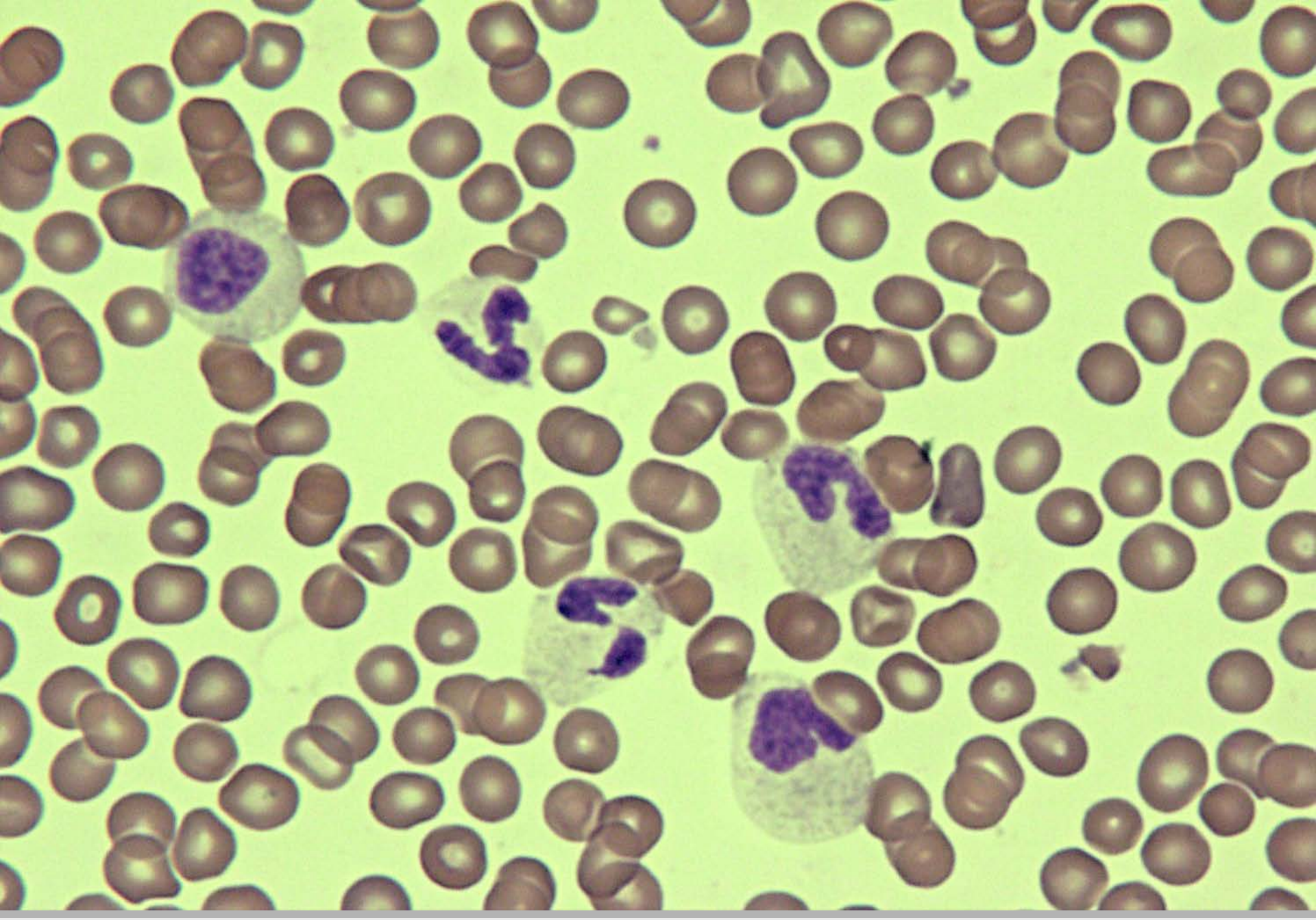


Case 1

An 88-year-old female is brought to the emergency room by her son after a fall in her apartment. In addition to hip pain, she complains of cramping and abdominal discomfort associated with episodes of mild-to-moderate diarrhea that has persisted for several days. She is feverish and disoriented. The results of the CBC are as follows:

WBC	$80.0x10^{9}/L$
RBC	$3.5x10^{12}/L$
Hgb	10.0 g/dl
Hct	30.2%
MCV	86 fl
MCH	29.0 pg
Plts	$160x10^{9}/L$
RDW	13.4%
Neutrophils	79%
Bands	12%
Metamyelocytes	5%
Myelocytes	1%
Lymphocytes	2%
Monocytes	1%





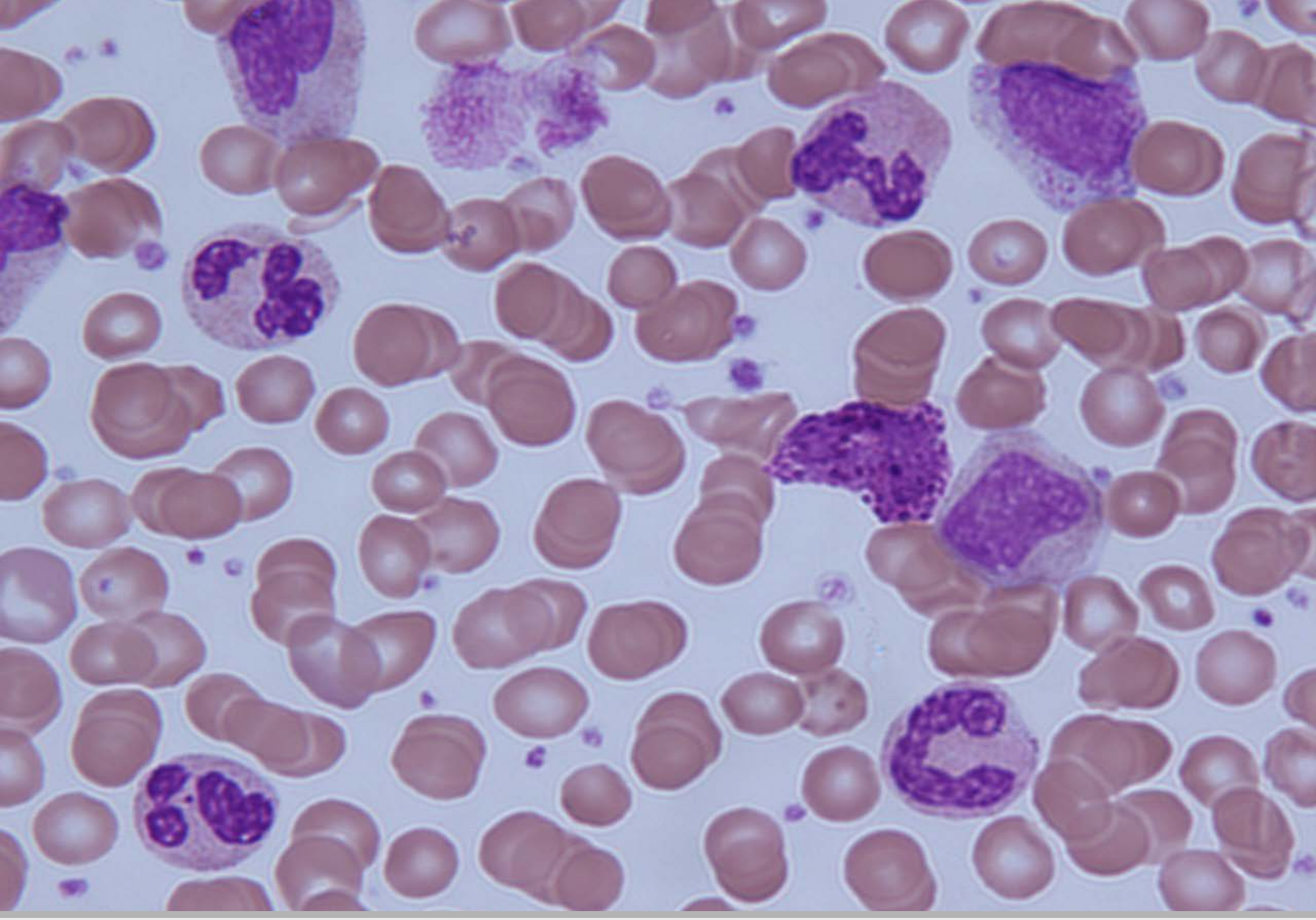
Case 1 Polling Question

Which of the following is the most likely explanation of this woman's condition?

- Chronic myelogenous leukemia
- Chronic neutrophilic leukemia
- Fulminant infection
- Myelodysplastic syndrome

1. What parameter from the CBC is unexpected given the patient's clinical presentation?

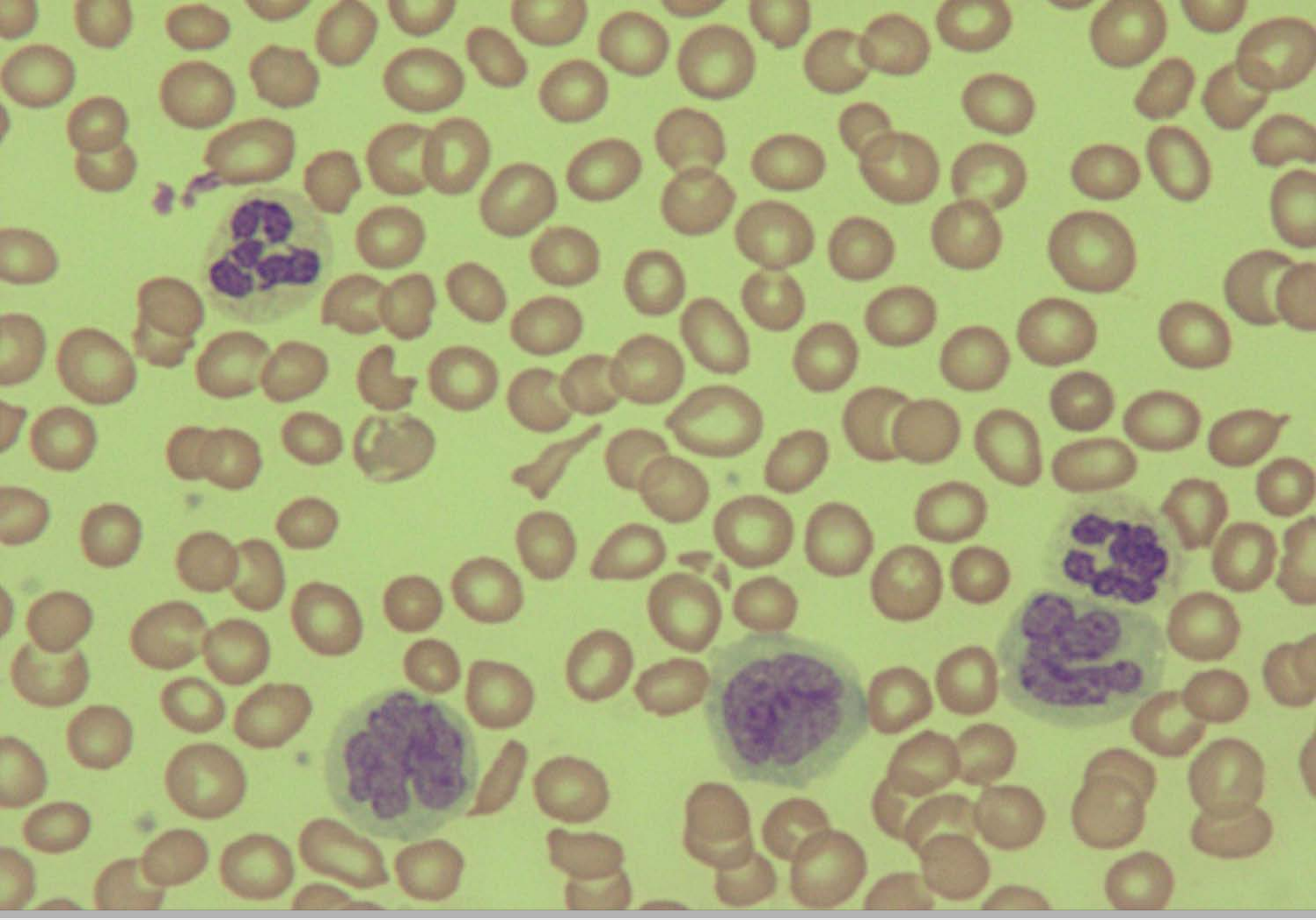
2. What additional tests can be performed to confirm the diagnosis?

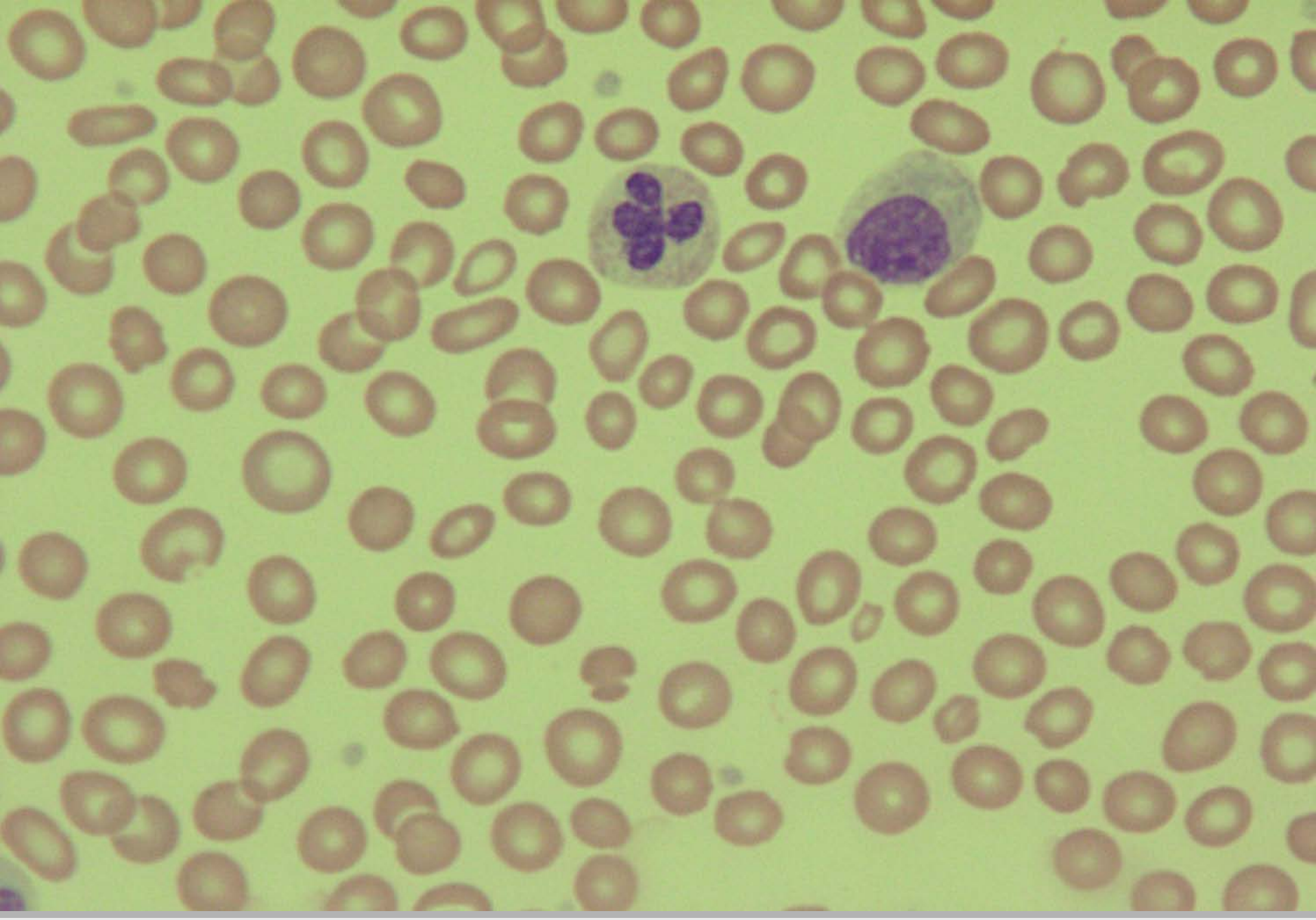


Case 2

A 77-year-old man visits his family physician for evaluation of consistent weight loss, fever, fatigue, and malaise. He appears pale and the physician notes marked splenomegaly. A CBC is performed with the following results:

WBC	$18.0x10^{9}/L$
RBC	$4.0x10^{12}/L$
Hgb	12.1 g/dl
Hct	37.3%
MCV	85.2 fl
MCH	28.3 pg
MCHC	33.3%
Plts	$103x10^{9}/L$
RDW	15.2%
Neutrophils	52%
Bands	6%
Metamyelocytes	2%
Myelocytes	1%
Blasts	1%
Lymphocytes	18%
Monocytes	20%





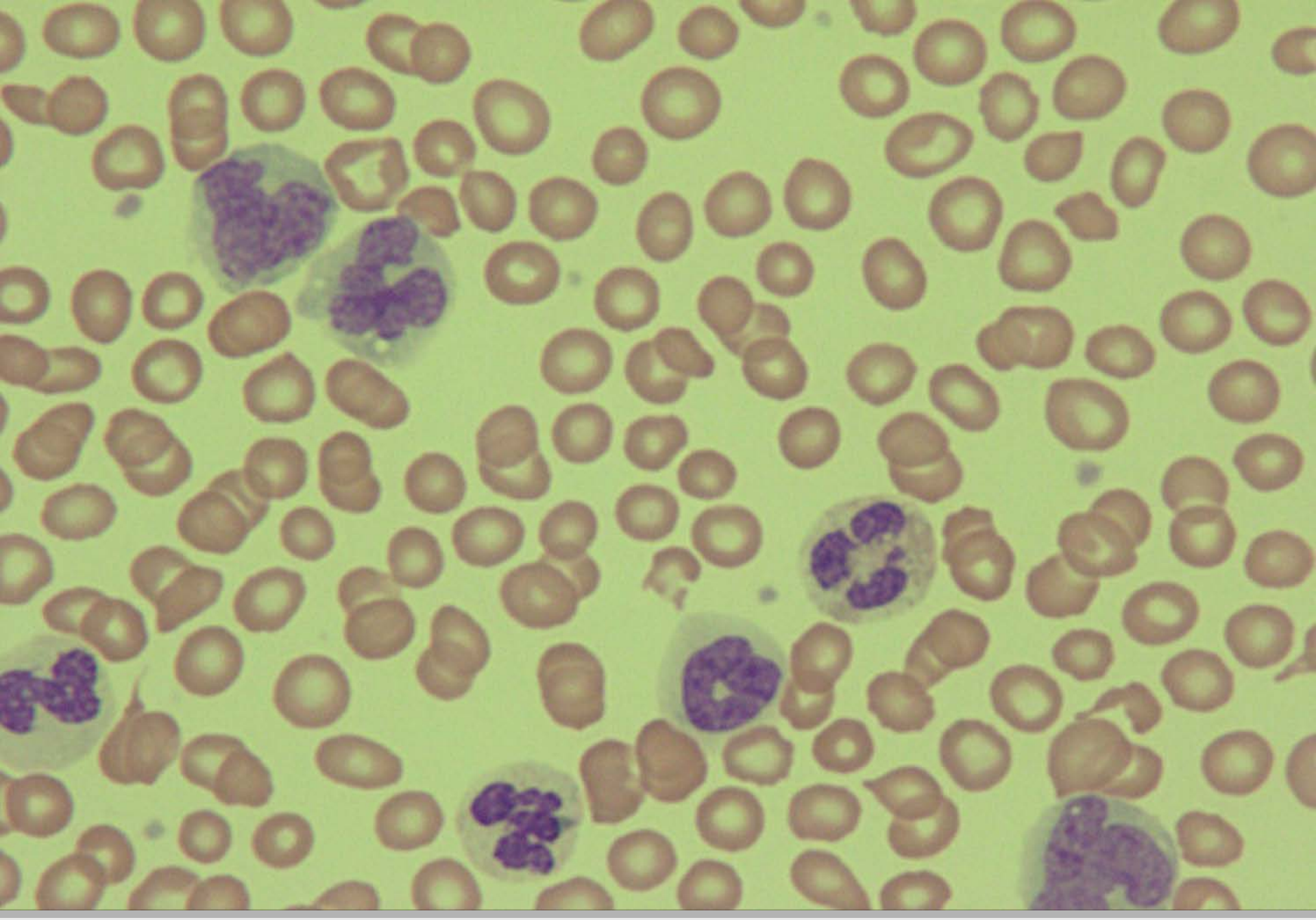
Case 2 Polling Question

What is the most probable diagnosis of this patient's disorder?

- Myelodysplastic syndrome
- Chronic myelomonocytic leukemia
- Chronic myelogenous leukemia
- Benign monocytosis

1. Describe the morphology of the prominent cells present in the images. Do these cells display classic morphology for this cell type?

2. What additional test(s) can be performed to confirm a diagnosis?



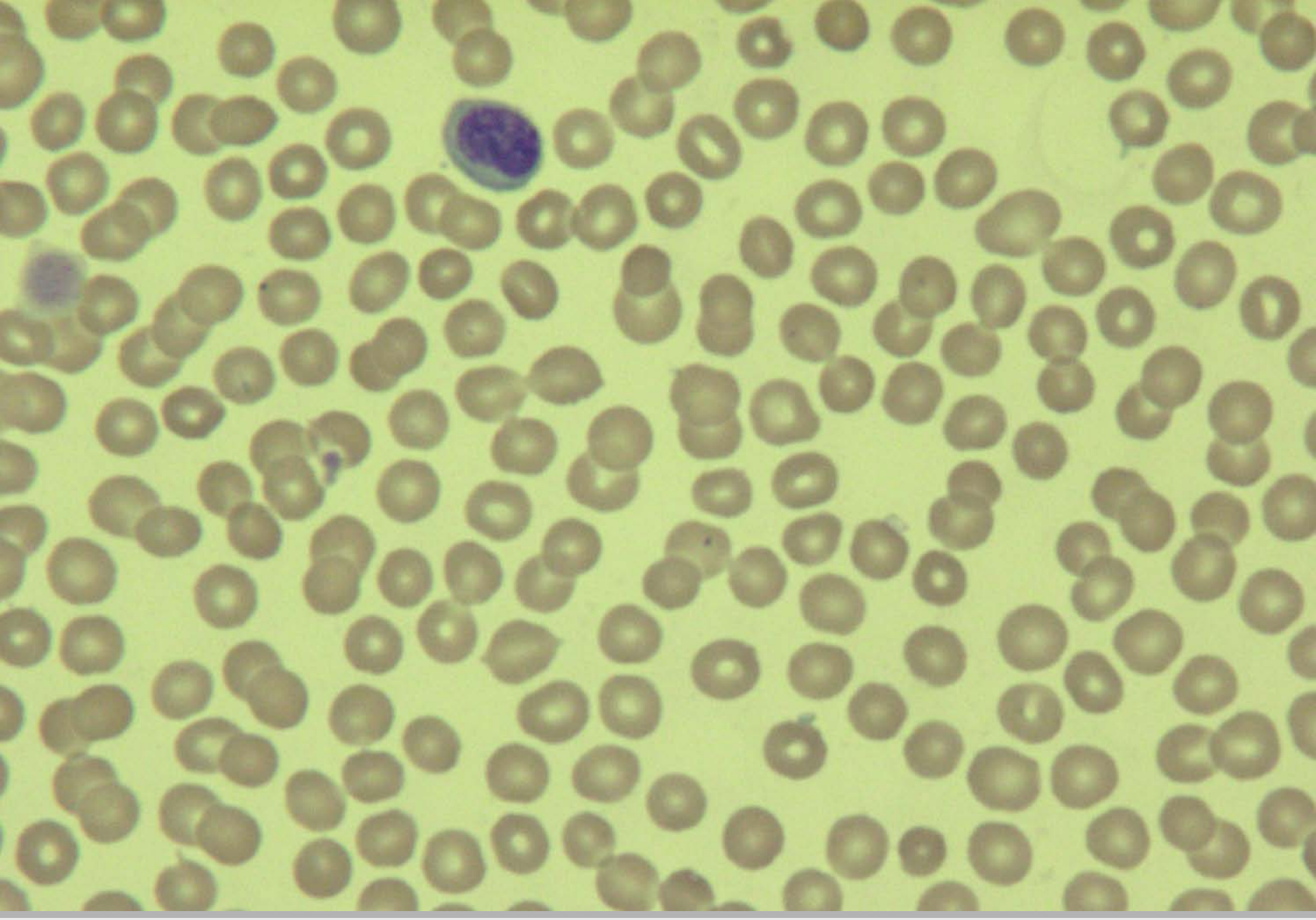
Case 4

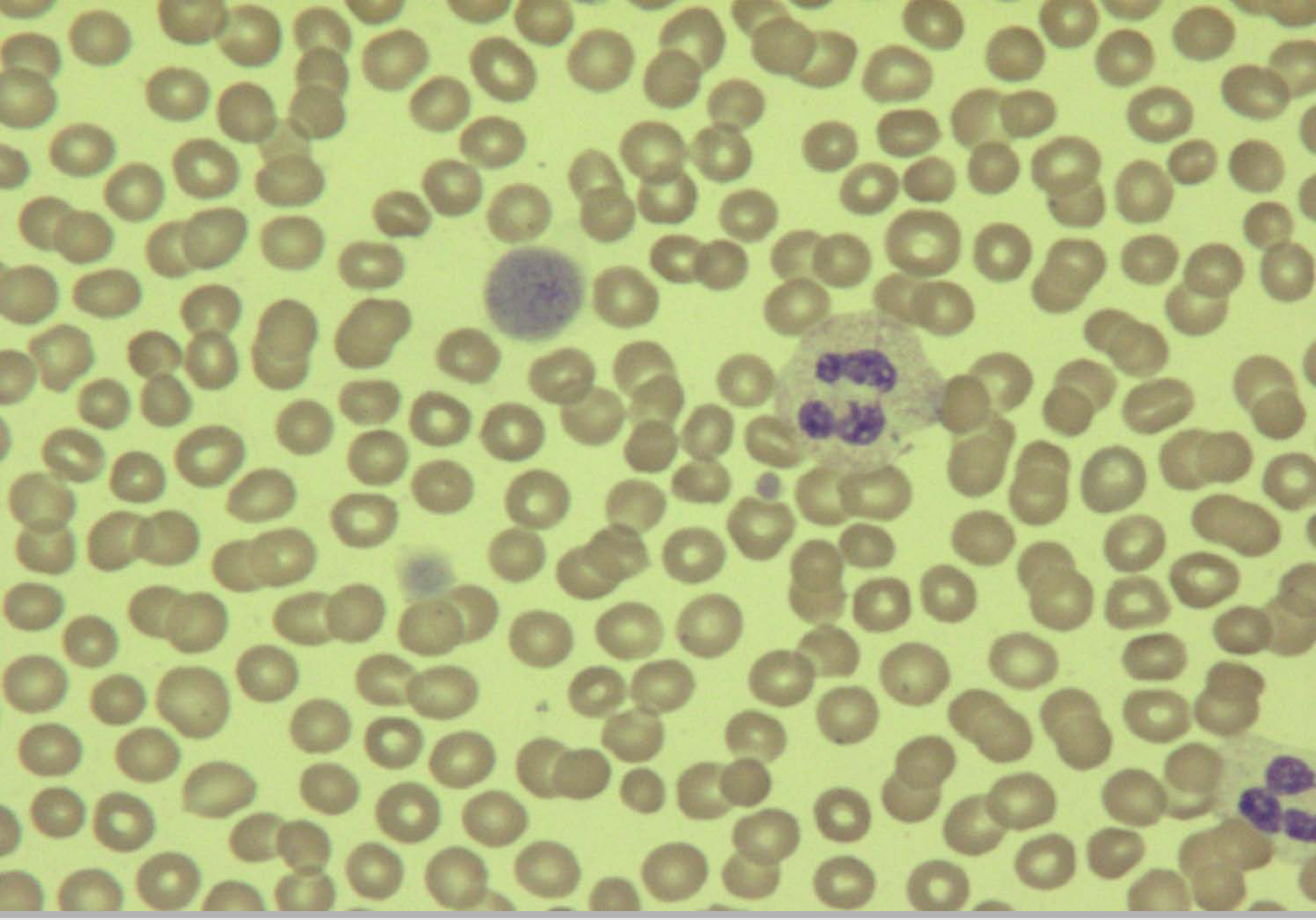
A Caucasian male in his early thirties presented at the Emergency Room with a nosebleed that could not be controlled. He reported that similar episodes of epistaxis occurred throughout his childhood. Once, when he was a toddler, his parents panicked when mucosal bleeding became so severe it could not be stopped. They took him to the hospital where he received a blood transfusion.

Case 4 (Continued)

He did not need any transfusions in high school, but he was not permitted to play any contact sports. His bleeding episodes resumed after high school and he has been transfusion-dependent ever since, though only platelets are usually transfused now. In one year, he received five transfusions to support an uncontrolled bleeding event. The family history is negative and no other relatives are affected. A CBC showed the following:

WBC	$9.6x10^{9}/L$
RBC	$5.2x10^{12}/L$
Hgb	15.0 g/dl
Hct	46.1%
MCV	90 fl
MCH	32.3 pg
MCHC	33%
Plts	$2.0x10^{9}/L$
RDW	12%





Case 4 Polling Question

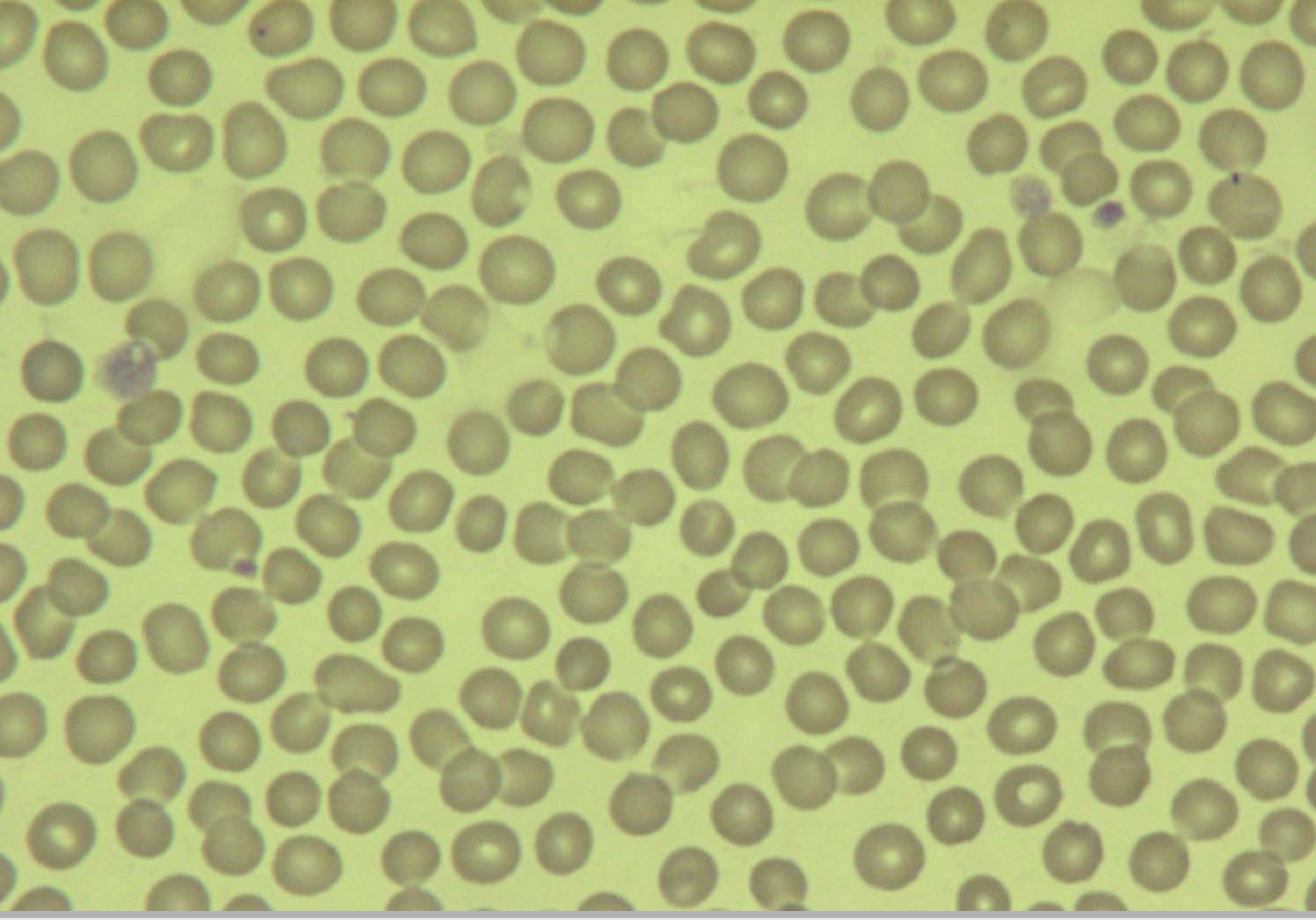
What are the abnormal findings seen in the images of the peripheral blood?

- Thrombocytopenia and large platelets
- Thrombocytopenia and normal platelets
- Anisocytosis and poikilocytosis
- Microcytosis and hypochromia

1. What is the underlying defect that results in this condition?

2. What test can be performed to confirm the diagnosis?

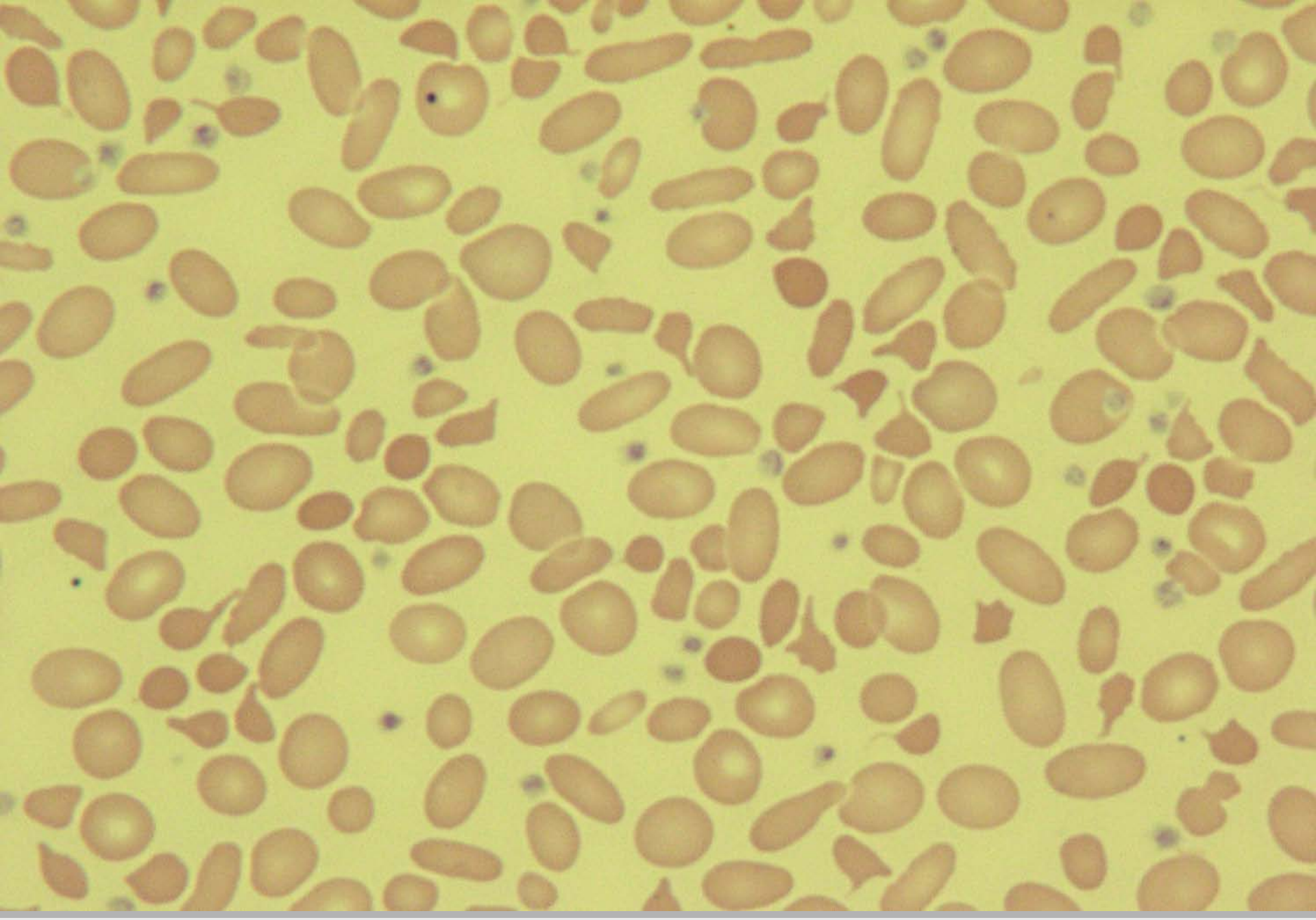
3. What is the explanation for a negative family history of this condition?

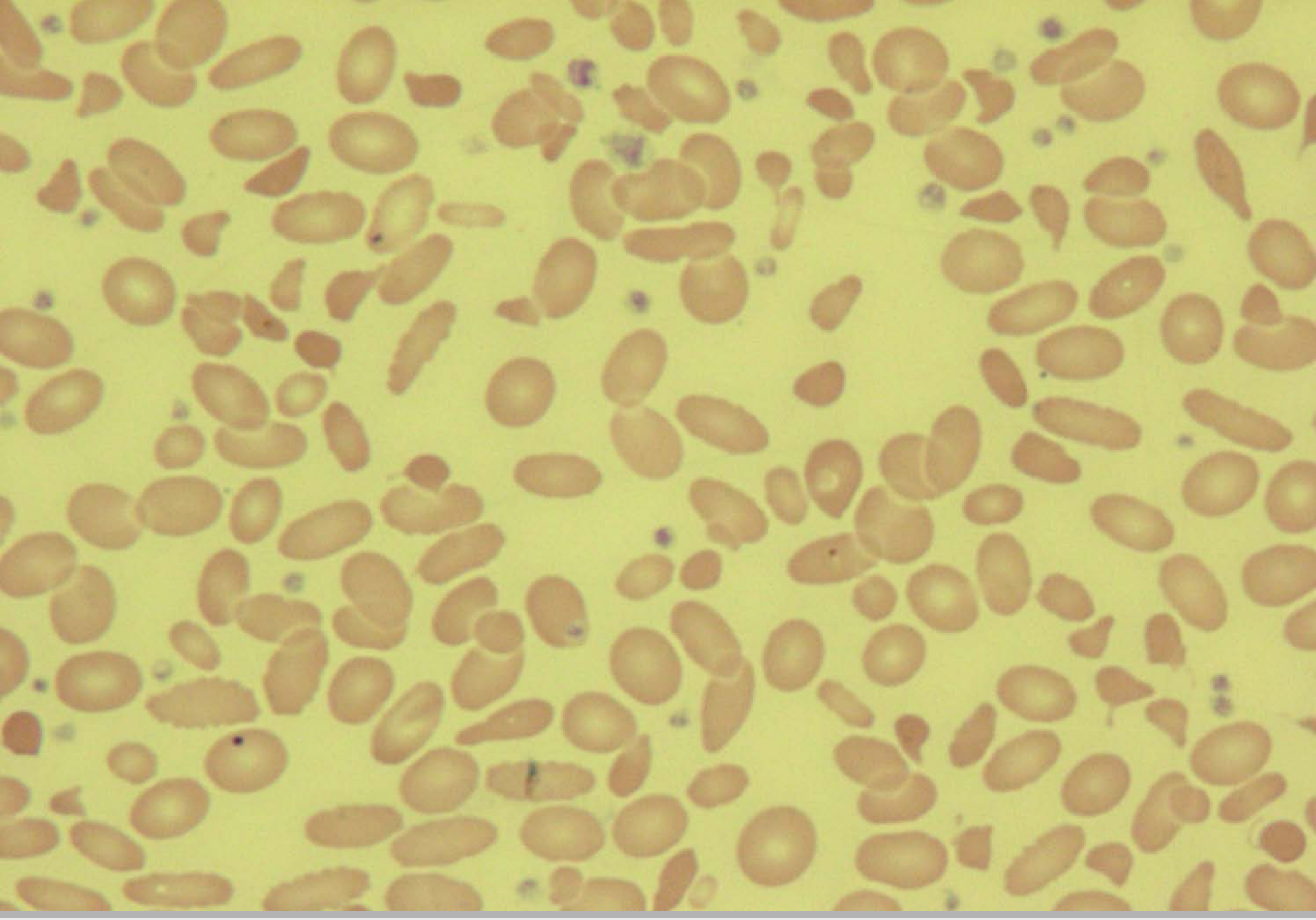


Case 7

An 8-year-old African-American girl was brought to her physician for evaluation of right upper quadrant pain. She has a lifelong history of hemolytic anemia. A CBC was performed and the results are as follows:

WBC	$8.2x10^{9}/L$
RBC	$4.3x10^{12}/L$
Hgb	10.7 g/dl
Hct	29.2%
MCV	67.9 fl
MCH	24.8 pg
MCHC	36.6%
Plts	$480x10^{9}/L$
RDW	16.2%

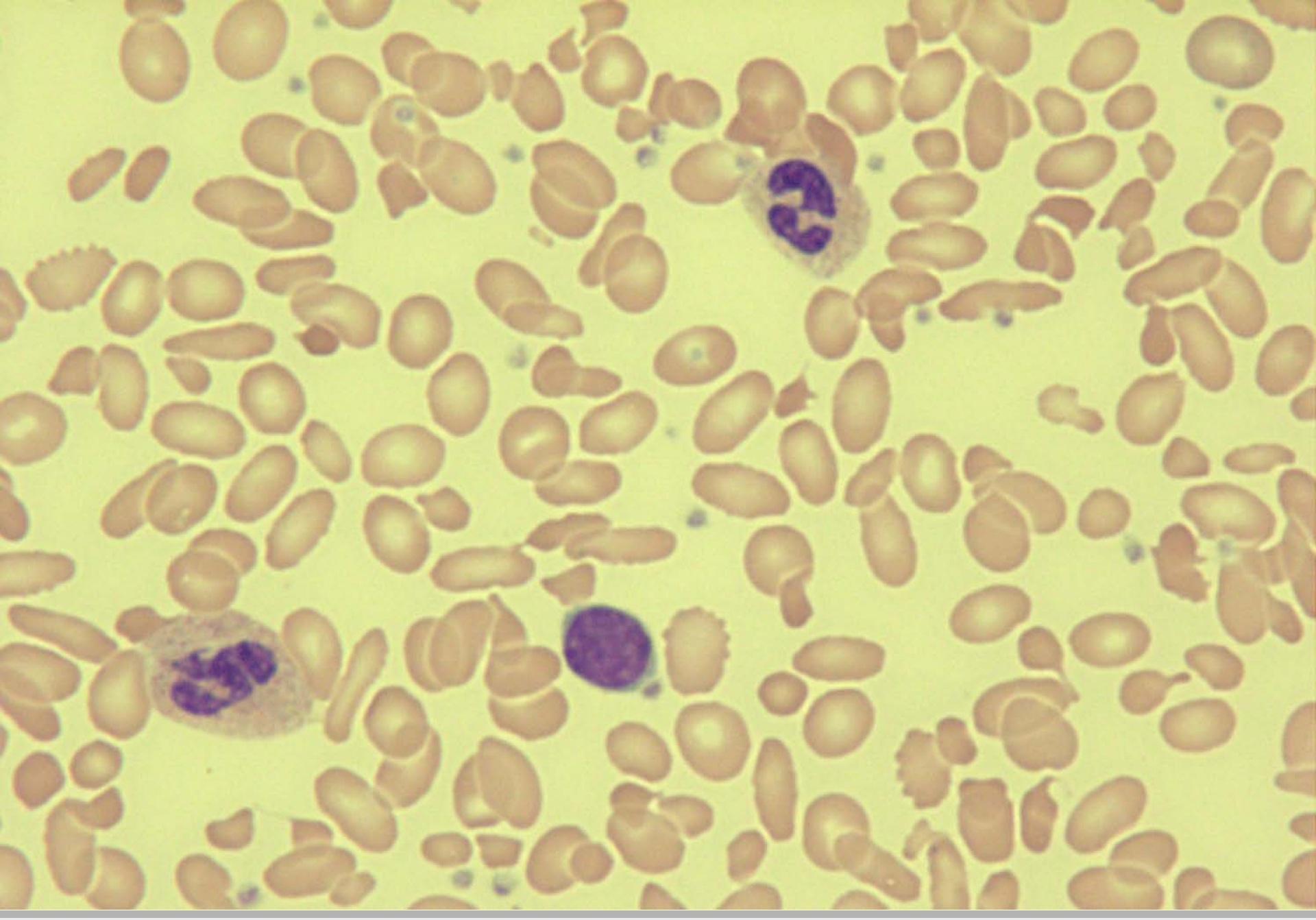




Case 7 Polling Question

Which of the following is the most likely explanation of this child's condition?

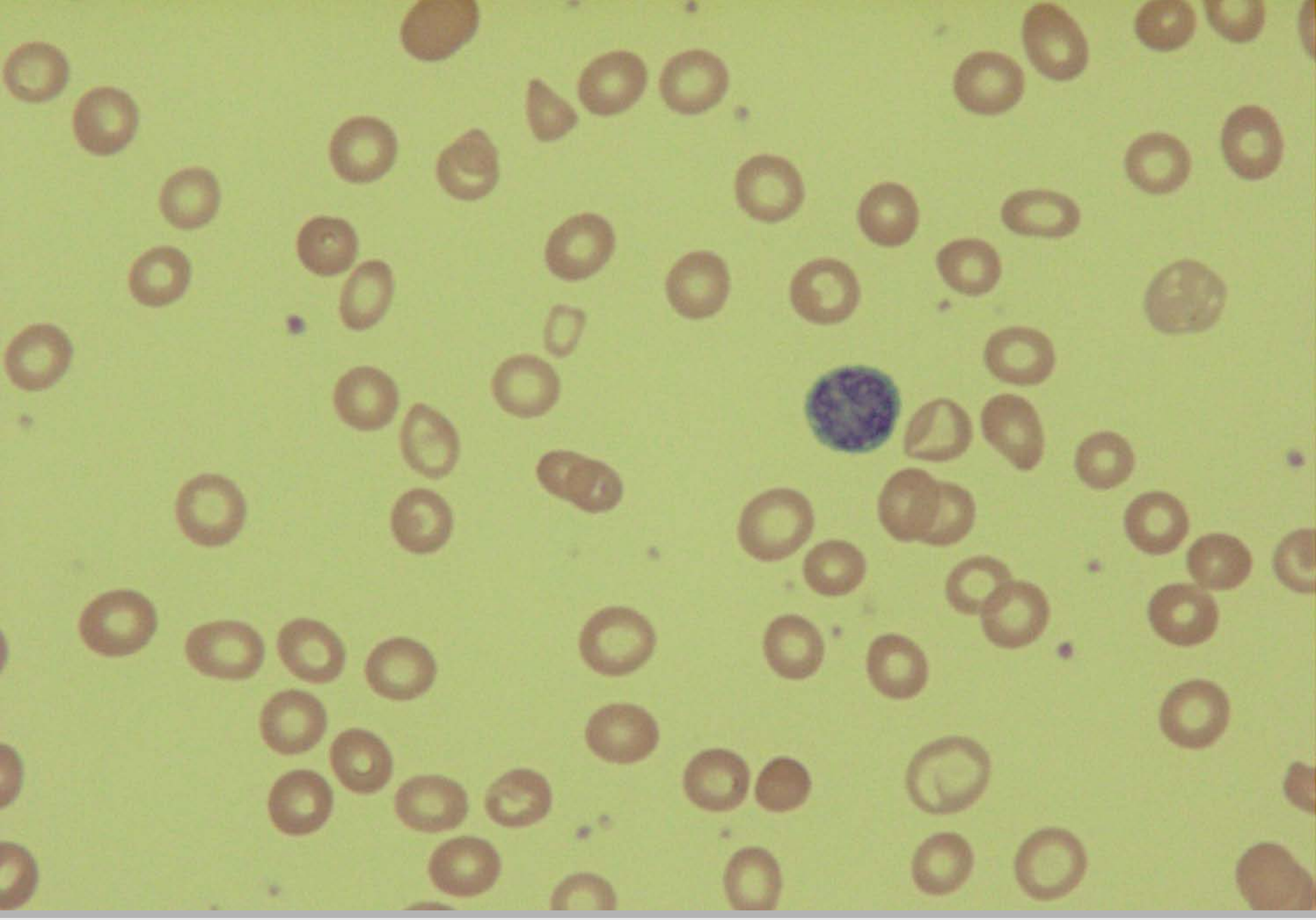
- Hereditary spherocytosis
- Hemolytic uremic syndrome
- Hereditary elliptocytosis
- Hereditary pyropoikilocytosis

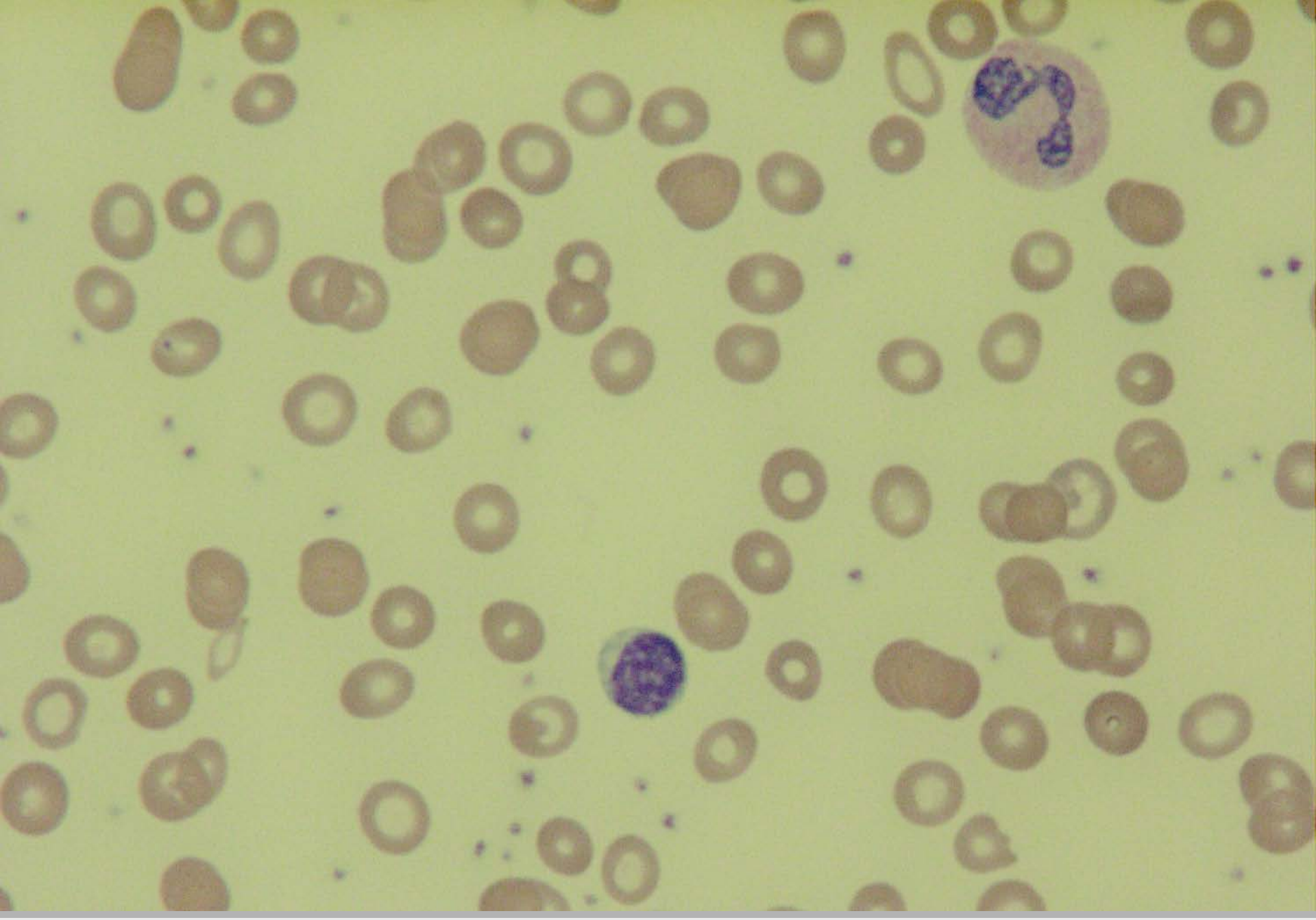


Case 8

A 28-year-old man suffers from persistent and chronic diarrhea of approximately two-months duration. He has also experienced abdominal cramps, fatigue, and weight loss. He is a medical laboratory scientist and performs a CBC as a first step in the evaluation of his disorder.

WBC	$3.5x10^{9}/L$
RBC	$5.4x10^{12}/L$
Hgb	14.0 g/dl
Hct	42.2%
MCV	74.8 fl
MCH	24.8 pg
MCHC	33.1%
Plts	$304x10^{9}/L$
RDW	14.5%

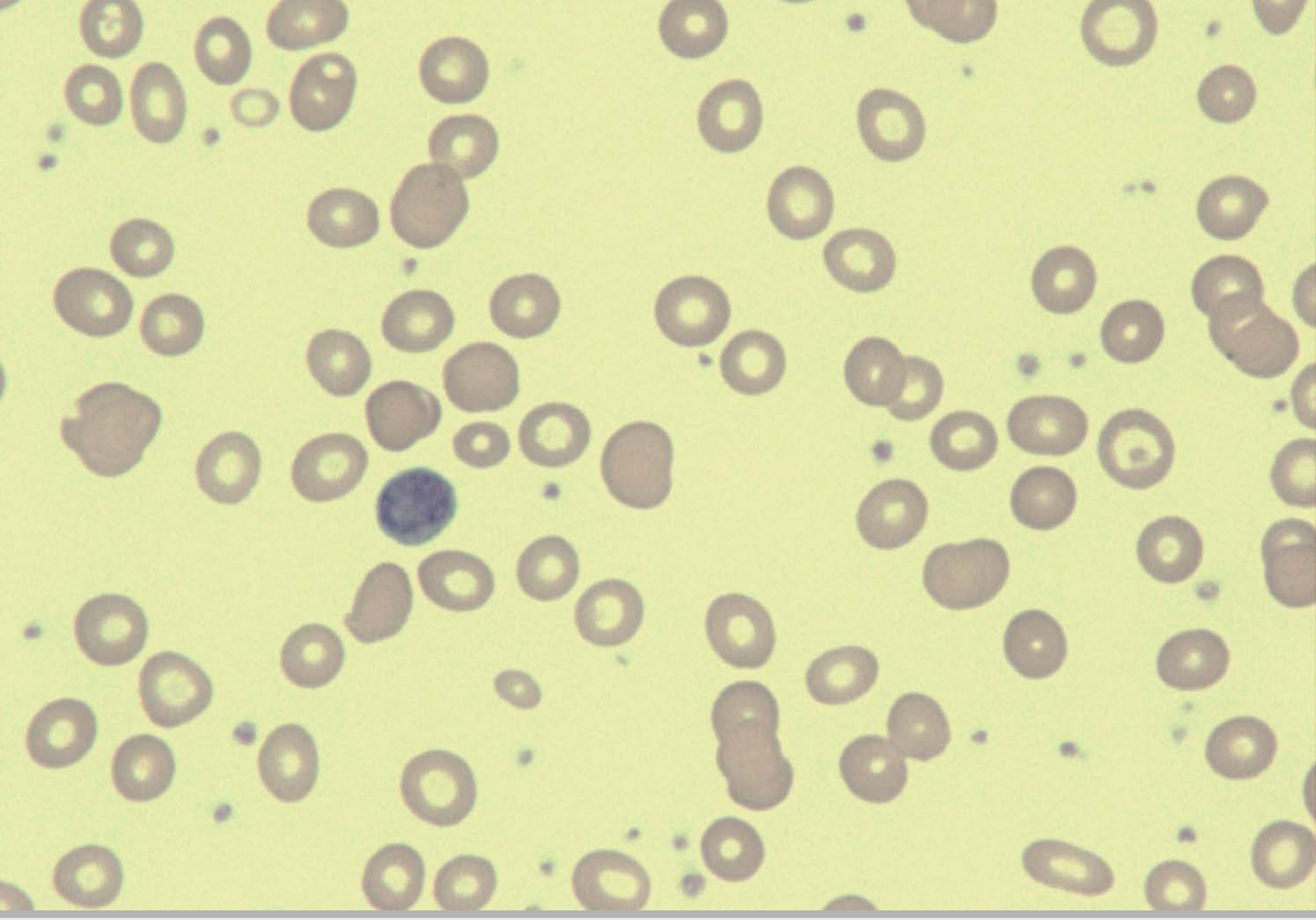




Case 8 Polling Question

What is the most probable diagnosis of this man's disorder?

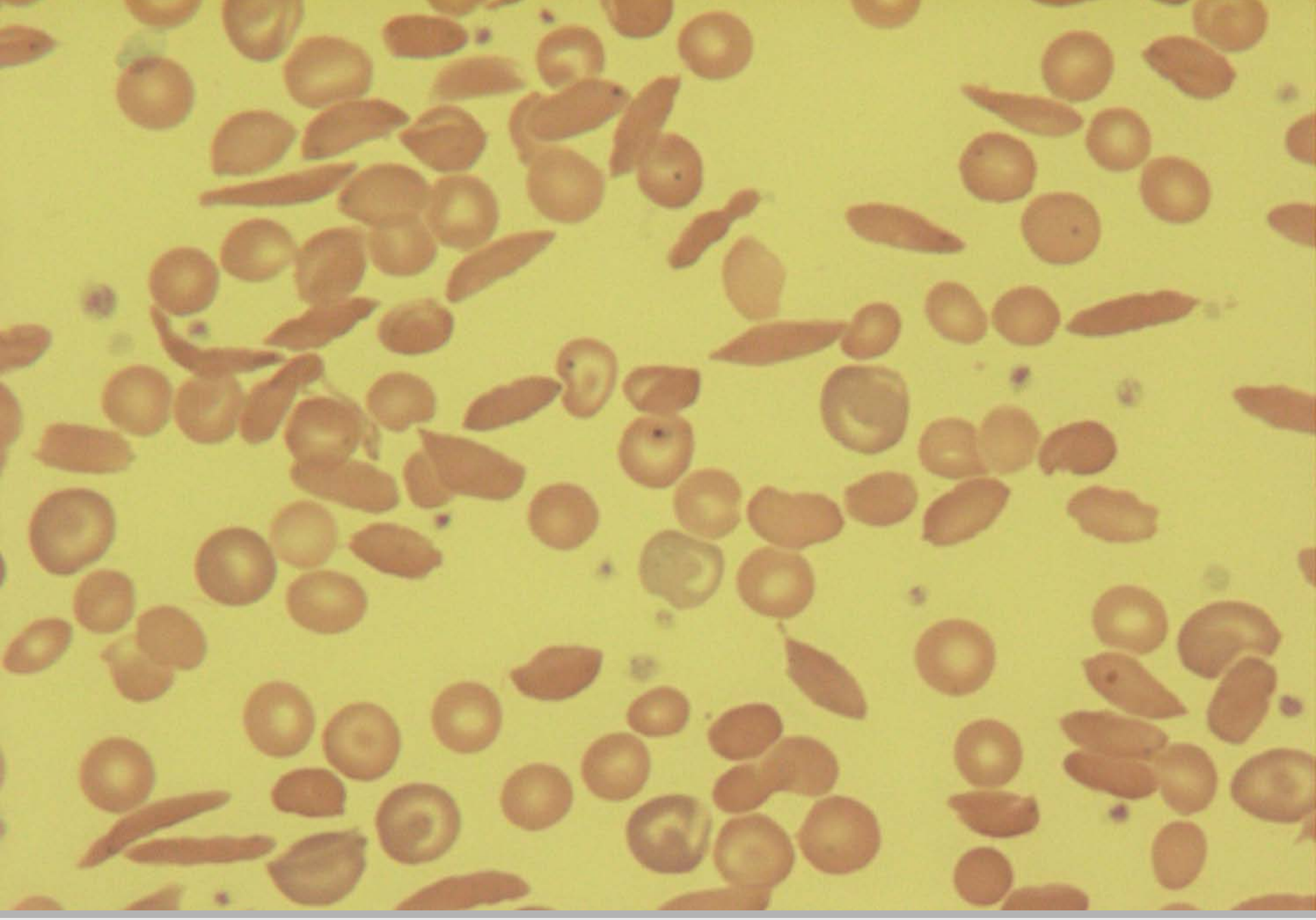
- Lead poisoning
- Anemia of chronic disease
- Iron deficiency anemia
- Heterozygous beta thalassemia

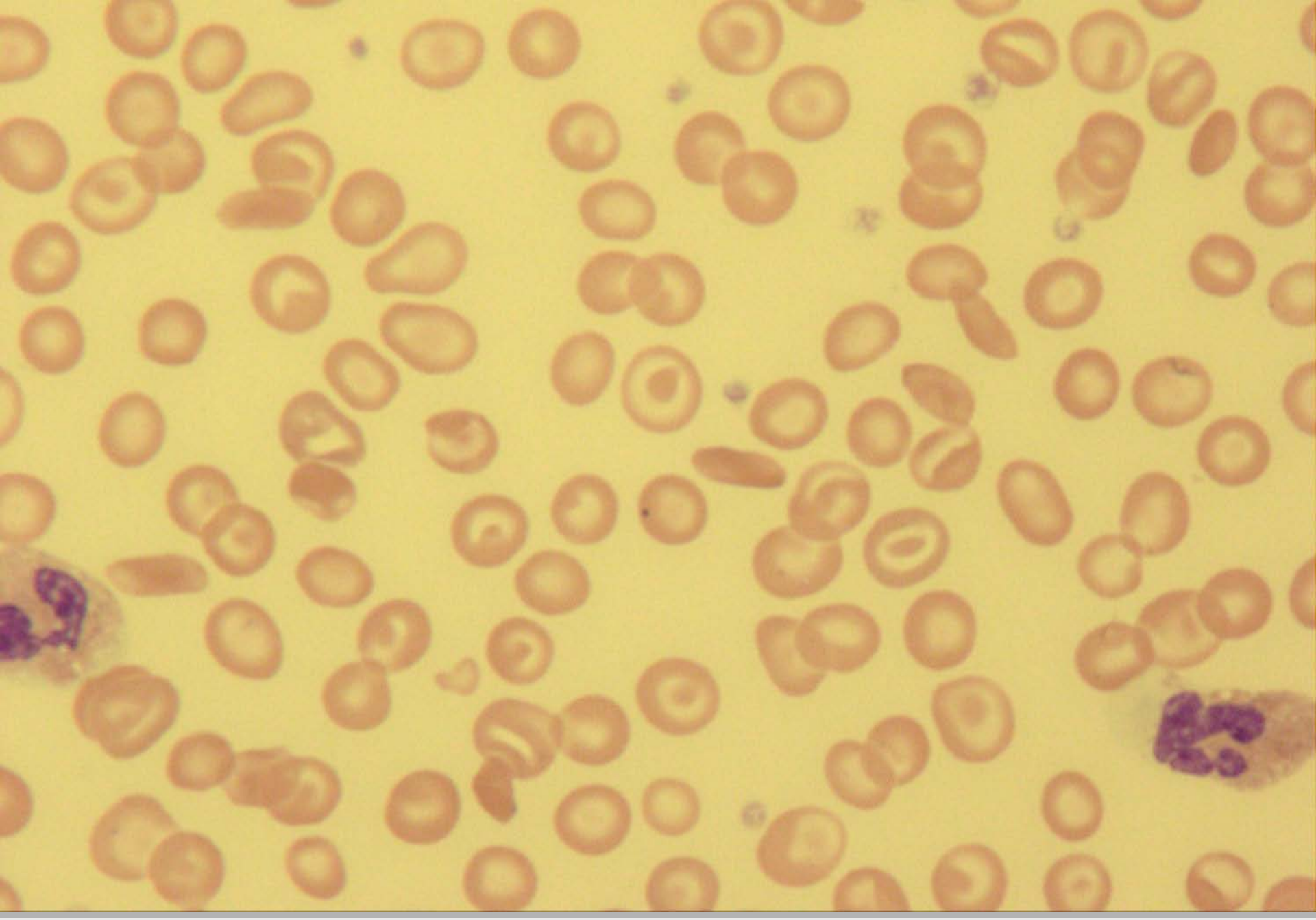


Case 9

A 33-year-old female from Guyana has experienced chronic low-level bone and joint pain all her life. At times, she is also so tired and weak she can not get out of bed in the morning. These episodes of extreme weakness can last for several days. She visits her physician for a routine evaluation of her condition. Results of a CBC are as follows:

WBC	$17.5x10^{9}/L$
RBC	$2.55x10^{12}/L$
Hgb	7.2 g/dl
Hct	23.5%
MCV	89.5 fl
MCH	28.0 pg
MCHC	30.6%
Plts	$250x10^{9}/L$
RDW	18.1%



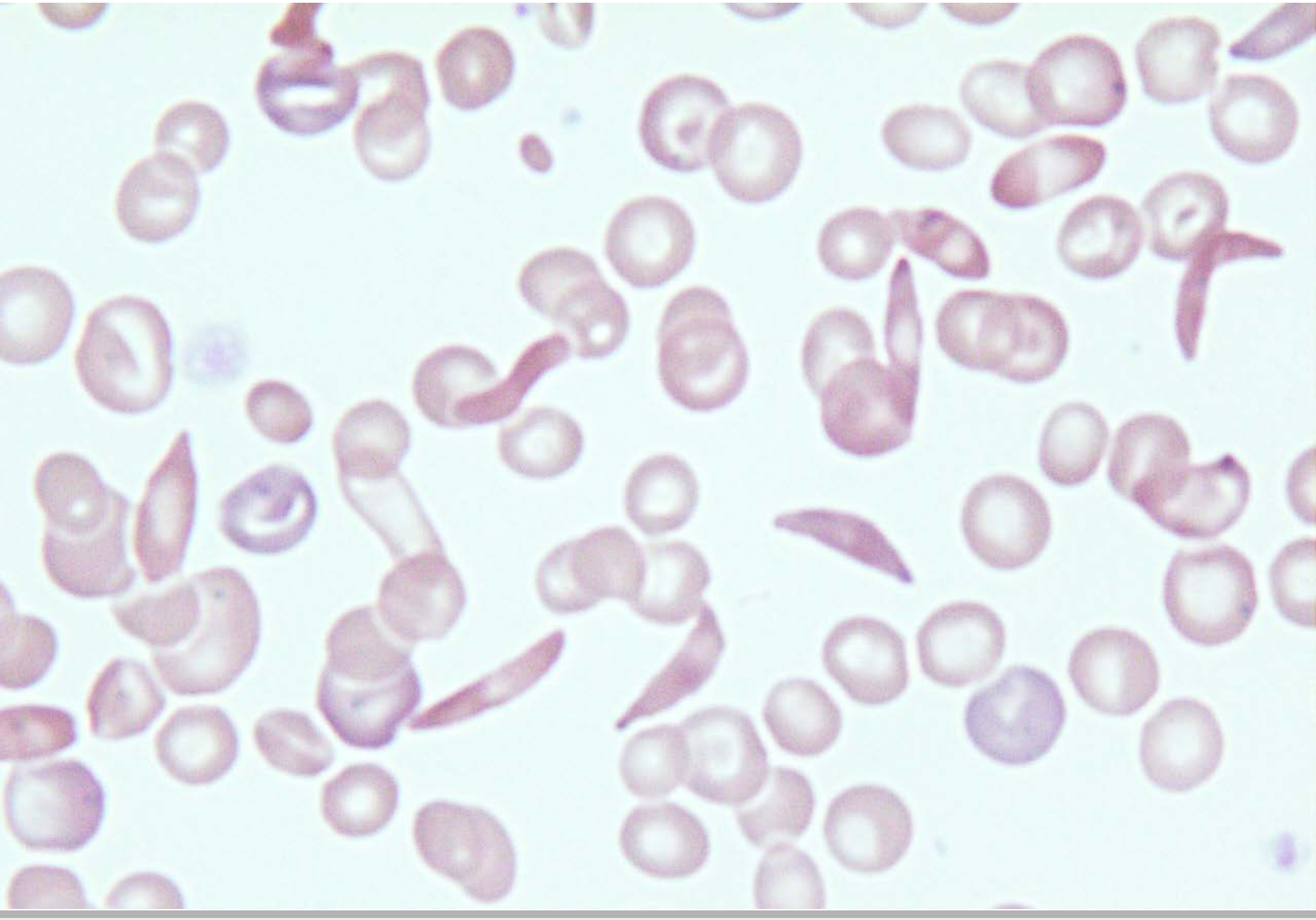


Case 9 Polling Question

What is the most clinically significant RBC abnormality present?

- Elliptocytes
- Sickle cells
- Polychromasia
- Target cells

What is the relationship between the abnormally shaped erythrocytes and the patient's clinical symptoms?



Summary and Conclusion


Thank You!

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