Anemias en pediatría

Dr. Pinuer
Residente Pediatria HPM

Conflictos de intereses

No poseo conflictos de interés.

Fuentes

Author: Claudio Sandoval, MD
Section Editors: Donald H Mahoney, Jr, MD, Martin I Lorin, MD
Deputy Editor: Carrie Armsby, MD, MPH

Contributor Disclosures

All topics are updated as new evidence becomes available and our peer review process is complete.

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Pediatric Chronic Anemia

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Author: Susumu Inoue, MD
Chief Editor: Max J Coppes, MD, PhD, MBA

Anemias en pediatría

- I parte: Generalidades
- II parte: anemias por disminución de la producción de glóbulos rojos
- III parte: anemias por aumento de la destrucción de glóbulos rojos

Enfrentamiento

- Definición
- Características del paciente
- Evaluación del paciente
- Enfoque diagnóstico

Definición

- Disminución de hematocrito o hemoglobina por debajo del percentil 2.5

Normal values for hemoglobin, hematocrit, and mean corpuscular volume in children

Age			Hemoglobin (g/dL)		Hematocrit (%)		MCV (fL)		
			50th percentile	Lower limit*	50th percentile	Lower limit*	50th percentile	Lower limit*	Upper limit*
1 year¶	Caucasian		12.5	11	37	32	80	71	89
	African American		12	11	36	31	77	63	88
2 to 3 years	Caucasian		12.6	11	37	33	82	74	89
	African American		12	11	36	32	80	64	89
4 to 6 years	Caucasian		12.9	11.7	38	34	84	77	91
	African American		12.5	11	37	33	83	67	91
7 to 10 years	Caucasian		13.5	12	40	35	85	78	91
	African American		12.7	11.2	38	34	84	72	92
11 to 14 years	Caucasian	Female	13.7	12.3	40	36	87	80	94
		Male	14.3	12.6	42	36	87	80	94
	African American	Female	12.9	10.6	38	33	86	71	95
		Male	13.6	11.8	40	35	86	73	95
15 to 18 years	Caucasian	Female	13.7	11.5	40	34	89	81	96
		Male	15.4	13.7	46	40	89	81	96
	African American	Female	12.8	10.7	38	32	87	71	96
		Male	14.9	12.9	44	38	87	75	96

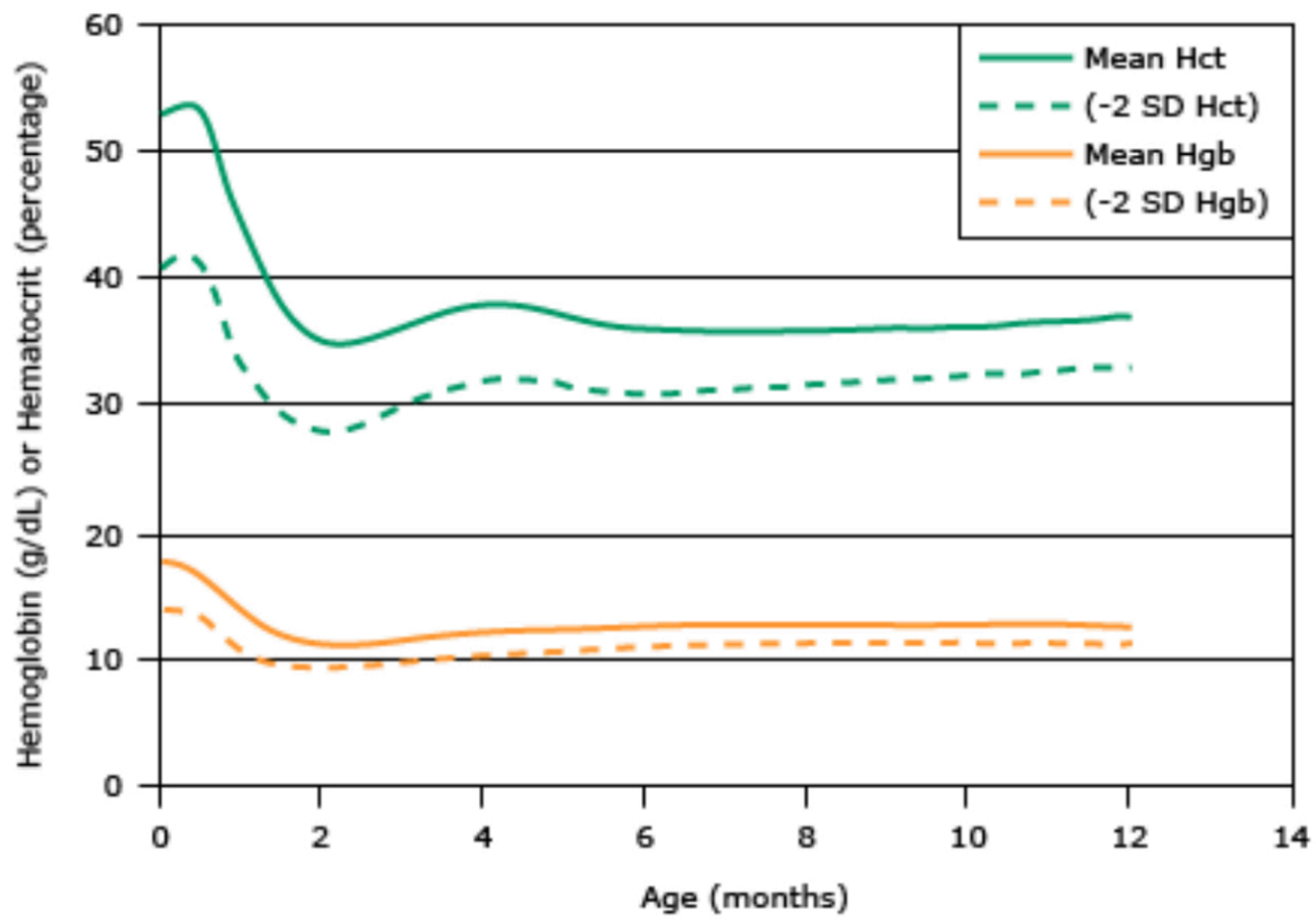
Características del paciente

Edad

- Hct y hb varían mucho según la edad
- En general cada causa tiene una edad típica de presentación

RN a 3 meses

Normal values for hematocrit and hemoglobin during the first year of life in healthy term infants



- Causa más frecuente: fisiológica

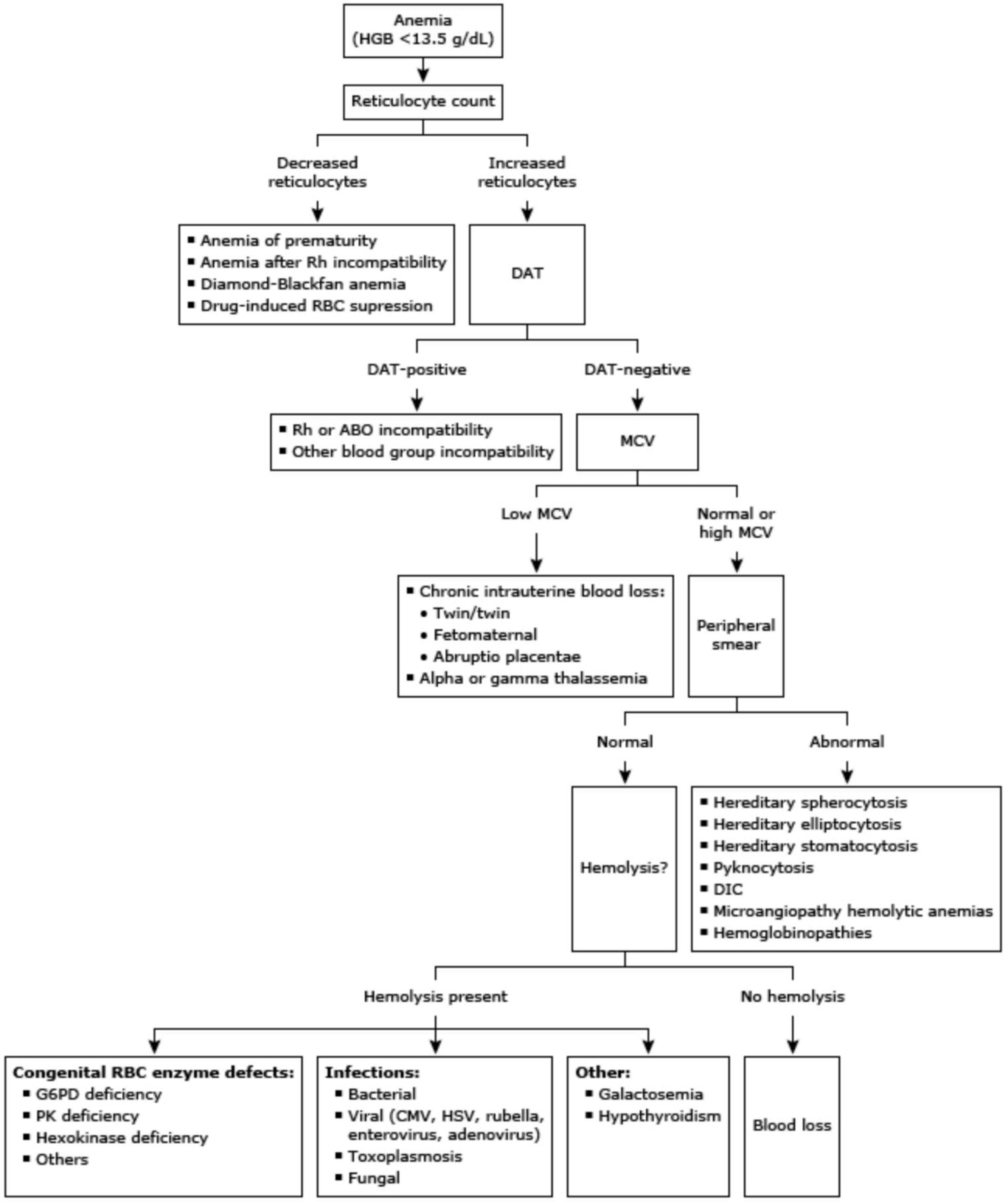
Causas patológicas

- Hb < 13,5 g/L durante el primer mes.
- Hb < 11 g/L
- Signos de hemólisis (ictericia, coluria)
- Síntomas de anemia (irritabilidad, rechazo alimentario)

Causas patológicas

- Hemorragia
- Incompatibilidad Rh y abo
- Infección congénita
- Sd. Transfusión feto-fetal
- Anemias hemolíticas congénitas
  (esferocitosis hereditaria, déficit G6PD)

Diagnostic approach to anemia in the newborn



3 a 6 M

- Más frecuente hemoglobinopatías (células falciformes, talasemia)
- El déficit de hierro es raro.

Lactantes > 6M, niños y adolescentes

- Predominan las causas adquiridas.
- Lo más frecuente es por déficit de hierro.

Sexo

- Déficit G6PD y anemia sideroblastica relacionada al cromosoma X
- Más frecuente en hombres
- Niñas postmenárquicas, considerar sangrado menstrual excesivo

Raza

- Células falciformes más frecuente en latinos
- Talasemias más frecuente en mediterráneos y Sudeste asiático
- D. G6PD judíos, filipinos, kurdos, afroamericanos

Evaluación

Anamnesis

Symptoms	▪ Changes in urine color, scleral icterus, or jaundice suggest a hemolytic disorder ▪ Bloody stools, hematemesis, severe epistaxis, or severe menstrual bleeding suggest anemia from blood loss and/or iron deficiency ▪ Infectious symptoms (eg, fevers, cough) suggest an infectious etiology of anemia
History of anemia	▪ Prior episodes of anemia suggest an inherited disorder ▪ Anemia in a patient with previously documented normal CBC suggests an acquired etiology ▪ Hyperbilirubinemia in the newborn period suggests a hemolytic etiology; microcytosis at birth suggests chronic intrauterine blood loss or thalassemia
Underlying medical conditions	▪ Underlying renal disease, malignancy, or inflammatory/autoimmune disorders may be associated with anemia
Drugs and toxin exposure	▪ Anemia following exposure to oxidant drugs or fava beans suggests G6PD deficiency ▪ Exposure to paint, home renovations, or use of imported or glazed ceramics suggest lead toxicity
Family history	▪ Family members with jaundice, gallstones, or splenomegaly suggests an inherited hemolytic anemia
Dietary history	In infants and young children, iron deficiency is suggested by the following: ▪ Use of low iron formula ▪ Introduction of unmodified cow's milk before the age of 1 year ▪ Excessive milk intake (>24 ounces per day) ▪ Poor intake of iron-rich foods (meats or fortified infant cereal)
Travel history	▪ Travel to/from areas of endemic infection suggests infectious etiology such as malaria or tuberculosis
Developmental history	▪ Developmental delay is associated with iron deficiency, vitamin B12/folic acid deficiency, and Fanconi anemia

Examen físico

Physical findings as clues to the etiology of anemia in children

Finding	Possible etiology
Skin	
Hyperpigmentation	Fanconi anemia
Petechiae, purpura	Autoimmune hemolytic anemia with thrombocytopenia, hemolytic-uremic syndrome, bone marrow aplasia, bone marrow infiltration
Carotenemia	Suspect iron deficiency in infants
Jaundice	Hemolytic anemia, hepatitis, and aplastic anemia
Cavernous hemangioma	Microangiopathic hemolytic anemia
Ulcers on lower extremities	Sickle cell disease (S and C hemoglobinopathies), thalassemia
Facies	
Frontal bossing, prominence of the malar and maxillary bones	Congenital hemolytic anemias, thalassemia major, severe iron deficiency

Eyes	
Microcornea	Fanconi anemia
Tortuosity of the conjunctival and retinal vessels	Sickle cell disease (S and C hemoglobinopathies)
Microaneurysms of retinal vessels	Sickle cell disease (S and C hemoglobinopathies)
Cataracts	Glucose-6-phosphate dehydrogenase deficiency, galactosemia with hemolytic anemia in newborn period
Vitreous hemorrhages	S hemoglobinopathy
Retinal hemorrhages	Chronic, severe anemia
Edema of the eyelids	Infectious mononucleosis, exudative enteropathy with iron deficiency, renal failure
Blindness	Osteopetrosis
Mouth	
Glossitis	Vitamin B12 deficiency, iron deficiency
Angular stomatitis	
Chest	
Unilateral absence of the pectoral muscles	Poland syndrome (increased incidence of leukemia)
Shield chest	Diamond-Blackfan syndrome
Hands	
Triphalangeal thumbs	Red cell aplasia
Hypoplasia of the thenar eminence	Fanconi anemia
Spoon nails	Iron deficiency
Spleen	
Enlargement	Congenital hemolytic anemia, leukemia, lymphoma acute infection, portal hypertension

Laboratorio

Hemograma

- Conteo completo de sangre (información sobre GR y otras series)
- Hb y hto
- Índices de GR (vcm, rdw, hcm)
- Frotis
- Reticulocitos

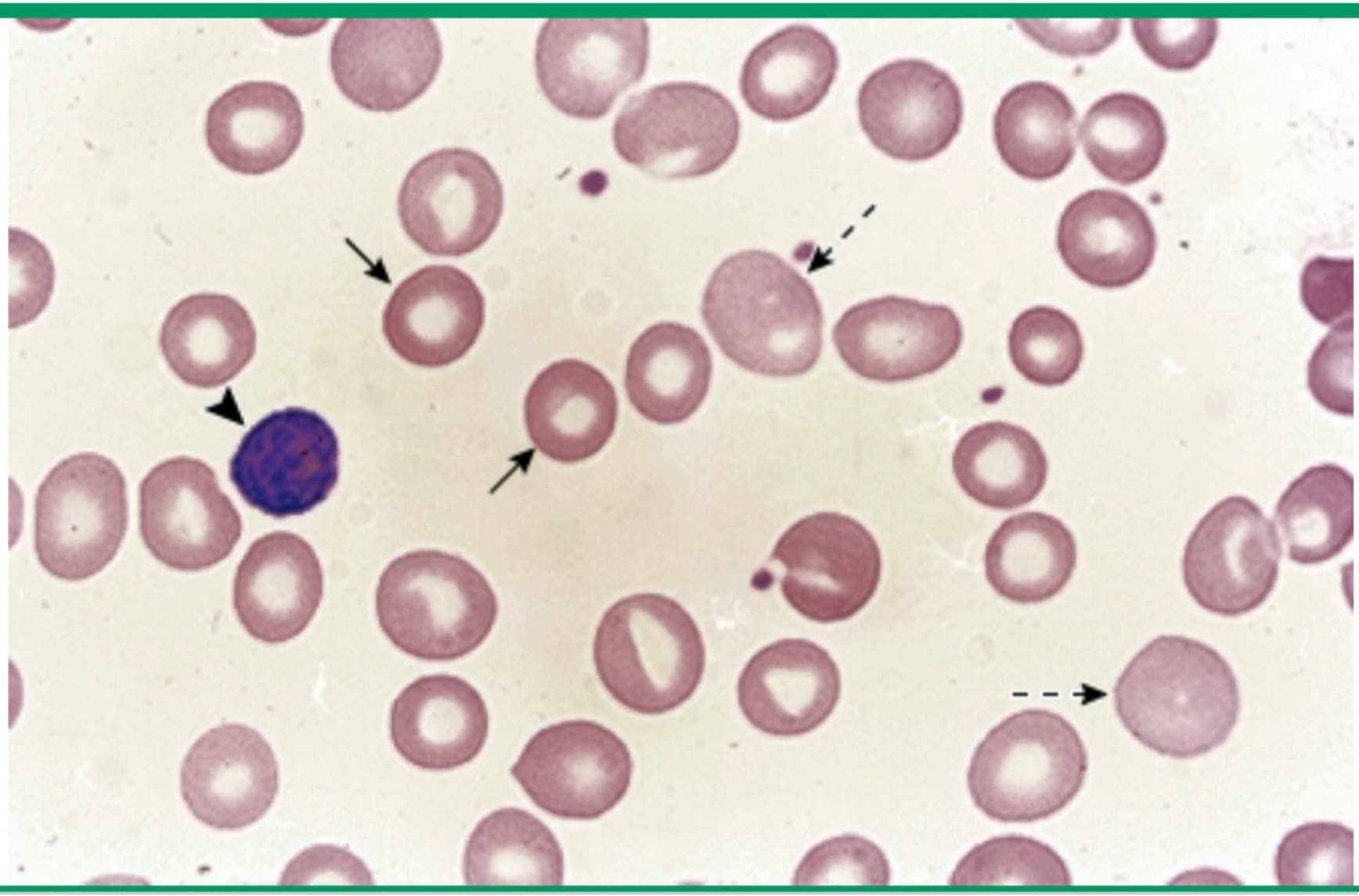
Vcm

- Parámetro automático mide volumen promedio en fentolitros
- Muy útil para clasificar anemias

Anemias según VCM

- Microcitosis: vcm < percentil 2.5. Déficit Fe, talasemia.
- Normocitosis: vcm entre p 2.5- 97.5 anemias hemoliticas, hemorragia, infección, fármacos, enfeemedades cronicas.
- Macrocitosis: vcm > p 97.5 fármacos, déficit vit b12, ac fólico, hipotiroidismo, Enf hepatica, anemia aplastica

Polychromatophilia due to increased reticulocytes



Peripheral blood smear taken from a patient with increased reticulocytes. Unlike mature red cells (arrows), which have central pallor and are the same size as the nucleus of a small lymphocyte (arrowhead), reticulocytes (dashed arrows) are larger, have a blue tint, and lack central pallor because they are not biconcave discs. (Wright-Giemsa stain.)

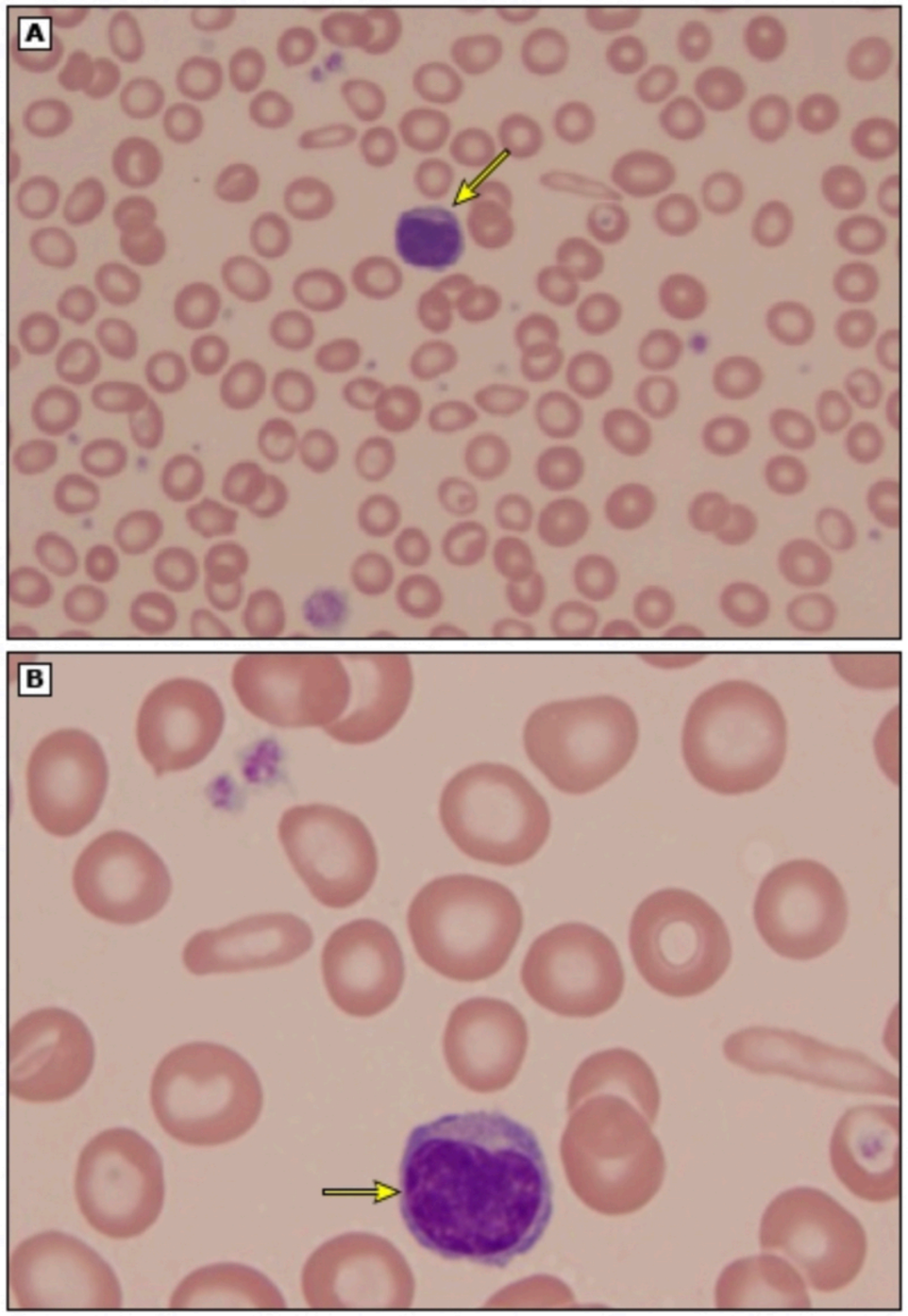
Rdw

- Vn 12-14% varia poco con la edad
- Muy útil para diferenciar déficit fe de talasemia
- Déficit fe cursa con RDW aumentado (anisocitosis) mientras que talasemia t8ene RDW normal

Hcm

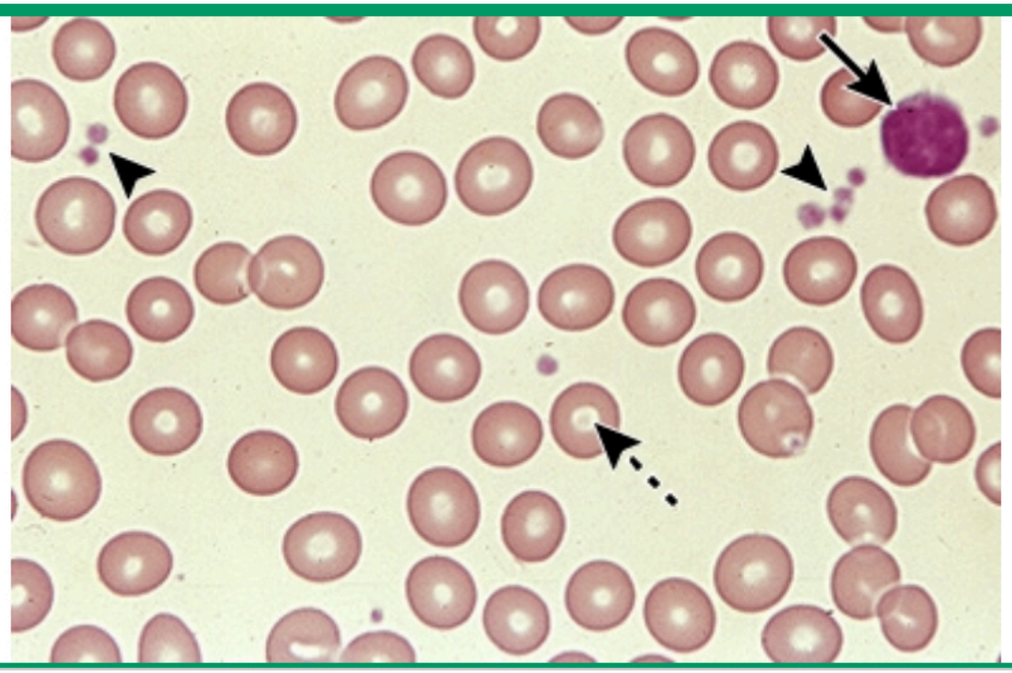
- Índice hb/hto
- Muy útil para clasificar
- Hipocromia hcm < 32 g/dl
- Normocromia hcm 33-34 g/dl
- Hipercomia hcm > 35 g/dl

Peripheral blood smear in iron deficiency anemia showing microcytic, hypochromic red blood cells



The same peripheral blood smear from a patient with iron deficiency is shown at two different magnifications. Small (microcytic) red blood cells are shown, many of which have a thin rim of pink hemoglobin (hypochromia). Occasional "pencil"-shaped cells are also present. A small lymphocyte is shown for size comparison (arrow). Normal red blood cells are similar in size to the nucleus of a small lymphocyte (arrow), and central pallor in normal red blood cells should equal approximately one-third of the cell diameter.

Normal peripheral blood smear

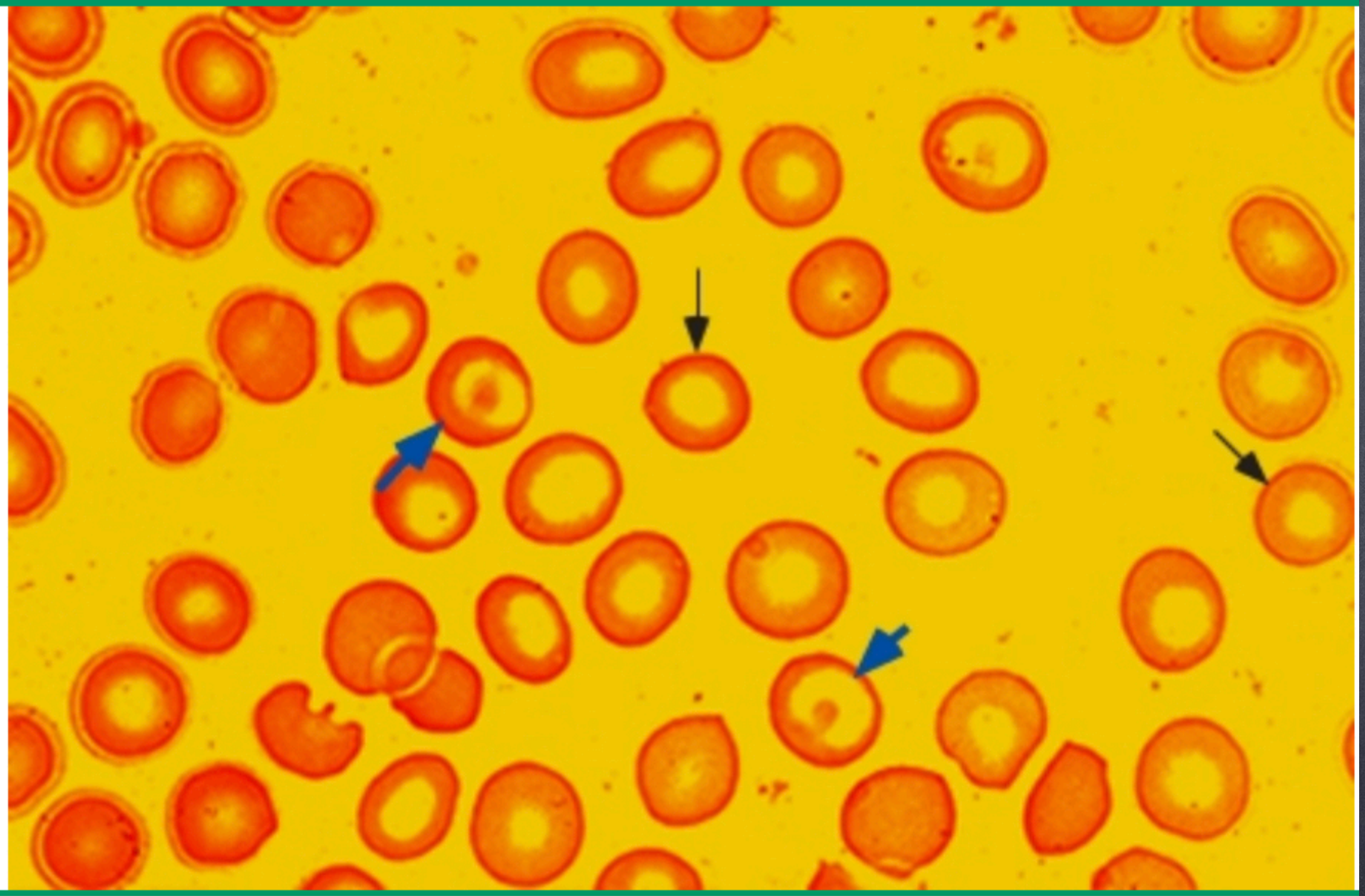


High-power view of a normal peripheral blood smear. Several platelets (arrowheads) and a normal lymphocyte (arrow) can also be seen. The red cells are of relatively uniform size and shape. The diameter of the normal red cell should approximate that of the nucleus of the small lymphocyte; central pallor (dashed arrow) should equal one-third of its diameter.

Frotis

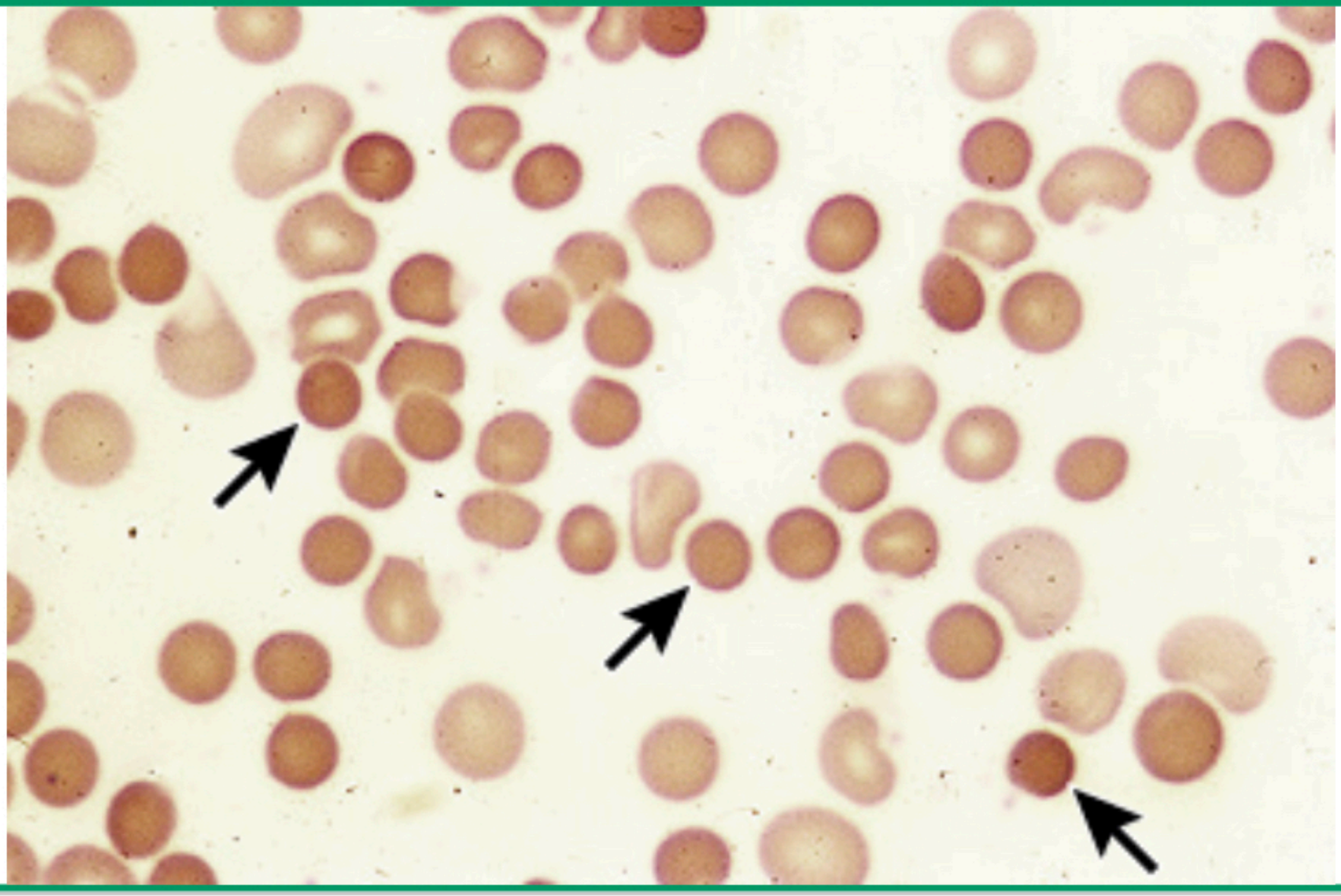
- Fundamental, en presencia de parámetros automatizados normales, se pueden detectar células anormales que dan el diagnóstico

Beta thalassemia trait



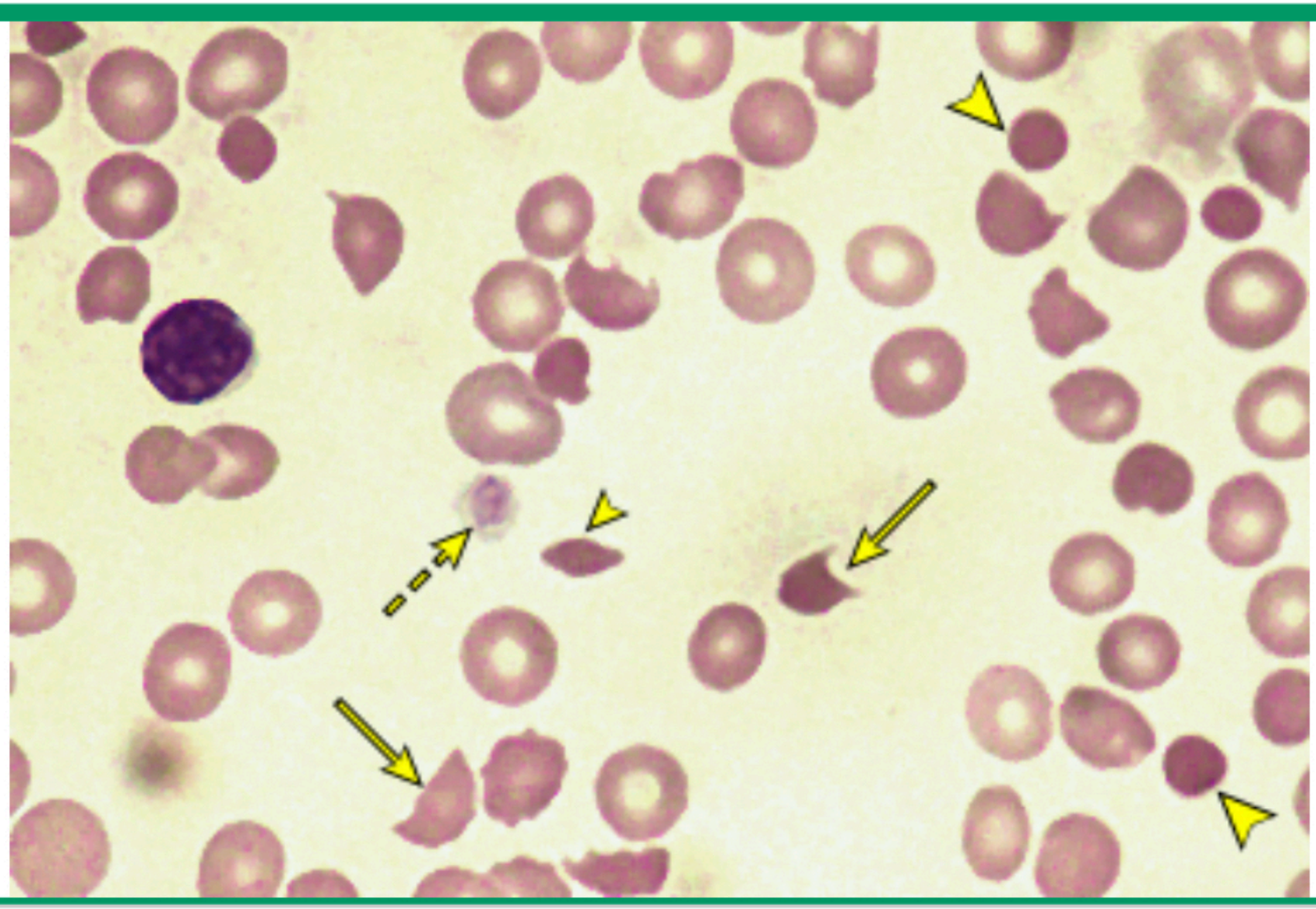
Peripheral smear from a patient with beta thalassemia trait. The field shows numerous hypochromic and microcytic red cells (thin arrows), some of which are also target cells (blue arrows).

Spherocytes



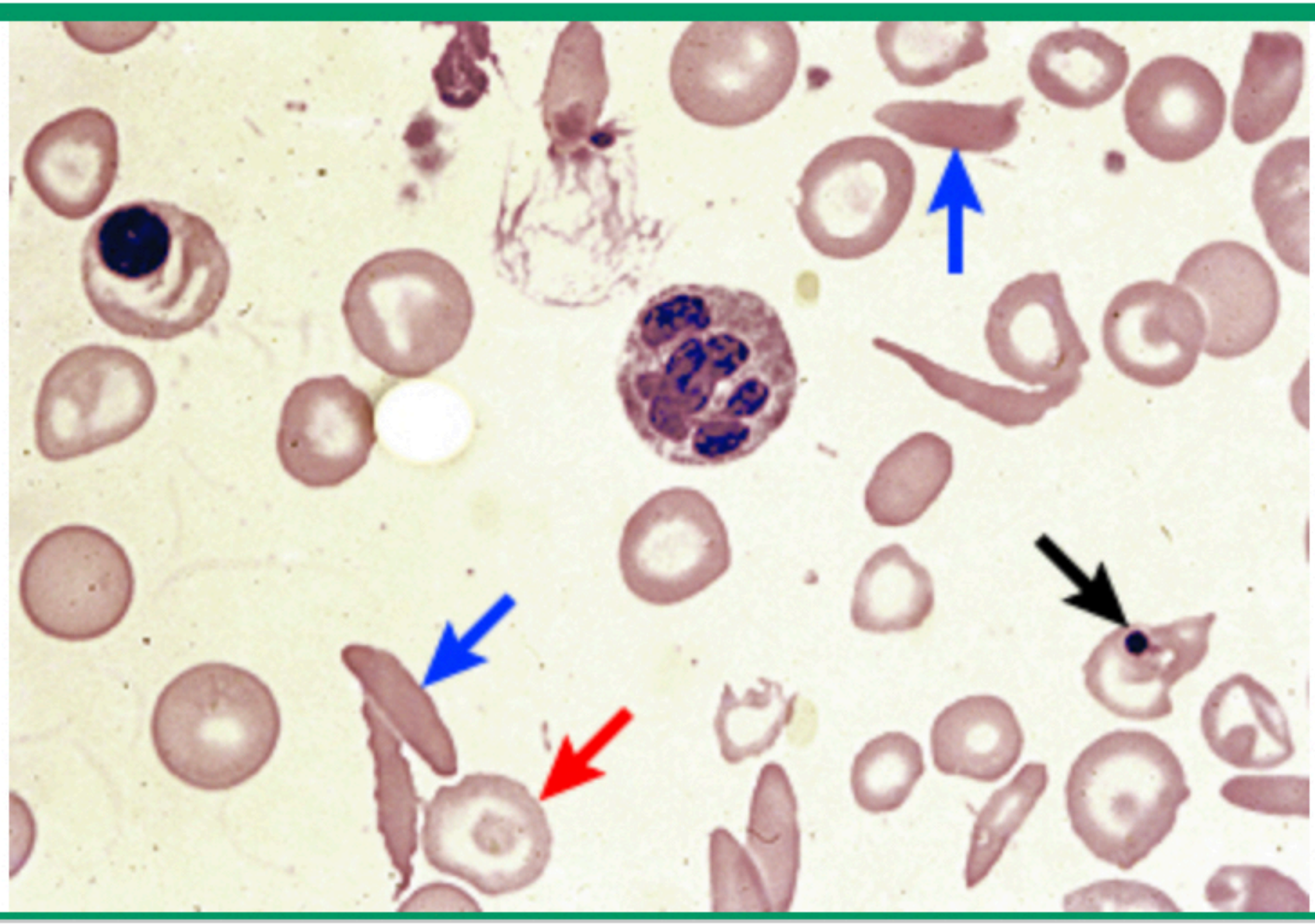
Peripheral blood smear shows multiple spherocytes, which are small, dark, dense hyperchromic red cells without central pallor (arrows). These findings are compatible with hereditary spherocytosis or autoimmune hemolytic anemia.

Peripheral smear in microangiopathic hemolytic anemia showing presence of schistocytes



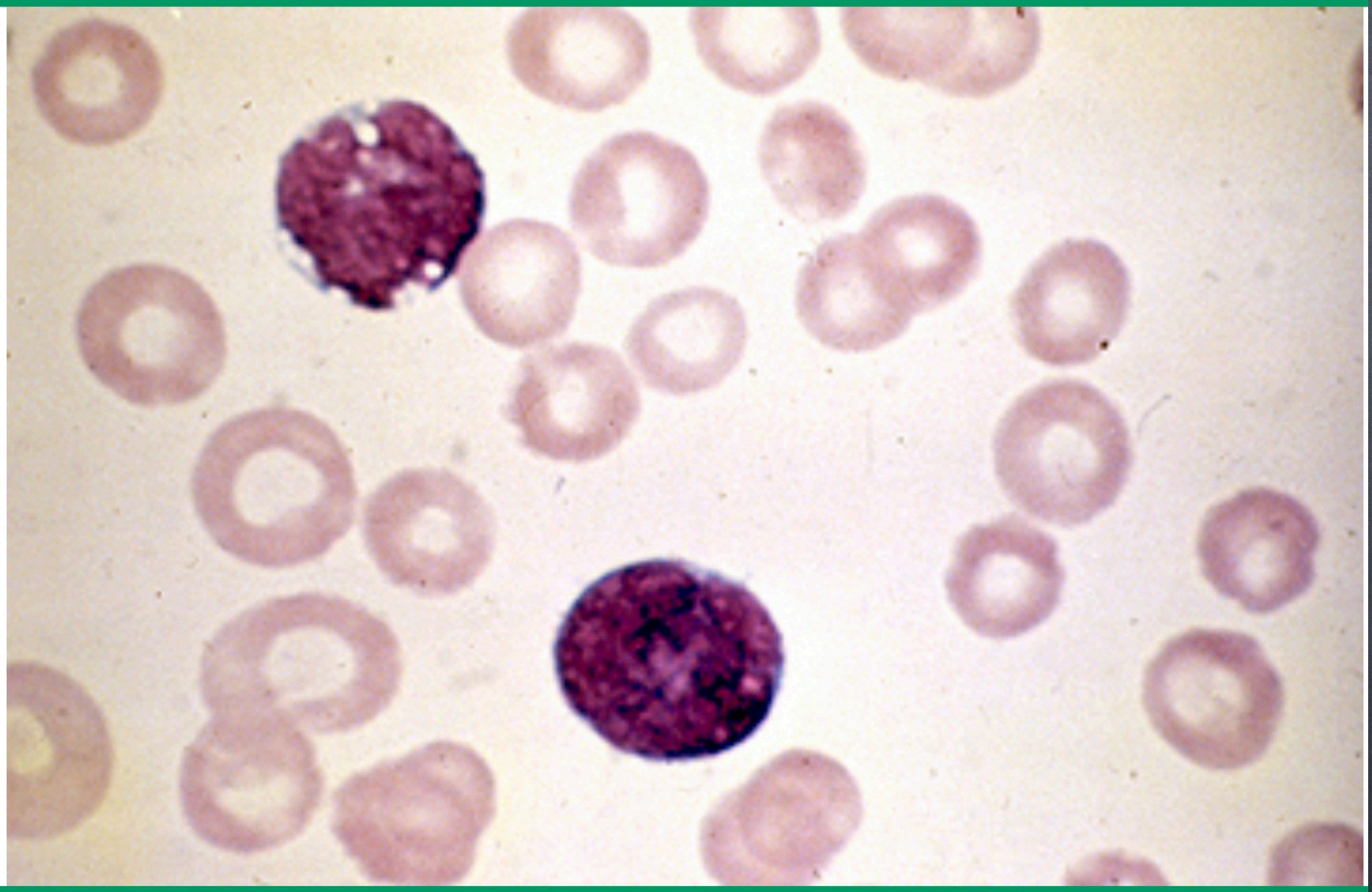
Peripheral blood smear from a patient with a microangiopathic hemolytic anemia with marked red cell fragmentation. The smear shows multiple helmet cells (arrows) and other fragmented red cells (small arrowhead); microspherocytes are also seen (large arrowheads). The platelet number is reduced; the large platelet in the center (dashed arrow) suggests that the thrombocytopenia is due to enhanced destruction.

Peripheral blood smear in sickle cell anemia



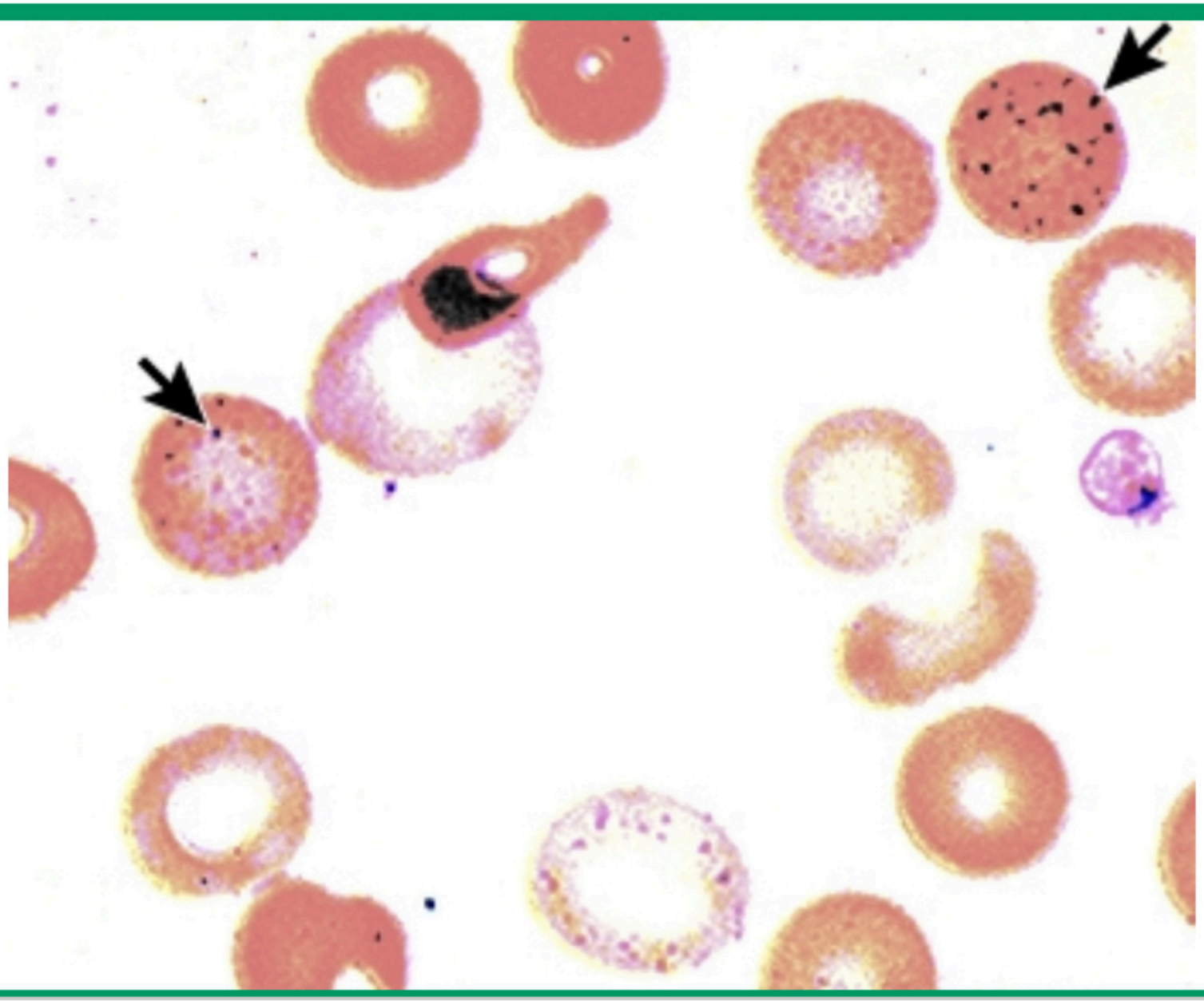
Peripheral blood smear from a patient with sickle cell anemia. This smear shows multiple sickle cells (blue arrows). There are also findings consistent with functional asplenia, including a nucleated red blood cell (upper left), a red blood cell containing a Howell-Jolly body (black arrow), and target cells (red arrow).

Lymphoblasts in acute lymphoblastic leukemia



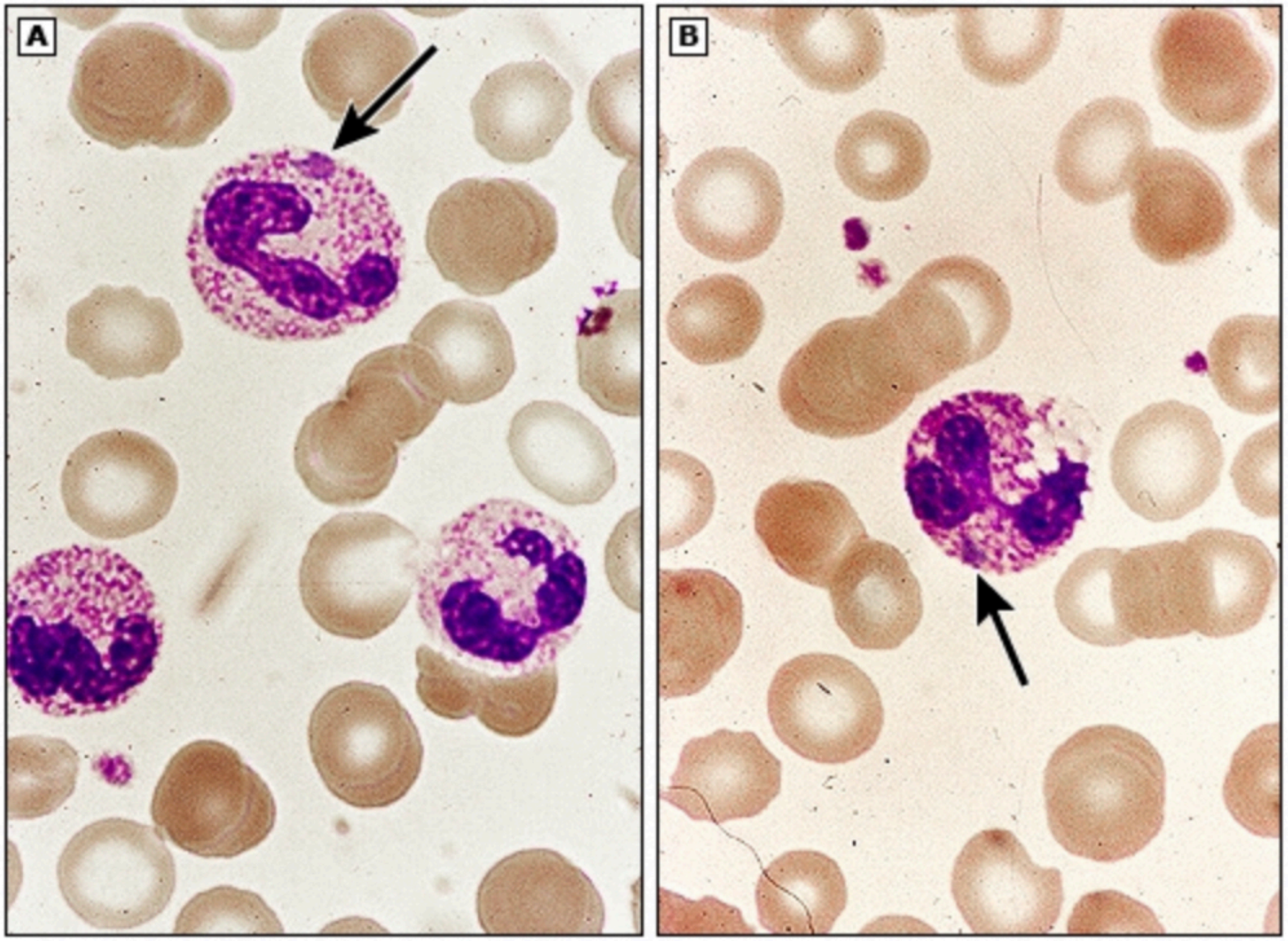
Blood smear showing small lymphoblasts with rare nucleoli and vacuoles, as seen in acute lymphocytic leukemia (ALL).

Basophilic stippling of red cells in lead poisoning



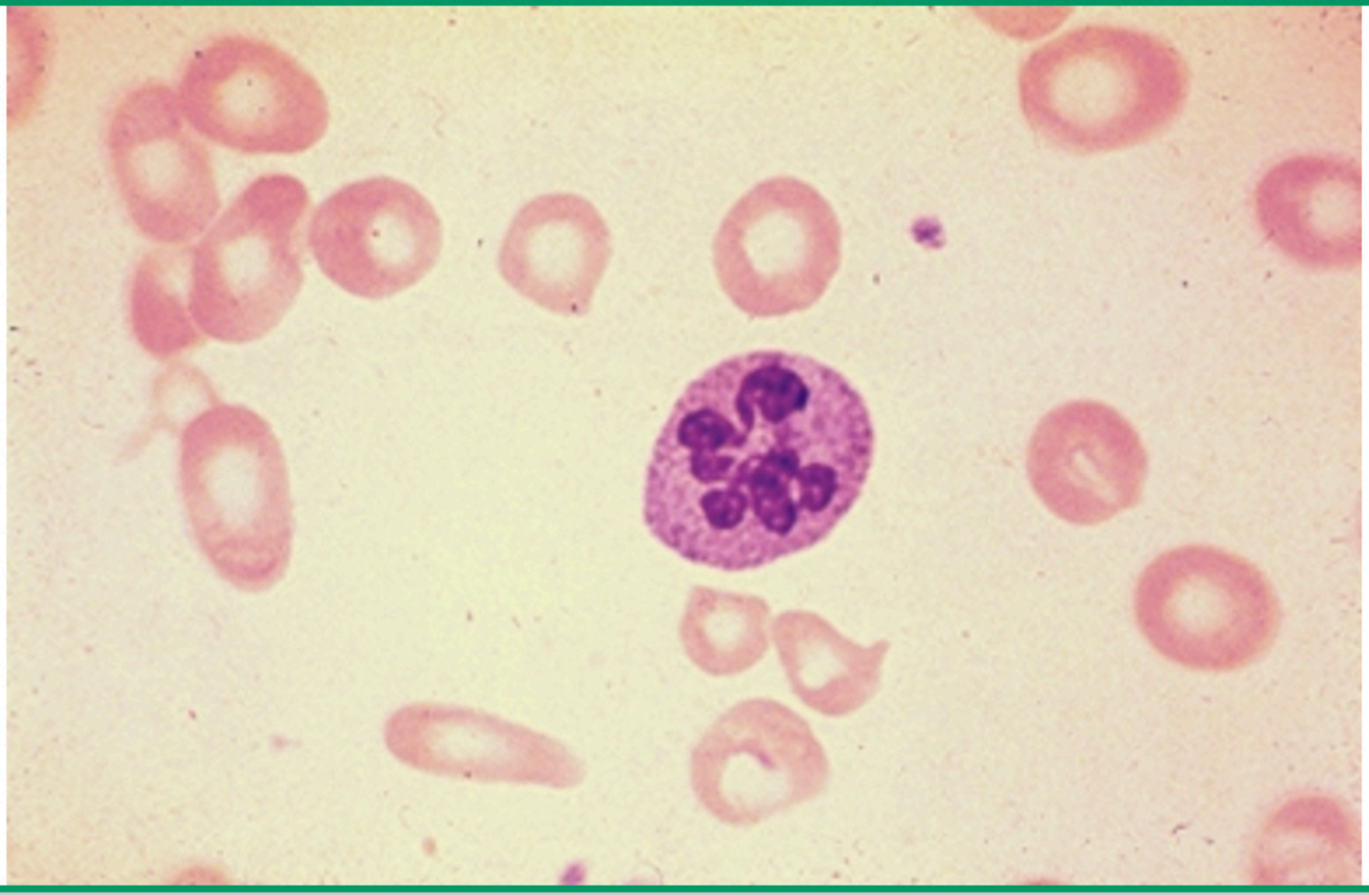
Peripheral blood smear shows basophilic stippling in several red cells from a patient with lead poisoning. The granules represent ribosomal precipitates. A similar picture can be seen in a number of other conditions including thalassemia, megaloblastic anemia, sickle cell anemia, and sideroblastic anemia.

Toxic granulations and Döhle bodies in infection/inflammation



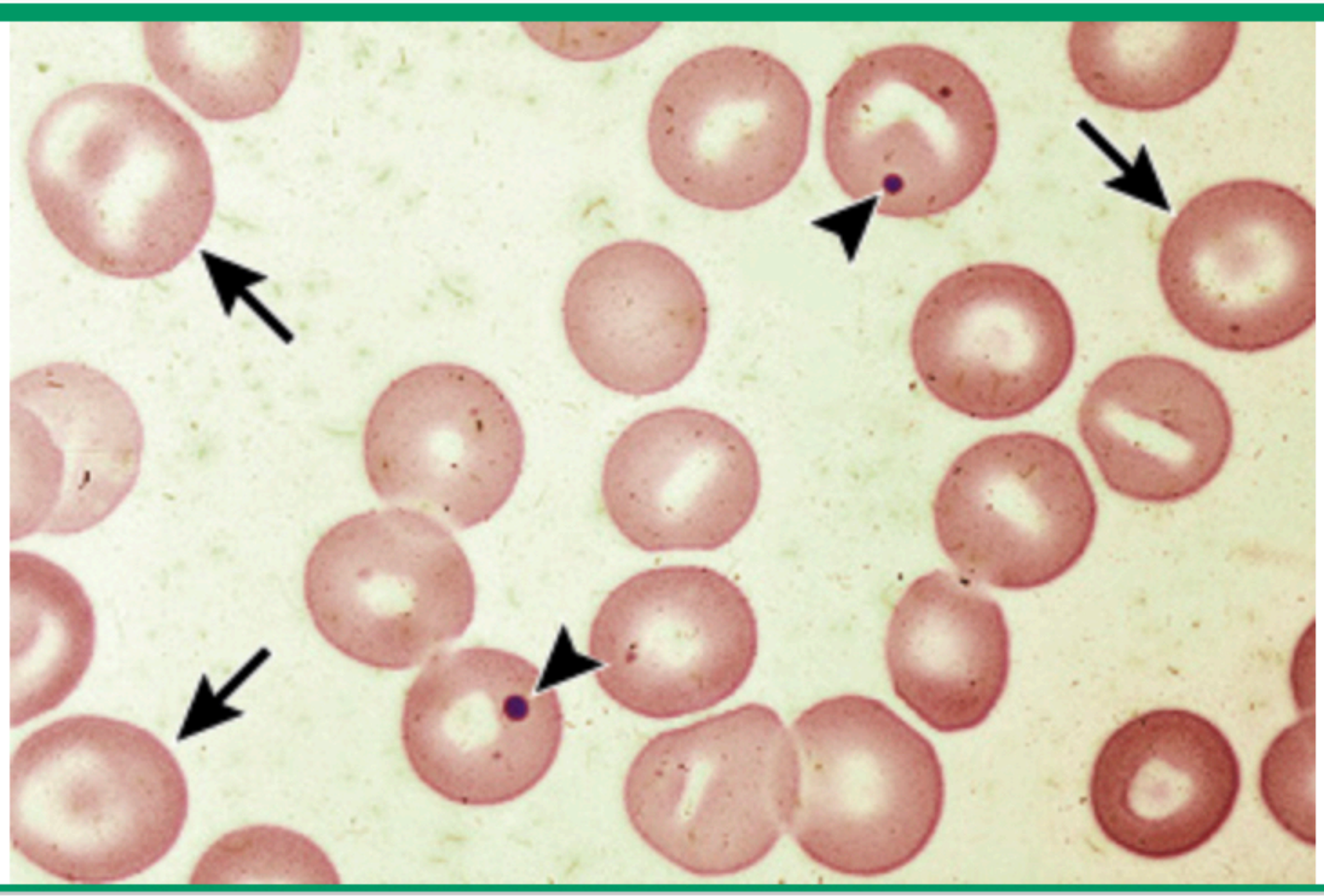
(A) Peripheral blood smear shows neutrophils with toxic granulations, which are dark coarse granules. A Döhle body is also seen (arrow).
(B) A neutrophil with toxic granulations, vacuoles (another toxic change), and a Döhle body (arrow). These abnormalities are characteristic of toxic systemic illnesses.

Megaloblastic blood picture



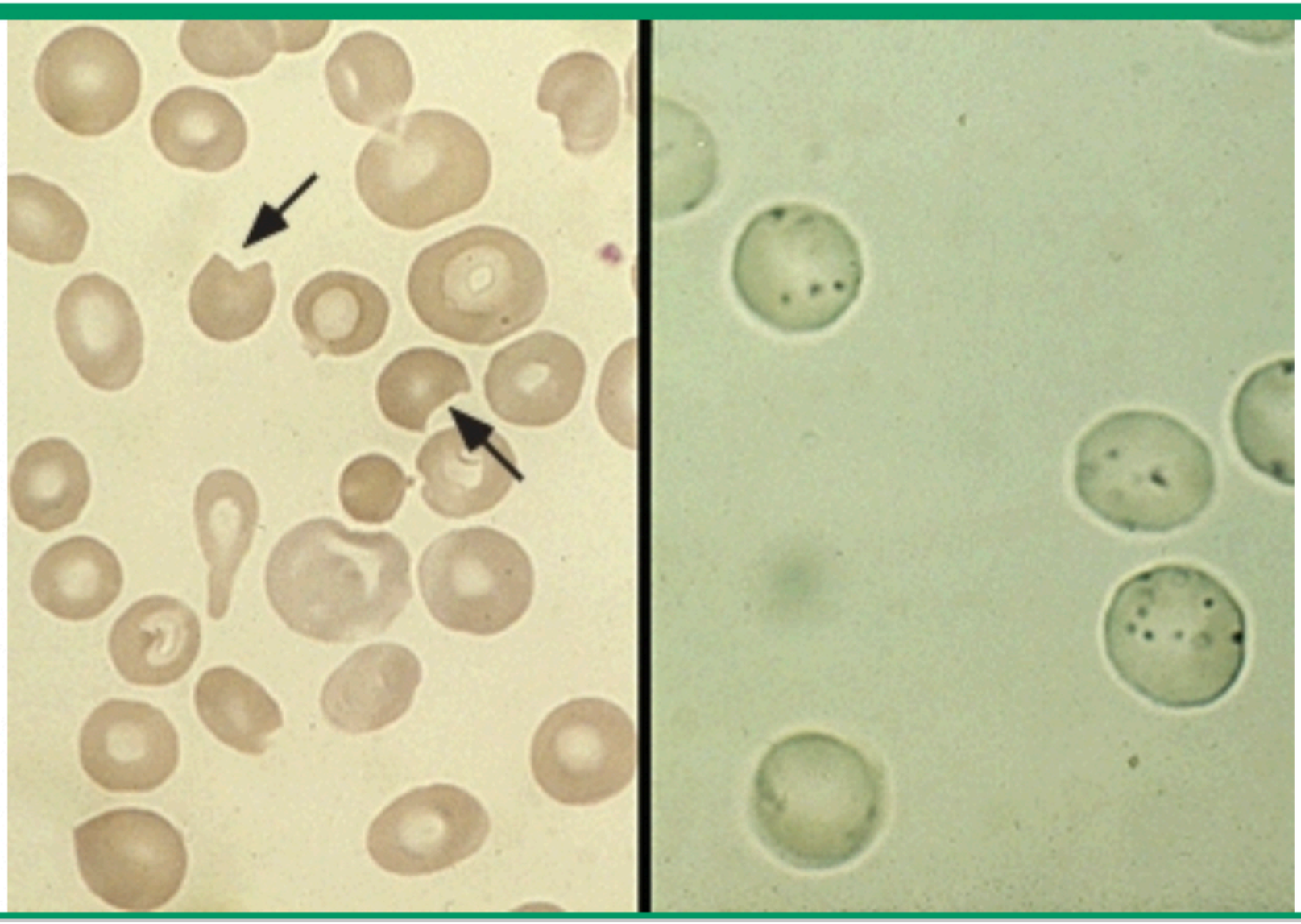
Peripheral blood smear showing a hypersegmented neutrophil (seven lobes) and macro-ovalocytes, a pattern that can be seen with cobalamin or folate deficiency.

Howell-Jolly bodies following splenectomy



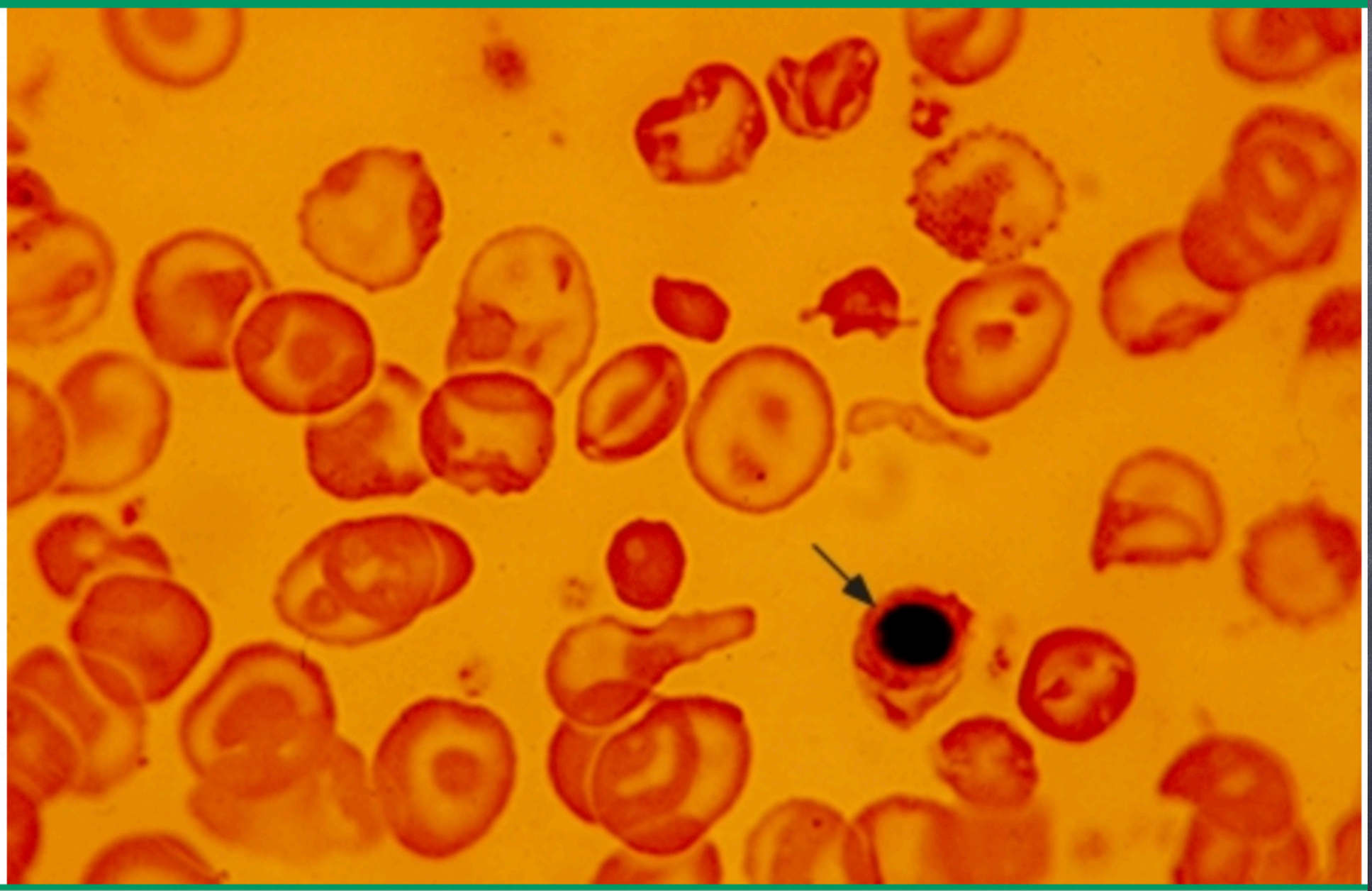
This peripheral blood smear shows 2 red blood cells (RBCs) that contain Howell-Jolly bodies (arrowheads). Howell-Jolly bodies are remnants of RBC nuclei that are normally removed by the spleen. Thus, they are seen in patients who have undergone splenectomy (as in this case) or who have functional asplenia (eg, from sickle cell disease). Target cells (arrows) are another consequence of splenectomy.

Peripheral smear in Heinz body hemolytic anemia showing Heinz bodies and bite cells



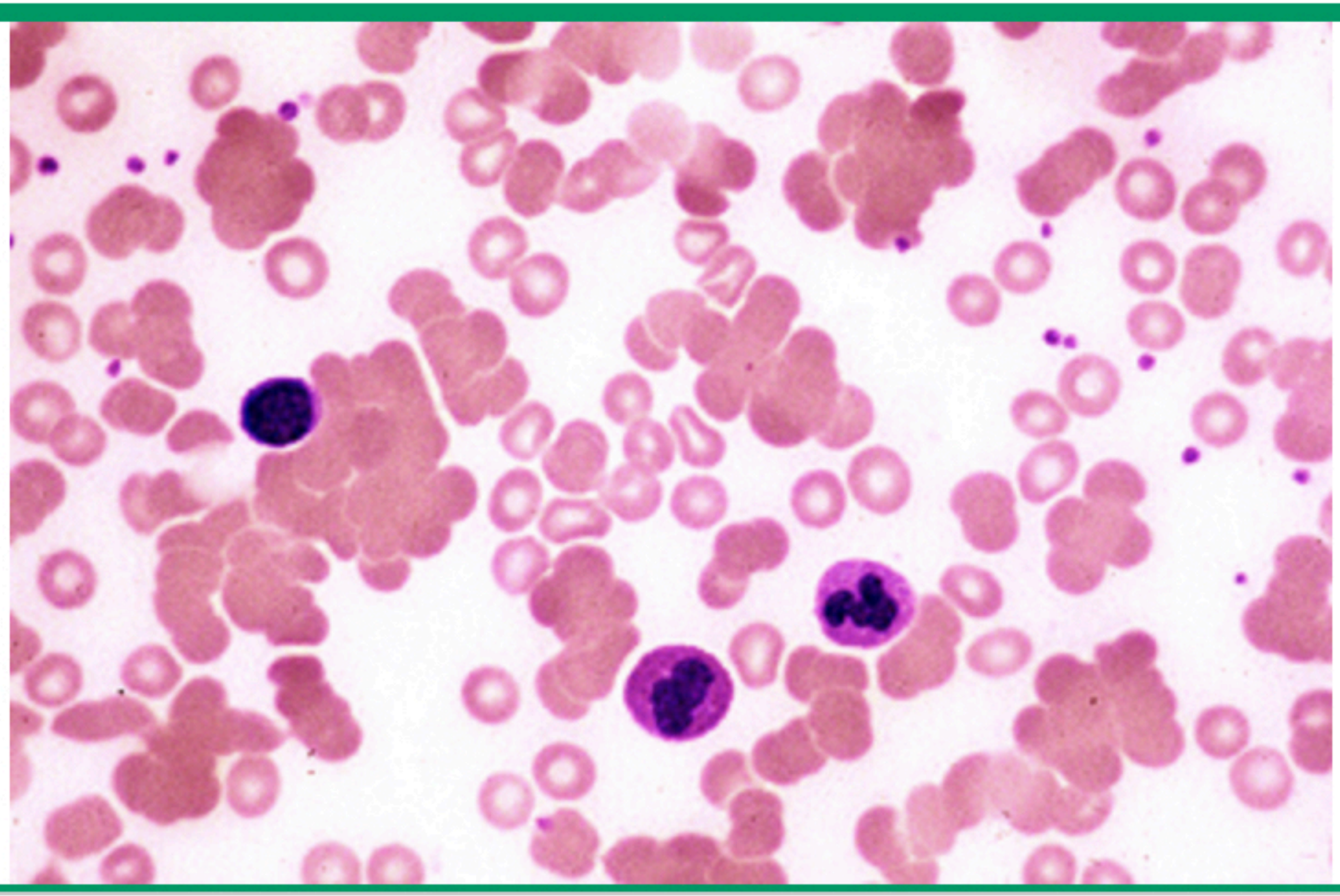
Images of a peripheral blood smear from a patient with Heinz body hemolytic anemia.
Left panel: red blood cells with characteristic bite-like deformity (left arrow) and a blister cell with hemoglobin puddled to one side (right arrow).
Right panel: Heinz body preparation that reveals the denatured hemoglobin precipitates.

Peripheral blood smear in beta thalassemia intermedia



Peripheral smear from a patient with beta thalassemia intermedia postsplenectomy. This field shows target cells, hypochromic cells, microcytic cells, red cell fragments, red cells with bizarre shapes, and a single nucleated red cell (arrow).

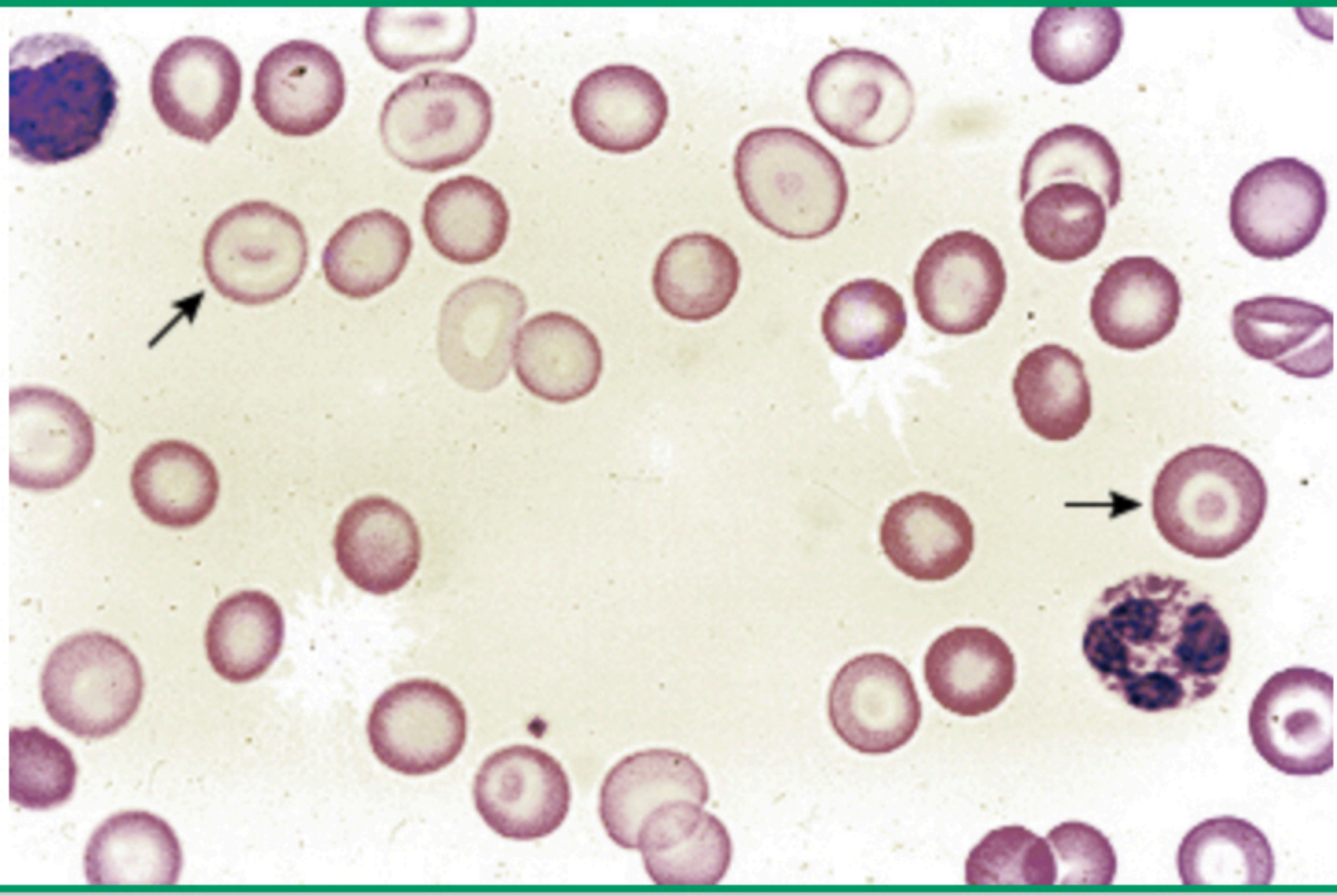
Peripheral blood smear showing red blood cell agglutination in a patient with cold agglutinin disease



The blood smear shows marked RBC agglutination into irregular clumps.

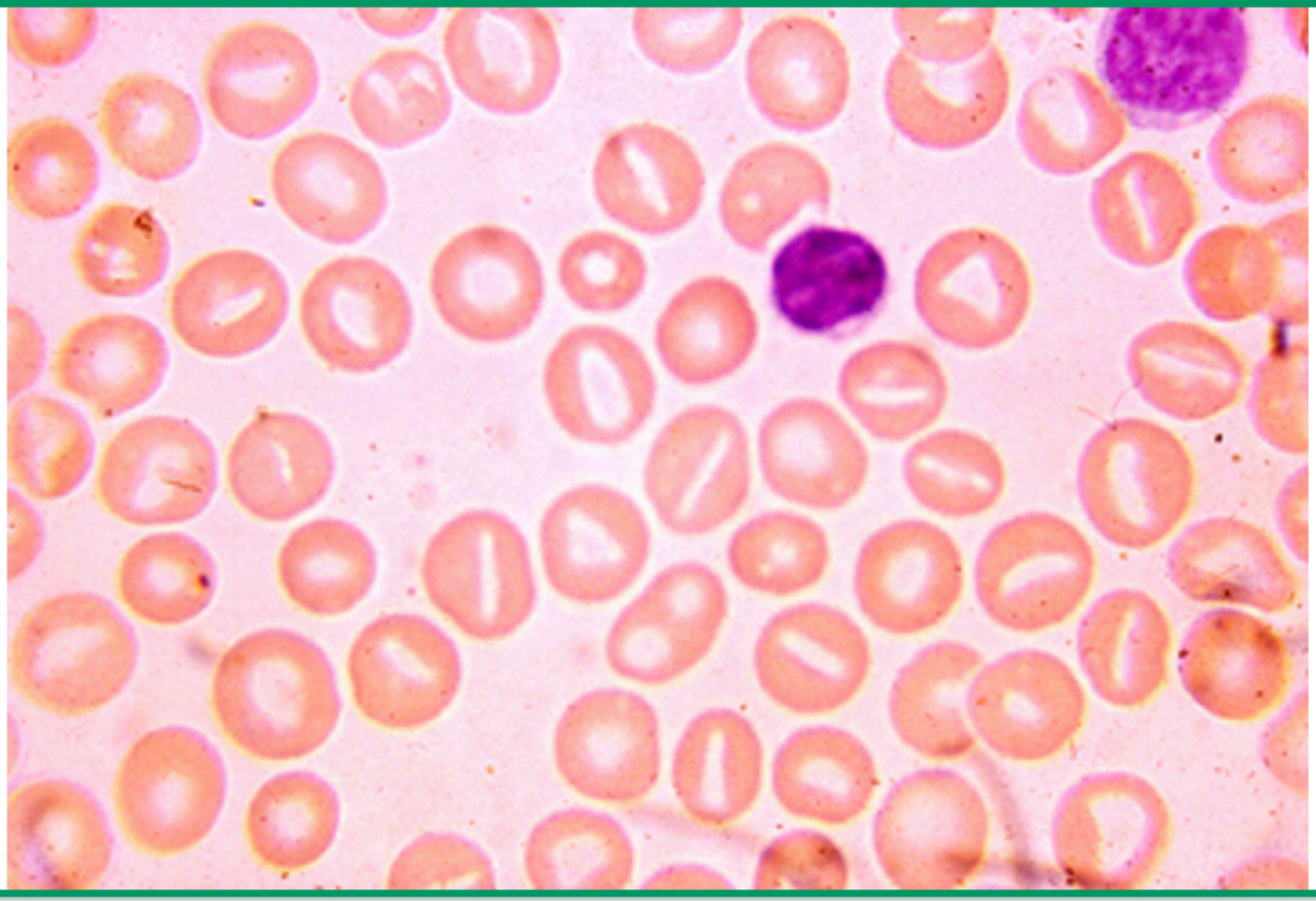
CAD: cold agglutinin disease; RBC: red blood cell.

Target cells



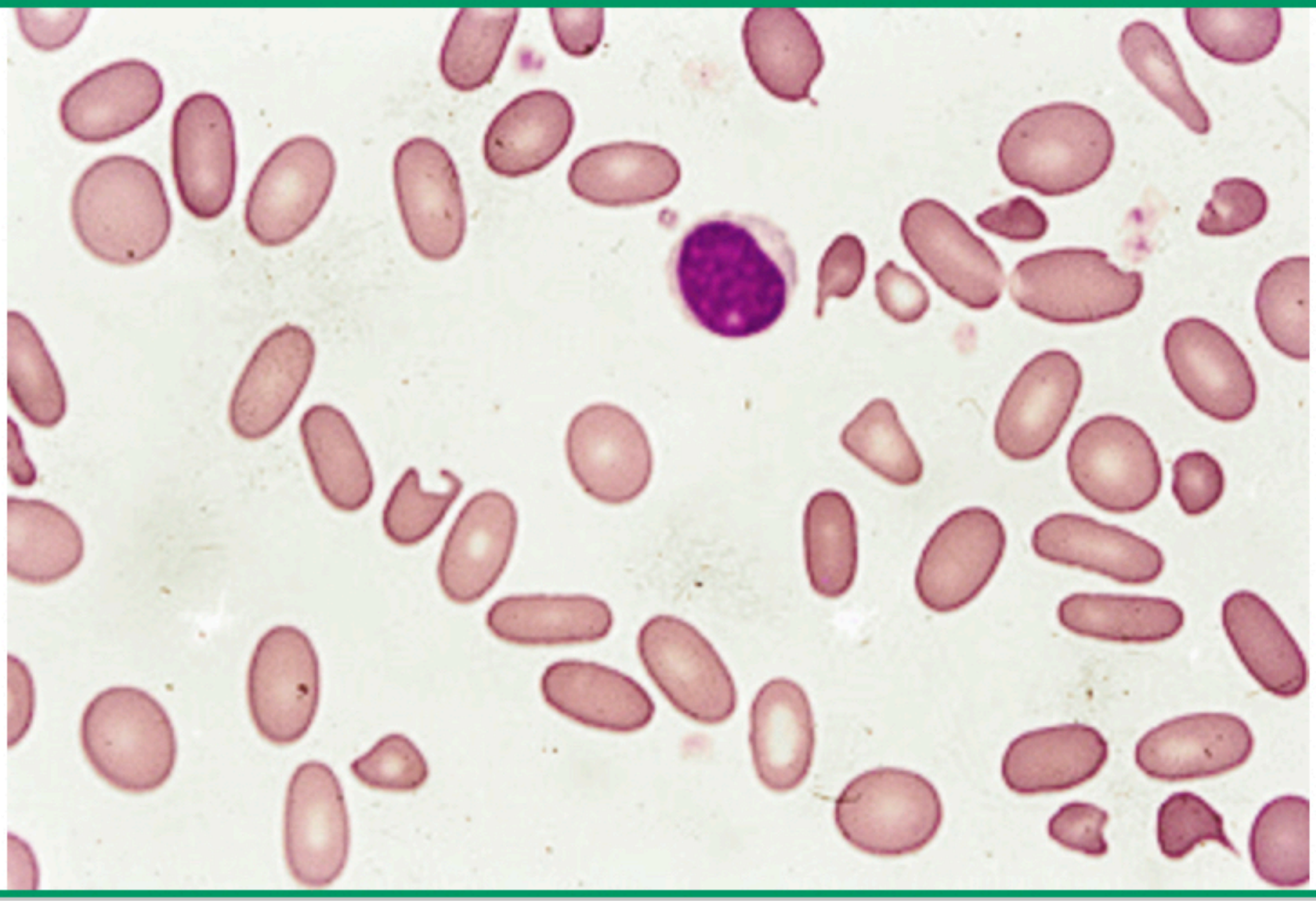
Peripheral smear shows multiple target cells that have an area of central density surrounded by a halo of pallor (arrows). These cells are characteristic of liver disease and certain hemoglobinopathies (most notably hemoglobin C disease).

Stomatocytosis



Peripheral blood smear showing multiple stomatocytes characterized by a mouth-shaped area of central pallor.

Elliptical red cells in hereditary elliptocytosis



Peripheral blood smear from a patient with hereditary elliptocytosis shows multiple elliptocytes.

Reticulicitos

- Especialmente útil en anemias normociticas
- Vn 1,5%
- Permite orientar a grupo de causas según regeneración

Reticulocitos aumentados

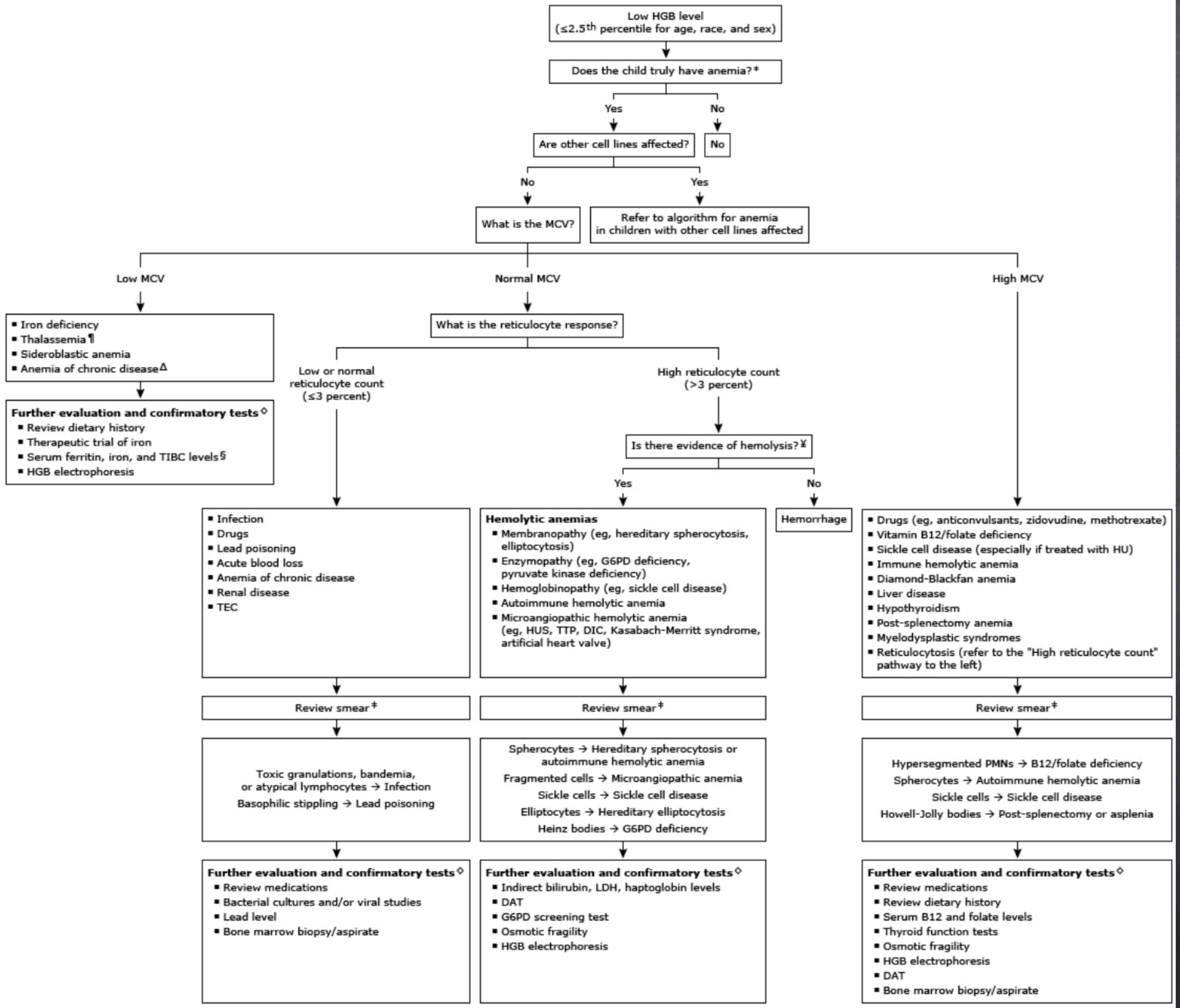
- > 3%
- Refleja respuesta eritropoyetica aumentada a pérdidas o hemolisis
- Causas: hemorragia, anemia hemolitica auto inmune, membranopatias, enzimopatias, hemoglobinopatias y anemia hemolitica microangiopatica

Reticulocitos disminuidos

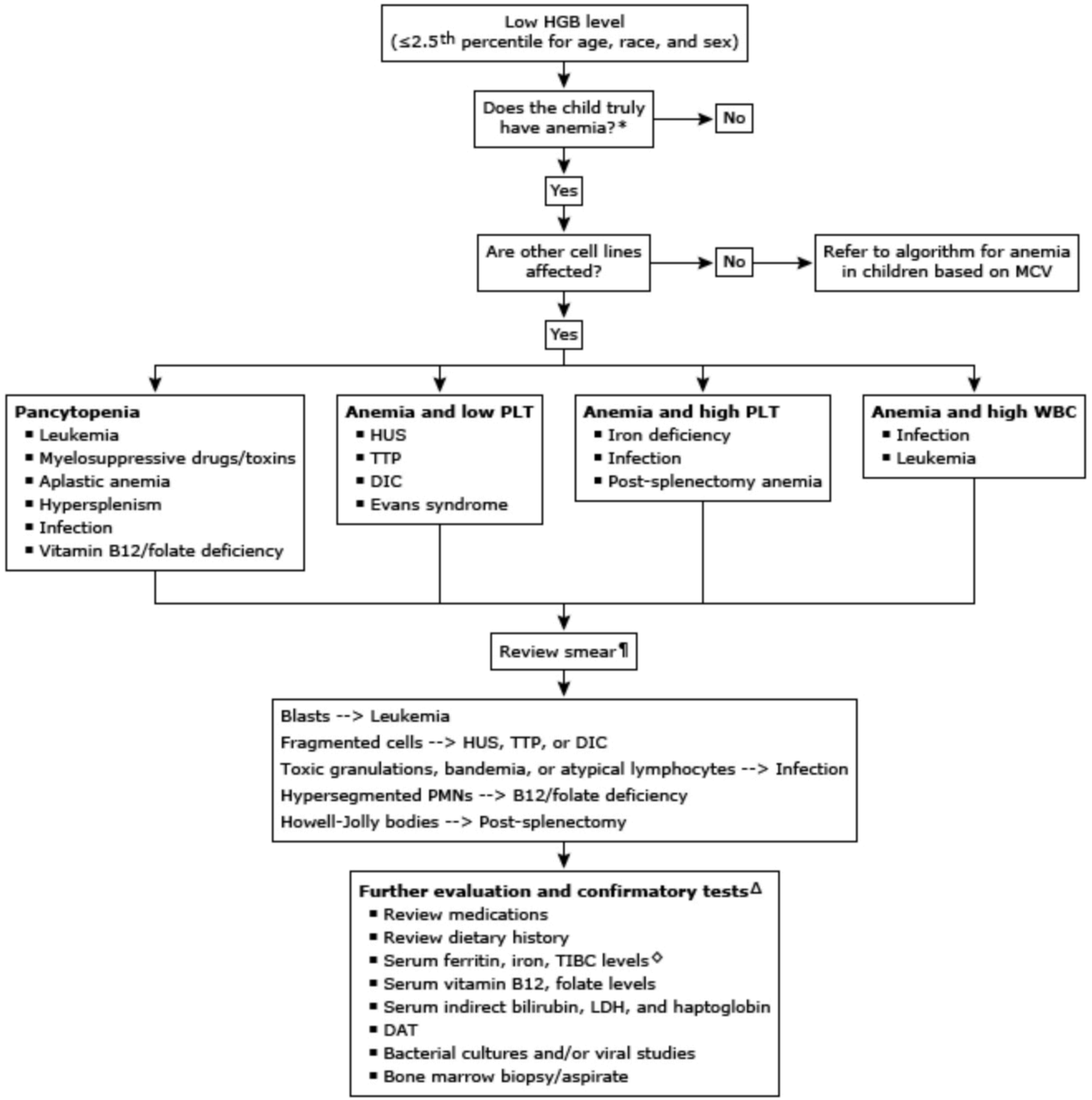
- Un conteo bajo o normal significa deficiente producción de GR
- Infección, saturnismo, drogas, erc

Enfoque diagnóstico

Diagnostic approach to isolated anemia in children: Morphologic classification



Diagnostic approach to the child with anemia and abnormalities of other cell lines



Conclusiones

- Síndrome frecuente
- Muchas veces el diagnóstico puede hacerse con una buena historia, examen y hemograma
- Causas raras no son tan raras como se cree.

"La anemia no debería aceptarse solo como una consecuencia del déficit de hierro"

- nn