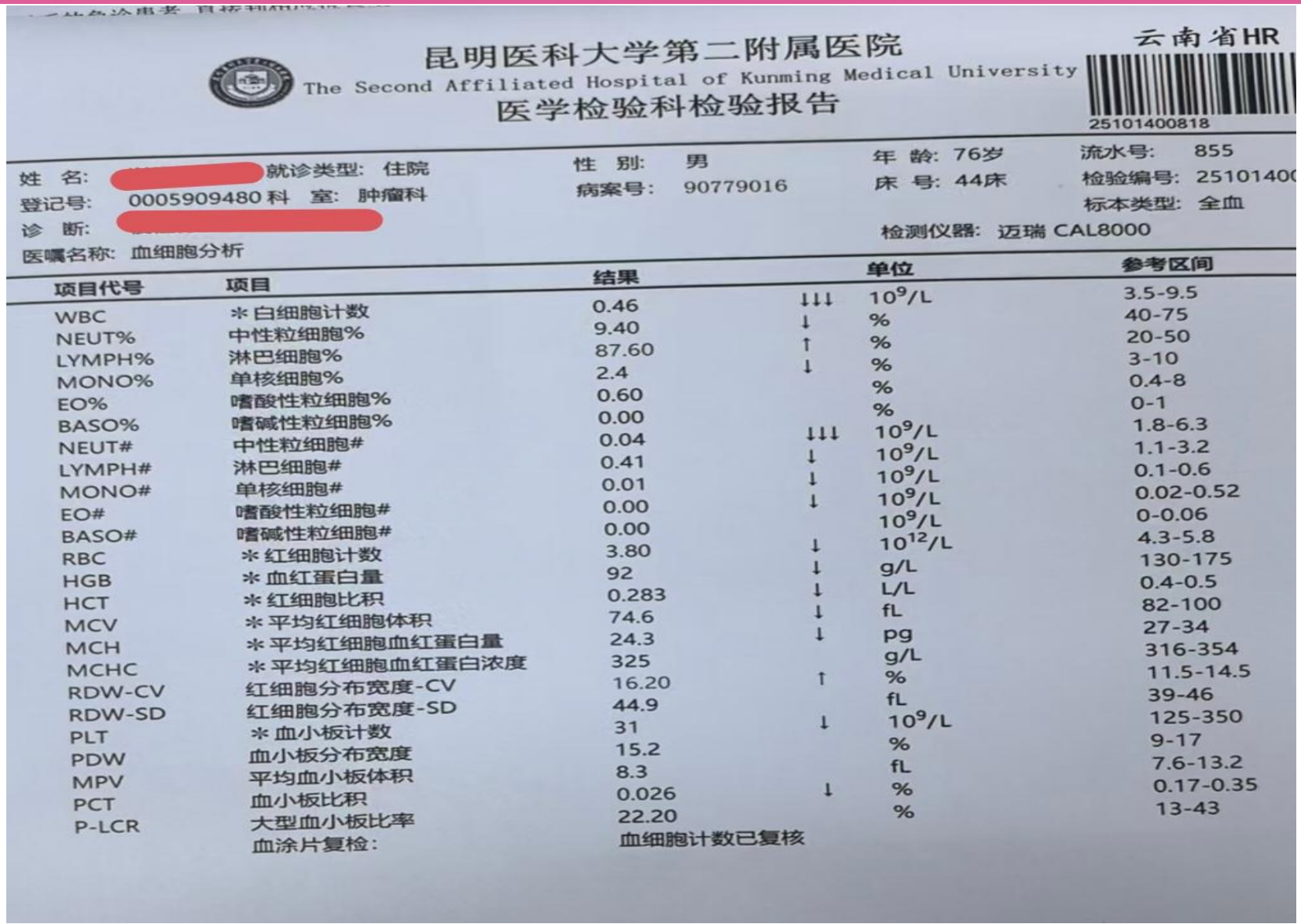
Pancytopenia

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昆明医科大学第二附属医院
The Second Affiliated Hospital of Kunming Medical University
医学检验科检验报告

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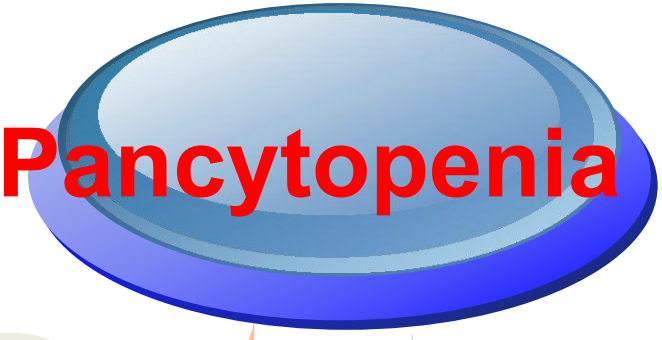
姓 名: [redacted] 就诊类型: 住院 性 别: 男 年 龄: 76岁 流水号: 855
登记号: 0005909480 科 室: 肿瘤科 病案号: 90779016 床 号: 44床 检验编号: 2510140
诊 断: [redacted] 标本类型: 全血
医嘱名称: 血细胞分析 检测仪器: 迈瑞 CAL8000

项目代号	项目	结果		单位	参考区间
WBC	＊白细胞计数	0.46	↓↓↓	10^9/L	3.5-9.5
NEUT%	中性粒细胞%	9.40	↓	%	40-75
LYMPH%	淋巴细胞%	87.60	↑	%	20-50
MONO%	单核细胞%	2.4	↓	%	3-10
EO%	嗜酸性粒细胞%	0.60		%	0.4-8
BASO%	嗜碱性粒细胞%	0.00		%	0-1
NEUT#	中性粒细胞#	0.04	↓↓↓	10^9/L	1.8-6.3
LYMPH#	淋巴细胞#	0.41	↓	10^9/L	1.1-3.2
MONO#	单核细胞#	0.01	↓	10^9/L	0.1-0.6
EO#	嗜酸性粒细胞#	0.00	↓	10^9/L	0.02-0.52
BASO#	嗜碱性粒细胞#	0.00		10^9/L	0-0.06
RBC	＊红细胞计数	3.80	↓	10^{12}/L	4.3-5.8
HGB	＊血红蛋白量	92	↓	g/L	130-175
HCT	＊红细胞比积	0.283	↓	L/L	0.4-0.5
MCV	＊平均红细胞体积	74.6	↓	fL	82-100
MCH	＊平均红细胞血红蛋白量	24.3	↓	pg	27-34
MCHC	＊平均红细胞血红蛋白浓度	325		g/L	316-354
RDW-CV	红细胞分布宽度-CV	16.20	↑	%	11.5-14.5
RDW-SD	红细胞分布宽度-SD	44.9		fL	39-46
PLT	＊血小板计数	31	↓	10^9/L	125-350
PDW	血小板分布宽度	15.2		%	9-17
MPV	平均血小板体积	8.3		fL	7.6-13.2
PCT	血小板比积	0.026	↓	%	0.17-0.35
P-LCR	大型血小板比率	22.20		%	13-43
	血涂片复检:	血细胞计数已复核			

Definition

- Pancytopenia refers to peripheral blood WBC < 4.0× 10^9/L, HB < 100 g/L and PLT < 100× 10^9/L.
- Pancytopenia is not an independent disease, but a change of peripheral blood caused by many diseases

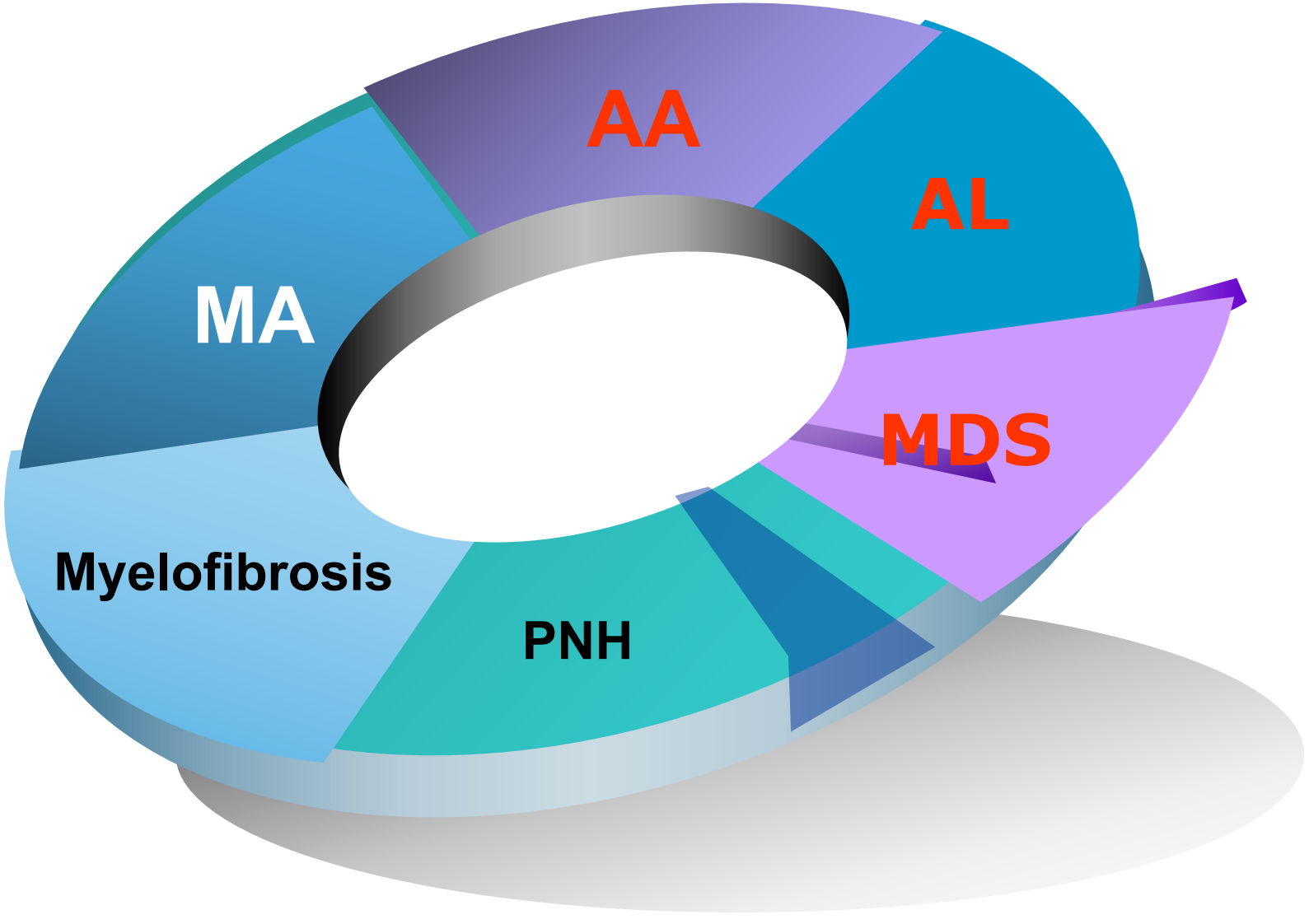
classify



Hematopoietic diseases (more than 70%)

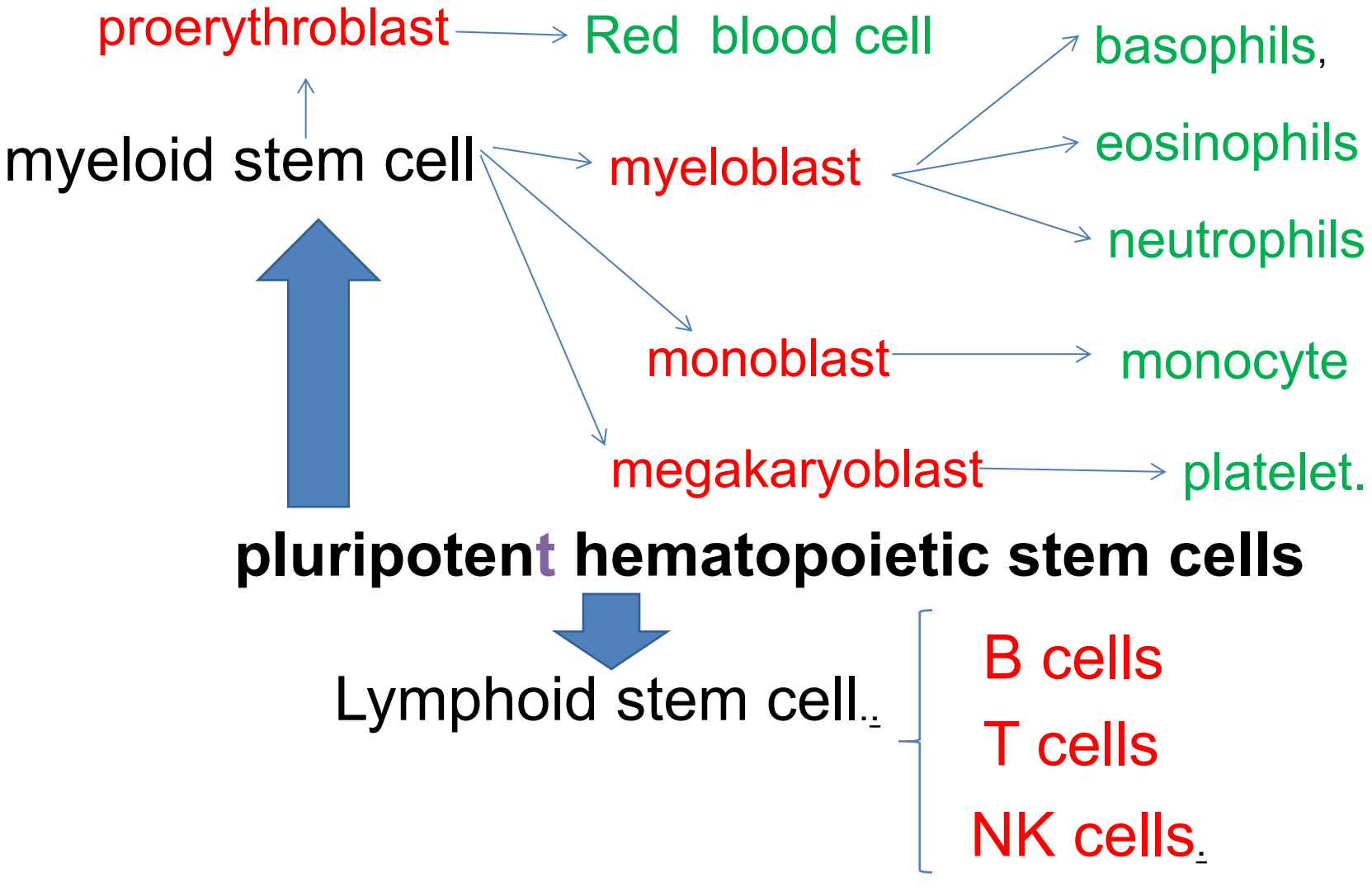
Non-hematopoietic diseases (less than 30%

一、Hematopoietic system diseases



（一）、Aplastic Anemia （AA）

Definition

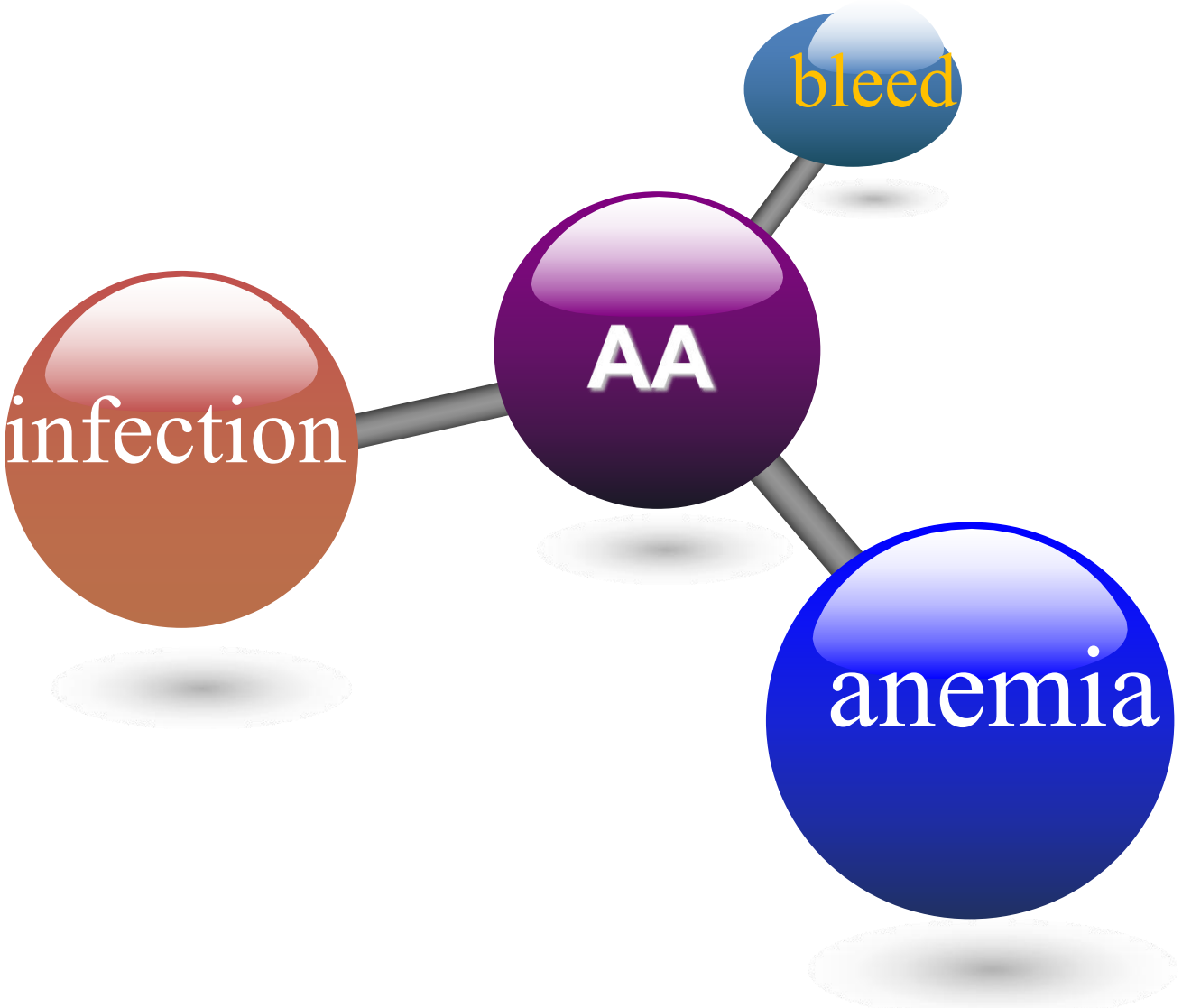

proerythroblast
Red blood cell
basophils,
myeloid stem cell
myeloblast
eosinophils
neutrophils
monoblast
monocyte
megakaryoblast
platelet.
pluripotent hematopoietic stem cells
Lymphoid stem cell..
B cells
T cells
NK cells.

Definition

- Aplastic means it does not make anything.

- Aplastic anemia is defined as a failure of pluripotent stem cells, producing hypoplasia of the bone marrow with a pancytopenia（anemia 、neutropenia and thrombcytopenia ）,low reticulocytes in the blood.

Clinical Manifestation



Clinical Manifestation

- **Anemia：**

  Pale、weak、shortness of breath

- **Infection：**

  Respiratory tract infection,sepsis

- **Bleeding：**

  Nose bleeding，gums bleeding

  Hematemesis, blood in stool，cerebral Hemorrhage

Laboratory Studies

Blood Smear

- Pancytopenia (anemia, leukopenia, and thrombocytopenia) is a universal presenting finding.
- Neutrophils and platelets are reduced in number
- **Reticulocyte decreased**

--- The morphology of neutrophils, platelets, and red cells on AA peripheral blood smear is usually normal.

Laboratory Studies

- Reticulocyte :

  --- is a young red blood cell (volume big)

  --- a kind of a step between the erythroblasts and erythrocytes.

  --- If we have a anemia, our bone marrow would work so hard and so fast to compensate for that loss.

  ---They would try to pump out more and more red blood cells that increased reticulocyte

Disgonosis

- Pancytopenia
  - Reticulocyte ＜0.01
  - Lympocyte percentage
- No hepatomegaly; splenomegaly and lymph node enlargement ⬆
- BMP and BMB

  --- multiple sites BM Puncture： hyperplasia ⬇-----
  BM biopsy ： hematopoietic tissue ⬇
- Except for the decrease of pancytopenia

（二）、 Megaloblastic Anemia（MA）

1、Definition of anemia

- Anemia is a shortage or a reduction in the number of red blood cells in the body as we need. This leads to a decrease in the oxygen delivery to tissues so that cause the symptoms of anemia.

Definition

- Anemia refers to a state in which the level of haemoglobin in the blood is below the range appropriate for age and sex.
- Other influential factors must be taken into account.

Normal values of the hemogram:

	RBC ($\times 10^{12}$/L)	Hb (g/L)	Hct (L/L)
(adult men)	4.0 ～ 5.5	130	0.40~0.50
(adult women)	3.5 ～ 5.0	120	0.37~0.48
6month-6 years		110	
6 years-14 years		120	
(pregnant)		110	

1972 WHO criteria

HCT: Haematocrit Hb: hemoglobin

Anemia Classification

- According to the rate of progress
- According to severity Classification
- According to RBC morphological classification
- According to Bone marrow proliferative degree
- According to etiology/pathogenesis

• Classification according to severity

Degree	Hb（g/L）
Mild anemia	90～120
Moderate anemia	60～90
Severe anemia	＜60
Very Severe anemia	＜30



120/110 90 60 30

• RBC Morphological Classification

RBC morphological type	MCV（fl）	MCHC (%)
Macrocytic anemia	＞100	32～35
Normocytic anemia	80～100	32～35
Microcytic hypochromic anemia	＜80	＜32

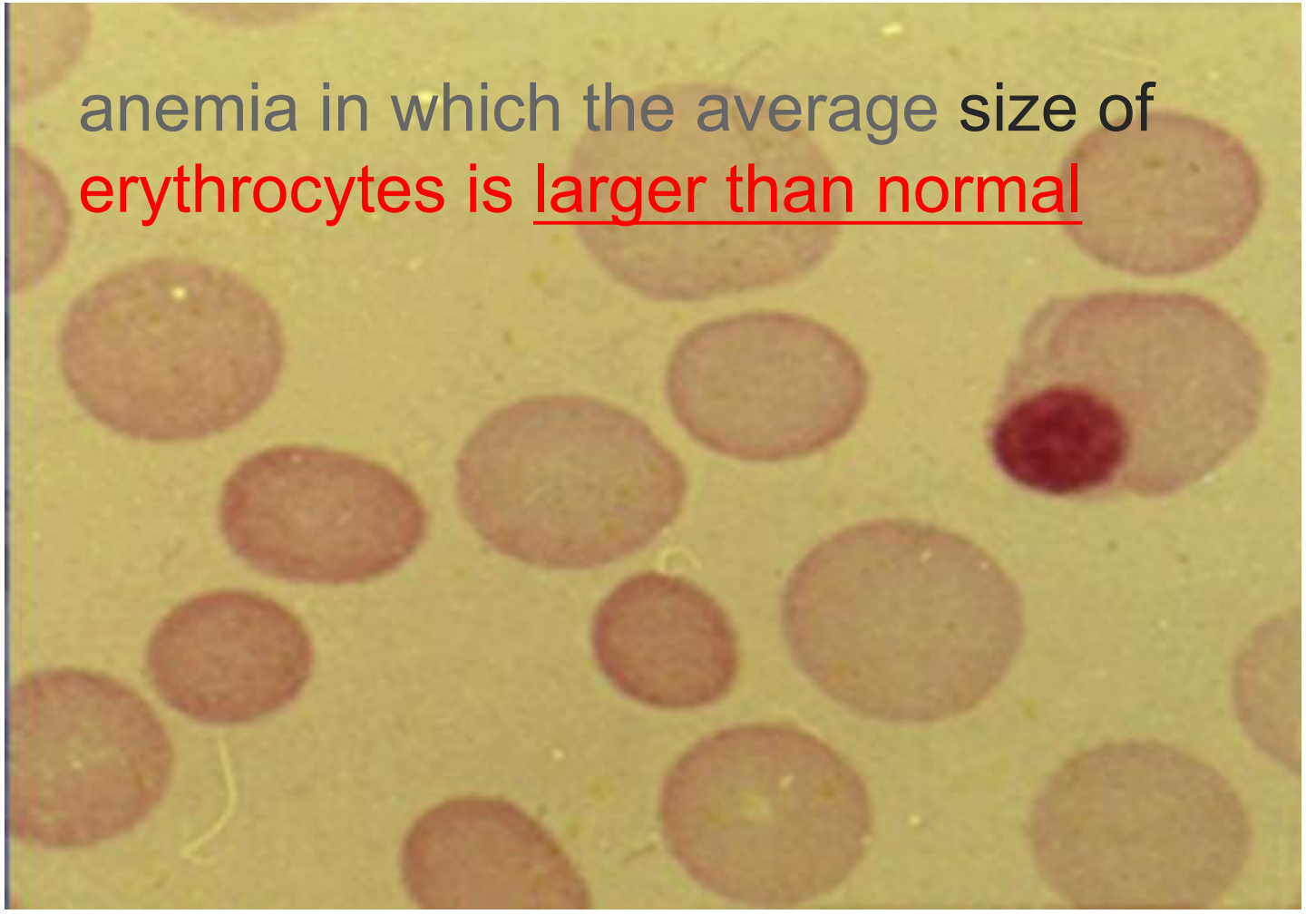
MCV：mean corpuscular volume ； the average volume of RBC

MCHC：mean cell hemoglobin concentration

RBC morphological	type	Cause
Macrocytic anemia	**MA**	**shortage of DNA precursors**
		Lack vitamin B12 and folate
Normocytic anemia	AA 、 Leukemia	
	Acute blood loss、 ACD	
		,
Microcytic anemia	IDA	**shortage of hemoglobin**
	Thalassemia	**abnormal hemoglobin form**

ACD:anemia of chronic disease AA: aplastic anemia

MA:megaloblastic anemia IDA:Iron deficiency anemia



Macrocytic anemia

Laboratory Studies

1. Anemia, bleeding, and fever
2. Some have **pancytopenia**, and the hemogram is **macrocytic anemia**.
3. Bone marrow images show megaloblastic changes of red, granular and megakaryocytes, which are similar to pathological hematopoiesis, and some megakaryocytes are reduced or absent.

Laboratory Studies

- Reticulocyte :

  --- is a young red blood cell (volume big)

  --- a kind of a step between the erythroblasts and erythrocytes.

  --- If we have a anemia, our bone marrow would work so hard and so fast to compensate for that loss.

  --- **Reticulocyte increased**

（三）、Leukemia

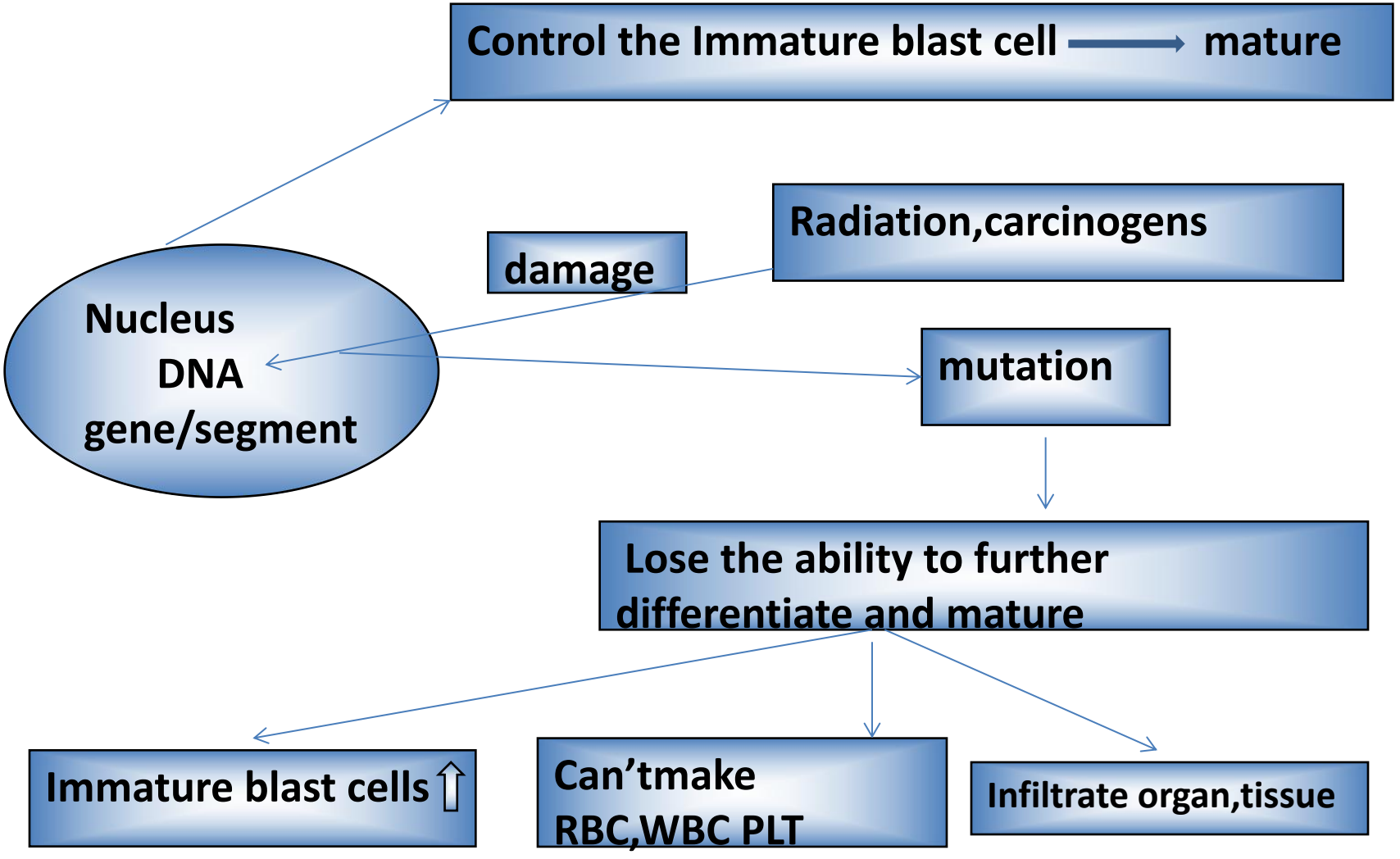
1、Definition

- Leukemias are malignant disorders of the haematopoietic stem cell , characteristically associated with increased numbers of white cells in bone marrow and/ or peripheral blood.

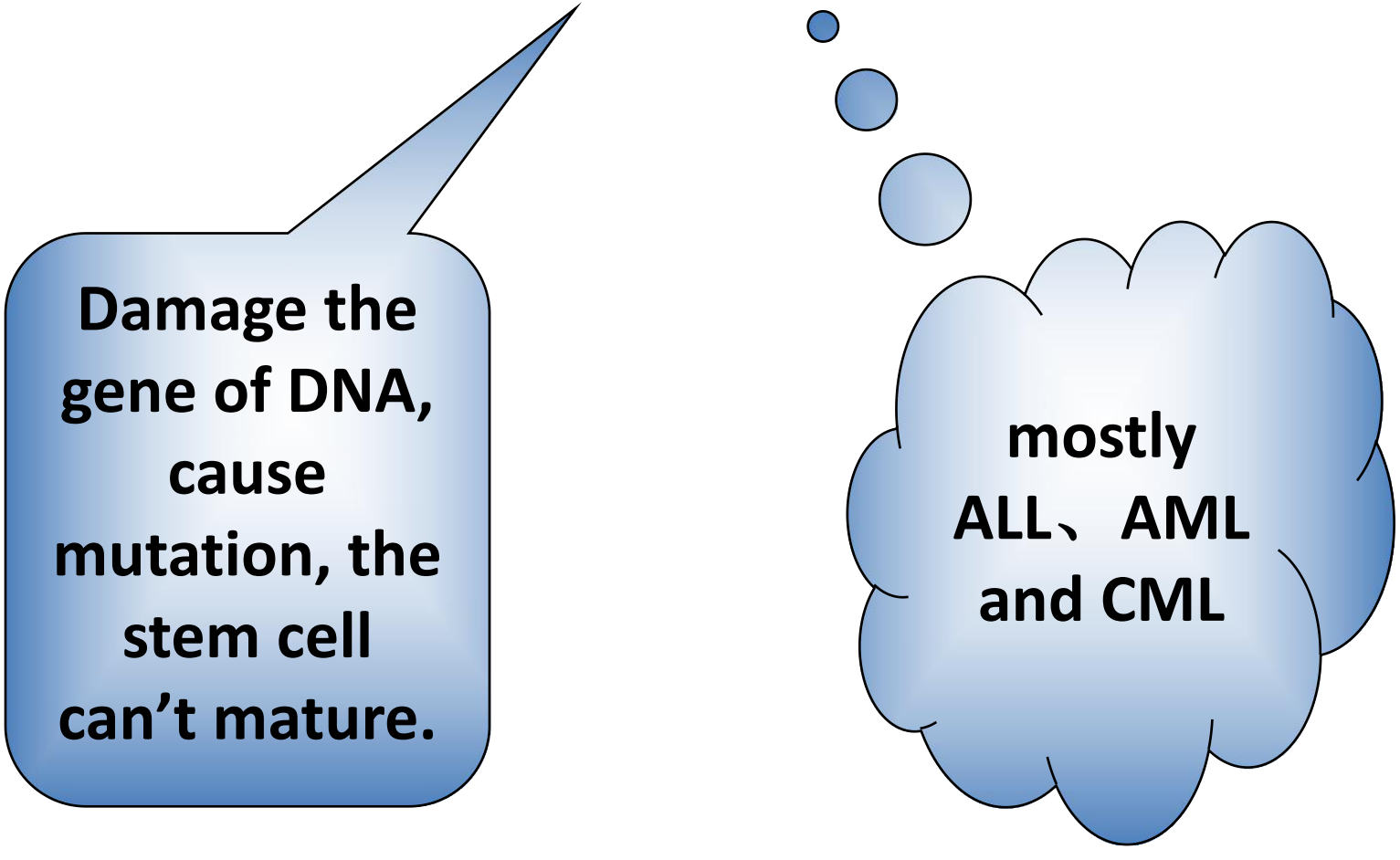
- The course of leukemia may vary from a few days or weeks to many years, depending on the type.

Why ?

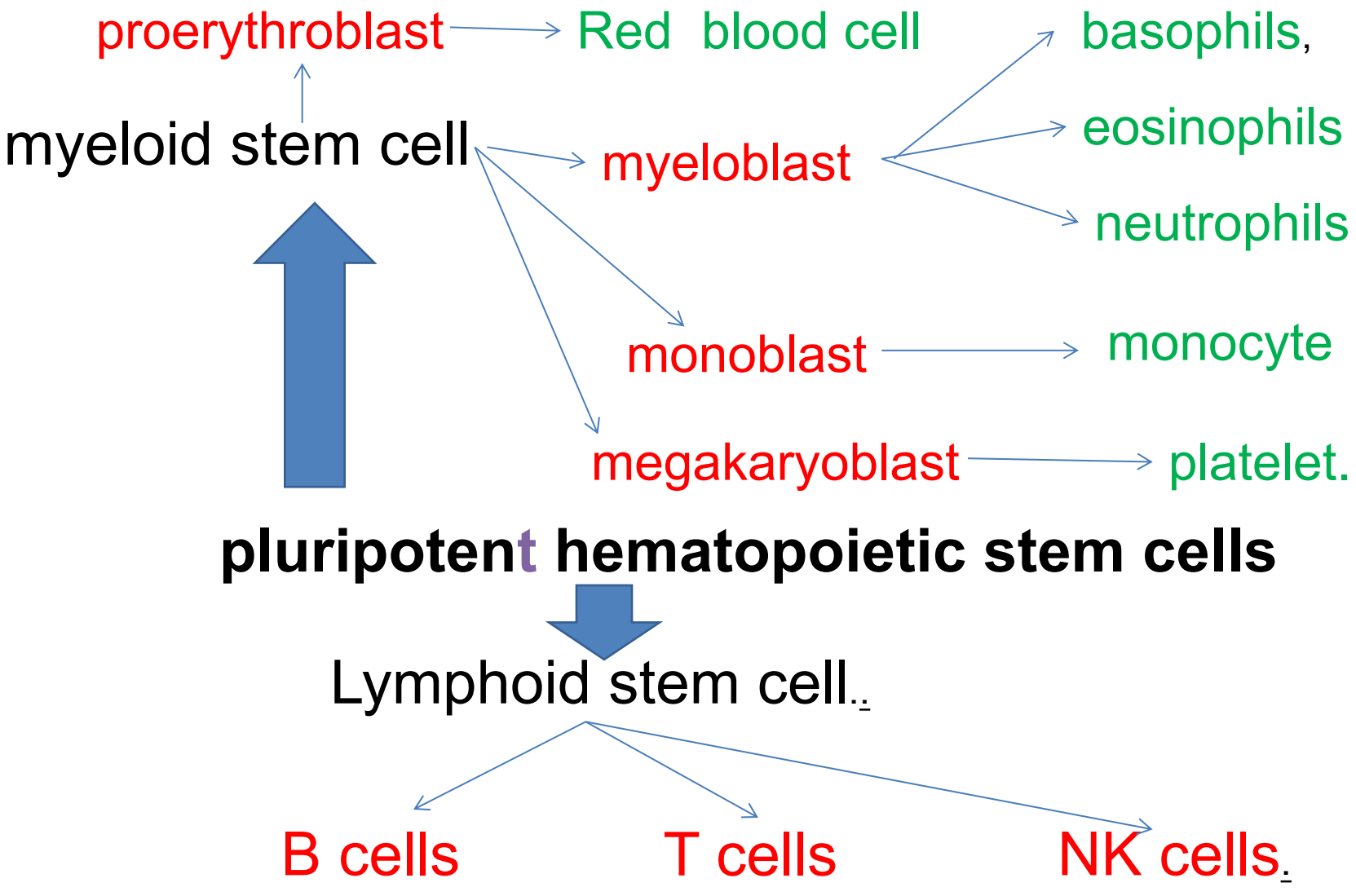
Haematopoietic stem cell ,



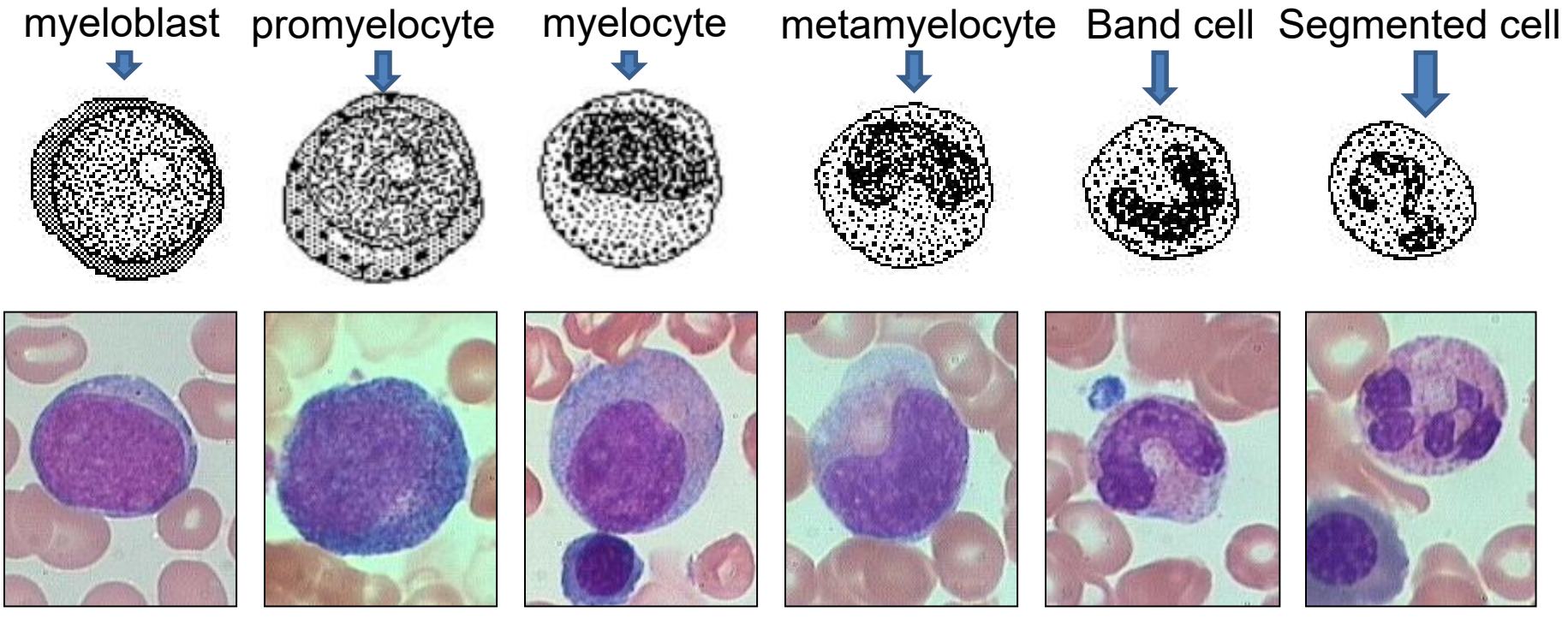
Ionising Radiation

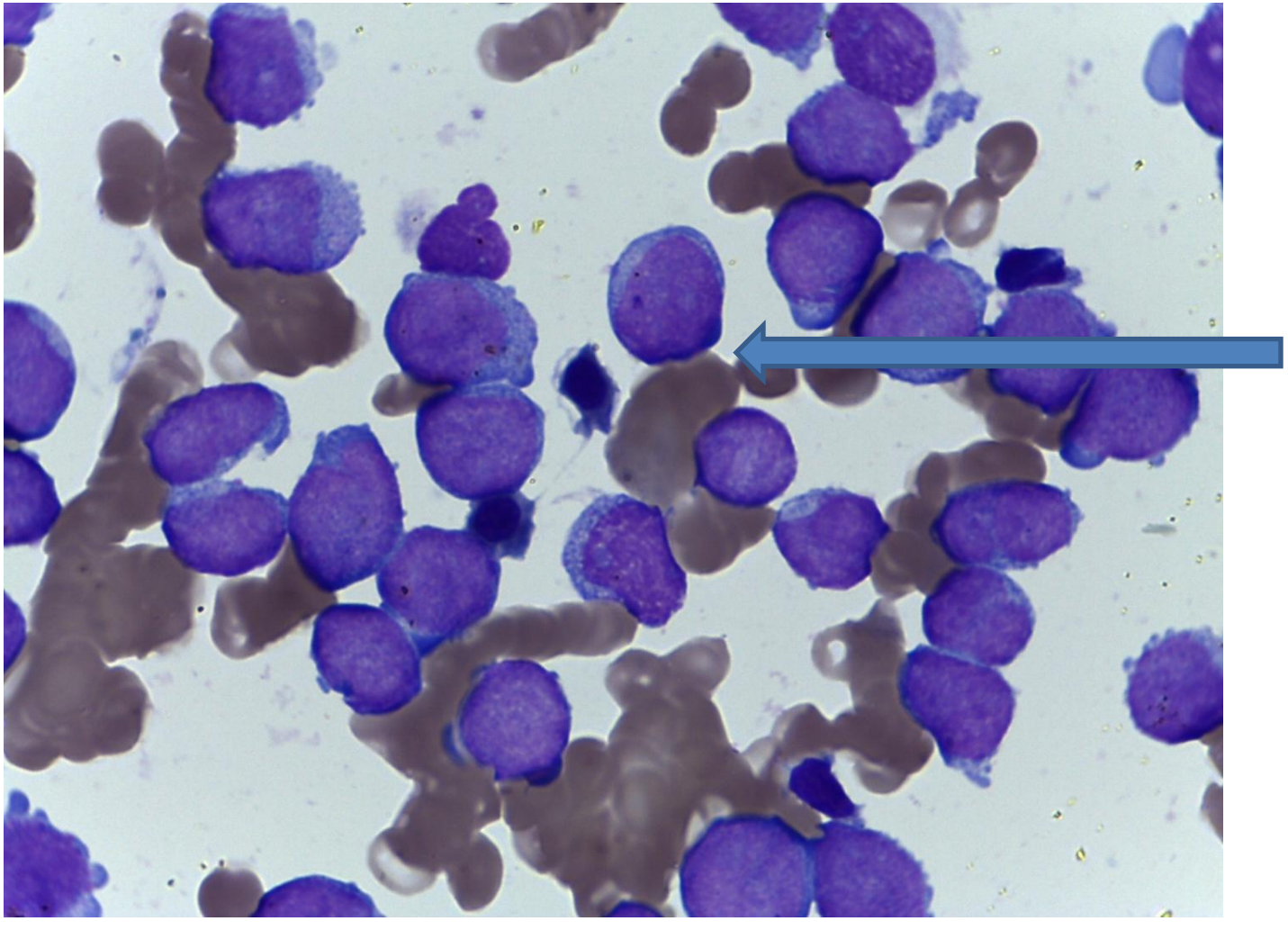


Definition


proerythroblast
Red blood cell
basophils,
myeloid stem cell
myeloblast
eosinophils
neutrophils
monoblast
monocyte
megakaryoblast
platelet.
pluripotent hematopoietic stem cells
Lymphoid stem cell.
B cells
T cells
NK cells.

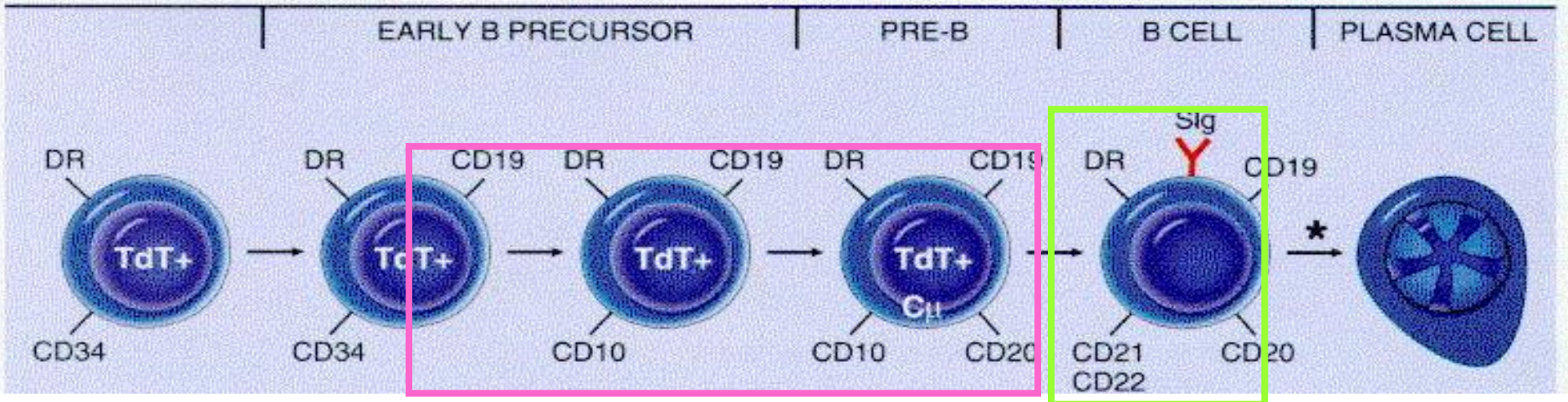
Development Of Myeloid





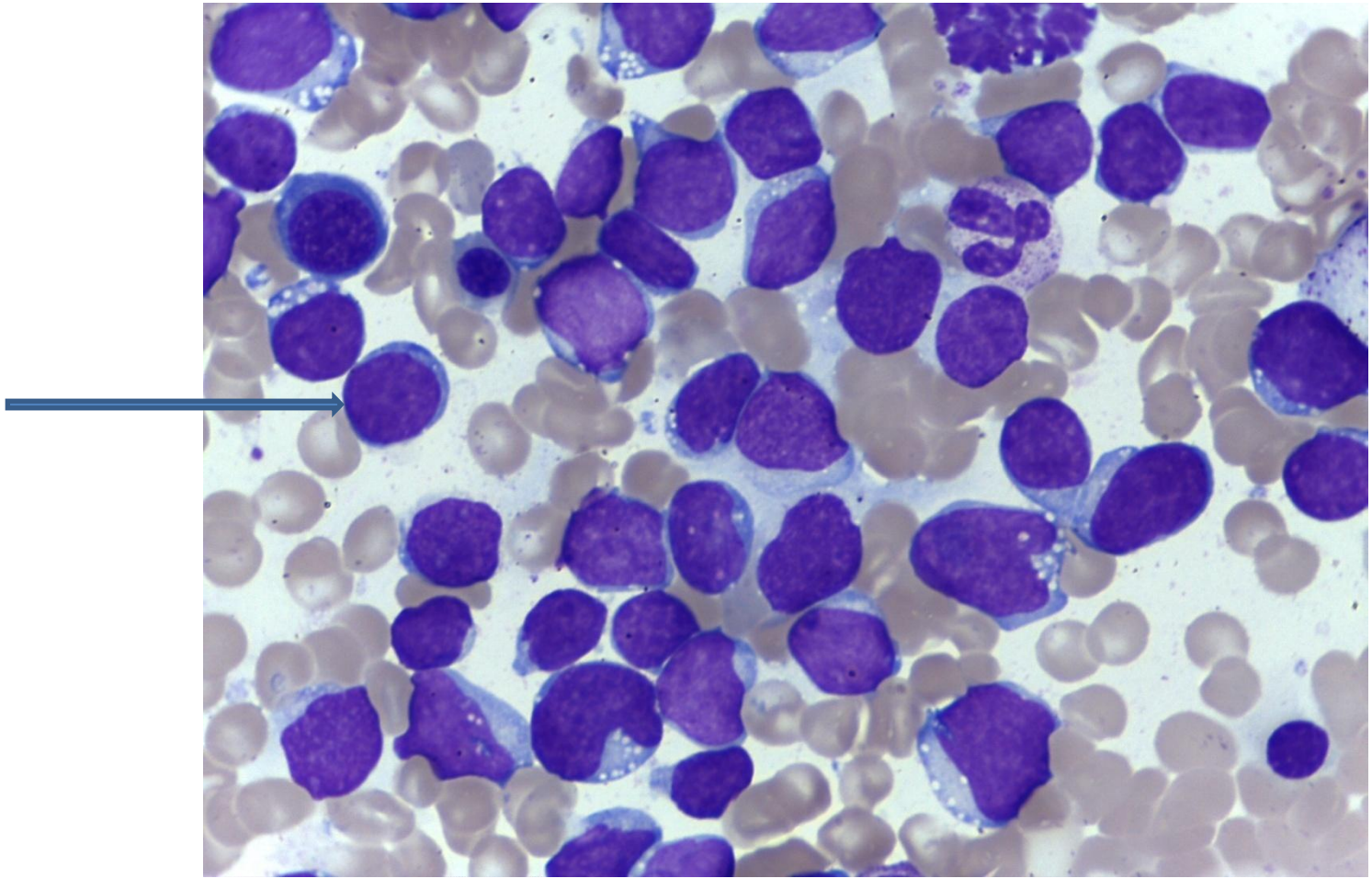
The arrow points to the myeloblast

Development Of Lymphoid



Lymphoblast

Mature lymphocyte



The arrow points to the lymphoblast

Clinical Manifestation

- The clinlcal features are usually those of bone marrow failure
  --- Anemia
  --- Bleeding
  --- Infection
  --- Infiltration of various organs and tissues
  hepatosplenomegaly and
  lymphadenopathy

Table 1 . Symptoms And Signs Of Leukaemia

		Symptoms and Signs
Marrow failure	Anaemia	Breathlessness , Pallor Fatigue, Angina
	Neutropenia	Infections : Fever
	Thrombocytopenia	Bleeding ,Bruising Gum bleeding
High WBC	Leukostasis	Headache, Hypoxia Breathlessness , Confusion, pulmonary infiltrates
low WBC		

Anemia

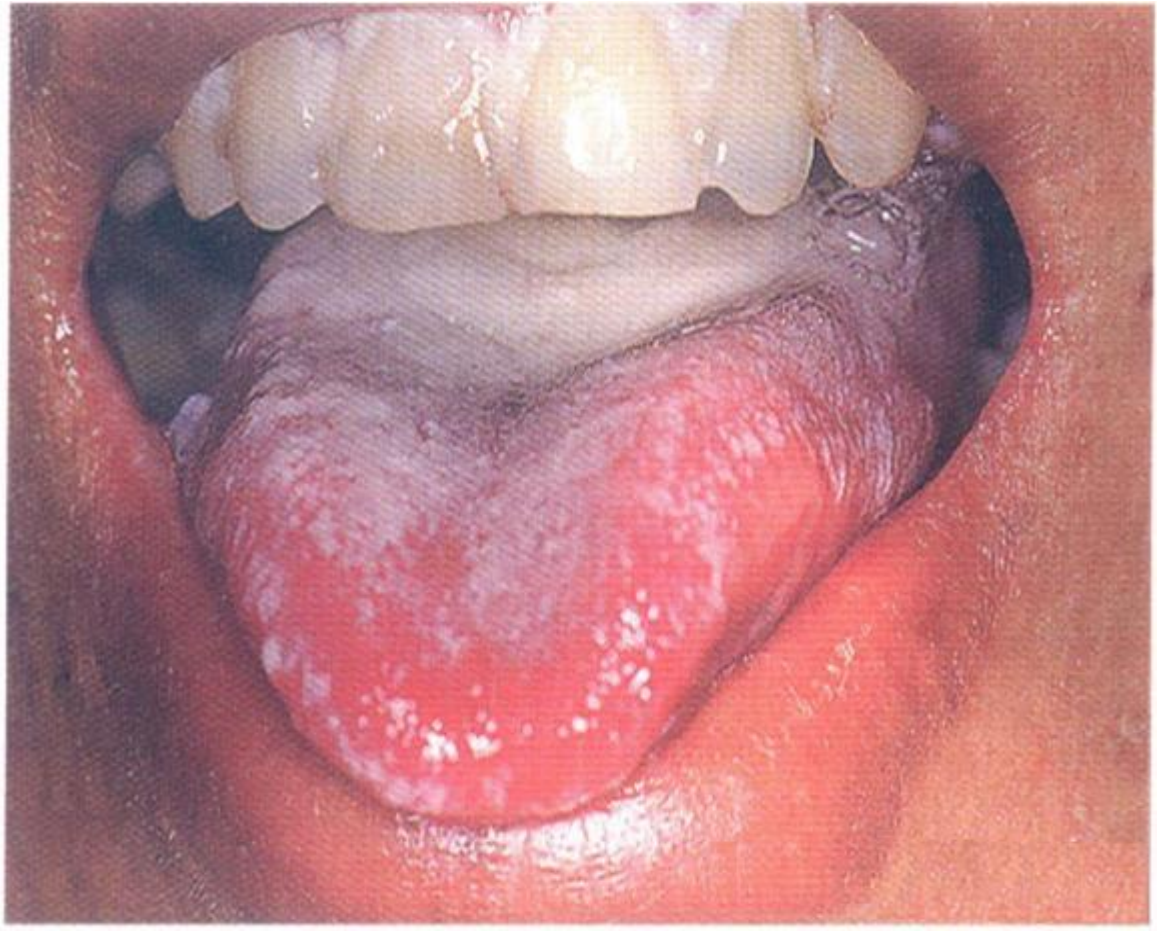




What is this?

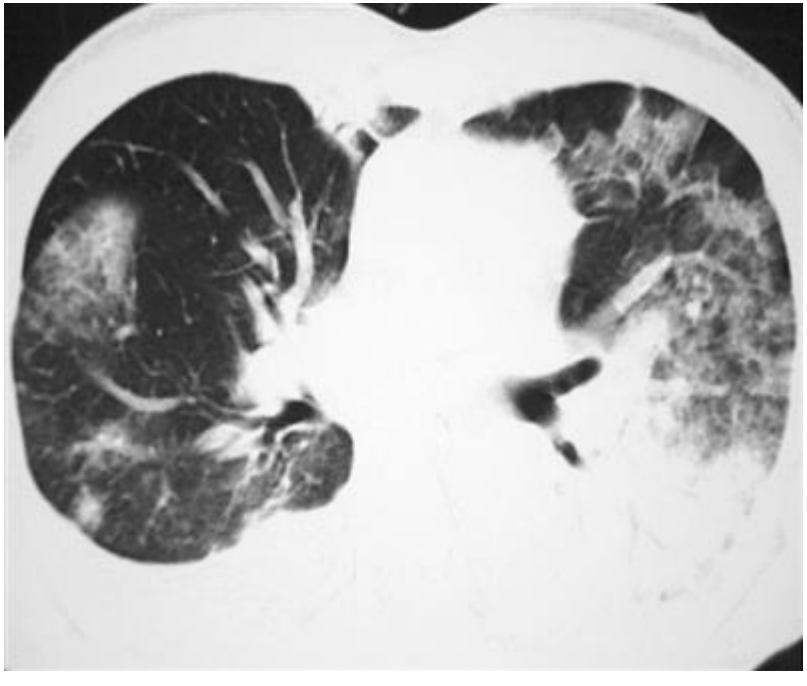






Infection






Purpura
Petechia
Ecchymosis
Face Pallor
Hematoma

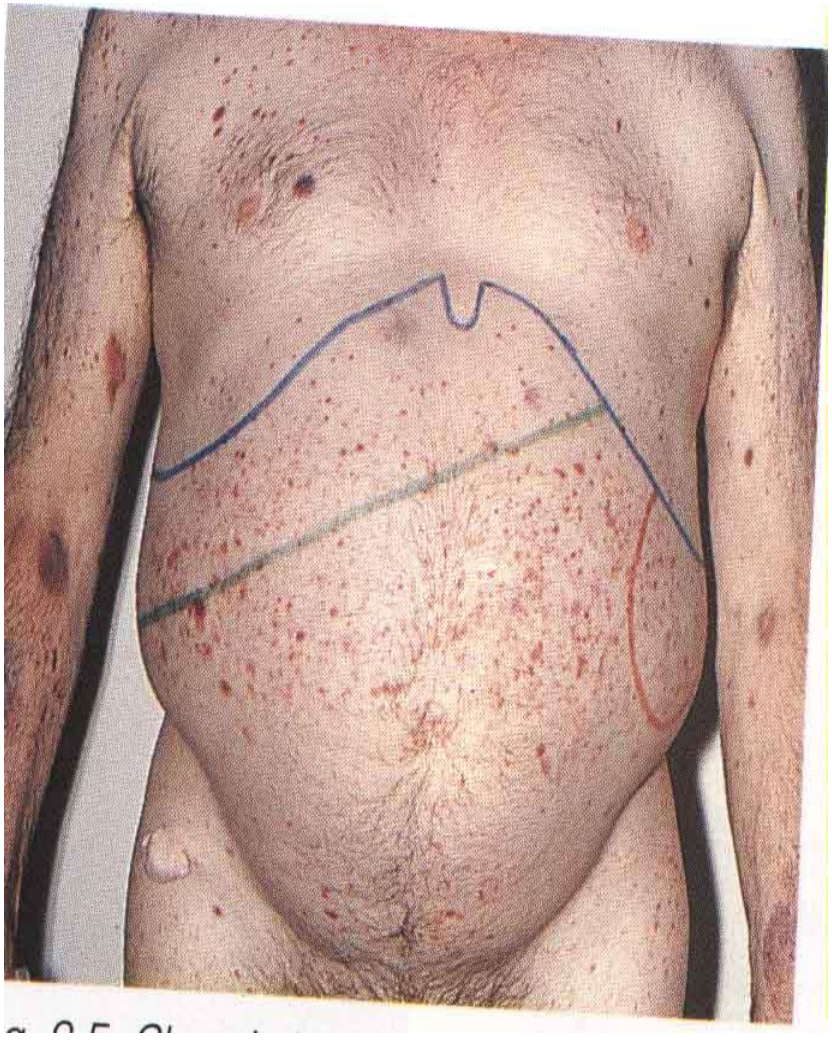
Bleeding





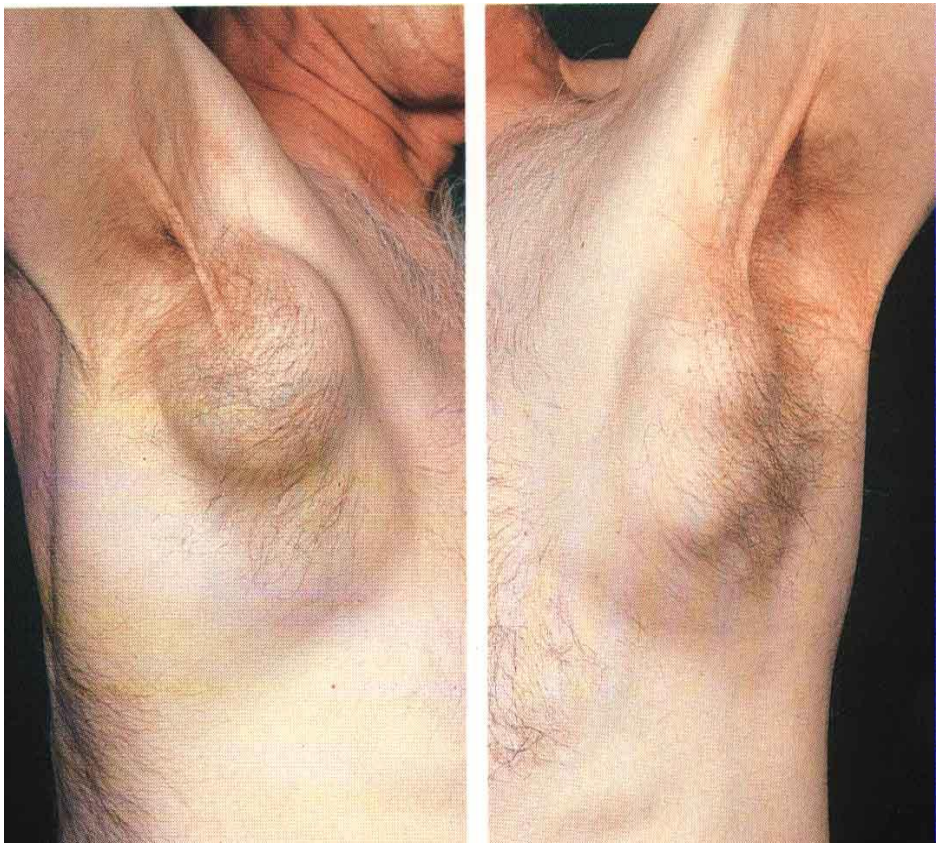


Granulocytic



Hepatosplenomegaly





Lymphadenopathy

Laboratory Studies

- **Peripheral blood**
- **Bone marrow**
- Cytochemistry
- Immunophenotyping
- Chromosome and gene
- Serum chemicals

Peripheral Blood

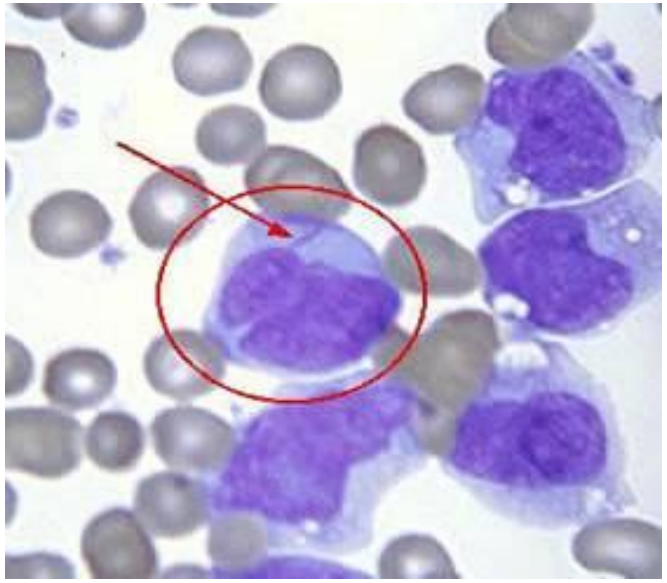
- Blood examination usually shows anaemia with a normal or raised MCV.
- The leucocyte count may vary from as low as **$1x10^9/L$** to high as **$500x10^9/L$** or more. In the majority of patients the count is below 100x109/L.
- Severe thrombocytopenia is usual but not invariable.
- The appearance of blast cells in the blood film is usually diagnostic

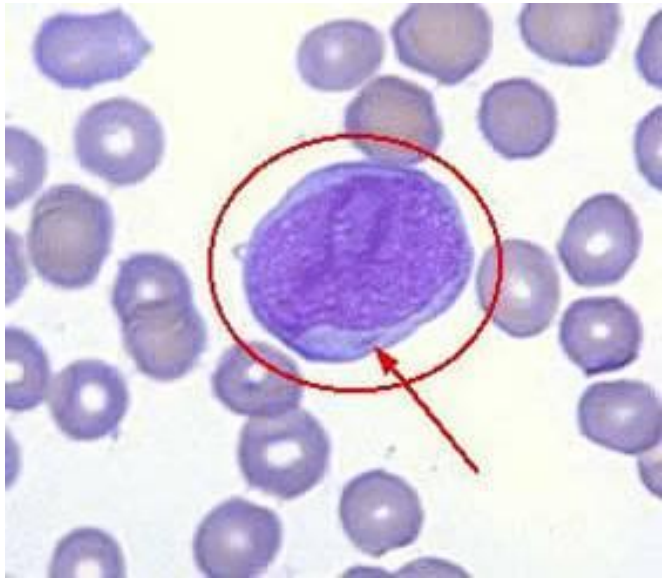
Peripheral Blood

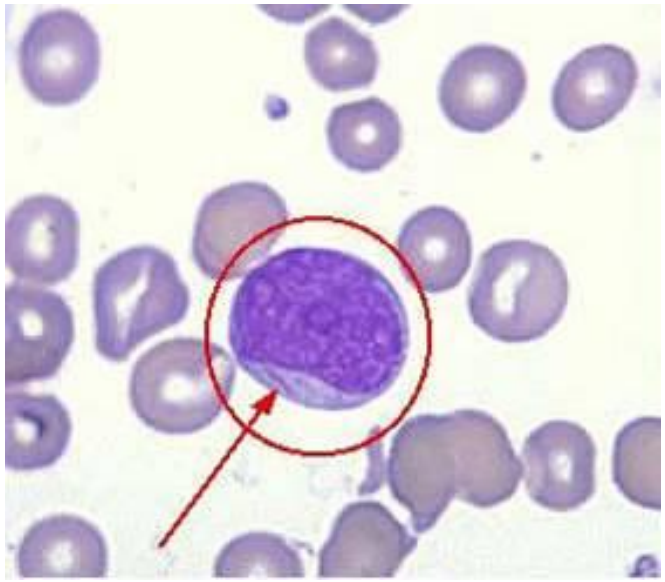
- Sometimes the blast cell count may be vary low in the Peripheral blood and a bone marrow examination is necessary to confirm the diagnosis.
-

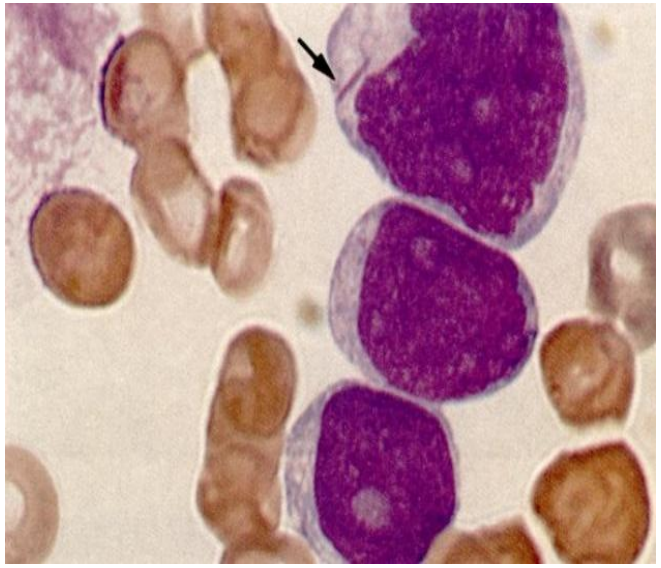
Bone Marrow

- The bone marrow is usually hypercellular, with replacement of normal elements by leukemic blast cells in varying degrees, but **more than and equal to 20%** of the cells. The presence of **Auer rods** in the cytoplasm of blast cells indicates a myeloblastic type of leukemia.









Auer rods

Disgonosis

- Pancytopenia
  - Reticulocyte ＜0.01
  - Lympocyte percentage
- No hepatomegaly; splenomegaly and lymph node enlargement ⬆
- BMP and BMB

  --- multiple sites BM Puncture： hyperplasia ⬇-----
  BM biopsy ： hematopoietic tissue ⬇
- Except for the decrease of pancytopenia

（四）、Myelodysplastic syndrome (MDS)

- MDS:Myelodysplastic syndromes

  ---- pancytopenia with excess blast and immature cells ,

  --- but less than 20%

  -- Bone marrow puncture showed pathological hematopoiesis of granulocyte, erythroid and megakaryoid.

（五）、Paroxysmal nocturnal hemoglobinuria（PNH）

- Paroxysmal nocturnal hemoglobinuria (PNH) is a hemolytic disease

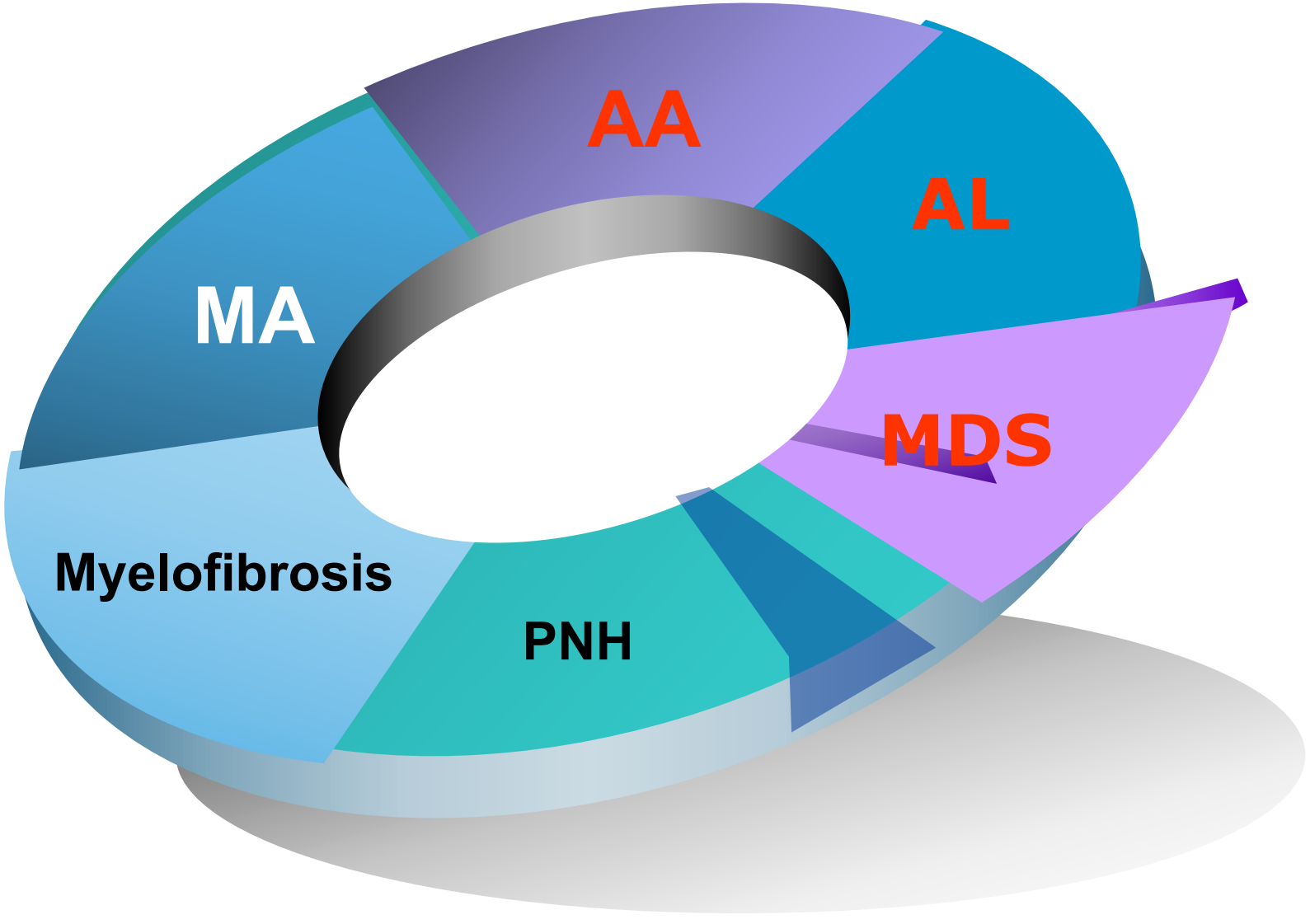
- Intermittent post-sleep hemoglobinuria.(间歇发作的睡眠后血红蛋白尿)

- Some cases have the characteristics of both PNH and AA, which are collectively called PNH-AA and AA-PNH syndrome

（五）、Paroxysmal nocturnal hemoglobinuria（PNH）

- Anemia is often macrocytic anemia or normocytic anemia;
- Reticulocytosis;
- The decrease of CD55 and CD59 was detected by flow cytometry;

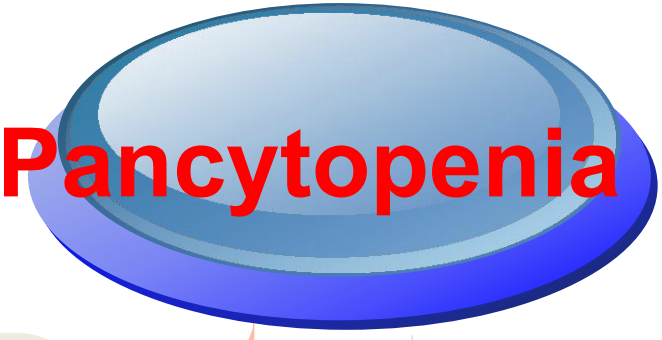
Differential Diagnosis



Hematologic Disease

characterstic	AA	PNH	MDS	hypoplasticAL
feature	Anemia infection bleeding	Recurrent hemoglobinuria ,jaundice,splenomegaly	Anemia infection bleeding	Anemia infection Bleeding infiltration
Lab test	Pancytopenia Ret ↓ hyperplasia to reduce	Pancytopenia Ret ↑ Ham(+) CD55+ ↓ CD59+ ↓	pancytopenia dyshamatopiesis Myeloblast＜20%	pancytopenia Myeloblast≥20%

classify



Hematopoietic diseases (more than 70%)

Non-hematopoietic diseases (less than 30%

二、Non-blood systemic disease

- Immune system diseases:

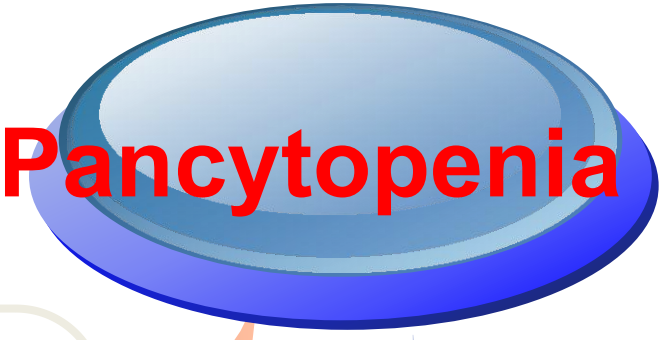
  systemic lupus erythematosus （SLE）

  Sjogren's syndrome.
- Acute and chronic liver diseases:

  Liver cirrhosis

  Hypersplenism.

summary



Hematopoietic diseases (more than 70%)

1、AA
2、MA
3、AL
4、MDS
5、PNH
6、Other

Non-hematopoietic diseases (less than 30%

1、SLE,ect
2、liver iseases

病例1

血常规：

WBC	2.8×10⁹/L	(4～10)×10⁹/L
ANC	1.2×10⁹/L	(2 ～ 7.5)×10⁹/L
Hb	53g/L	(成年男性120 ～ 160g/L) (成年女性110 ～ 150g/L)
Ret	0.004	(0.005 ～ 0.015)
PLT	35×10⁹/L	(100 ～ 300)×10⁹/L

→ 诊断NSAA

项目名称	结果	单位	参考范围
白细胞	0.59	10~9/L	3.5-9.5
中性粒细胞%	5.10	%	40-75
淋巴细胞%	86.40	%	20-50
中性粒细胞	0.03	10~9/L	1.8-6.3
淋巴细胞	0.51	10~9/L	1.1-3.2
红细胞	2.50	10~12/L	3.8-5.1
血红蛋白	83	g/L	115-150
RBC平均体积（MCV）	92.8	fL	82-100
血小板	36	10~9/L	125-350
网织红细胞比值	1.83	%	0.5-1.5
网织红细胞绝对值	45.8	10~9/L	24-84

贫血三项：

项目名称	结果	单位	参考范围
叶酸测定(folate)	15.55	ng/mL	3.1-19.9
血清维生素B12测定	>1118	pmol/L	133-675
血清铁蛋白测定ferritin	404.10	ng/mL	11-306

CD55、CD59

项目名称	结果	单位	参考范围
红细胞CD55	99.5	%	95-100
红细胞CD59	99.2	%	95-100
粒细胞CD55	100.0	%	95-100
粒细胞CD59	100.0	%	95-100

项目名称	结果	参考值
ANA抗体	阴性	阴性
ds-DNA	阴性	阴性
抗组蛋白抗体	阴性	阴性
抗SSB抗体	阴性	阴性
抗着丝点抗体	阴性	阴性
抗中性粒细胞胞浆抗体	阴性	阴性
抗肾小球基地膜抗体	阴性	阴性

肝炎全套(Hepatitis test)

甲型肝炎IgM抗体测定	阴性
丙型肝炎病毒抗体	阴性
乙肝表面抗原	阴性
乙肝表面抗体	阳性
乙肝e抗原	阴性
乙肝e抗体	阳性
乙肝核心抗体	阴性

