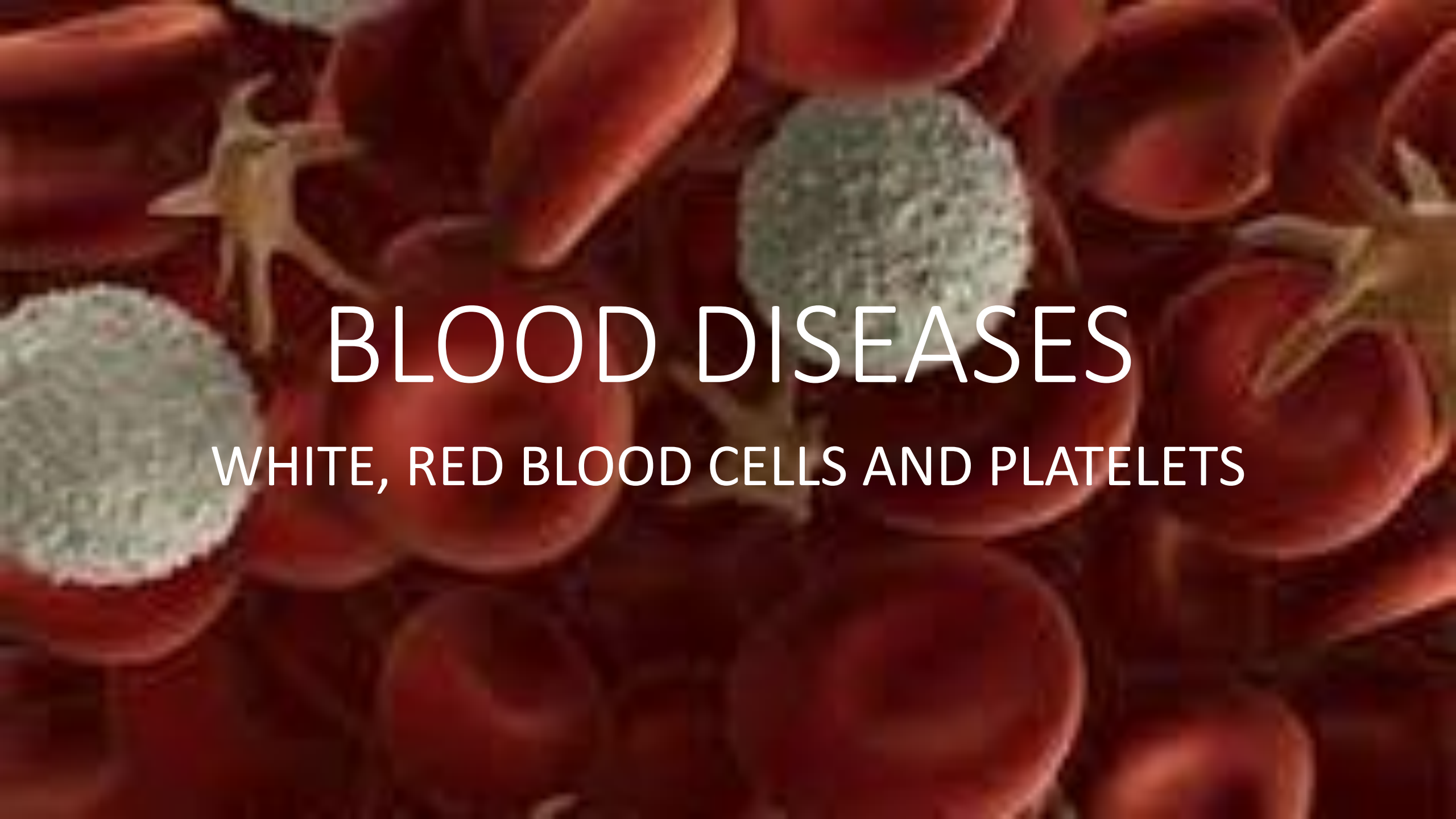


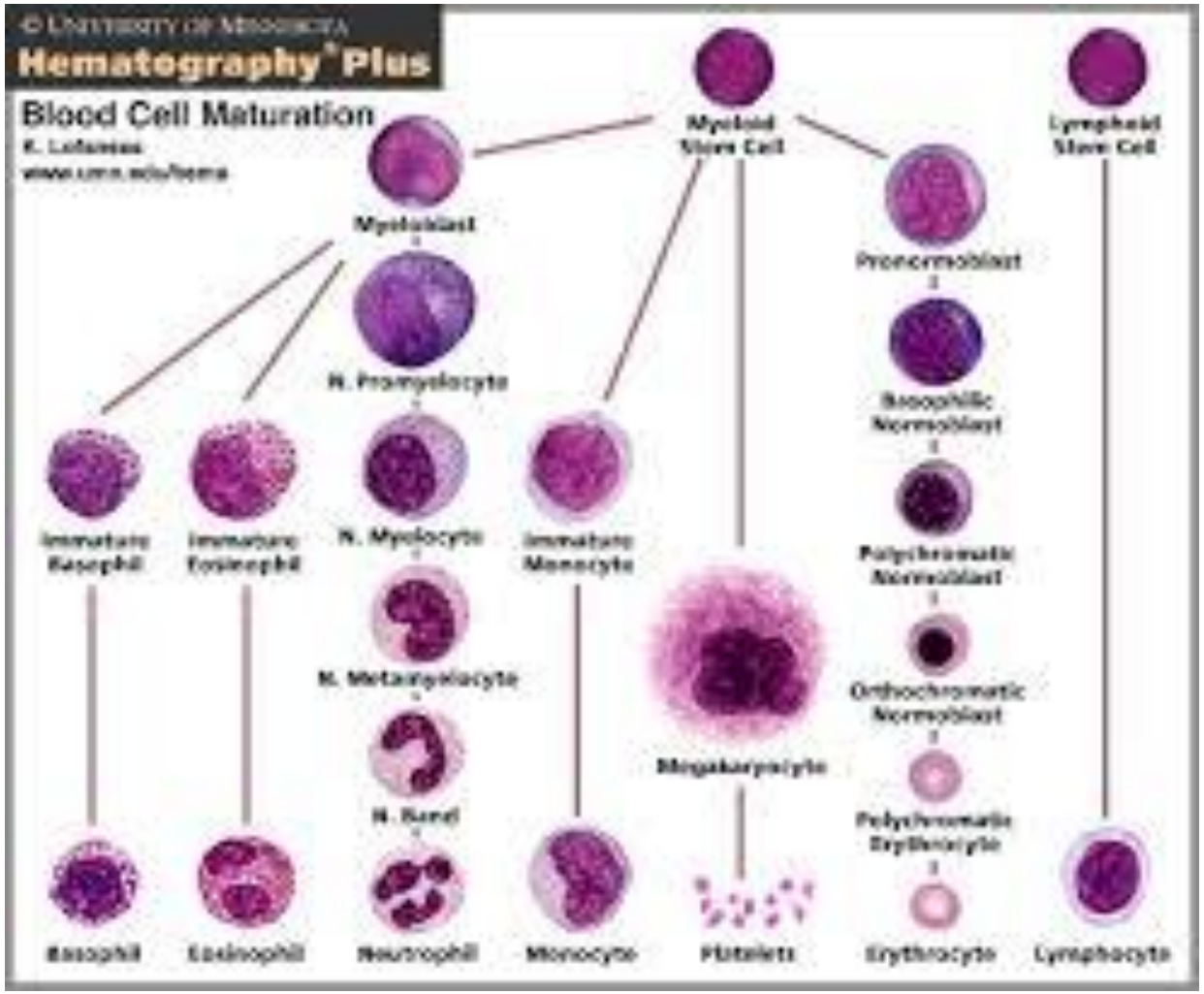
BLOOD DISEASES

WHITE, RED BLOOD CELLS AND PLATELETS

What are blood cell disorders?

- A blood cell disorder is a condition in which there's a problem with your red blood cells, white blood cells, or the smaller circulating cells called platelets, which are critical for clot formation.
- All three cell types form in the bone marrow, which is the soft tissue inside your bones.
- Red blood cells transport oxygen to your body's organs and tissues.
- White blood cells help your body fight infections.
- Platelets help your blood to clot.
- Blood cell disorders impair the formation and function of one or more of these types of blood cells.

NORMAL HAEMATOPOIESIS



What are the symptoms of blood cell disorders?

Symptoms will vary depending on the type of blood cell disorder.

Common symptoms of red blood cell disorders are:

- fatigue
- shortness of breath
- trouble concentrating from lack of oxygenated blood in the brain
- muscle weakness
- a fast heartbeat

Common symptoms of white blood cell disorders are:

- chronic infections
- fatigue
- unexplained weight loss
- malaise, or a general feeling of being unwell

Common symptoms of platelet disorders are:

- cuts or sores that don't heal or are slow to heal
- blood that doesn't clot after an injury or cut
- skin that bruises easily
- unexplained nosebleeds or bleeding from the gums

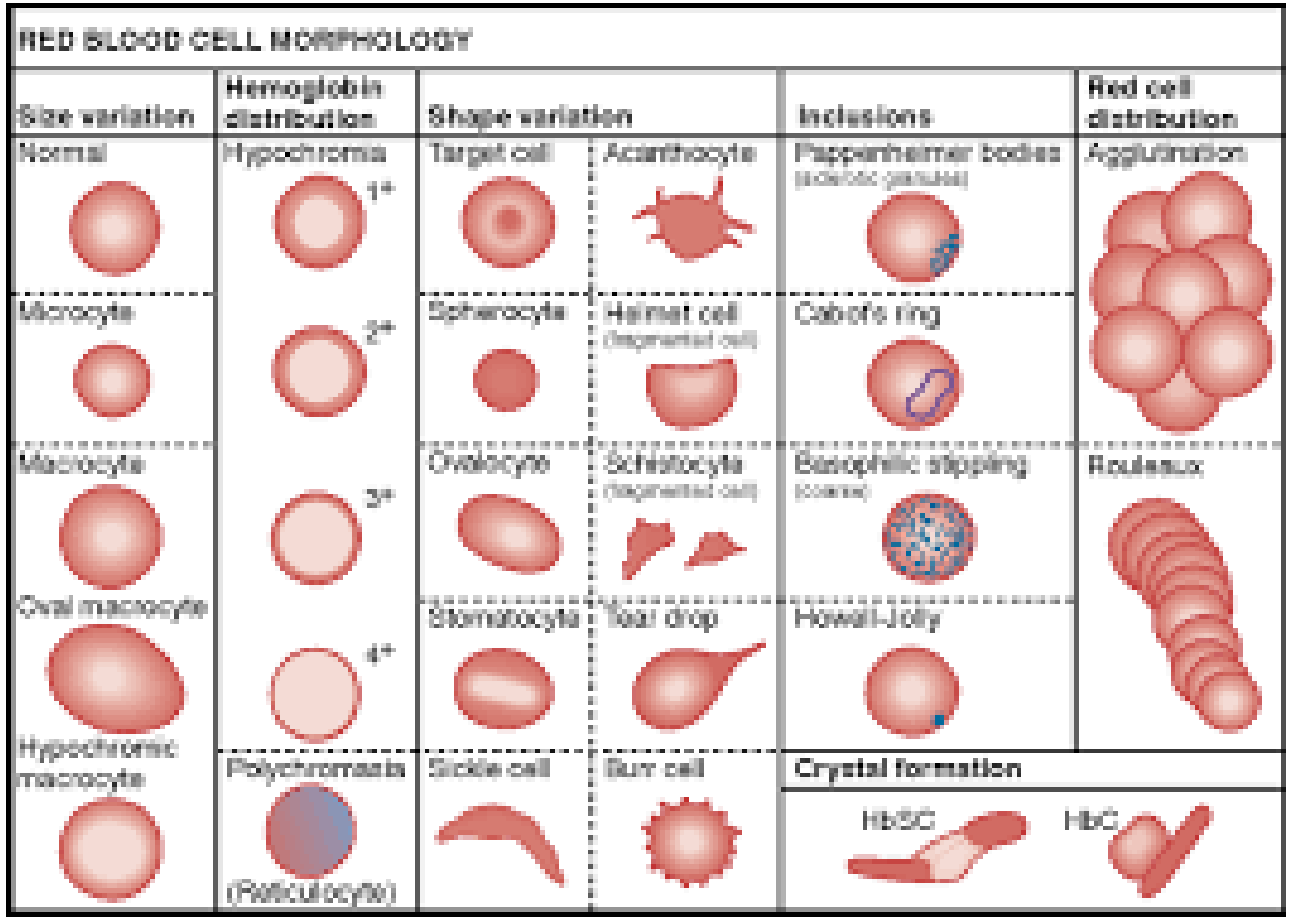
There are many types of blood cell disorders that can greatly affect your overall health.

NORMAL BLOOD COUNT

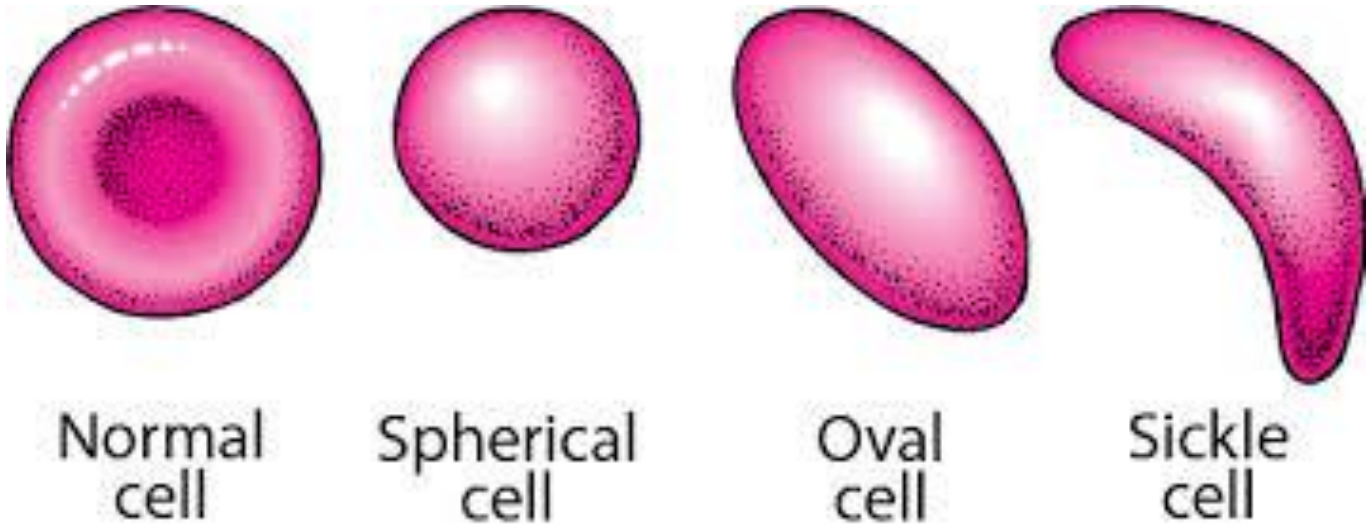
Blood cell types	Men	Women
RBC	4.5 - 6.0 million/microliter	4.0 to 5.0 million/microliter
WBC	4.5 - 11 thousand/ microliter	4.5 to 11 thousand/ microliter
Platelet	150 - 450 thousand/ microliter	150 - 450 thousand/ microliter
Hematocrit	42% to 50%	36% to 45%
Hemoglobin	14 - 17 grams/100 milliliters	12 - 15 grams/100 milliliters

RED BLOOD CELL DISORDERS

Red blood cell disorders affect the body's red blood cells. These are cells in your blood that carry oxygen from your lungs to the rest of your body. There are a variety of these disorders, which can affect both children and adults.



RBC VARIATIONS



ANAEMIA

Anaemia is one type of red blood cell disorder. A lack of the mineral iron in your blood commonly causes this disorder. Your body needs iron to produce the protein haemoglobin, which helps your red blood cells (RBCs) carry oxygen from your lungs to the rest of your body. There are many types of anaemia.

- **Iron deficiency anaemia:** Iron deficiency anaemia occurs when your body does not have enough iron. You may feel tired and short of breath because your RBCs are not carrying enough oxygen to your lungs. Iron supplementation usually cures this type of anaemia.
- **Pernicious anaemia:** Pernicious anaemia is an autoimmune condition in which your body is unable to absorb sufficient amounts of vitamin B-12. This results in a low number of RBCs. It is called “pernicious,” meaning dangerous, because it used to be untreatable and often fatal. Now, B-12 injections usually cure this type of anaemia.

- **Aplastic anaemia:** Aplastic anaemia is a rare but serious condition in which your bone marrow stops making enough new blood cells. It can occur suddenly or slowly, and at any age. It can leave you feeling tired and unable to fight off infections or uncontrolled bleeding.
- **Autoimmune haemolytic anaemia (AHA):** Autoimmune haemolytic anaemia (AHA) causes your immune system to destroy your red blood cells faster than your body can replace them. This results in you having too few RBCs.
- **Sickle cell anaemia:** Sickle cell anaemia (SCA) is a type of anaemia that draws its name from the unusual sickle shape of the affected red blood cells. Due to a genetic mutation, the red blood cells of people with sickle cell anaemia contain abnormal haemoglobin molecules, which leave them rigid and curved. The sickle-shaped red blood cells can't carry as much oxygen to your tissues as normal red blood cells can. They may also become stuck in your blood vessels, blocking blood flow to your organs.

THALASSAEMIA

Thalassemia is a group of inherited blood disorders. These disorders are caused by genetic mutations that prevent the normal production of haemoglobin. When red blood cells do not have enough haemoglobin, oxygen doesn't get to all parts of the body. Organs then do not function properly.

These disorders can result in:

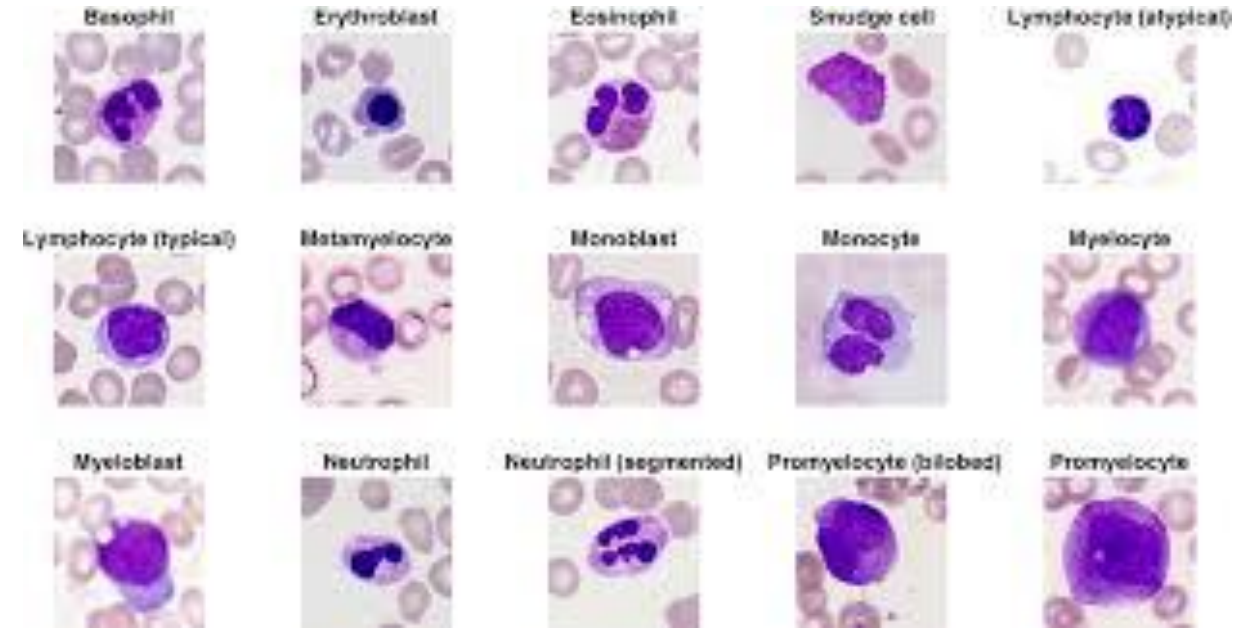
- bone deformities
- enlarged spleen
- heart problems
- growth and developmental delays in children

POLYCYTHEMIA VERA

Polycythemia is a blood cancer caused by a gene mutation. If you have polycythemia, your bone marrow makes too many red blood cells. This causes your blood to thicken and flow more slowly, putting you at risk for blood clots that can cause heart attacks or strokes. There is no known cure. Treatment involves phlebotomy, or removing blood from your veins, and medication.

WHITE BLOOD CELL DISORDERS

White blood cells (leukocytes) help defend the body against infection and foreign substances. White blood cell disorders can affect your body's immune response and your body's ability to fight off infection.
These disorders can affect both adults and children.



Disorders of white cells include:

A. Proliferations (leucocytosis)

- reactive

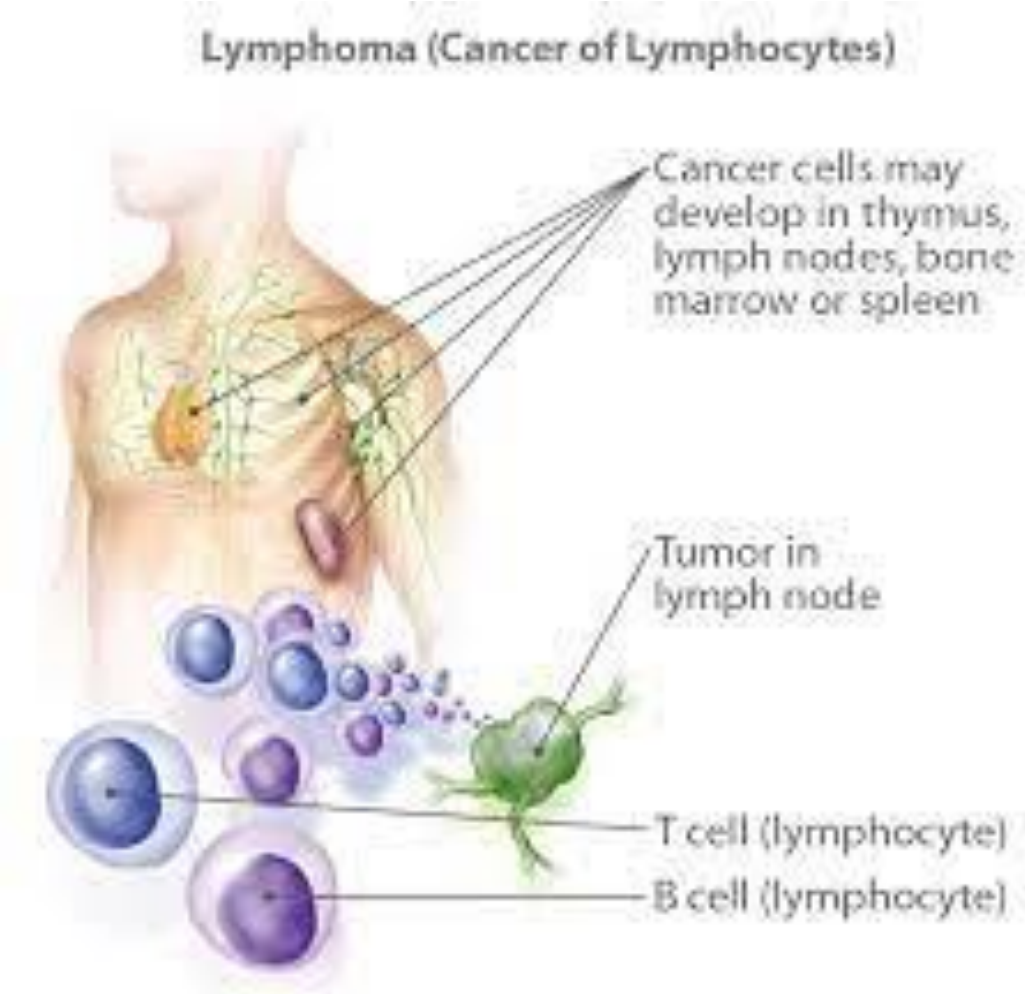
- neoplastic

B. Deficiencies (leukopenias)

- Reactive proliferations of WBCs in response to an underlying primary, often microbial, disease is fairly common.
- Neoplastic disorders, though less common, are more ominous and cause approximately 9% of all cancer deaths in adults and a staggering 40% in children younger than 15 years.
- In this session, we'll discuss about non-neoplastic disorders of white blood cells.

LYMPHOMA

Lymphoma is a blood cancer that occurs in the body's lymphatic system. Your white blood cells change and grow out of control. Hodgkin's lymphoma and non-Hodgkin's lymphoma are the two major types of lymphoma.

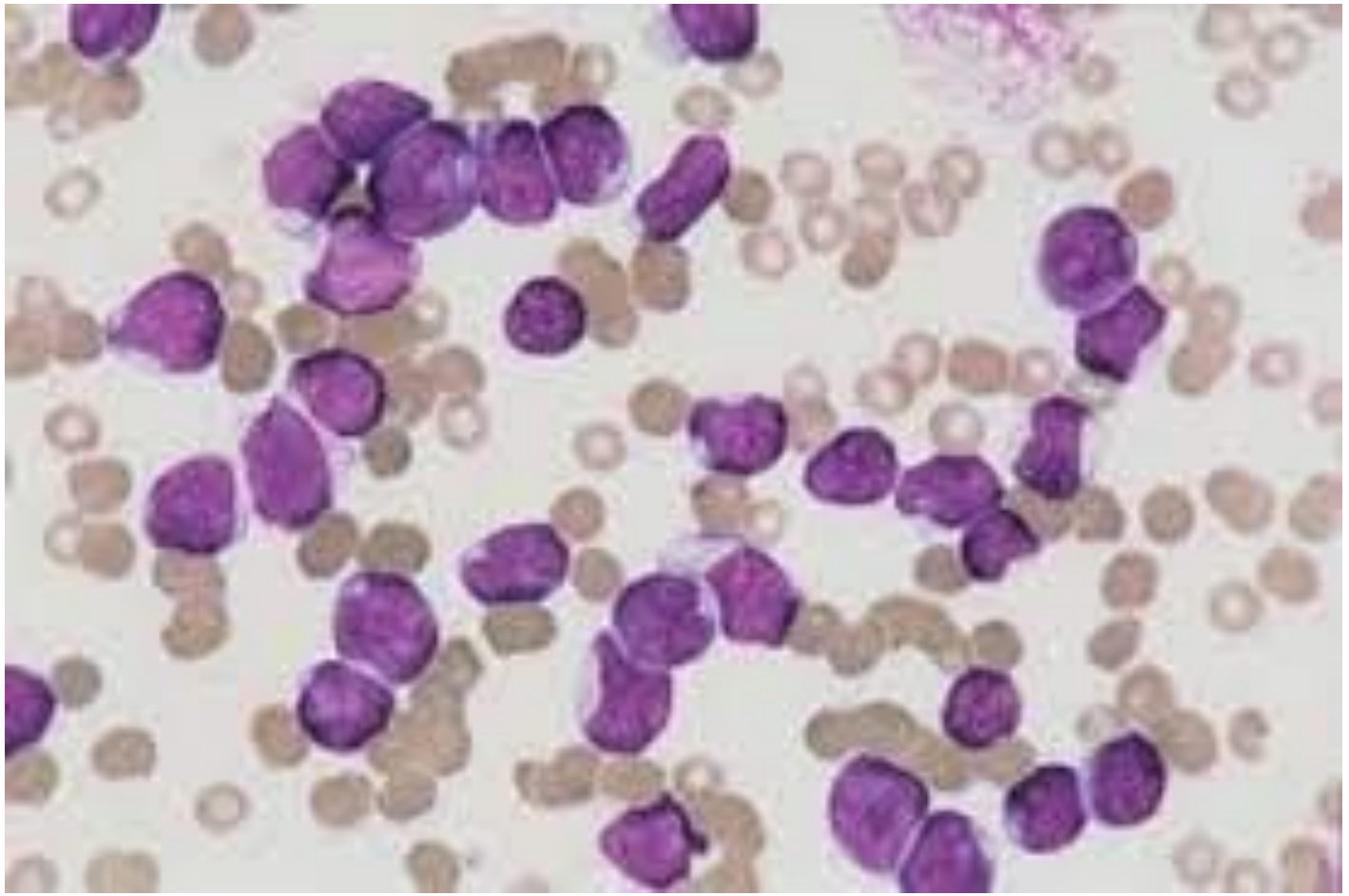


LEUKAEMIA

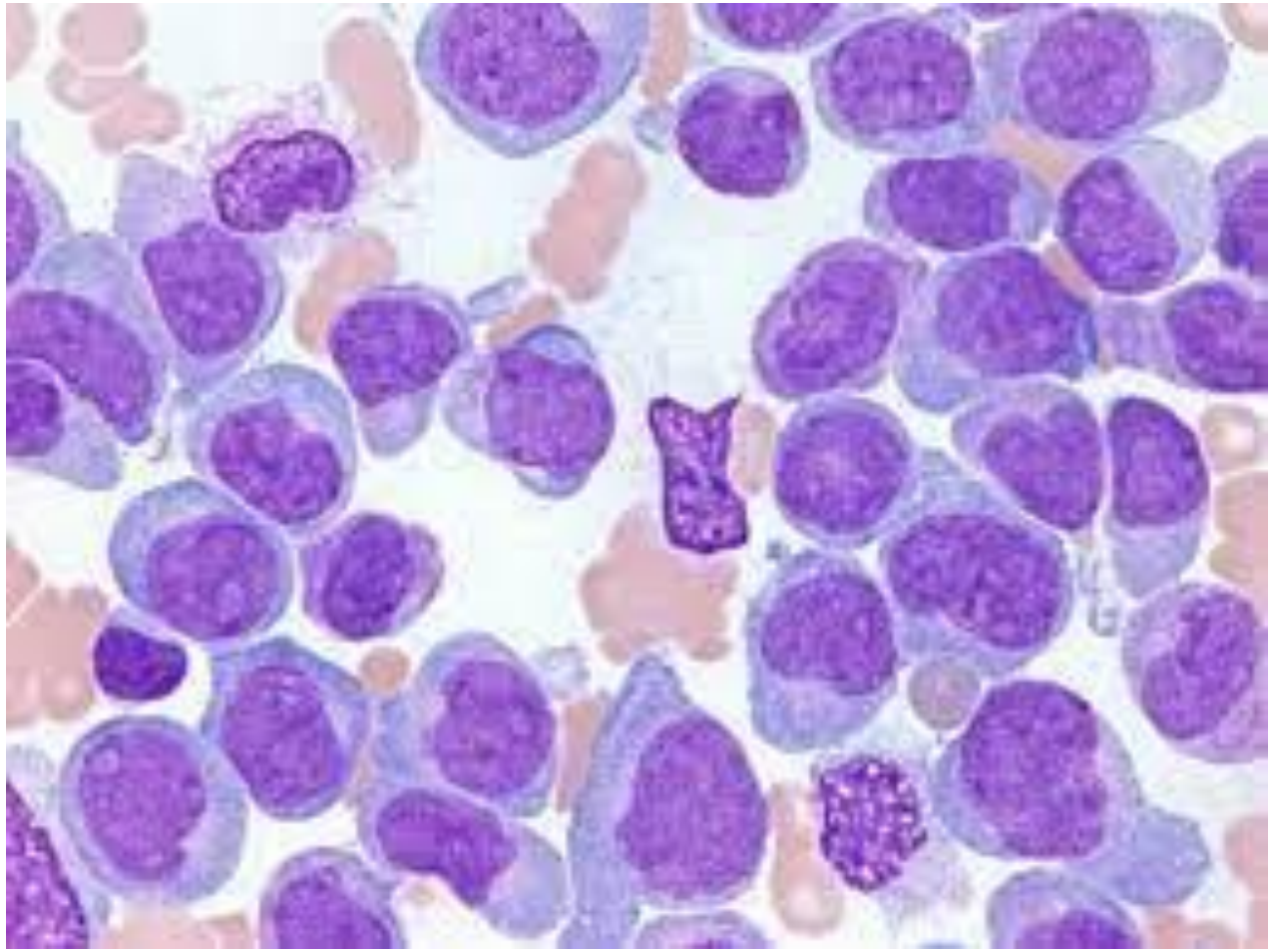
Leukaemia is blood cancer in which malignant white blood cells multiply inside your body's bone marrow. Leukaemia may be either acute or chronic. Chronic leukaemia advances more slowly.

- Acute lymphocytic leukaemia (ALL). This is the most common type of leukaemia in young children
- Acute myelogenous leukaemia (AML). AML is a common type of leukaemia
- Chronic lymphocytic leukaemia (CLL)
- Chronic myelogenous leukaemia (CML)
- Other types.

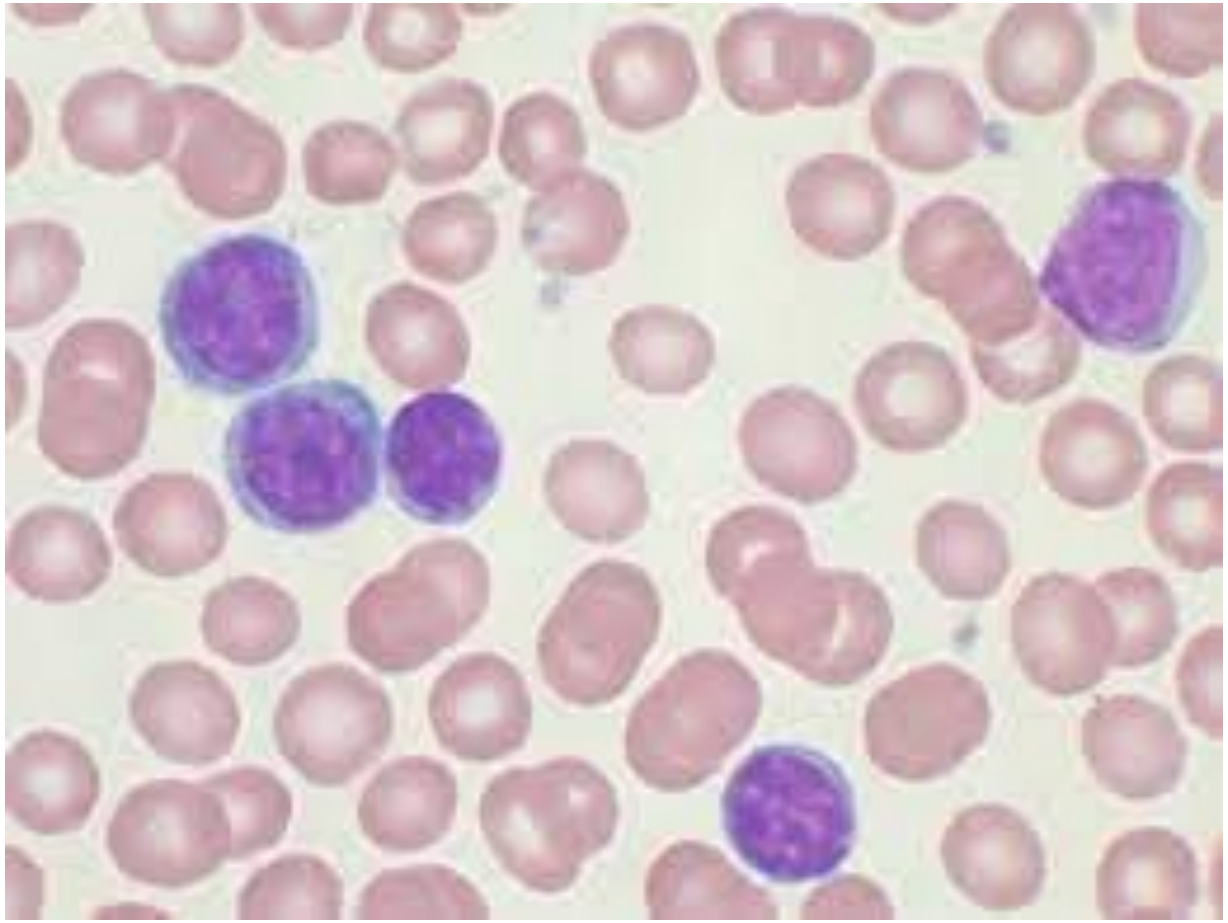
Acute lymphocytic leukaemia (ALL)



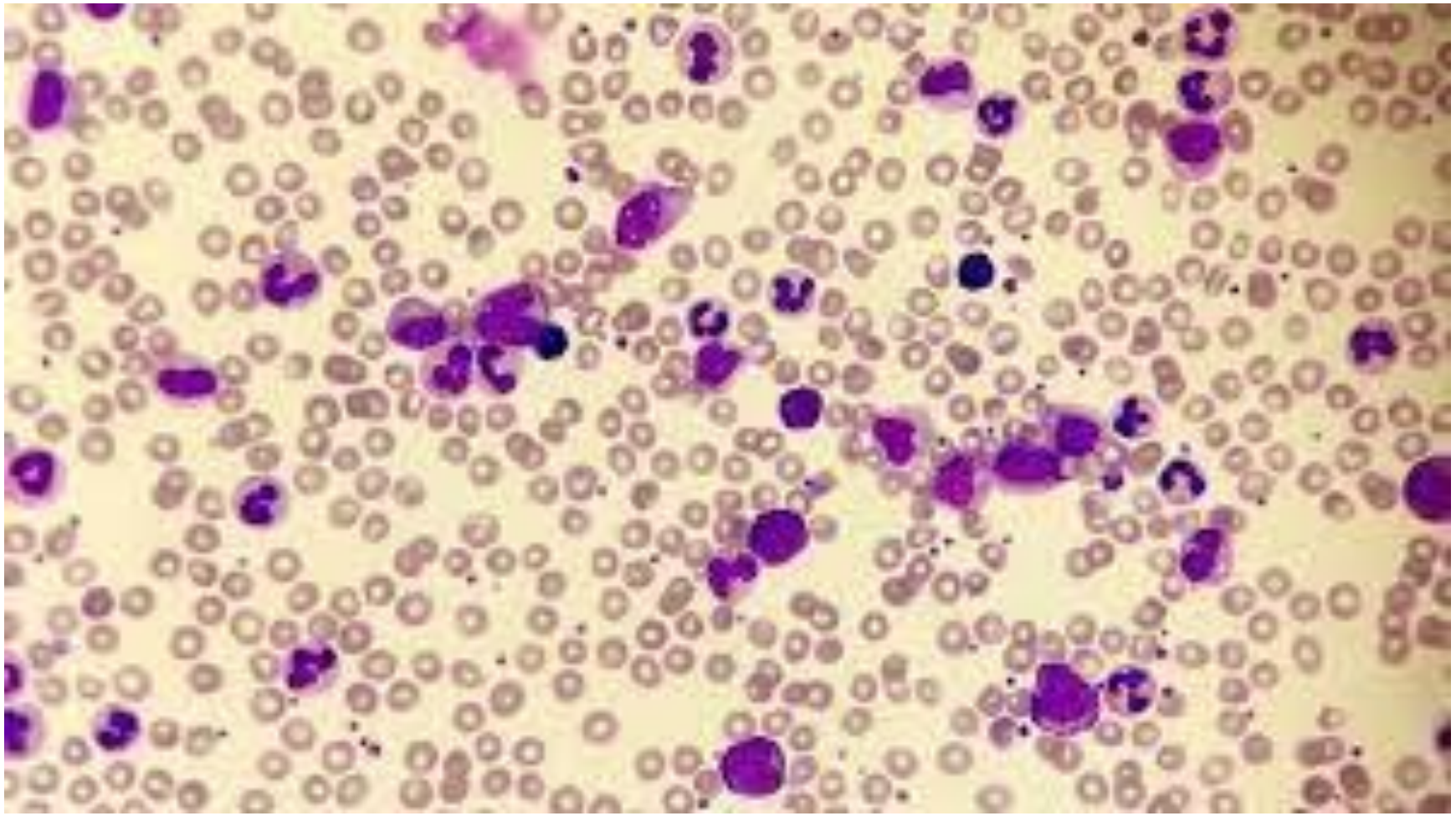
Acute myelogenous leukaemia (AML)



Chronic lymphocytic leukaemia (CLL)



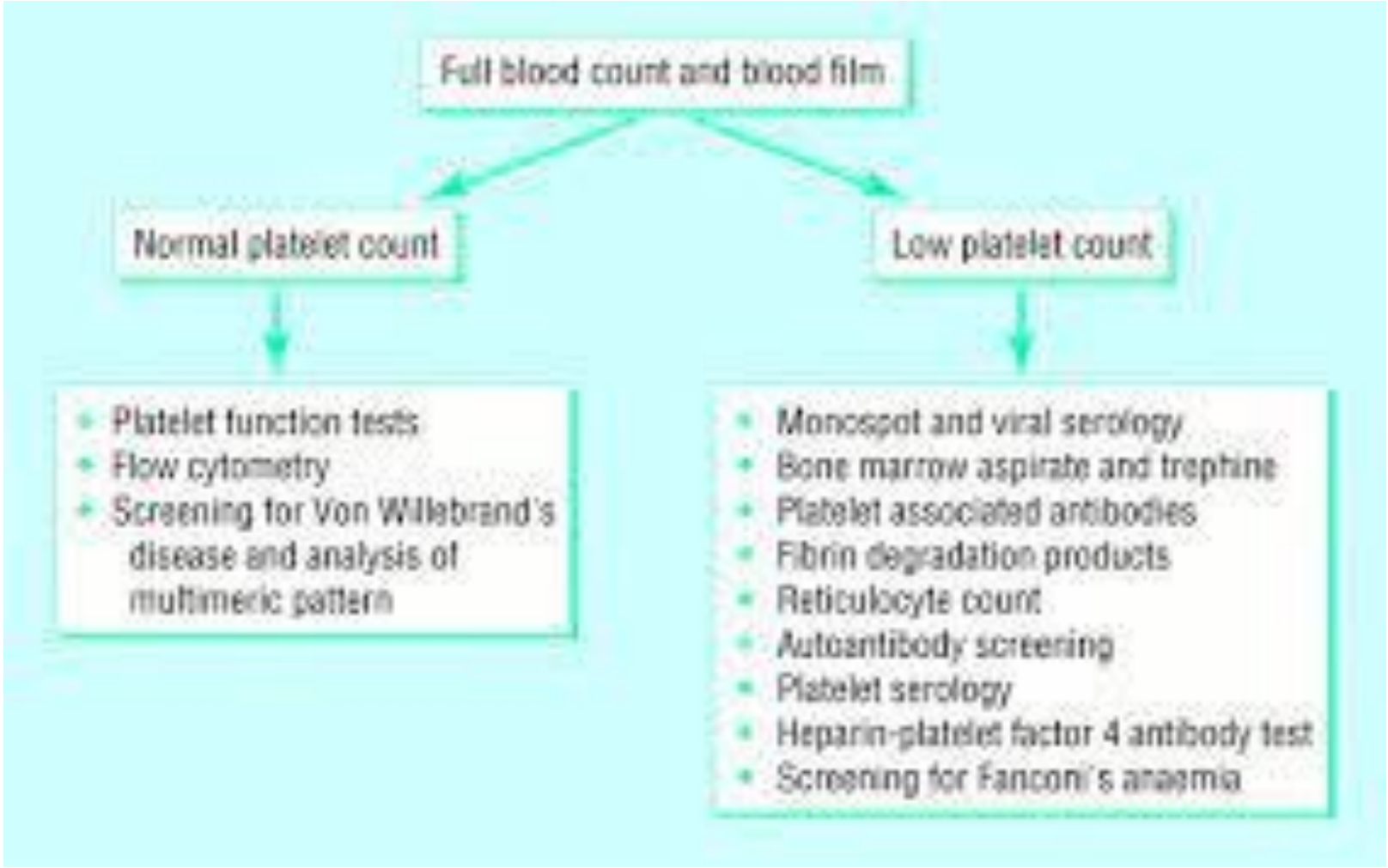
Chronic myelogenous leukaemia (CML)



MYELODYSPLASTIC SYNDROME (MDS)

Myelodysplastic syndrome (MDS) is a condition affecting the white blood cells in your bone marrow. The body produces too many immature cells, called blasts. The blasts multiply and crowd out the mature and healthy cells. Myelodysplastic syndrome may progress either slowly or quite fast. It sometimes leads to leukaemia.

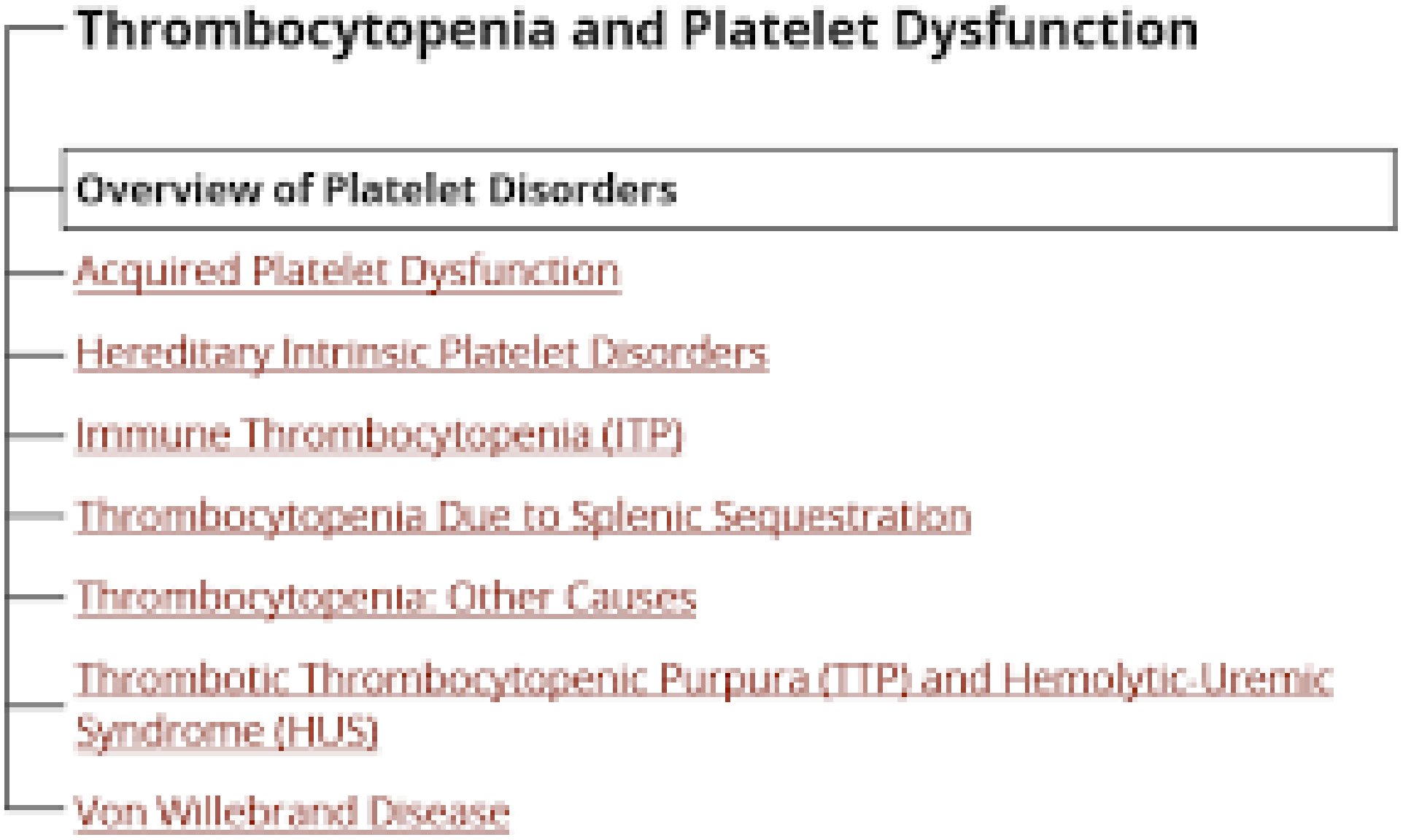
Platelet count



PLATELET DISORDERS

Blood platelets are the first responders when you have a cut or other injury. They gather at the site of the injury, creating a temporary plug to stop blood loss. If you have a platelet disorder, your blood has one of three abnormalities:

- Not enough platelets. Having too few platelets is quite dangerous because even a small injury can cause serious blood loss.
- Too many platelets. If you have too many platelets in your blood, blood clots can form and block a major artery, causing a stroke or heart attack.
- Platelets that don’t clot correctly. Sometimes, deformed platelets can’t stick to other blood cells or the walls of your blood vessels, and so can’t clot properly. This can also lead to a dangerous loss of blood.


Thrombocytopenia and Platelet Dysfunction
Overview of Platelet Disorders
Acquired Platelet Dysfunction
Hereditary Intrinsic Platelet Disorders
Immune Thrombocytopenia (ITP)
Thrombocytopenia Due to Splenic Sequestration
Thrombocytopenia: Other Causes
Thrombotic Thrombocytopenic Purpura (TTP) and Hemolytic-Uremic Syndrome (HUS)
Von Willebrand Disease

Platelet disorders are primarily genetic, meaning they are inherited. Some of these disorders include:

- Von Willebrand disease

Von Willebrand disease is the most common inherited bleeding disorder. It is caused by a deficiency of a protein that helps your blood clot, called von Willebrand factor (VWF).

- Haemophilia

Hemophilia is probably the best-known blood clotting disorder. It occurs almost always in males. The most serious complication of haemophilia is excessive and prolonged bleeding. This bleeding can be either inside or outside your body. The bleeding can start for no apparent reason. Treatment involves a hormone called desmopressin for mild type A, which can promote release of more of the reduced clotting factor, and infusions of blood or plasma for types B and C.

PRIMARY THROMBOCYTHAEMIA

Primary thrombocythemia is a rare disorder that can lead to increased blood clotting. This puts you at higher risk for stroke or heart attack. The disorder occurs when your bone marrow produces too many platelets.

Acquired platelet function disorders:

Certain drugs and medical conditions can also affect the functioning of platelets. Be sure to coordinate all your medications with your doctor, even over-the-counter ones you choose yourself. The Canadian Haemophilia Association (CHA) warns that the following common drugs may affect platelets, especially if taken long-term.

- aspirin
- nonsteroidal anti-inflammatory (NSAIDs)
- some antibiotics
- heart drugs
- blood thinners
- antidepressants
- anaesthetics
- antihistamines


THE END