**LEUKEMIA**

The term **leukemia** (l.)is a progressive malignant disease of the bone marrow, characterized by abnormal proliferation and development of haematopoietic cells and their precursors. The neoplastic cells are seen in the blood and/or bone marrow. Blood leukocyte counts may be low (cytopenia), normal, or high in animals with leukemia. Reduction in the number of normal blood cells, because the bone marrow becomes overwhelmed by the neoplastic cells.

An exception is the neoplastic proliferation of plasma cells in bone marrow (multiple myeloma), which is not referred to as a leukemia.

**CLASSIFICATION OF LEUKEMIA**

Hematopoietic neoplasms arise from the bone marrow, lymph nodes, spleen, or thymus. They are classified as either lymphoid or myeloid neoplasms. Different types of leukaemia are recognized according to the cell lineage(line) involved. The most common types of leukaemia are:



* The term acuteleukemia is used to describe leukemia in which a massive proliferation of undifferentiated cells (blast cells) that incapable of maturation occurs in the bone marrow.
* the term chronic leukemiais used for leukemia in which there are an overproduction of mature differentiate cells in blood and bone marrow.
* The progression of disease is usually rapid (weeks to months) in acute leukemia and slow (months to years) in chronic leukemia.
* In acute leukemia accompanied by severe nonregenerative cytopenias.
* Chronic leukemia may or may not be accompanied by cytopenia in other cell lines. If cytopenia is present it is usually less severe than that seen in acute leukemia.

The term **lymphoma**, arises from the solid organs of the lymphoid system (lymph nodes, thymus) and organs through which lymphocytes normally traffic (gut, skin) , tumors of neoplastic lymphocytes located outside of the bone marrow.

The term **lymphoid leukemia** indicates a neoplastic condition of lymphocytes present in bone marrow and/or blood that is not associated with a solid tumor. Lymphoid leukemias are classified as acute or chronic, depending on the maturity of the cells involved.

**Leukemia** may be restricted to the bone marrow and morphologically inapparent on blood smears (aleukemic leukemia), may circulate in little numbers (subleukemic leukemia), or may appear in large numbers (leukemic leukemia) in the blood.

 the terms **leukemic lymphoma** or **lymphosarcoma cell leukemia** have been used when neoplastic cells are present in the blood of an animal with a lymphoma,.

Metastasis from bone marrow to lymphoid tissues and from lymphoid tissues to bone marrow is **common**. therefore it may be difficult to differentiate a true leukemia from a lymphoma with leukemia(leukemic lymphoma) in animals with advanced stages of disease. The measurement of **CD34** on neoplastic cells may help differentiate acute lymphoblastic leukemia (ALL) from leukemic lymphoma in dogs. In which neoplastic cells in dogs with ALL are typically positive, and neoplastic cells in the blood of dogs with leukemic lymphoma are usually negative.

**Clinical findings of leukemia**

The clinical findings on physical examination of the animal will not specifically suggest a diagnosis of leukemia. The majority of cases show non-specific signs such as lethargy, weakness, anorexia, vomiting and weight loss, but the specific signs related to the following complications include :

1. Pyrexia,
2. Cardiac arrhythmia,
3. Pale mucous membranes,
4. Clotting defects: petechial hemorrhages and ecchymotic hemorrhages,
5. Ocular lesions,
6. Neurological signs/abnormal cerebral function (depression,paresis),
7. Lymphadenopathy,
8. Hepatoseplenomegaly,
9. Lameness, skeletal pain and musule weakness

**Complications of leukemia**

1-**Haematological** complications :

1- Cytopenia: anaemia, neutropenia and thrombocytopenia

2- Immune-mediated haemolytic anaemia and/or thrombocytopenia

3- Hyperviscosity and formation of microthrombi

4- Disseminated intravascular coagulation (DIC): secondary to the above haematological complications is a common terminal event in leukaemia.

2- **Metabolic** complications:

1-Hypercalcaemia: is due to neoplastic lymphoid cells stimulate osteoclastic resorption of bone .

2-Hyperproteinaernia: isdue to abnormal production of immunoglobulins by neoplastic lymphoid cells resulting in hypergammaglobulinaemia.

 3-Hyperviscosity: excess plasma protein concentrations

**Diagnosis of leukemia**

 Always a series of laboratory investigations are required to reach a definitive diagnosis of leukaemia :

1-Haematological examination: patient with leukemia usually provides haematological abnormalities include: anemia , neutropenia and thrombocytopenia .

2- Bone marrow examination : bone marrow sampled and evaluated in one of two ways:

* Bone marrow aspirate (examined by cytology)
* Bone marrow biopsy (examined by histology).

3-Biochemistry

1. Serum electrolytes ( calcium)
2. Urea and creatinine concentrations for renal function,
3. Hepatic enzymes (such as alkaline phosphatase and alanine aminotransferase)
4. Serum protein (albumin and globulin concentration)

4-Urine examination

Urinalysis is especially indicated in cases with hypercalcaemia or hypergammaglobulinaemia.

5-Specific evaluations:

* + - * 1. Serum protein electrophoresis
				2. Haemostatic profile

6- Diagnostic imaging

 1- Radiography and/or ultrasonography to internal organ .

 2- Skeletal radiography.