Avian leukosis complex (ALC)
INTRODUCTION

- **Synonym**: Lymphoid leukemia, Big liver disease
- **Definition**: Avian lymphoid leukemia is a neoplastic disease of chickens caused by a virus of the leukosis/sarcoma group and characterized by tumor formation of the bursa of fabricius with metastasis to other tissues and all abdominal organs and the neoplastic changes start in bursa and metastasize to the organs, particularly the liver, spleen and kidneys.
• The leukosis/sarcoma group of diseases of the chicken comprises lymphoid, erythroid and myeloid leukosis, a variety of other tumours, such as fibrosarcomas, hemangiomata and neuroblastoma, and the bone disorder, osteopetrosis. Lymphoid leukosis is a B cell tumor which start in the bursa.

• Until recently, lymphoid leukosis has been the commonest form of leukosis.
• **Erythroblastosis (Erythroid Leukosis)**

• Erythroid leukemia is a rare and sporadic disease, affecting mainly adult chickens. There is always anaemia, which is associated with the presence of a large number of immature red cells in the blood. The disease originates in the bone marrow and leads to erythroblastosis in sinusoids in organs such as the liver, spleen, and bone marrow, giving them a cherry-red colour which characterizes this condition at postmortem. The liver and spleen are moderately enlarged.
• Myeloblastosis (Myeloid Leukosis)-
  • Myeloblastosis involves an extra vascular proliferation of cells of the granulocytic series. It is a sporadic disease mainly of adult chicks. It may occur as a myeloblastosis, originating in the bone marrow and involving immature cells. In diffuse myeloblastosis, the liver and spleen are diffusely and greatly enlarged. The liver usually has a granular appearance.
• **Other Tumor**
  include fibrosarcoma, chondroma, endothelioma, haemangioma, nephroblastoma, hepatocarcinoma.

• **Osteopetrosis**
  This is a bone disorder affecting mainly the long bones, particularly of the legs and wings. Excessive osteoblast proliferation and bone formation result in gross thickening of the diaphysis of the long bones. Occlusion of the marrow cavity may eventually give rise to anaemia.

• **Reticuloendotheliosis**
  Reticuloendotheliosis (RE) includes a group of pathological syndromes caused by retroviruses of the reticuloendotheliosis virus (REV) group. The disease syndromes include: 1) acute reticulum cell neoplasia, 2) a runting disease syndrome, and 3) chronic neoplasia of lymphoid and other tissues.
• **Myelocytomatosis**

• Myelocytomatosis, like myeloblastosis, also originates in the bone marrow, but in this condition the cells affected are more mature. The tumours of myelocytomatosis are discrete (separate) and nodular, and have a yellowish white colour. The tumor may occur in a wide range of organs, including the liver, spleen, and kidney; and they have a predilection for the visceral surface of flat bones such as ribs, skull, sternum and pelvis.
• Avian leukemia is caused by Avian Type C Oncoviruses Leukosis/Sarcoma Group of the Family Retroviridae.  
• These viruses are commonly called avian leukemia viruses and belong to subgroups A, B, C, D, E, and J.
SUSCEPTIBLE HOSTS

• Chickens, some exotic birds.
Transmission and epidemiology

• are transmitted in two ways:
  1. vertically from hen to progeny through the egg, and
  2. horizontally between birds by direct and indirect contact. Avian leukemia virus is shed by the hen into the albumen or yolk, or both; infection probably occurs after the onset of incubation.

• Congenitally infected chickens fail to produce neutralizing antibodies and usually remain viraemic for life.

• Horizontal infection after hatching is also important, especially when chicks are exposed immediately after hatching to high doses of virus, eg, in feces of congenitally infected chicks or in contaminated vaccines.
Pathogenesis

- Lymphoid leukemia is a clonal malignancy of the bursal-dependent lymphoid system.
- Transformation invariably occurs in the intact bursa, often as early as 4-8 wk after infection.
- These tumors require 14-16 wk to develop. Death rarely occurs before 14 wk of age and is more frequent around the time of sexual maturity.
- The disease can be prevented, even up to 5 mo of age, by treatments that destroy the bursa.
- The tumors are composed almost entirely of B lymphocytes that, in many instances, have IgM on their surfaces.
- No antitumor immune response has been recognized. Antibodies are readily induced after infection, except when tolerance occurs.
- The induction of lymphoid leukemia tumors can be enhanced in chickens co infected with serotype 2 Marek’s disease virus, a common vaccine virus.
- This enhancement requires a genetically susceptible chicken and early infection with lymphoid leukemia virus in addition to serotype 2 Marek’s disease vaccination.
- Because most commercial chicken strains are resistant and lymphoid leukemia virus infection has been largely eradicated from susceptible stocks, enhancement is not currently recognized as a field problem.
A subclinical disease syndrome characterized by depressed egg production in the absence of tumor formation is more important economically than mortality from lymphoid leukosis.

Chickens with subclinical disease usually shed virus or viral antigen into the albumen of eggs. The pathogenic mechanisms are poorly understood.

Myeloid leukemia is a malignancy of myeloid precursors arising from the bone marrow. Its pathogenesis is not well understood.
Clinical findings

- Depression.
- Loss of weight
- Persistent low mortality.
- Enlargement of abdomen, liver or bursa.
- Many are asymptomatic.
- The comb may be pale, shriv old, and cyanotic.
- Anorexia
- Emaciation, weakness and
- Diarrhoea
PM LESIONS

• **GROSS LESIONS** - Focal or diffuse white or gray neoplastic lesions are seen in the bursa, liver, spleen and kidneys.

• External tumor may be seen, and the abdomen is enlarged and feathers are sometimes spotted with urates and bile.

• Tumor may be nodular, miliary or diffuse.

• Bursa are always enlarged and may contain nodular tumor.

• Tumors are smooth, soft and glistening.

• Ecchymotic hemorrhage around the skin follicles of the wing
Microscopic Lesions

- Microscopically, the lesions consist of diffuse areas or coalescing foci of extravascular lymphoid cells.
- The cytoplasm of most tumour cells contains a large amount of RNA, indicating that the cells are immature and rapidly dividing.
- The main cell is a lymphoblast.
- They have B cell markers and carry surface IgM.
Diffuse nodular lesions in the liver, spleen, intestine and heart
Neoplastically transformed ovary in lymphoid leucosis
Diffuse and focal tumor lesions in the heart
Focal neoplastic lesions in kidney
The internal organs of a chicken affected by lymphoid leucosis
DIAGNOSIS

- pathological and virological examinations to determine 1) the type of neoplasm responsible for mortality, and 2) which viruses are present in a flock. Post mortem lesions and tumors are diagnostic.
- Tumors occur in birds >14 week old.
- In lymphoid leukemia, the lymphoid cells are histologically uniform in character, large, and contain IgM and B-cell markers on their surface.
- Tumors can be differentiated from those of Marek's disease by gross and microscopic pathology and by molecular techniques.
- ELISA Kits for detection of antibodies to avian leukemia virus subgroups A, B, and J are available commercially.
- Cytological examination of May-Grunwald-Giemsa stain impression smears of fresh tumour tissue is a useful aid to diagnosis.
## Different Between Mareks & Lymphoid Leucosis

<table>
<thead>
<tr>
<th>Feature</th>
<th>Lymphoid leucosis</th>
<th>Marek’s diseases</th>
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</thead>
<tbody>
<tr>
<td>Age of onset</td>
<td>16 weeks</td>
<td>4–6 weeks or older</td>
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<tr>
<td>Symptoms</td>
<td>Absent</td>
<td>Frequently paralysis or paresis</td>
</tr>
<tr>
<td>Incidence</td>
<td>Seldom above 5 %</td>
<td>Usually above 5 %</td>
</tr>
<tr>
<td><strong>Gross Lesions</strong></td>
<td></td>
<td></td>
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<tr>
<td>Peripheral nerve enlargement</td>
<td>Absent</td>
<td>Usually present</td>
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<tr>
<td>Bursa of Fabricius</td>
<td>Nodular tumours</td>
<td>Diffuse enlargement or atrophy</td>
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<tr>
<td>Skin, muscle or proventriculus tumours</td>
<td>Usually absent</td>
<td>May be present</td>
</tr>
<tr>
<td><strong>Microscopic Lesions</strong></td>
<td></td>
<td></td>
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<tr>
<td>Peripheral nerve infiltration</td>
<td>Absent</td>
<td>Present</td>
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<tr>
<td>Cuffing in white matter of cerebellum</td>
<td>Absent</td>
<td>Present</td>
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<tr>
<td>Tumour in the liver</td>
<td>Focal or diffuse</td>
<td>Frequently perivascular</td>
</tr>
<tr>
<td>Bursa of Fabricius</td>
<td>Intra-follicular tumour</td>
<td>Inter-follicular tumours or atrophy</td>
</tr>
<tr>
<td>Follicular patterns of lymphoid cells infiltration in the skin</td>
<td>Absent</td>
<td>Present</td>
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<tr>
<td>Cytology</td>
<td>Uniform lymphoblasts</td>
<td>Pleomorphic mature and immature cells including lymphoblast, small medium and large lymphocytes and reticulum cells.</td>
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THANKS