



**Bovine leucosis BL**  
**(Enzootic bovine leucosis EBL)**  
**(Bovine lymphosarcoma)**  
**(Bovine leukemia)**

**By**

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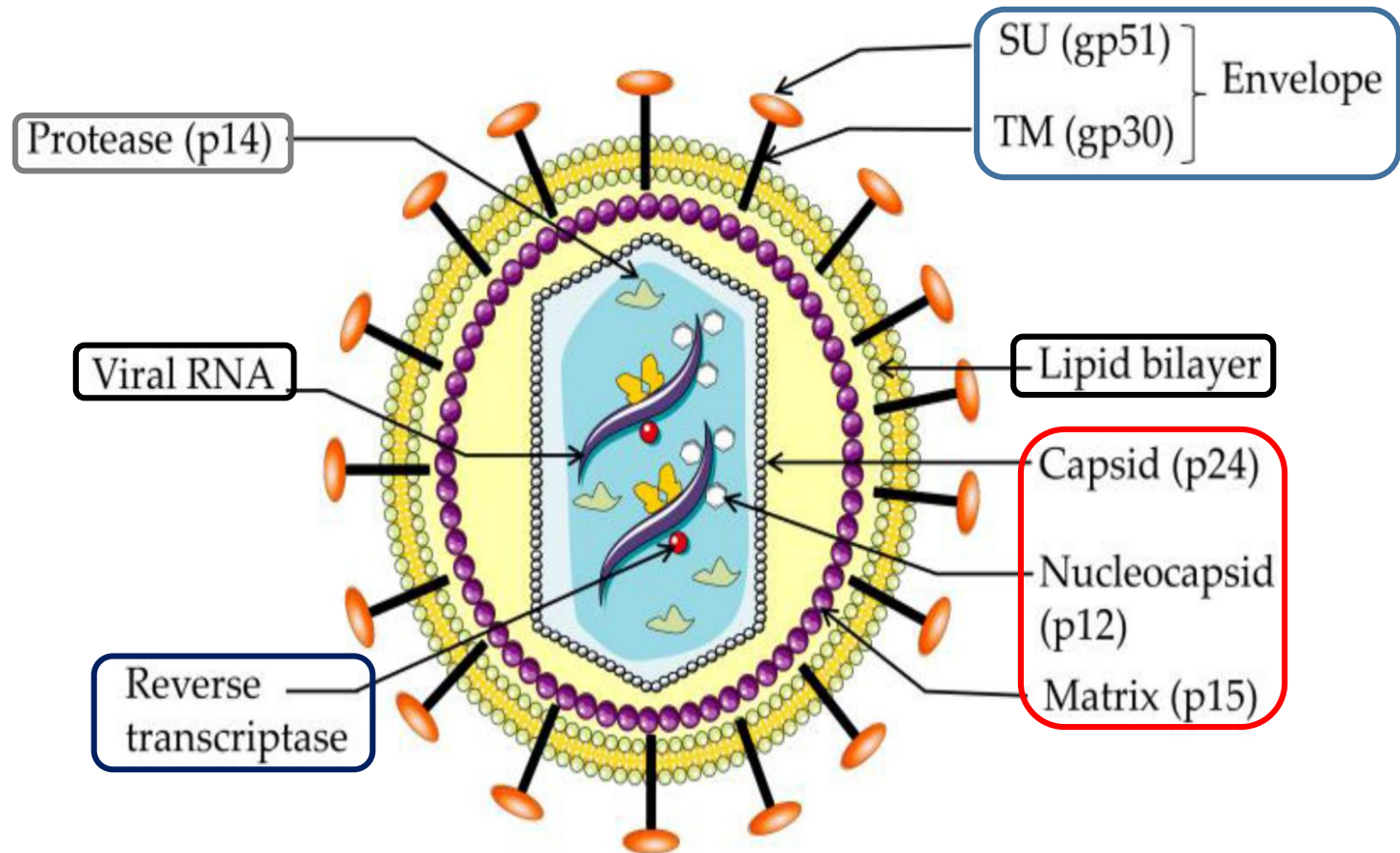
# Definition

- Highly fatal systemic malignant neoplasm of the reticulo- endothelial system of cattle.
- Ch. by **generalized lymphadenopathy** (symmetrical enlargement of most peripheral lymph nodes).
- **Other signs** as GIT, cardiac and nervous signs due to aggregations of neoplastic lymphocytes.
- Infected animals **remain infected for life and carrying the virus in B- lymphocyte.**

# Etiology

- Bovine leukemia virus (BLV) RNA, genus *Deltaretrovirus* Family *Retroviridae* cell associated not free.
- Viral protein can replicated as host cells replicate because the virus integrate its nucleic acid into the chromosomal DNA of the host cells.
- Heat labile and sensitive to lipid solvents, phenols, trypsin, formaldehyde and freezing &thawing.

# Virus structure and its Genome (100 -120 nm)



- **Predisposing factors:** Genetic predisposition are the major factor where resistance to the virus infection is genetically determined.



# Epidemiology

- 1. Distribution:** Worldwide ([Europe](#) consider to be the homeland of the disease) and recorded in [Egypt](#).
- 2. Host rang:**
  - Naturally affect cattle and buffaloes.
  - Dairy more than beef.
  - Adult more than young (rare less than 2 y).
  - Experimentally infect sheep (more faster sever signs)
- 3. Seasonal incidence:** Summer (more than others)

## **4. Transmission:**

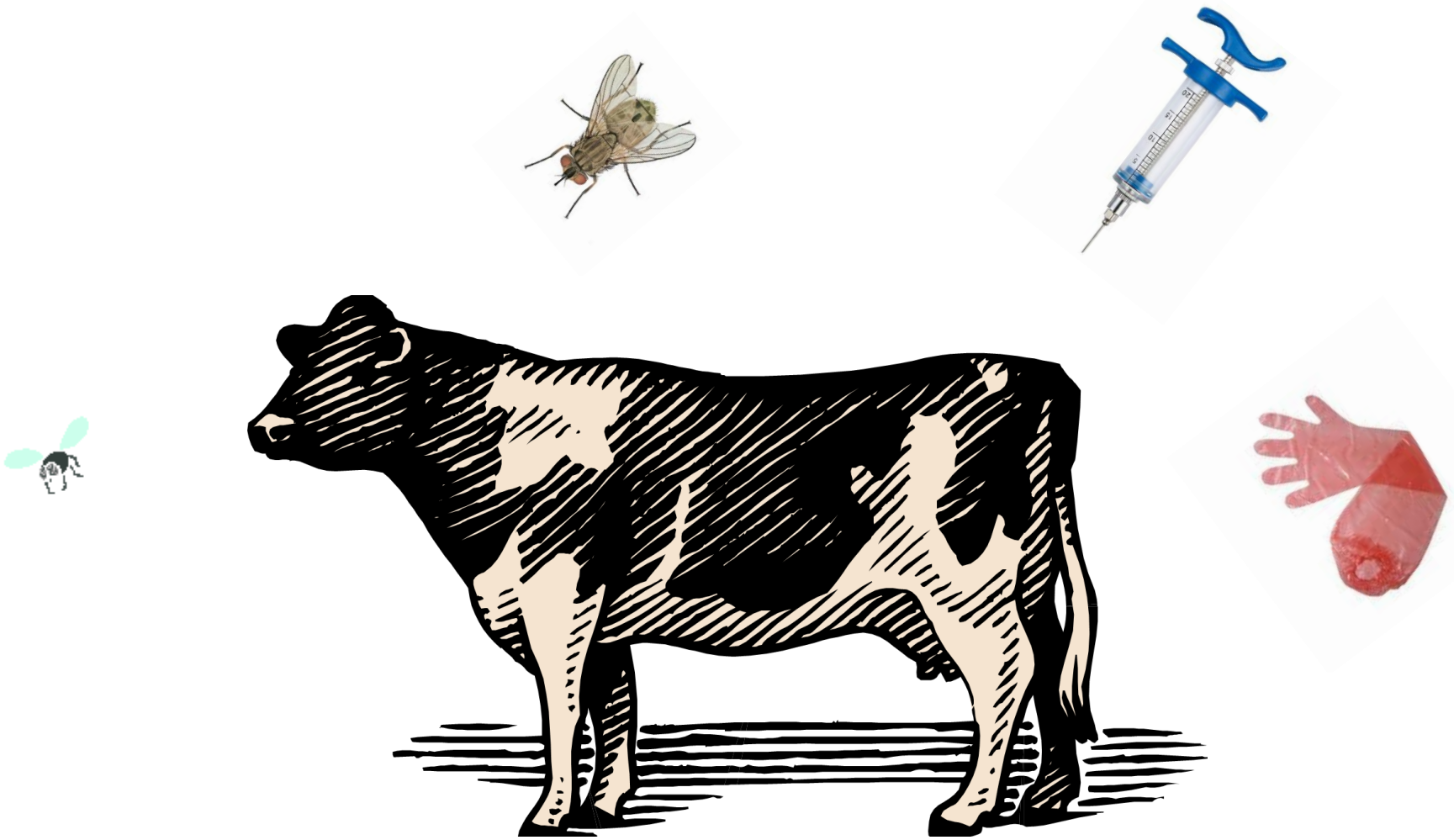
**a. Source:** Infected fresh blood or any secretions and excretions contain (infected B lymphocytes).

### **b. Mode:**

#### **1. Mainly horizontal transmission:**

- Blood sucking insect (Tabanus or ticks )
- Inappropriate re-use of injection needles.
- Common gloves for rectal examination.
- Contaminated surgical instruments.
- Milk and colostrum ingestion.
- Introduction of new animals to the herd.





**2. Vertical perinatal transmission 20 % (trans-placental or birth canal route) may also occur.**

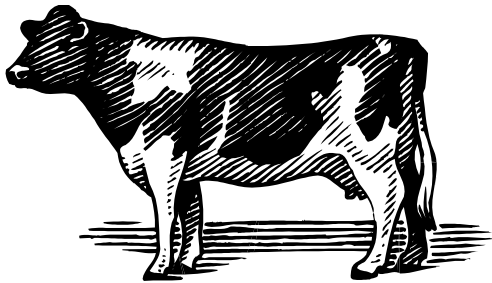
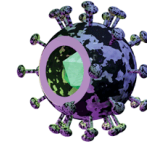
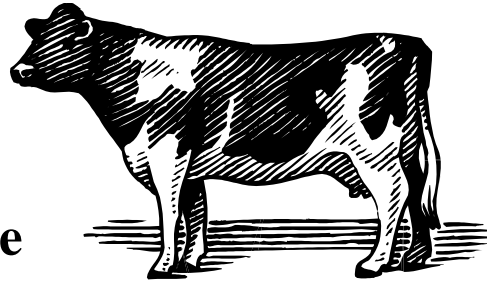
## **5. Economic and zoonotic importance**

- 1) Decrease milk and meat production.
- 2) Decrease cow longevity.
- 3) Significant morbidity resulting from opportunistic infections following BLV infection.
- 4) Export restriction of animal and animal's product from infected localities.

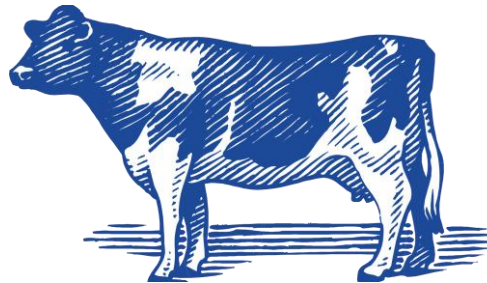
**Not Zoonotic**

# Pathogenesis

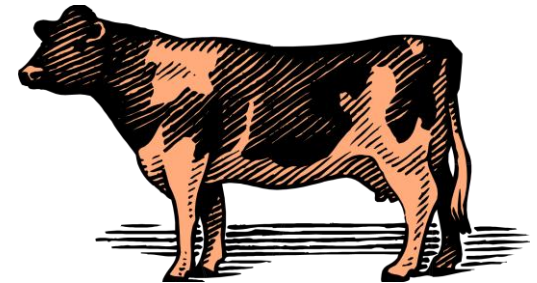
- Genetics
- Immune states
- Size of virus infective dose



**70 %**  
**AL**  
**+ve ab**



**30 %**  
**PL**  
**+ve ab**



**< 5 %**  
**EBL**  
**+ve ab**

- After infection, the virus is established in **spleen for 8 days** then appears in **peripheral blood leukocytes**.
- Antibodies are detectable in serum 6.w after infection.
- **Cattle:** any organ may be the site of lesion (tumors which is aggregation of neoplastic lymphocytes ) but abomasum, heart, visceral and peripheral lymph nodes are mostly infected.
- **Calves:** visceral lymph nodes, spleen, liver are common sites.

# Clinical signs (2 patterns)

## 1. EBL or bovine lymphosarcoma

(Represent less than 5 % of PL animals).

- Long I.P (5 years or more but in experimentally infected sheep around 2y).
- Long course.
- Low morbidity rate and high mortality.

**A. Peracute form:** This form occurs in 5-10 % of animals, death without prior signs of illness (good body conditions) due to:

- Involvement of adrenal glands.
- Rupture of an abomasal ulcer.
- Rupture of affected spleen followed by acute internal hemorrhages.

## **B. Subacute & chronic form:**

- Loss of appetite.
- Slow progressive loss of weight.
- Pale mucous membranes.
- Muscular weakness, heart rate is normal unless the myocardium is involved.
- Temperature is normal unless tumor growth is rapid and extensive and raised to 39.5-40°C.

## C. Specific forms :

### 1. Lymph node form:

- Generalized symmetrical enlarged superficial Lns. with edema.
- Enlarged visceral Lns. which are symptomless unless they press on other organs as in intestines or nerves (detected by rectal examination).
- Small S/C tumors masses of varying diameter on flanks and on the perineum or cover entire body.



## 2. Digestive tract form:

- Due to abomasal and intestinal wall involvement.
- Capricious appetite.
- Persistent diarrhea.
- Melena due to bleeding from abomasal ulcer,
- Tumor of medistinal Lns. cause chronic moderate bloat.
- Liver may be enlarged.

### **3. Cardiac form:**

- Due to atrial wall involvement.
- CHF.
- Enlargement of jugular vein and edema of brisket and sometimes intermandibular edema.
- Hydropericardium with muffling of heart sounds or tachycardia or irregularity of heart or systolic murmur.
- Hydrothorax with resulting dyspnea.

## 4. Nervous form:

- Due to nerves involvement.
- Neural lymphomatosis result in gradual onset of posterior paralysis.
- Cow begin to knuckle at hind fetlock while walking.
- Difficulty in getting up.
- Loss of sensation.

## **5. Less common lesions:**

- Snoring and dyspnea.
- Bulging of eye ball.
- Lesions in muscles, uterus, kidney and genitalia.

# Clinical signs (2 patterns)

## 2. Sporadic bovine leucosis SBL

- Uncommon **sporadic** disease.
- Usually affect cattle **under 3.y** age.
- The virus causes this form **can not cultured**, nor antibody to the virus be detected in infected animals.
- Has **3 clinical forms** as the following:

# 1. Cutaneous form (less than 3y):

- Very rare and appear as cutaneous plaques of 5-10 cm in diameter on various parts of skin as neck, back and croup.
- These plaques become covered by thick gray white scab with hair loss and depressed center.
- The plaques start to shrink and hair grow and are disappearing after weeks or months.
- Relapse after 1-2y with Lns. involvement may occur.

## **2. Juvenile or calf lymphosarcoma (2 W – 6 M):**

- Fever, depression, weakness and tachycardia.
- Gradual loss of weight.
- Sudden enlargement of all lymph nodes and many internal organs.
- Signs of pressure on internal organs as bloat or congestive heart failure
- Posterior paresis (less constant signs).
- Death occur after 2-8 m. of illness.

### **3. Thymic form (Beef cattle 1-2 years):**

- Massive thymic enlargement.
- Lesions in bone marrow and regional lymph nodes.
- Jugular enlargement.
- Respiratory obstruction.
- Local edema.



## **N.B:**

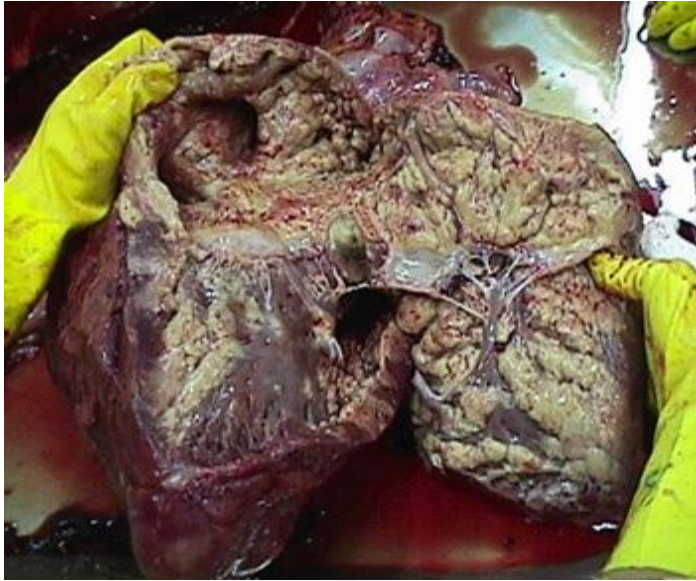
- ❖ **Sheep do not develop PL** but the frequency of tumors development is much **higher and earlier** than in cattle.
- ❖ **Carrier state is the normal condition** of the disease which persists for life of the animal and seropositive animals carrier animals with persistent lymphocytosis are the major source of infection.



# P/M lesions

- **Lymphosarcoma** appear in a wide range of tissues (peripheral and visceral lymph nodes, uterus, abomasum, heart, liver, spleen and kidneys) as **round cell tumor infiltrated with neoplastic cells** (locally or diffuse infiltration).
- **In nervous system**, there is **thickening of peripheral nerves** which may be associated with one or more circumscribed **thickening in the spinal meninges**.





# Diagnosis

**1- Field diagnosis;** depends on case history, clinical signs and P/M lesions.

**2. Lab. Diagnosis;**

**A. Sample:**

- Biopsy or **slices** from organs as lymph nodes, bone marrow, spleen, liver, kidney, uterus.
- **Milk or colostrum.**
- **Blood** (leukocytes) and paired **serum.**

## B. Laboratory procedures:

1. Virus isolation in cell cultures (cell syncytia ).
2. Serological screening using AGID or ELISA but ELISA more sensitive and specific.
3. Extraction of BLV from whole blood of ELISA positive samples and detection using PCR and RT-PCR.
4. Sequencing and phylogenetic analysis of the isolated strains to detect the genetic relatedness worldwide.
5. Detection of tumor associated antigen (TAA) in tumors tissues via IFAT using monoclonal antibody.

6. **Heamatological** examination to detect PL, leukocyte count is marked increase in lymphocytes (65%).
7. **Histopathology**, tumors masses are composed of neoplastic lymphocytic cells.
8. **Experimental infection** using tumors material, milk or colostrum, blood or tissue culture virus, in cattle, sheep and goats by S/C (Infected 1000 lymphocyte can be infectious).

# Differential Diagnosis

1. TB, tuberculin is the basis in differentiation.
2. Digestive form confused with johne's disease, johnin test.
3. Cardiac form confused with traumatic pericarditis or endocarditis, absence of fever and toxemia and there is characteristic neutriophilia.
4. Spinal nerves involvement:
  - Spinal cord abscess (exam of CSF)



- Dumb form of rabies, has much short course beside other signs of rabies.
- 5. Snoring due to enlargement of retropharyngeal lymph nodes due to any cause as in TB.
- 6. All infectious diseases characterized by enlargement of lymph nodes as in Theliosis & TB

# Treatment

- **No treatment** should be attempted but cases should be slaughtered and
- **Prognosis** of the disease is **bad**.

# Control & vaccination

## Control

- ❖ Controlling of EBL at the national level usually consists of one or more of the following three approaches;
  - Management interventions.
  - Test and segregation.
  - Test and slaughter.

1. **Free areas:** Safety procedures which aim to prevent the import of infected cattle from abroad are important to obtain BLV free herd;
  - An appropriate **quarantine** period upon cattle arrival and serological testing of it against BLV antibodies,
  - Using **closed trading system** without introduction of animals from infected localities

## 2. Endemic areas:

- A. Traditional management practices are recommended:
- Single use of hypodermic needles and reproductive examination sleeves.
  - Use of AI instead of bulls for breeding purposes.
  - Control of stable flies and other biting insects.
  - feeding calves only heat-treated colostrum or colostrum replacers.
  - Cleaning and disinfecting blood contaminated equipment between animals during routine procedures such as application of ear tags, tattooing, and dehorning.

**(All these practices might eventually decrease the prevalence of BLV-infected cattle to a level sufficiently low)**

## 2. Endemic areas:

- B. Real-time PCR and culling cattle with high BLV proviral loads.
- C. Hematological basis of culling older cows with higher WBCs and lymphocytes.
- D. Genetic selection of animals with resistance genes in their major histocompatibility complex class II (MHC-II) producing BLV resistant animals against BLV infection.
- **Vaccination:** No available commercial vaccine for field application.

