

Big liver disease in Birds

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Introduction

Big liver disease is a synonym to Avian Lymphoid Leucosis which is also known as Visceral leucosis. Avian leucosis is a group of diseases of chicken comprises of lymphoid, erythroid, myeloid leucosis, Other tumours such as fibroma, haemangioma, nephroblastoma and Osteopetrosis. Avian leucosis is prevalent throughout the world. Lymphoid leucosis (LL) is the commonest neoplastic condition in chicken caused by avian leucosis virus (ALV) usually occurs between 14th to 30th week of age. Incidence is highest at about sexual maturity (Vegad and Katiyar, 2001) which induces lymphoma in chicken called Lymphoid leucosis (LL) (Pizer and Humpheries, 1989). Avian neoplastic diseases are responsible for economic loss due to both mortality and depressed performance (Panda, 1983). Transmission of ALV occurs both horizontally and vertically (Payne and Venugopal, 2000). It is a lymphocytic lymphoma arising from malignant lymphocytes of bursal origin and later the malignant lymphocytes migrate and proliferate in other visceral organs to form tumors (Purchase and Burmester, 1972). ALV are classified into five subgroups (A, B, C, D and J) based on their host range, viral envelope interference and cross-neutralization patterns. ALV subgroups A and

B are more commonly associated with lymphoid leucosis (Payne and Fadly, 2003). It is called big liver disease, because the liver is usually enlarged with nodular tumours. Commonly found in broiler breeders around 1994-1999. Nowadays, hardly seen due to severe eradication programs on pedigree level of the top commercial breeds in the world. Local breeds may still harbor the viruses.

Cause

Lymphoid leukosis is the commonest neoplasm in chicken caused by avian leucosis virus (ALV), retro (leuco) virus.

Transmission

LL spreads through the egg (transovarian). It is a ubiquitous organism in backyard poultry flocks. There is some lateral transmission with congenitally infected chickens. Infected breeders can be detected by testing hatching eggs and cloacal swabs for the presence of the virus.

Pathogenesis

The pathogenic mechanisms are poorly understood. Lymphoid leukosis is a clonal malignancy of the bursal-dependent lymphoid system. Transformation invariably occurs in the intact cloacal bursa, often as early as 4–8 weeks after infection. Tumors are often not detectable until chickens are ~14 weeks old. Death rarely occurs before 14

weeks and is more frequent around the time of sexual maturity. The disease can be prevented, even in chickens up to 5 months old, by treatments that destroy the cloacal 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 leukosis tumors can be enhanced in chickens coinfecting with serotype 2 Marek's disease virus, a common vaccine virus. This enhancement requires a genetically susceptible chicken and early infection with avian leukosis virus in addition to serotype 2 Marek's disease vaccination. Because most commercial chicken strains are resistant, and avian leukosis virus infection has been largely eradicated from susceptible stocks, enhancement is not currently recognized as a field problem. Chickens with subclinical disease usually shed virus or viral antigen into the albumen of eggs.

Signs

Signs include paleness, emaciation, weakness, inappetence and wasting away. LL generally causes birds to weaken, lose weight and eventually die. The abdomen is enlarged and feathers are sometimes spotted with

urates and bile. The feed/gain ratio is decreased. Increased culls and decreased egg production occurs. Osteopetrosis is lymphoid leukosis of the bones of the legs and wings which become enlarged. Affected birds have bowed and thickened legs. A subclinical disease syndrome characterized by depressed egg production in the absence of tumor formation is more important economically than are deaths from lymphoid leukosis. Lymphoid leukosis can also occur as blood leukosis. However, such erythroid and/or myeloid leukemias are also quite rare.

Lesions

Visceral tumors are the main feature of LL. They are found in the liver, spleen, kidneys and bursa of birds that are in general, older than 25 weeks. Visceral tumours are soft, smooth, and glistening. Tumours may be nodular, miliary or diffuse. Tumours are common in gonads, lungs, liver, spleen, heart, kidney, mesentery and bone marrow and liver tumours are predominant (Fig.1). Peripheral nerves are never involved. Bursae are always enlarged and may contain nodular tumours. Involvement of the cloacal bursa has been considered virtually pathognomonic. Sometimes the bursal tumors are small and observed only after careful examination of



Fig.1. Diffused enlargement of liver with white foci were noticed in Lymphoid leucosis

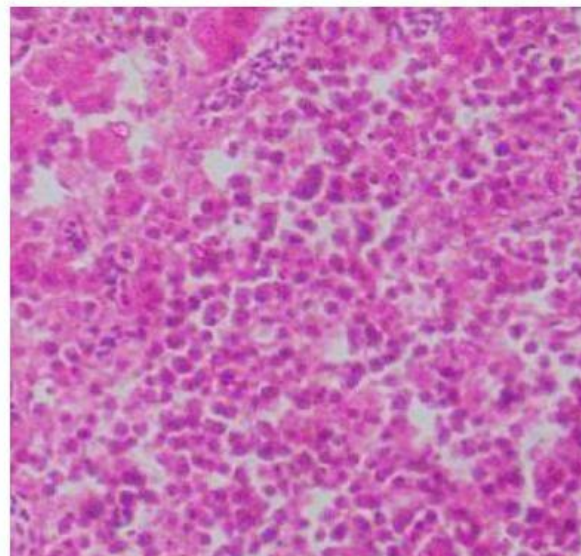


Fig.2.Liver section showing uniform sized immature lymphoid cells in LL. H&E x40.

the mucosal surface of the organ. The skin is never affected and skeletal muscles often contain tumours. Eyes are never affected. More recently, within the known subgroup of exogenous LL viruses (A, B, C, and D), a new subgroup denominated "J" has emerged. The new "J" virus shows tropism for cells of the myelomonocytic series, causing tumors and which are identified tropism for meat-type birds. The tumors caused by this virus are frequently located on the surface of bones such as the junction of the ribs, sternum, pelvis, mandible and skull. Tumors may also be found in visceral organs. Microscopically, the tumor cells are uniform, large lymphoblasts (Fig.2.). Mitotic figures are frequent.

Outbreaks of neoplasms other than lymphoid leukosis, such as myelocytomas, hemangiomas, and renal tumors, have also been noted in meat-type chickens infected with subgroup J avian leukosis virus.

- Myelocytomas may cause protuberances on the head, thorax, and shanks.
- Myelocytomas may occur in the orbit of the eye, causing hemorrhage and blindness.
- Hemangiomas may occur in the skin, appearing as "blood blisters," which may rupture and bleed.
- Renal tumors may cause paralysis due to pressure on the sciatic nerve.

Microscopically, in cases of myelocytomas induced by subgroup J avian leukosis virus, the liver shows a massive intravascular and extravascular accumulation of myeloblasts characterized by the presence of cytoplasmic eosinophilic granules.

Diagnosis

History and clinical signs, gross pathological findings, histological examination, immunohistochemical testing, standard and quantitative PCR assay, virus isolation, serological testing. Avian leukosis virus is widespread among chickens; therefore, virus detection tests alone, including virus isolation and PCR assay and the demonstration of antigen or antibody,

have limited or no value in diagnosing field cases of lymphomas. Gross characteristics of diagnostic importance include the tumorous involvement of the liver, spleen, or cloacal bursa in the absence of peripheral nerve lesions. The tumors are found in birds > 14 weeks old. Histologically, the lymphoid cells are uniform in character, large, and contain IgM and B-cell markers on their surface. Tumors in avian leukosis can be differentiated from those of Marek's disease on the basis of gross and microscopic pathological changes and by molecular techniques that demonstrate the characteristic clonal integration of proviral DNA into the tumor cell genome with the associated disruption of the *c-myc* oncogene. Lymphoid leukosis cannot easily be differentiated from B-cell lymphomas due to reticuloendotheliosis virus except by virological assays; however, such tumors probably are extremely rare. PCR primers specific for detection of each subtype of avian leukosis virus have been developed. PCR assay has been used to detect and characterize avian leukosis virus strains contaminating commercial live virus vaccines of poultry. ELISA kits for detection of antibodies against avian leukosis virus subgroups A, B, and J are available commercially.

Treatment and Control

No treatment is known. The best control method is the laboratory detection of infected breeders. Breeding leukosis-free offspring from leukosis-free breeders can eventually lead to the eradication of the disease. The virus is not highly contagious compared with other viral agents and is readily inactivated by disinfectants. Transmission can be decreased or eliminated by strict sanitation. After the infection is eradicated, standard disease control and sanitation practices can keep chicken flocks free of the disease.

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