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Chicken Infectious Anaemia: Risk and Remedies

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Chicken infectious anaemia is an immunosuppressive disease mainly found in chicken caused by the chicken anaemia virus (CAV). The virus has a wide distribution globally and act as significant economic threat to the poultry industry. It usually affects the young chickens of 2-4 weeks of age characterized by anemia, decreased weight gain, immunosuppression and mortality. Infection in chickens older than 3 or 4 weeks of age usually does not cause any clinical signs, but can cause immunosuppression resulting in secondary infections or can result in severe economic losses even in the absence of any disease. The disease can be diagnosed by reduced hematocrit, detection of CAV nucleic acids in blood lymphocytes by PCR, postmortem lesions such as thymic atrophy, lymphoblast depletion in the thymic cortex, pale bone marrow, and detection of CAV DNA or antigens in tissues. There is no specific treatment available, but can be prevented by good management practices and vaccination.

Etiology

Chicken anaemia virus (CAV) only known member of the Anelloviridae family under Gyrovirus genus is small (25 nm), nonenveloped, icosahedral virus with single-stranded, negative sense, circular DNA genome. It was earlier classified as a Circovirus, but important differences in genome organization led to its reclassification into the new Anellovirus family. The genome basically codes for three viral proteins (VPs). VP1, the only structural protein, is the capsid protein concerned with replication and virulence but VP2 may be needed as a scaffold protein to allow proper folding of VP1and also induces apotosis and cytopathic effects. On the other hand, VP3, or apoptin, is a non-structural protein that induces apoptosis in infected cells and has other functions in viral replication.

When susceptible chicks (day old) are inoculated intramuscularly with CAV, viremia occurs within a period of 24 hours. Virus can be recovered from most of the organs and rectal contents as long as 35 days after the virus inoculation. The principal virus replication sites for CAV are hemocytoblasts in the bone marrow, precursor T cells in the cortex of the thymus, and dividing CD4 and CD8 T cells in the spleen. Replication in and destruction of the

hemocytoblasts and T cells leads to anaemia and immunosuppression respectively. Neutralizing antibodies are detectable 21 days after infection, and clinical, hematologic, and pathologic parameters return to normal almost 35 days after infection.

Chicken anaemia virus infection has adverse effects on proliferative activities of spleen lymphocytes and on the synthesis of interleukin-2 and interferons by splenocytes. There will be a marked decrease in generation of antigen-specific cytotoxic T cells and T-helper cells during the disease course. Additionally, macrophage functions such as Fc-receptor expression, phagocytosis, and antimicrobial activity may be impaired. As a result of decreased T-helper cells, antibody production after vaccination against other pathogens can also be declined.

Transmission of the disease

The transmission of the virus can occur by both horizontal and vertical routes. Feacal-oral route is the common way for horizontal transmission of the virus. It was found that contaminated litter act as source of virus introduction in to chicks. Sometimes by respiratory or through infected feather follicle epithelium also the virus can enter the body. Vertical transmission occurs when seronegative hens become infected and continues until adequate levels of neutralizing antibodies develop in the hens. Chicks hatched from these eggs are viraemic, and CAV can rapidly spread horizontally from these chicks to susceptible, chicks of the same hatch. Roosters can shed CAV through semen which is another source of vertical transmission. In order to prevent vertical transmission of CAV, vaccination of seronegative flocks is recommended before the onset of egg production.

Clinical signs

The most significant signs include paleness due to anaemia, anorexia, lethargy, depression and reduced weight gain in chicks. Mortality occurs sometimes but not more that 10-20% However, in young birds of around 3 weeks old, mortality occasionally reach up to 60%. Most of the other symptoms are linked with secondary infections as result of immunosuppression. The blood smear examination also revels the anaemia, leukopenia, and pancytopenia.

Gross lesions

It includes paleness in internal organs, atrophy of the immune organs such as thymus and bursa of Fabricius. Bone marrow is pale or yellow. Hemorrhages may be visible in or under the skin and in muscle and other internal organs. Lesions associated with secondary infections may also be present due to immunosuppression.

Diagnosis

A tentative diagnosis of chicken anaemia virus infection can be made based on history, signs, and gross and histopathologic lesions. Confirmation requires detection of virus or viral DNA in the thymus or bone marrow. PCR and quantitative PCR techniques are commonly used to demonstrate the presence of CAV DNA. Furthermore, viral antigens can be detected by immunohistochemistry or immunofluorescence in tissues especially thymus. Commercial ELISA kits are also available to detect serum antibodies to CAV and can be used to identify breeder flocks that are seronegative before egg production and to monitor the efficacy of vaccination.

Treatment, control, and prevention

There is no specific treatment available for chicken infectious anaemia. But the secondary bacterial infections can be treated with antibiotics and supportive therapy. One approach to control CAV infection is vaccination of breeder flocks with commercially available live vaccines before the start of egg production. Depending on the type of vaccine, it can either administrated by injection or through drinking water addition. In addition to vaccination of breeders, a vaccine is approved in the USA for vaccination of broilers at the age of 7 days old and administration is by addition to the drinking water. Because of its great resilience to heat and chemical disinfectants, eliminating CAV from a premises is not a practical control method. Still, we can prevent the entry of the virus in to the flock through strict control measure like biosecurity measures and vaccination.

Zoonotic risk

Chicken anaemia virus poses no potential zoonotic risk to humans. There is no significant proof for CAV replications in humans or is associated with human disease. CAV has also been detected in or isolated from faeces of stray mammals and ferrets fed chicken meat, but it is unlikely that the virus replicates in these hosts.

Conclusion

Chicken infectious anaemia is viral disease of economic importance in poultry especially in broiler industry and specific pathogen free (SPF) egg producers. It is commonly present in young chickens characterised by anaemia, atrophy of immune organs and haemorrhages. The immunosuppression imposed by viral agent make the chicken susceptible to other diseases which in turn impart great loss to the producers. Good management and vaccination are the keys to prevent the occurrence of the disease condition. Regular monitoring and strict vaccination before the onset of egg production can prevent the vertical transmission as well.

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