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Evaluation of Two Different Avian Reovirus Vaccination Programs in Broiler Breeder Chickens

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ABSTRACT

Background: Avian reovirus vaccine was used for prevention of signs and lesions associated with avian reovirus infections which cause malabsorption syndrome, especially in progeny it will be protect against signs of malabsorption associated via maternal antibodies. **Objective:** The objective of this study was to investigate the serological differences of two different reovirus vaccination programs in broiler breeder farms. **Methods:** Ninety broiler breeder chickens was selected and randomly distributed in three groups (each group with three repetitions). In two experimental group two different vaccination programs was used and group three was as a control group and the reovirus vaccine was not used. On days 1, 110, and 145 blood samples were collected and examined with ELISA test. For Data analyzing One-way ANOVA statistical method was used for compare antibody titers against reovirus disease and statistical software was PASW SPSS 18th edition. **Results:** Results of ELISA test showed that mean of antibody titers was higher in the groups that reovirus booster vaccines was used, and also ELISA antibody titer in group that vaccines was used statistically different from the control group ($p < 0.05$). **Conclusion:** Because of economical losses causes by reovirus disease in both broiler breeder flocks and their progeny, it is necessary to applying exact vaccination programs in broiler breeder flocks and observes of biosecurity to decrease economical losses.

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INTRODUCTION

Tenosynovitis caused by avian reoviruses is clinically characterized by lameness initially related to inflammation of the digital flexor and tarsometatarsal extensor tendons (Van Der Heide *et al.*, 1974). Chronic tendinitis (Olson and Kerr, 1966) may result and may be followed by rupture of the gastrocnemius tendon (Itakura *et al.*, 1977, Olson and Kerr, 1966). Articular erosions may occur in long-standing cases (Olson and Solomon, 1968).

The disease is seen mainly in heavy breeds of chickens, usually at about five to seven weeks of age (Olson and Solomon, 1968), but has been reported in broiler breeders of up to 12 to 18 weeks of age (Itakura *et al.*, 1977, Johnson, 1972) and in White Leghorn laying birds of up to approximately nine months of age (Schwartz *et al.*, 1976).

The arthritic form (tenosynovitis) usually seen in broilers 4-8 wk old as unilateral or bilateral swellings of the tendons of the shank and above the hock; it can also be found in much older chickens. The birds walk with a stilted gait. In severely affected flocks, rupture of the gastrocnemius tendon is frequent, and many cull birds are seen around the feeders and waterers. Mortality is 2-10% and morbidity 5-50%. Severely affected birds rarely recover; less severely affected birds recover in 4-6 wk. The infection is in apparent in many birds. Feed efficiency and rate of gain are decreased (Goodwin *et al.*, 1993, Page *et al.*, 1982).

A possible control method for the disease was suggested when Van der Heide *et al.*, observed that the susceptibility of day-old chicks to oral infection by a tenosynovitis causing strain of reovirus (S-1133) was inversely related to the immune status of their dams (Van Der Heide *et al.*, 1974). This breeder immunity, in

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turn, could be developed by vaccination with the reovirus via the drinking water, and it was concluded that breeder flock vaccination might be an important method of controlling viral tenosynovitis in broilers. This was supported by subsequent work suggesting that immunity to strain 1133 might protect against infection by other reovirus isolates (Cessi and Lombardini, 1974) and a vaccine is now commercially available for use in breeders in the United States. Also researchers indicated that the reoviruses are an important cause of suboptimum performance in broilers, resulting in poor feed conversion, lowered BW, higher mortality, and increased condemnation (Giambrone and Solano, 1988, Giambrone and Clay, 1986)

Most birds are thought to be susceptible to respiratory-intestinal strains of reoviruses. Chickens and, to a lesser degree, turkeys are susceptible to viral arthritis, which is seen worldwide. Reoviruses also have been associated with pericarditis and myocarditis, hydropericardium, pasting, malabsorption, and femoral head necrosis, although further study is needed to define their role (Dutta and Pomeroy, 1967).

Respiratory and digestive infections may occur but are of short duration; however, the virus survives in tendon sheaths for extended periods. The virus spreads via aerosols, fomites, and mechanical means, and is resistant to heat and chemical inactivation (Dutta and Pomeroy, 1967). Several antigenic subtypes of avian reoviruses have been identified; however, there appears to be significant cross-protection among most of the isolates or subtypes. Pathogenicity of the isolates varies widely. Serious outbreaks of viral arthritis are followed by a decreased incidence in later hatch groups of birds from the same parent flock (Fahey and Crawley, 1954, Petek *et al.*, 1967). This may be related to decreased egg transmission and development of parental immunity. Day-old chicks are more susceptible than older birds when exposed by natural means. The earlier in life the chick is infected, the longer the virus persists in the tissues (Bains *et al.*, 1974).

An acute, infection is occasionally seen in young chicks and embryos with cardiomegaly, hepatomegaly, and splenomegaly with necrotic foci. Edema of the tendons of the leg is marked, petechial hemorrhages develop in the synovial membranes above the hock, and fusion and calcification of the tendon bundles are common.

Blood clots and hemorrhages are seen with rupture of the gastrocnemius tendon. Pitted erosions of the cartilage of the distal tibiotarsus are seen with flattening of the condyles (Van Der Heide, 1977, Van Der Heide *et al.*, 1981). Histologically, the synovial cells are hypertrophied, hyperplastic, and infiltrated by lymphocytes and macrophages. The synovia contains heterophils and macrophages. Infiltration of heterophils or lymphocytes, or both, between myocardial fibers is a constant finding.

Avian Reovirus Vaccine is a Killed Virus for the subcutaneous or intramuscular revaccination of healthy chickens 10 weeks of age as an aid in the prevention of signs and lesions associated with avian reovirus infections which cause malabsorption syndrome. Progeny of vaccinated breeders protected against signs of malabsorption associated with reovirus disease via maternal antibodies. It is essential for best protection to prime birds at least once with live virus vaccine for Tenosynovitis (Cook, 1991).

Vaccination is important to control diseases caused by reoviruses. Both attenuated and inactivated vaccines are utilized in the poultry industry (Van Der Heide, 1977, Van Der Heide *et al.*, 1983), to provide active immunity in the breeders or passive immunity for progeny as maternally passed antibody. Reovirus vaccination of the broiler breeding stock is common for protecting progeny. However, maternal antibody levels are not uniform in progeny. Chickens with low maternal antibody are susceptible to field strains of reovirus early in life. Thus vaccination against reoviruses important in both breeder and progeny.

The aim of present study was to evaluation the efficacy of two different vaccination programs against reoviruses in broiler breeders by ELISA method.

Methodology:

Ninety broiler breeder chickens was selected and randomly distributed in three groups (each group with three repetitions). In two experimental group two different vaccination programs was used and group three was as a control group and the reovirus vaccine was not used. On days 1, 110, and 145 blood samples were collected and following serum isolation, the samples undergoes ELISA (IDEXX) test and antibody titers obtained from each of vaccines were evaluated.

A vaccination program in two experimental groups was indicated in table 1, and in control group vaccine was not used.

Table 1: Vaccination programs in experimental groups.

Day of vaccine administration	Group 1	Group 2	Control Group
90	S1133 (SC)	S1133 (SC)	----
126	----	S1133 (SC)	----

Statistical Analyzing: For Data analyzing One-way ANOVA statistical method was used for compare antibody titers against Newcastle disease and statistical software was PASW SPSS 18th edition.

Results:

The results of study showed that the antibody titer was different significantly between studied groups and second inactivated vaccine that was used in group 2 was increase antibodies levels, Also on day 145 there was significant differences between two vaccinated groups ($p < 0.05$), but on 110 days there was not any differences between two vaccinated groups. The Results of flocks antibody monitoring was demonstrated in table 2:

Table 2: The results of antibody titers evaluation on days 1, 110, and 145.

Group	Day		
	1	110	145
1	8318.10±337.924	4687.05±362.29 ^{ab}	4020.10±332.75 ^b
2	8091.00±308.069	4786.70±391.32 ^b	6088.95±399.97 ^c
Control	8678.15±324.048	1012.35±735.682 ^a	147.65±32.91 ^a
Sig.	0.438	0.001	0.001

* Different letter in each column, indicated statistical difference between groups.

Our results indicated in the control group, which any reovirus vaccine was not used, antibody titers were decreased and the unvaccinated chickens susceptible to disease. In group 1, only we used vaccine on 90 days old, the antibody titers was reach to 4687.05±362.29 on 110-day old and then decreased to 4020.10±332.75 on day 145. In group 2, because inactivated vaccine was used two times on days 90 and 126, antibody titers was reach to 6088.95±399.97 on 145-day old. Our results indicated that two time vaccination was better for protection of breeders and also theirs progenies.

Discussion:

Vaccination plays an important role in the poultry flocks health management. There are numerous diseases that are prevented by vaccinating the birds against them (Bacon, 1992). The purpose in using a vaccine to prevent a particular disease is to trigger or boost the bird's immune system to produce antibodies that in turn fight the invading causal organisms. A natural invasion that actually causes the disease will have the same result – the bird will produce antibodies that fight future invasion. Unfortunately the damage done to the bird suffering such disease is usually too great and the bird either dies or becomes unthrifty and nonproductive. A natural invasion caused infection will be uncontrolled and has the possibility of causing severe damage. Vaccination is a way of obtaining a controlled result with a minimum of harm to the birds. Vaccines are generally fragile products some of which are live but in a state of suspended animation (Cook, 1991).

Avian reoviruses have also been associated with other disease conditions in chickens where the role of the virus is less clear and indeed sometimes tenuous. These include enteric problems such as cloacal pasting and mortality (Dutta and Pomeroy, 1967), ulcerative enteritis (Krauss and Ueberschar, 1966), enteric disease (Bouquet *et al.*, 1982), respiratory disease, inclusion body hepatitis, increased mortality and heart lesions in young broilers, sudden deaths in young broilers associated with lesions in the heart, kidney and liver and the variously named runting/malabsorption/brittle bone disease in young broilers (Goodwin *et al.*, 1993). Recently, sudden deaths have been reported in young broilers in Poland. The disease was characterised by liver lesions, from which a reovirus was isolated which could reproduce the disease experimentally.

Avian Reovirus has been implicated in many disease syndromes and is not discernible from other poultry diseases by clinical examination; therefore laboratory diagnosis of the disease is required. In comparison with the existing antibody assay technique in viral neutralization of AGP, the ELISA method offers high sensitivity and is more simple, faster and less expensive (Slaght *et al.*, 1978). But this test is not effective to detect all Reovirus strains and serotypes. So negative results obtained by commercial ELISA cannot reject the presence of anti- Reovirus antibodies. This fact restricts the results for interpretation. Furthermore, ELISA test cannot distinguish between Reovirus vaccine and natural Reovirus antibodies. Reovirus-associated disease has been reported predominantly in the United States (De Herdt *et al.*, 1999).

Results derived from a seroprevalence study on Nigerian poultry show that the prevalence of Reovirus antibody is 41% (Owoade *et al.*, 2006). In Iran for the first time Khodahenas and Aghakhan (1992) isolated and characterized avian Reovirus from the case with malabsorption syndrome and arthritis/tenosynovitis (Khodashenas and Aghakhan, 1992).

Conclusion:

The results of current study showed that the use of reovirus vaccine in broiler breeder is necessary and it should be used before laying period. Also for prevention progenies it is recommended booster vaccine to be used in broiler breeders to obtain high level of antibody titers.

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