

Growth performance of broilers in experimental *Reovirus* infections

Sudhakar P. Awandkar, Sathish J. Manwar, Dilip M. Badukale, Mahesh B. Kulkarni

College of Veterinary and Animal Sciences,

MAFSU, Udgir, Dist. Latur 413 517, Maharashtra, India

Corresponding author: Sudhakar P Awandkar, E-mail: drspawandkar@gmail.com

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Abstract

Background: The avian reoviruses have emerged to induce various manifestations in chickens. They are associated with disease conditions including malabsorption syndrome, tenosynovitis etc. Reoviruses are an important cause of suboptimum performance in broilers, resulting in poor growth performance. Poultry industry in India is facing a catastrophe due to such infections which go unnoticed in field due to masking of the symptoms by secondary infections and commonly observed nutritional disorders.

Aim: To investigate the effect of reovirus infection on overall performance of broiler birds.

Material and Methods: The broiler birds were challenged with homologous strains of malabsorption syndrome and tenosynovitis syndrome of reovirus. The growth performance was recorded.

Results and conclusion: The growth performance and immune response to NDV did not differ in the birds challenged with tenosynovitis syndrome strain of reo virus as compared to unchallenged birds. However, poor live body weight, feed intake, FCR, PE and BPEI and better serum NDV titres were found in chicks challenged with malabsorption syndrome strain of reo virus as compared to the chicks from control group.

Key words: avian, broiler, performance, Reovirus

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Introduction

The avian reoviruses were considered to be harmless in the past. But they have emerged to induce various manifestations in chickens. They are associated with disease conditions including malabsorption syndrome (MAS), femoral head necrosis, pericarditis, myocarditis, hydropericardium, gastroenteritis, hepatitis, and acute and chronic respiratory syndromes [1,2]. Reoviruses are an important cause of suboptimum performance in broilers [3,4,5]. These disease conditions, many times, go unnoticed in field due to masking of the symptoms by secondary infections and commonly observed nutritional disorders [6].

In affected flock, especially at early ages, a small number of birds (1-5%) show severely stunted growth and a considerable proportion (10-50%) show variable growth rate in MAS. All the affected birds do not show the signs of illness but remain active and voracious

feeders. The signs of illness may include diarrhoea, catarrhal enteritis, stunted and uneven growth, poor feathering, hydropericardium, pericarditis, hepatitis and respiratory signs [7]. The farms with such infection suffer from heavy economic losses due to higher culling rate, poor feed conversion ratio, reduced and variable body weights at the time of sale.

The next important manifestation of reovirus infection is tenosynovitis/viral arthritis (TSS). It is usually seen in young birds 4 to 7 weeks old but may be seen in much older chicken also. Though the mortality remains less than 6%, morbidity may reach to almost 100% in the infected flocks [7]. Economic losses caused by tenosynovitis/viral arthritis are due to the lameness because of viral arthritis and a general lack of performance including diminished weight gain, poor feed conversion and a reduced marketability of the affected birds.

The present study was aimed to investigate the

effect of reovirus infection on overall performance of broiler birds.

Materials and methods

All the necessary permissions from Institutional Bio-safety Committee and Institutional Animal Ethics Committee had been obtained to carry out the research work.

Broiler Birds: A total number of 100 straight-run, day old and healthy "Vencobb" broiler chicks were obtained from M/s. Venkateshwara Hatcheries Ltd., Pune. They were equally divided into four groups (A, B, C and D, n = 25 per group). The birds were reared under deep litter system following standard and uniform managerial practices.

Vaccines and Virus: All the vaccines viz. LaSota, IBD, IB and inactivated IBH vaccine and virulent *Reoviruses* were obtained from M/s. Ventri Biologicals, Pune. The required medicines and supplements were purchased from local market.

Broiler Feed: The broiler feed (starter and finisher) was obtained from M/s. Huma Hatcheries and Breeding Farms, Udgir.

Challenge studies:

Experiment 1 (TSS): Fifty, day old susceptible chicks were equally divided into two groups, group A and group B. On 46th day of age, group B was challenged with 0.1 ml of 10⁴ TCID₅₀ (per bird) of tenosynovitis syndrome strain of *Reovirus* via left intra-foot pad inoculation. The group A was kept as unchallenged control. The birds were further observed for 14 days after challenge.

Experiment 2 (MAS): Fifty, day old susceptible chicks were equally divided into two groups, group C and group D. On third day, group D were challenged with 0.1 ml of 10⁴ TCID₅₀ (per bird) malabsorption syndrome strain of *Reovirus* via intra-muscular route. The group C was kept as unchallenged control. The chicks were observed daily for 24 days after challenge.

Growth Performance:

Live Body weight: The birds from each group were weighed individually on day 3, 14, 21, 28 (Group A, B, C, D) and 35 and 60 (Group A, B). Mean live body weight (g/b) was computed.

Feed Intake: Measured quantity of feed (g/b) was offered to the birds of each group and the left over feed was recorded after completion of the experiment. The difference between the feed offered and the left over feed was recorded as actual feed intake.

Feed conversion ratio: The feed conversion ratio (FCR) for each group was calculated using standard formula.

Broiler performance efficiency index: The broiler performance efficiency index (BPEI) was calculated using standard formula [8].

Protein efficiency: The protein efficiency was calculated based on unit protein consumed to unit body weight gain in each group, separately [9].

Immunity: The immune status was recorded by estimating serum antibody titres against NDV vaccine by Haemagglutination Inhibition Test.

Mortality: Mortality was recorded as and when occurred and sent for the post mortem examination to the Department of Pathology, Veterinary College, Udgir, Maharashtra, India.

Statistical analysis: The data obtained on various parameters studies during these trials was subjected to statistical analysis following standard methods [10].

Results and Discussion

Live Body weight: The data on live body weight of broilers is indicated in Table-1.

The results revealed no significant difference in live weights up to the age of 3 days. The chicks challenged with homologous strain of tenosynovitis syndrome reo virus (Group B) showed non-significant difference in body weights throughout the observation period of 60 days when compared with control group A.

The chicks from group D showed significantly lower weight gain after challenged with homologous strain of malabsorption syndrome reo virus when compared with control group C. The uneven growth rate and live weights were recorded in group D after challenge. In control group C the growth was found to be uniform with increasing trend in body weight.

Feed Intake: The overall feed intake of the broiler chickens throughout the experiments has been presented in Table-2.

In experiment 1, the feed intake did not differ in the birds challenged with tenosynovitis syndrome strain of *Reovirus* (group B) as compared to birds from control group (group A) throughout observation period.

However, the results of experiment 2 indicated that the feed intake was reduced in chicks challenged with malabsorption syndrome strain of *Reovirus* (group D) as compared to the chicks from control group C.

Feed conversion ratio: The feed conversion ratio

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Table-1. Body weight of broiler chicken throughout the experiments.

Age (days)	03				14				21				28				35		60	
Groups	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	A	B
Mean	118	118.6	118.2	118.2	440.8	442.8	449.4 ^a	367.8 ^b	829	830	833 ^a	596 ^b	1122	1124	1156 ^a	811 ^b	1750	1750	3346.5	3380.9
SEM	0.57	0.45	0.70	0.49	5.89	5.94	7.22	10.25	8.98	9.13	10.67	21.73	21.90	20.69	14.08	19.58	37.42	33.42	69.39	66.75
Significance	NS		NS		NS		P < 0.05		NS		P < 0.05		NS		P < 0.05		NS		NS	

NS – Non significant, ^a and ^b – Significant difference at P < 0.05

Table-2. Performance of broiler chicken throughout the experiments.

Sr. No.	Group	No. of birds	Feed Intake (Kg)	FCR	BPEI	PE	Serum NDV Titers (GMT)
After 28 days of age							
1	A	25	77.50	1.77	98.31	0.3388	46.24
2	B	25	78.00	1.78	98.87	0.3408	48.58
Significance			NS	NS	NS	NS	NS
After 60 days of age							
3	A	25	185.50	2.22	151.43	1.0500	71.84
4	B	25	187.00	2.21	152.29	1.0474	57.05
Significance			NS	NS	NS	NS	NS
After 28 days of age							
5	C	25	77.50 ^a	1.68 ^a	110.12 ^a	0.3204 ^a	40.32 ^b
6	D	25	67.50 ^b	2.44 ^b	45.09 ^b	0.4728 ^b	90.51 ^a
Significance			P < 0.05	P < 0.05	P < 0.05	P < 0.05	P < 0.05

NS – Non significant, ^a and ^b – Significant difference at P < 0.05

(FCR) for each group has been presented in Table-2.

In experiment 1, the FCR did not differ in the birds challenged with tenosynovitis syndrome strain of *Reovirus* (Group-B) as compared to birds from control group (Group-A) throughout observation period.

However, the poor FCR was recorded in chicks challenged with malabsorption syndrome strain of *Reovirus* (Group-D) as compared to the chicks from control group C.

Broiler performance efficiency index: The broiler performance efficiency index (BPEI) has been presented in Table-2.

In experiment 1, the BPEI did not differ in the birds challenged with tenosynovitis syndrome strain of *Reovirus* (Group-B) as compared to birds from control group (Group-A) throughout observation period.

However, the poor BPEI was recorded in chicks challenged with malabsorption syndrome strain of *Reovirus* (Group-D) as compared to the chicks from control group C.

Protein efficiency: The protein efficiency (PE) has been presented in Table-2.

In experiment 1, the PE did not differ in the birds challenged with tenosynovitis syndrome strain of *Reovirus* (Group-B) as compared to birds from control group (Group-A) throughout observation period.

However, the poor PE was recorded in chicks challenged with malabsorption syndrome strain of

Reovirus (group D) as compared to the chicks from control group C.

In experiment 1, the immune response to Newcastle disease virus vaccine did not differ in the birds challenged with tenosynovitis syndrome strain of reo virus (group B) compared to control birds (group A) up to the age of 60 days.

The results of trial 2 indicated better serum NDV titres were recorded in group D as compare to group C up to the first 27 days of their age.

Mortality: No mortality was recorded in any group throughout the experiment.

During the present investigation, all birds inoculated with *Reovirus* were developed the disease. It indicated that the birds are most susceptible to avian Reovirus infection at a young age [11]. The Reovirus infection is suggestive of suppressive factors [12]. Though the vaccine strains of Reovirus differ from field strains, majority of strains are virulent [13,14]. Investigators documented anaemia, nonuniformity and poor performance that had reportedly occurred in several successive grow-out flocks on a commercial broiler due to this infection [15,16]. Avian Reoviruses are an important cause of economic losses in commercial poultry [17].

The GI tract has the most extensive exposed surface in the body, and a wide variety of factors associated with diet. Infectious disease agents like

Reovirus can negatively affect the delicate balance among the components of the chicken gut. Such infections may disturb this balance which may result into poor health status and production performance of broiler birds [18]. Reoviruses are an important cause of poor feed conversion, lowered body weight, higher mortality and increased condemnation [1,2,3]. The findings of experiment 2 in present investigation indicated altered absorption of nutrients from gut due to reovirus infection and resulted into poor and uneven growth. The high morbidity and low mortality is recorded in reovirus infections [19]. However, the apparent lack of effect on the growth rates of the infected chickens is surprisingly in contrast to previous reports [20], although experimental conditions were such that birds had easy access to food and water.

Conclusion

The chicks infected with malabsorption syndrome strain of *Reovirus* showed poor growth performance. However, the birds from challenged with tenosynovitis syndrome strain of *Reovirus* showed no significant difference in growth performance.

Author's contribution

SPA designed and conducted the study. SJM and DMB managed the study. MBK recorded the data. SPA analyzed the data. SPA and SJM drafted and revised the manuscript. All the authors read and approve the final manuscript.

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Competing interests

Authors declares that they have no competing interests.

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