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# Alterations in the body weights of chicken experimentally infected with novel nephropathogenic IBV strain, IND/AHL/16/01

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**Abstract**
IBV (Infectious Bronchitis Virus) is a highly contagious viral infection of poultry caused by avian corona virus which has an affinity for respiratory, renal, gastrointestinal and reproductive systems thus causing decreased FCR (Feed conversion ratio) and reduced body weights. In this study, birds are experimentally infected with a novel strain of IBV, IND/AHL/16/01, isolated from gout, nephritis, mortality cases in pure line birds at ICAR-DPR and molecularly characterised. A total of 150, twenty days old seronegative vanaraja birds were inoculated with $10^{4.7}$ embryo infective dose 50 ($EID_{50}$ / 1 mL) virus through intranasal (IN) and intravenous (IV) routes. Weekly body weights were recorded to test the influence of the virus on body weight gains for 3 weeks. It was observed that there was a significant decrease in the body weights of chicken in the IBV infected groups when compared to the control group chicken by the end of 3rd week. Hence it can be concluded that the nephropathogenic virus isolate used in the study is highly pathogenic, causing a significant decrease in the feed intake and body weight gains in chicken.

**Keywords:** body weights, IBV, nephropathogenic, infectious bronchitis

## Introduction
Infectious bronchitis virus (IBV) is one of the foremost causes of economic losses in the poultry industry and is one of the economically significant pathogens of commercial chicken. Economic consequences to the poultry industry comprise of mortality, growth retardation and high condemnation rates in broilers [3]. Diseases like IBV brings piles of economic losses to the farmers in the form of inefficient feed conversion, decreased production, mortality, loss of market value and increased production cost [9]. Infectious bronchitis is prevalent worldwide, despite scientifically advanced poultry industry practices and availability of good vaccines and remains a global threat to poultry industry [1].

Flock management and the strain of virus involved plays a major role in the impact of IBV infection and the principal losses are from production inefficiencies. Following an outbreak of IB (Infectious bronchitis), around 3% to 8% of the broilers will be condemned at the processing plant, in comparison to flocks in which IBV is controlled, where condemnation can be below 1%. In cases of IB nephritis, in addition to losses from poor weight gains and downgrading of carcasses, losses from mortality may be in the order of 10% to 25% [10]. IB Virus causes respiratory disease, poor weight gain and feed efficiency in broiler, resulting in economic losses [14]. Infectious bronchitis virus (IBV) can cause reduction in body weight gains and feed efficiency in broiler chickens [4]. The IBV causes a respiratory, renal and urogenital disease characterized by high mortality rates in affected flocks and severe losses on the productive performance of both egg and meat producing poultry flocks [5]. The typical signs of IBV in chickens are depression, huddling under the heat source, gasping, coughing, tracheal rales, nasal discharge, lethargy, diarrhoea, dehydration, decreased FCR (Feed conversion ratio) and decreased body weight gains [5,7]. Live attenuated and inactivated vaccines have been available to control IB for many decades. The most commonly used vaccine strains are representatives of the Massachusetts and Connecticut antigenic groups, and they are reasonably effective in controlling clinical disease and production losses associated with IBV infection. However, the continuous emergence of new IBV variants and serotypes as a consequence of mutation and recombination of the virus genome remains a problem for both the poultry industry [11]. The virus isolate, IND/AHL/16/01 is novel strain and hence, the pathological characteristics of the virus is not well characterized.

The present study was undertaken with an aim to know the pathology of this novel strain, IND/AHL/16/01 on the body weight gain of chicken, when inoculated by different routes and doses i.e., intranasal 1 mL, intranasal 2 mL and intravenous 1 mL.

## Materials and Methods

### Virus

Infectious bronchitis virus (IBV) isolate (IND/AHL/16/01) isolated from the outbreak of nephritis and gout related mortality cases from coloured layer pure line at avian health lab, ICAR- Directorate of Poultry Research (ICAR-DPR, Hyderabad) was used in this study. The isolate was initially passaged in ECE (embryonated chicken eggs), in which, the isolate showed IBV specific lesions of embryo curling, dwarfing and haemorrhage. Allantoic fluid was confirmed for IBV with S1 gene specific primers by RT- PCR [8].

### Embryonated Chicken Eggs (ECE) and Chicks

Nine-day-old ECE and one-day-old vanaraja chicks were obtained from in-house hatchery, ICAR-DPR. They were tested were presence of IBV and other viruses. After finding negative for viruses, chicks were transferred to isolation unit and kept there throughout the experiment and fed with *ad libitum* water and feed. All the experiments were approved by Institute Animal Ethics Committee (IAEC) of ICAR-DPR (IAEC/DPR/18/5).

### Experimental Design

A total of 150 twenty-day old chicks were randomly divided into four groups, consisting of 40 chicks each. The chicks were distributed in such a way that the difference in the group mean body weight is not more than 20g. Chicks were bled on 19$^{th}$ day of age and serum was checked for negative titres against IBV by ELISA. First two groups of chicks were inoculated with 1ml and 2ml of $10^{4.7}$ $EID_{50}$ allantoic fluid (AF) through intranasal route (IN) and third group with 1ml of $10^{4.7}$ $EID_{50}$ AF through intravenous (IV) route and the fourth group was kept as control which received only virus free AF. The infected chicks were observed daily throughout the 21 days of experiment period for clinical signs.

### Body Weight Analysis

Body weights of birds were recorded by using the electronic balance. The average body weight gain of chicks was calculated by weighing all chicks from each group on every 0$^{th}$, 7$^{th}$, 14$^{th}$, 21$^{st}$ day of post inoculation (DPI) to study the alteration in body weights of chicken.

### Statistical Analysis

The data of body weight gains were subjected to statistical analysis by applying one-way ANOVA using statistical package for social sciences (SPSS) version17.0. The differences between the means were tested by using Duncan's multiple comparison tests and the significance level was set at $P \leq 0.05$ [16].

## Results and Discussion

After the inoculation of birds with IBV, weekly body weights were recorded until 21 DPI. The results showed a significantly ($P<0.05$) higher mean values in the body weights of birds of the control group when compared to that of the intranasal 1 mL group, intranasal 2 mL group and intravenous 1 mL group on 7$^{th}$, 14$^{th}$ and 21$^{st}$ day of experiment respectively (Fig. 1).

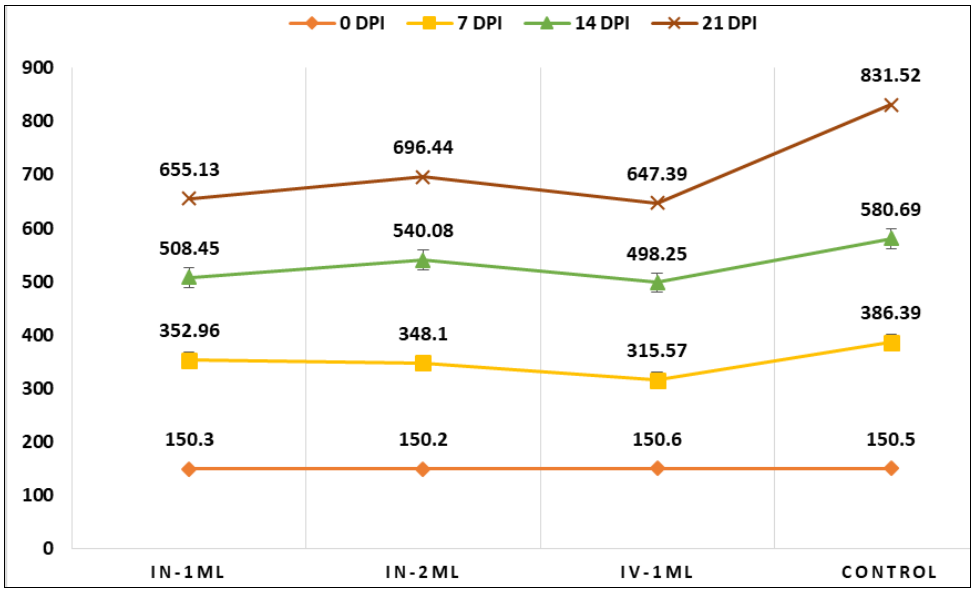


**Fig 1:** Body weight alterations in birds infected with IBV.

The intravenous group showed more significant decrease in body weight gains compared to other groups. The intranasal 1 mL and 2 mL groups also showed a decrease in body weight gains when compared to the control group but the decrease is not as significant as intravenous group. This decrease in body weight might be due to dehydration from diarrhoea caused due to malabsorption of nutrients. Otsuki *et al.*, (1990) [12]; Afanador and Roberts (2007) [2] also observed that, in IBV challenged birds, feed consumption and weight gain were significantly reduced which is in accordance with our present study.

One of the important findings of this study was the significantly lower average weekly weight gain among chickens inoculated with the virus in all the three groups suggesting the effect of virus during the acute phase of infection. A number of authors also have reported the lower weight gain associated with IBV infection [4, 10, 13]. These authors found that noninfected chicken gained more weight

per bird than those that were infected which is similar to our results.

Shihong *et al*., 2020 used a new Isolate of the QX-like infectious bronchitis virus (IBV) to inoculate into SPF chicken and body weights were measured after a 14-day observation period. He observed that the mean weights differed very significantly from those of the control group. These recordings are in accordance with our present study. The cause for the decreased body weights in IBV inoculated birds can be due to the virus targeting the epithelial covering of the tips of villi of the ilium and rectum, leading to atrophy of the villi and desquamation of epithelial cells, causing malabsorption, diarrhoea, reduced weight gain.

## Conclusion

From the study it is understood that the virus isolate IND/AHL/16/01, affects the feed intake of the birds thereby reducing the body weight gains. The cause for the reduction in feed intake might be due to effect of the virus on gastrointestinal tract along with hunger centre in the brain. The future perspective should aim at studying the pathogeneses and tissue tropism of the nephropathogenic virus isolate, IND/AHL/16/01, on different body systems including nervous and gastrointestinal system.

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