

Novel Treatment Approach of Inclusion Body Hepatitis Coinfected with *E. coli* in Backyard Poultry

Muhammad Irfan^{1*}, Kashif Prince², Zain Ali¹, Raheel Mubarak¹, Numan Hassan¹, Muhammad Moiz Munawar¹, Muhammad Bilal¹, Muhammad Aqib¹, Jannat Gohar¹

1. Faculty of Veterinary Science, Cholistan University of Veterinary and Animal Sciences, Bahawalpur, Pakistan.
2. Department of Medicine, Cholistan University of Veterinary and Animal Sciences Bahawalpur, Pakistan.

*Corresponding author: muhammadirfan37046@gmail.com

ABSTRACT

In October 2023, a study was conducted to investigate an outbreak of inclusion body hepatitis in 100 desi birds (GOLDEN MISCRI) at Chak 88 Hasilpur Punjab, Pakistan. Secondary bacterial infection of *Escherichia coli* was observed after IBH. Birds were being reared in the backyard with the history of Newcastle disease vaccination. The flock experienced 1% mortality between the 11th and 12th week of age. Birds were treated for *E. coli*. Birds were found anorexic, dull, and depressed, with ruffled feathers, anemic comb, and wattles with yellow mucoid droppings. After the treatment, mortality was raised to 3%. Post-mortem investigation revealed straw-colored transudate in the pericardial sac, swollen kidneys, splenomegaly, hemorrhagic foci on the liver, hepatomegaly, cheesy white material on the liver, and edematous liver. IBH and *E. coli* were diagnosed based on clinical signs and postmortem findings. Birds were treated for the viral infection after stopping the anti-bacterial treatment and birds started feeding with reduced mortality. We observed that in poultry mix infection of IBH and *E. coli* if viral infection is covered first by supportive therapy and then treated for bacterial infection showed better results.

Keywords: IBH=Inclusion Body Hepatitis, *Escherichia coli*, poultry

Introduction:

Fowl adenoviruses have a worldwide distribution and are reported to be frequently isolated from healthy chickens as well as affected birds [1]. Inclusion body hepatitis (IBH) is caused by fowl adenovirus (FAdV) under the Adenoviridae family [2]. FAdVs responsible for IBH and HHP have been classified into 13 serotypes (1-7, 8a, 8b, and 9-11) based on virus neutralization assay [3]. FAdVs have been classified into five species (A-E) based on molecular techniques [3]. There is causality between strains from species FAdV-A, FAdV-C, and FAdV-D together with FAdV-E with specific diseases in chickens, such as adenoviral gizzard erosion (AGE), hydropericardium hepatitis syndrome (HHS) and inclusion body hepatitis (IBH), respectively [4]. Hepatic intranuclear inclusion bodies have been described in two chicken broiler flocks [5]. Group I avian adenoviruses are ubiquitous in domestic fowl and frequently of low virulence. They have also been isolated from asymptomatic chickens [6].

Colibacillosis is a localized or systemic infection caused by avian pathogenic *Escherichia coli* (APEC). [7] *Escherichia coli* is a normal inhabitant of the gastrointestinal tract of mammals and birds and belongs to the Enterobacteriaceae family [8]. *E. coli* is a gram-negative, facultative anaerobic, rod-shaped, non-spore-forming bacteria [8]. Most of its strains are nonpathogenic however certain serotypes can cause disease in poultry [8]. Avian colibacillosis is characterized in its acute form by septicemia resulting in death and its subacute form by a complex syndrome that includes multiple organ lesions peri-carditis, air vasculitis, perihepatitis, and peritonitis. [8] [7] The study aims to apply a novel treatment approach of IBH coinfecting with *E. coli* in Poultry Flock.

Case presentation:

Case History:

Mortality was observed to be 1 % in a free-range poultry flock, composed of 100 Desi Golden Misri Chicken at the 11th to 12th week of age and reared outdoors. The flock was vaccinated with Newcastle Disease at an early age. Biosecurity measures in this farming were poor. The signs observed in birds were ruffled feathers, anemic comb, and wattles with yellow mucoid droppings while some birds expressed non-specific signs.

Physical Examination:

On physical examination, the birds were off-feed, anorexic, and lean. No respiratory signs were observed. Ruffled feathers and yellow mucoid droppings were found with no vent-pasting.

Clinical Signs:

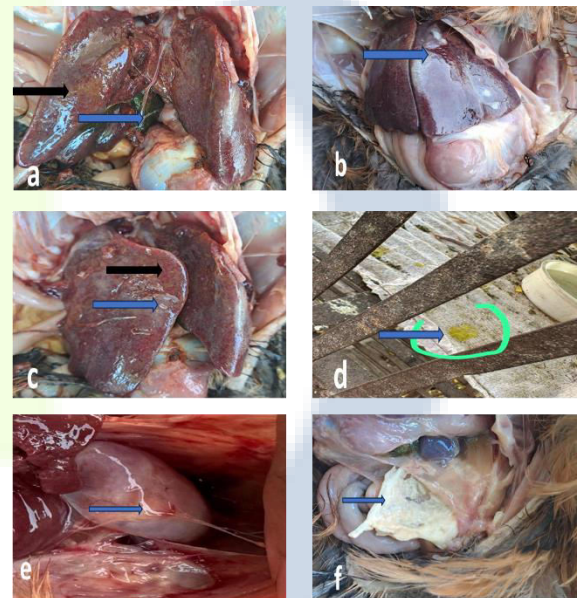
Clinical signs observed on the birds were pale comb and wattle, depression, apathy, decreased feed consumption, and ruffled feathers. Some birds had icteric skin and hemorrhages in skeletal muscles. Yellow mucoid droppings were also found (Fig:1d).

Post-Mortem Findings:

The postmortem of four birds was performed to diagnose the disease. For follow-up treatment, five birds were slaughtered. Post-mortem investigation

revealed an enlarged gall bladder (Fig:1a, 1c), straw-colored transudate in the pericardial sac (Fig:1e), swollen kidneys, splenomegaly, hemorrhagic foci on the liver, hepatomegaly, cheesy white material on the liver (Fig:1b) and intestines (Fig:1f).

Figure 1



Postmortem findings of IBH coinfecting with *E. coli*-affected poultry birds

a: The black arrow shows Liver foci and the blue arrow shows enlarged gallbladder, b: Caseous material on the liver. c: The black arrow shows Foci and the blue arrow shows the caseous layer on the liver, d: Yellow mucoid droppings e: Straw Color Fluid in Pericardial Sac, f: Caseous layer on intestine

Treatment:

After suspecting of *E. Coli* infection, we treated the birds with antibiotic; Colisol Powder (Colistin Sulphate) 1g= 5000000 IU 1g/10L water for 100 birds for 3 days. Paramin C (1kg contains Vitamin C 500gm, Paracetamol 250gm, Vitamin K3 1000mg, Vitamin B12 4000mg and Vitamin D3 1500mg) 1g/8L Water for 3 days. After that, we stopped antibiotics and immune boosters, and another supplementary treatment was given including; Bogart Liver Tonic/Nutraceutical (Propionic acid 15000mg, Formic Acid 10000mg, Ammonium Propionate 15000mg, Ammonium Formate 15000mg, Vitamin E 30000mg, Vitamin C 30000mg, Copper as Sulphate 20000mg, Potassium as Chloride 15000mg, Yeast Extract 20000mg, Thyme oil 1500mg, Rosemary oil 750mg, Powdered Andrographis Extract 10000mg)

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1ml/2L water for 5 days. Acidified Copper Sulfate 1g/2L water. Magnesium Sulfate 50gm in 50 kg feed.

Follow Up:

The birds showed improved feed consumption after this treatment and mortality was reduced to zero. Also, yellow mucoid droppings returned to normal. After a few days, the owner slaughtered 5 birds for household meat purposes, the birds were healthy with normal liver and no straw color fluid in the period sac.

Discussion:

Inclusion body hepatitis, as a disease resulting from the immunosuppression caused by viral diseases such as infectious bursal disease virus or chicken anemia virus, was diagnosed mainly towards the end of the last century [1]. Current increased trends in the prevalence and severity of IBH with *E. coli* indicate that it is likely to be a greater problem in the poultry industry. *E. coli* is normal inhabitant in the digestive tracts of poultry, particularly in the lower part of the small intestine and caeca [7]. The infection occurs when pathogenic *E. coli* invades the bird's body from the respiratory tract when mucosal barriers are compromised [7]. Usually, birds at 3-8 weeks of age are found to be susceptible to IBH [3]. After suspecting *E. Coli* infection, birds were treated with antibiotics. [9] Antibiotic therapy can also be help to prevent secondary bacterial growth in affected birds. Good liver tonic is used to treat IBH [9]. Immunodeficiency is one of the major issues and immunostimulants like Vitamin E and Selenium in combination is useful in elevating immunity in birds. Liver supplements were given to birds to support the hepatic damages caused by IBH [9]. Colistin gives best result in case of *E. coli* infection [10]. Bogart Liver Tonic/Nutraceutical was used to support and improve liver health, it has a component named thyme oil. A wide variety of pharmacological activities are detected for thymol such as anti-spasmodic, anti-oxidant, anti-microbial, anti-cancer, anti-viral, anti-inflammatory and growth enhancer [11]. Essential oils given to the birds in this study are reported to have good activity for at against *E. coli* isolates deriving from poultry [12]. We also used acidified copper sulfate in our flock as copper promotes oxidation of low-density lipoproteins in vitro [13]. Copper in its unbound form is a pro-oxidant [14]. It is however also an essential component of superoxide dismutase, an enzyme defending living organisms against reactive oxygen species [15]. We had used magnesium sulfate in feed as magnesium is one of the most divalent ions in the living cell, as it is a stimulant or auxiliary agent for many important enzymes in the body and plays a vital role in 300 essential enzymatic reactions including oxidative phosphorylation that activates all major metabolic pathways [16]. It is concluded that in the condition of inclusion body hepatitis co-infected with *E. coli*, timely supportive care of viral infection followed by antibiotic treatment is required to control the *E. coli* infection.

Conclusion:

From the findings of the present case study, it is concluded that antibiotic therapy is not enough in the case of *E. coli* co-infected with Inclusion body Hepatitis so therapeutic applications for *E. coli* should be considered after supportive care by liver tonics, vitamin supplements, copper sulfate and magnesium sulfate for the viral infection caused by IBH.

Conflict of Interest:

All authors have declared that there is no conflict of interest regarding the publication of this case report.

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