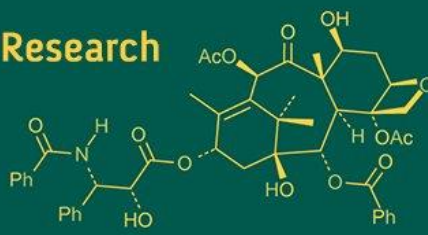


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Pathomorphological changes in the liver and kidney of broiler chickens infected with nephropathogenic infectious bronchitis virus

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Abstract

Infectious bronchitis virus (IBV), particularly nephropathogenic strains, causes severe renal and hepatic pathology in broiler chickens, leading to significant economic losses. The present study was conducted in Assam to investigate the gross and histopathological changes in the liver and kidneys of broiler chickens affected with nephropathogenic IBV. The study was carried out from December 2023 to December 2024 on broiler carcasses received for post-mortem examination. Clinically, affected birds showed dehydration, depression, diarrhoea, ruffled feathers, and mild respiratory signs. Gross examination revealed predominant renal involvement characterized by congestion, necrosis, ureteral distension with urates, and visceral gout with urate deposition on serosal surfaces of visceral organs. Microscopically, the liver showed congestion, haemorrhages, and mild hepatitis, while kidneys exhibited interstitial nephritis, glomerulonephritis, tubular degeneration, and urate crystal deposition. The study demonstrates that nephropathogenic IBV primarily targets the kidneys while also inducing notable hepatic alterations in affected broiler chickens.

Keywords: Infectious bronchitis virus, nephropathogenic strain, visceral gout, broiler chickens

Introduction

Disorders of the liver and kidneys are commonly reported in poultry and can negatively influence bird health and productive performance, resulting in significant economic losses [20, 15]. Among the causative agents, infectious bronchitis virus (IBV) is recognized as a principal factor associated with nephropathies in young chickens and contributes to renal impairment in broiler flocks [3, 15]. Infectious bronchitis (IB) is a highly contagious viral disease of chickens, and the emergence of nephropathogenic strains of IBV has resulted in severe renal damage, urolithiasis, visceral gout, and increased mortality, posing a significant challenge to poultry health and productivity worldwide [6, 21, 16, 19]. IBV is an enveloped, positive-sense, single-stranded RNA virus of the genus *Gammacoronavirus* that exhibits strain-dependent tissue tropism, including marked renal involvement in nephropathogenic strains [9, 11, 17, 8]. IBV primarily spreads via horizontal transmission, including direct and indirect contact, aerosols, and fecal shedding, and wild birds may act as asymptomatic carriers contributing to the emergence of new strains [12, 10]. The present study was conducted in Assam to investigate the gross and histopathological changes in the liver and kidneys of broiler chickens infected with nephropathogenic infectious bronchitis virus.

Materials and Methods

The present study was conducted from December 2023 to December 2024. Broiler carcasses were obtained from post-mortem submissions to the Department of Veterinary Pathology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22, and from organized commercial broiler farms in various districts of Assam. Each carcass underwent a systematic necropsy following standard post-mortem procedures. Clinical signs and flock history were recorded as reported by the respective farm managers, and all gross pathological lesions were carefully examined and documented. Representative tissue samples from the liver and kidney were collected, fixed in 10% formalin, routinely processed, sectioned at 4 µm, and stained with Haematoxylin and Eosin (H&E) for histopathological examination.

Results and Discussion

The clinical signs observed included dehydration, depression, ruffled feathers, diarrhoea, and mild respiratory signs such as nasal discharge and coughing. These clinical findings were in agreement with earlier reports [4, 13, 7]. Gross examination of broilers demonstrated marked pathological alterations, with the kidneys being predominantly affected. Visceral gout was consistently observed and was characterized by the accumulation of chalky white urate deposits on the serosal surfaces of the liver, kidneys, heart, and within the peritoneal cavity (Fig. a). The liver exhibited evident urate deposition on its surface. Renal changes comprised pronounced congestion and necrosis of the renal parenchyma (Fig. b), accompanied by urate accumulation (Fig. b) and distension of the ureters with urates. Additionally, severe haemorrhages were present in the renal tissue, along with unilateral lobular hypertrophy and atrophy of the opposing lobes. Similar gross pathological findings have been documented by other authors [2, 15, 19].

Microscopic examination of the liver revealed marked congestion and haemorrhages with mild hepatitis, characterized by mononuclear cell infiltration and disruption

of hepatic cord architecture (Fig. c). These microscopic findings are consistent with previous reports [14]. These hepatic changes may be attributed to the ability of infectious bronchitis virus (IBV) to reach the liver via portal circulation following gastrointestinal infection and through systemic dissemination, where infection of Kupffer cells contributes to hepatic involvement [1, 8]. Renal histopathology revealed interstitial nephritis and glomerulonephritis characterized by mononuclear cell infiltration and narrowing of Bowman's space, along with haemorrhages, desquamation of the proximal convoluted tubular epithelium, and periglomerular lymphoid cell accumulation (Fig. d). Additional findings included tubular necrosis, tubular epithelial hyperplasia, urate crystal deposition (Fig. e), and proteinaceous material within tubular lumens. Similar histopathological alterations have been described previously [2, 14, 19]. The marked renal lesions reflect the strong renal tropism of nephropathogenic IBV strains, which infect epithelial cells of the lower nephron and collecting ducts, leading to renal dysfunction, impaired uric acid excretion, hyperuricemia, and subsequent urate deposition in visceral organs, resulting in visceral gout [5, 18].

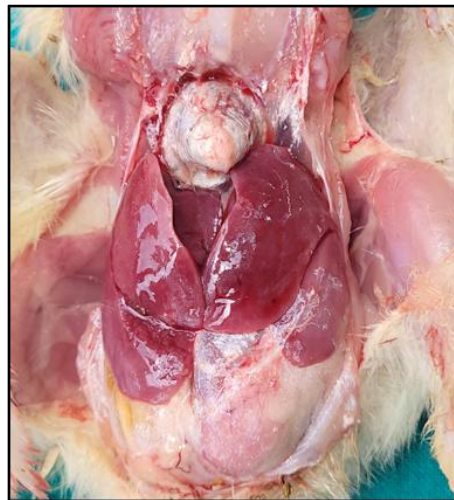


Fig 1a: Carcasses showing visceral gout



Fig 1b: Kidney showing sever congestion, necrosis and deposition of urate crystals

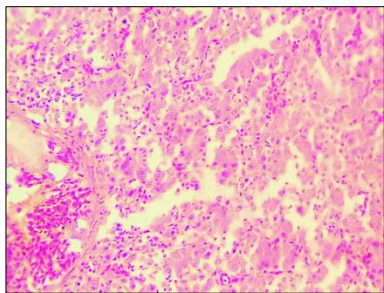


Fig 1c: Photomicrograph of liver showing hemorrhage, congestion, and mild infiltration of mononuclear cells (H & E, X40)

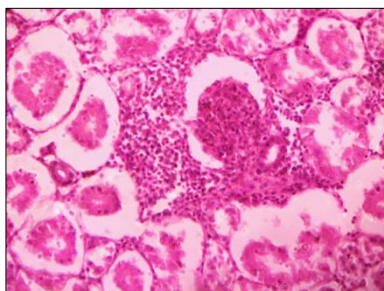


Fig 1d: Photomicrograph of kidney showing periglomerular aggregation of mononuclear cells (H & E, X40)

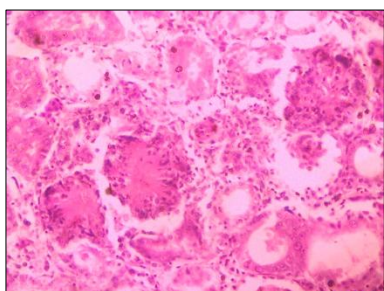


Fig 1e: Photomicrograph of kidney showing deposition of urate crystals in the tubules (H & E, X40)

Conclusion

The present study highlights nephropathogenic infectious bronchitis virus infection in broiler chickens, with prominent clinical, gross, and histopathological alterations. Clinically affected birds showed dehydration, depression, diarrhoea, and mild respiratory signs. Gross examination revealed severe renal lesions with visceral gout and urate deposition on serosal surfaces, while microscopic evaluation demonstrated interstitial nephritis, glomerulonephritis, tubular degeneration, and urate crystal accumulation. Hepatic involvement was evident as congestion, haemorrhages, and mild hepatitis. These findings emphasize the significant pathological impact of nephropathogenic IBV on the liver and kidneys of broiler chickens.

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