

Clostridium perfringens associated enteritis in a pigeon (*Columba livia domestica*): Clinical, gross and histopathological observations

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ABSTRACT

Clostridium infection in pigeons is an emerging concern in avian medicine, characterized by gastrointestinal disturbances and high morbidity. It is primarily caused by *Clostridium perfringens*, an anaerobic, spore-forming bacterium capable of producing potent toxins that lead to necrotizing enteritis. This case report describes the clinical presentation, diagnosis and management of intestinal *Clostridium* infection in an adult domestic pigeon (*Columba livia domestica*). The bird was presented with symptoms including lethargy, decreased appetite, watery greenish droppings and progressive weight loss. Clinical examination revealed signs of dehydration, ruffled feathers and soiled vent. Post-mortem examination showed severe enteritis with haemorrhagic lesions along the small intestine and fibrinous exudates. Intestinal contents were collected and submitted to the Department of Veterinary Pathology, Bihar Veterinary College, Patna for microbiological and histopathological examination. Gram staining confirmed the presence of large Gram positive rods consistent with *Clostridium perfringens*. Histopathological analysis revealed extensive mucosal necrosis, inflammatory cell infiltration and bacterial colonization in the intestinal lumen confirming clostridial enteritis. The findings highlight the pathogenic role of *Clostridium perfringens* in pigeons and underline the need for timely diagnosis and appropriate antibiotic therapy. The case emphasizes the importance of incorporating routine microbial and histological evaluations in avian gastrointestinal disorders for accurate diagnosis and effective management.

Keywords: *Clostridium perfringens*, histopathology, mucosal necrosis, necrotizing enteritis, Pigeon

Clostridial enteric infections in birds especially in domestic pigeons (*Columba livia domestica*) represent a growing concern in avian veterinary medicine due to their acute onset, high morbidity and mortality and significant pathological consequences. Among these, *Clostridium perfringens*, a Gram positive, spore-forming, anaerobic bacillus is recognized as the primary causative agent of necrotizing enteritis in avian species¹. This organism is capable of producing a range of potent exotoxins, including alpha and beta toxins which contribute to severe mucosal damage, necrosis and enteric hemorrhage². The disease predominantly affects young or immunocompromised birds and is often precipitated by stress, poor hygiene, concurrent infections or dietary imbalances^{3,4}.

Clostridium perfringens associated enteritis in pigeons typically presents with nonspecific clinical signs such as anorexia, lethargy, watery greenish droppings, progressive emaciation and sudden death in some cases⁵. Diagnosis can be challenging and is often confirmed post-mortem through bacteriological culture, toxinotyping and histopathological evaluation which may reveal necrosis of the intestinal epithelium, mucosal sloughing, inflammatory infiltration and the presence of large Gram positive rods⁶. The pathogenesis involves rapid bacterial proliferation in the intestinal lumen, leading to toxin mediated disruption of the intestinal barrier and systemic toxemia⁷. In pigeons, the condition is frequently under diagnosed due to its overlapping symptoms with other enteropathies and the need for specialized diagnostic approaches.

Despite its clinical relevance, detailed case-based documentation of *Clostridium perfringens* infection in domestic pigeons is relatively scarce in the veterinary literature. Early diagnosis, combined with appropriate antimicrobial therapy and improved husbandry practices is critical for effective disease control and

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reducing flock level outbreaks⁸. This clinical case report describes the natural occurrence of intestinal *Clostridium perfringens* infection in an adult domestic pigeon. The primary aim of the study is to document the clinical presentation, gross and histopathological findings and microbiological confirmation of the infection. The report under scores the importance of integrated diagnostic methods for accurate identification and timely intervention in managing clostridial infections in avian species.

The present study was conducted on a clinical case of

intestinal *Clostridium perfringens* infection in an adult domestic pigeon (*Columba livia domestica*) submitted to the Department of Veterinary Pathology, Bihar Veterinary College, Patna, Bihar, India for post-mortem examination. A backyard flock of 50 pigeons of which 15 died, had a reported history of progressive weight loss, anorexia, greenish watery droppings, lethargy and sudden death. The affected pigeon had shown signs of illness for approximately three days before being found dead. According to the owner, the bird was being fed a homemade high protein diet primarily consisting of soaked grains and pulses with no recent deworming or anti-microbial treatment.

Out of a backyard flock of 50 pigeons, 15 birds died and were subjected to gross post-mortem examination which revealed consistent findings across all cases including moderate dehydration and emaciation, soiled vent feathers and distended intestinal loops. Fifteen pigeons that died from a backyard flock of 50 were submitted for necropsy. Each bird underwent a thorough gross post-mortem examination following standard protocols. Observations were systematically recorded for external and internal lesions. Particular attention was given to the gastrointestinal tract, liver, spleen, lungs and

heart. The small intestines were examined for segmental thickening, congestion and mucosal haemorrhages. The nature of intestinal contents (colour, consistency, presence of mucus or blood) was noted. The liver was assessed for size, colour and texture and the spleen for swelling or discoloration. The lungs and heart were examined for any gross abnormalities.

Tissue samples were collected from the small intestine and fixed in 10% neutral buffered formalin for a minimum of 48 hours. Following fixation, the samples were processed through a routine paraffin embedding technique. Sections of 4-5 µm thickness were cut using a rotary microtome and mounted on glass slides. These sections were stained with Haematoxylin and Eosin (H&E) for microscopic examination. Histopathological evaluation focused on identifying lesions such as inflammation, necrosis, haemorrhage, congestion and other pathological changes.

Post-mortem and laboratory findings confirmed a diagnosis of necrotizing enteritis caused by *Clostridium perfringens* infection. Gross lesions in the small intestine were characterized by showing multiple circular, raised, dark necrotic foci on the mucosal surface (Fig. 1). The small intestine showed segmental areas of

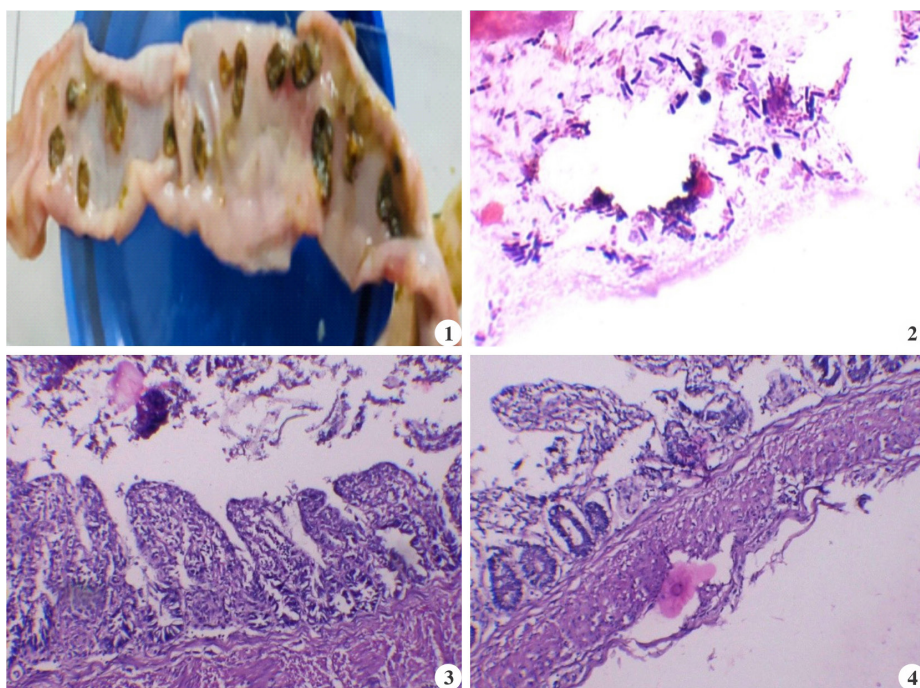


Fig.1. Gross photograph of pigeon intestine showing multiple circular, raised, dark necrotic foci on the mucosal surface characteristics of necrotic enteritis caused by *Clostridium perfringens*; **Fig.2.** Gram stained section of pigeon intestine showing numerous large Gram positive rod shaped bacteria (*Clostridium* spp.) adherent to the necrotic mucosa; **Fig.3.** Histological section of intestine of a pigeon (H&E,10x) shows severe necrosis and loss of epithelial lining in the intestinal villi with congested lamina propria having inflammatory cells; **Fig.4.** Histological section of intestine of a pigeon (H&E, 10x) shows disrupted, shortened and fused villus architecture. The lamina propria and submucosa show congestion, edema and fibrin deposition. The surface has necrotic debris with bacterial colonies.

thickening and severe congestion with multiple foci of mucosal haemorrhages. A moderate amount of yellowish, mucoid and occasionally blood stained intestinal content was observed. The liver appeared enlarged and pale and the spleen was mildly swollen. No significant lesions were observed in the lungs/heart. Impression smears revealed large Gram positive bacilli and no other pathogens were observed (Fig. 2). Haematoxylin and eosin stained intestinal sections revealed extensive mucosal necrosis, desquamation of villous epithelium and dense infiltration of heterophils and mononuclear cells in the lamina propria and submucosa. Numerous large Gram positive rods were observed within necrotic debris and among epithelial crypts.

Histopathological examination showed widespread necrosis of the intestinal villi, infiltration of heterophils and mononuclear cells and dense

colonies of large Gram positive rods in the mucosal layers (Fig. 3). These findings were consistent with necrotizing enteritis due to *Clostridium perfringens*, a condition previously described in poultry and pigeons suffering from acute enteric disease^{1,5}.

The intestinal architecture was markedly disrupted, with the lamina propria replaced by necrotic debris and inflammatory exudates. The villi appeared shortened, fused or entirely sloughed in certain regions. Bacterial colonies were evident along the luminal surface and crypts, accompanied by desquamated epithelial cells and fibrin (Fig. 4). No parasitic or protozoal organisms were identified. These features were indicative of a severe toxin mediated mucosal injury typical of *C. perfringens* infection⁶.

Clostridial enteritis is frequently observed in birds maintained under poor hygienic conditions or fed high protein diets without proper microbial balance². In this case, the affected pigeon was part of a backyard flock fed on high protein soaked grains with no routine probiotic or antimicrobial supplementation. Such nutritional and environmental imbalances may contribute to clostridial overgrowth in the intestine⁴. The sudden death observed was likely the result of acute toxemia and fluid loss due to mucosal necrosis and haemorrhagic enteritis.

Although clostridial infections have been extensively reported in commercial poultry operations their documentation in domestic pigeons remains limited. However, the pathogenesis, gross lesions and histopathological features in this case were consistent with previous descriptions in chickens, turkeys and pigeons⁷. The presence of Gram positive bacilli in intestinal smears and characteristic necrotic lesions on histopathology confirm the diagnosis and rule out differential diagnoses such as coccidiosis, salmonellosis or trichomoniasis⁸.

Effective prevention of *C. perfringens* enteritis relies heavily on improved husbandry practices such as regular cleaning of enclosures, controlled feeding strategies and minimizing stress⁹. Probiotic supplementation and use of toxin binding agents have been shown to reduce intestinal colonization and toxin production in susceptible avian species¹⁰. In future cases, early antimicrobial intervention with agents such as penicillin, metronidazole or bacitracin may help limit mortality when clinical signs are first observed¹¹. Vaccination strategies against *C. perfringens* are being explored in poultry but such approaches remain unavailable for domestic pigeons at present¹².

Based on the clinical history of progressive weight loss, anorexia, greenish watery droppings, lethargy and sudden death along with consistent gross pathological findings (segmental thickening and congestion of the

intestines, mucosal haemorrhages, pale enlarged liver and mildly swollen spleen), impression smears revealing large Gram positive bacilli and histopathological evidence of necrotizing enteritis, the condition was diagnosed as *Clostridium perfringens* induced necrotizing enteritis^{13,14}. No concurrent parasites or protozoal organisms were detected in intestinal smears ruling out other common enteric pathogens.

The present case underscores the importance of integrating clinical history, postmortem evaluation and histopathological confirmation for definitive diagnosis of clostridial enteritis in pigeons. Early recognition of subtle signs like weight loss and diarrhoea, combined with timely laboratory testing can help mitigate the risk of flock level outbreaks. Proper hygiene, balanced diet and routine health monitoring are essential components of a successful prevention plan.

CONCLUSION

The present case report describes a fatal case of necrotizing enteritis suggestive of being caused by *Clostridium perfringens* infection in an adult domestic pigeon based on the postmortem, cytological and histopathological evaluations. The intestinal lesions exhibited extensive mucosal necrosis, dense inflammatory infiltration and the presence of large Gram positive bacilli consistent with clostridial enteritis. Clinical history and gross findings highlighted the rapid and aggressive nature of the disease especially under suboptimal husbandry conditions. The absence of concurrent parasitic or protozoal infections supported *Clostridium perfringens* as the primary etiological agent. This case emphasizes the critical importance of early detection, proper dietary management and hygiene in the prevention of enteric clostridial infections in pigeons. Histopathological confirmation remains essential for definitive diagnosis and should guide future preventive and therapeutic strategies in avian practice.

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