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Microbiological and histopathological study of avian colibacillosis in macaw (*Ara ararauna*)

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Abstract

A rare post-mortem case from the Department of Veterinary Pathology at the College of Veterinary and Animal Sciences in Mannuthy revealed several lesions in a macaw. However, the presence of *E. coli* infection and histopathological examination of the organs were carried out at the Department of Veterinary Microbiology. This study investigated the isolation and histopathology of *E. coli* infection in organs such as the heart and lungs. On Histopathology, the Macaw's heart exhibited Congestion, hemorrhage between muscle fibres and infiltration of inflammatory cells in the lungs with prominent Emphysema and congestion-related alveolar wall damage occurs.

Keywords: *Escherichia coli*, avian colibacillosis, macaw, histopathology

1. Introduction

Macaws are found all over the world and widely kept as pets. The flat coastal planes in Kerala, located on the southwestern coast of India, are rich in so many exotic bird varieties like speaking amazons and beautiful macaws. In addition, Cockatoos, Conures, Monks, Parakeets, Grey parrots, Lories, Lorikeets, and Eclectus rearing in this place.

For appropriate treatment and comprehending the disease's epidemiology, routine screening of birds for bacterial infection is also essential (Machado *et al.*, 2018) [6]. Isolation, identification and characterisation of the microbes at the time of disease outbreaks are important. It is most concerns in identifying whether the organism is pathogenic or non-pathogenic. The primary concern is determining the pathogenicity of the organism. In addition to this, macaws, parrots, and parakeets are common household pets that engage in intimate interactions with humans. They have a well-established history of serving as reservoirs for zoonoses, including psittacosis (Halsby *et al.* 2014) [3].

The pathotypes EPEC (enteropathogenic *E. coli*), APEC (avian pathogenic *E. coli*), and UPEC (uropathogenic *E. coli*) are frequently reported (Nataro and Kaper, 1998; Barnes *et al.*, 2004) [7, 1]. Whereas APEC is known to have caused the poultry industry to suffer large financial losses and to have caused septicemia and pneumonia, EPEC is a substantial category of diarrheagenic *E. coli* and a major cause of infant diarrhoea in underdeveloped nations (Nataro and Kaper, 1998; Barnes *et al.*, 2004) [7, 1]. UPEC is implicated in causing human urinary tract infections usually manifested as cystitis, which can develop into pyelonephritis (Johnson *et al.*, 2000) [4]. In this study focus on the pathogenicity of *E. coli* that caused avian colibacillosis

2. Materials and Methods

A 6-year old, recently dead Macaw with gross lesions with suggestive of infection obtained from Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Mannuthy was the base study material. Swabs were collected from lesions and inoculated in nutrient broth, and then cultured on brain-heart Infusion agar (BHIA), Eosin Methylene Blue agar (EMB) and MacConkey's agar (MAC) were incubated at 37°C for 24-48 hrs. The colonies were identified by morphological, staining and biochemical techniques (Koneman *et al.*, 1983; Quinn *et al.*, 1994) [5, 8].

Organs such as the heart and lungs were collected and fixed in 10% neutral buffered formalin. The fixed tissue samples were dehydrated and diaphanized before being embedded in paraffin.

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Following conventional protocols, the paraffin blocks were sectioned in a microtome and stained with Hematoxylin and Eosin. Tissues were inspected with a normal light microscope (Suvarna *et al.* 2019)^[10].

3. Results and Discussion

In BHIA large, thick, greyish white, moist, smooth colonies were isolated from the swab taken from the lungs and pericardium layer of the heart. On Gram staining organism appeared as Gram-negative rod-shaped bacteria. Bacteria was confirmed as *Escherichia coli* during primary screening like growth on selective and differential media. In MAC, the colonies appeared pink in colour suggestive of lactose fermentation, which distinguishes *E. coli* and the colonies exhibited a greenish metallic sheen on Eosin methylene blue agar (EMB), which is due to the metachromatic property of dyes.

These findings are suggestive of the fact that there existed a steady host/parasite interaction, at least at the time of sampling. In contrast to avian species found in the wild, parrots kept in captivity are often subjected to many triggers that compromise their immune systems and make them more susceptible to diseases. These include inadequate diets, inadequate hygiene, and a lack of physical and mental stimulation; when an animal is exposed to a microbe, any of these factors could affect how the disease develops (Harrison and Lightfoot, 2006)^[9]. Gram-negative bacteria, which are regarded as either pathogenic or opportunistic pathogens, are commonly responsible for diseases in parrots kept in man-made environments (Gerlach, 1994)^[2]. In captive parrots, respiratory, digestive, and septicemic diseases are often associated with one such pathogen, *Escherichia coli* (*E. coli*) (Gerlach, 1994)^[2].

Histological examination of the macaw heart shows infiltration of inflammatory cells and mild vacuolisation in the cytoplasm of the cardiac myofibers in the myocardium with proteinaceous deposits around the blood vessel (Figure 1). In the lungs, severe interstitial haemorrhages with marked extension of alveolar spaces due to congestion were observed (Figure 2).

In the current study, the isolate was confirmed as a typical *E. coli* species, the histopathological results suggest the presence of virulence mechanisms of the bacteria. This results can postulate that the hemorrhagic lesions and the histological findings are correlated by the first effect.

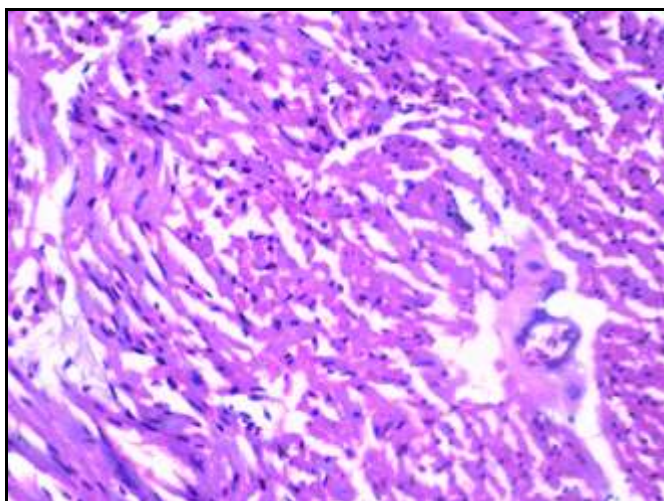


Fig 1: Mild vacuolisation in cytoplasm of the cardiac myofibers in myocardium with proteinaceous deposits around the blood vessel (H&E x200).

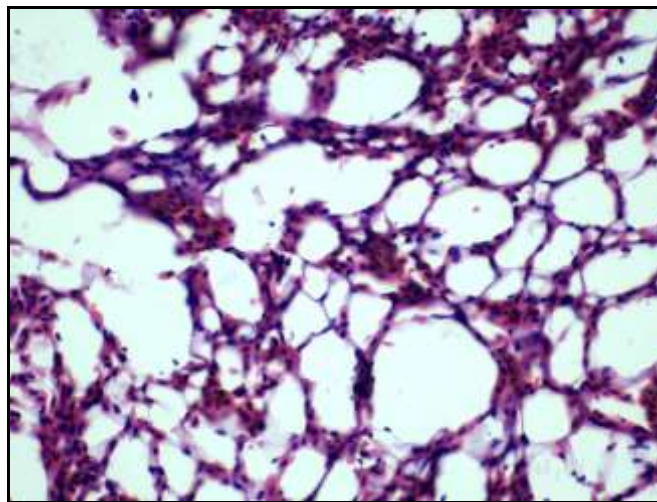


Fig 2: Severe interstitial haemorrhages with marked extension of alveolar spaces (H&E x200)

4. Conclusion

E. coli. Infections can be zoonotic which can be transmitted from carrier animals and pets that in fact close with people. In addition to that, there is a known evolutionary relationship between gene sequences of humans and animals exposed to anthropogenic activities, and some the *E. coli* species that impact then haemorrhage both humans and animals. Histopathologically, organs infected with *E. coli*. were examined. In the heart, cardiac muscle fibres, congestion, and infiltration of inflammatory cells were observed. Emphysema and alveolar wall damage from congestion are seen in the lungs. These findings suggested the severity of the infection grade higher the risk of infection to people, better sanitary and husbandry practices for captive parrots are required.

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