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## Microbiological and histopathological study of *E. Coli* infection in African Grey Parrot (*Psittacus erythracus*)

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### Abstract

In the field of avian medicine, enteric bacteria are regarded as important potential pathogens capable of causing either primary or opportunistic infections. This study is focused on evaluating the microbiological and histological aspects of *E. coli* infection in *Psittacus erythracus*. Within this research, a postmortem examination of an eleven-month-old grey parrot with a history of relocation was conducted. The heart blood smear and impression smear examination from the liver and lungs revealed clumps of numerous coccobacilli. Gross changes observed include pulmonary congestion with oedema, air sacculitis, pneumonia, severe hepatic and renal congestion, diffuse haemorrhages in the proventriculus, haemorrhagic enteritis and engorgement of meningeal blood vessels. Histopathological Severe interstitial haemorrhage with mild inflammatory infiltrates in the lungs. The heart exhibited Severe haemorrhage in between cardiac muscle fibers of epicardium with myocardial degeneration. Congestion, hemorrhage, infiltration of mono-nuclear cells was also noted in liver and spleen. The kidneys exhibited Cell swellings with tubular epithelial degeneration. The case was identified as *E. coli* based on isolation studies.

**Keywords:** *Escherichia coli*, *Psittacus erythracus*, Histopathology, Isolation

### Introduction

*Escherichia coli* (*E. Coli.*) is a facultative anaerobic Gram-negative bacillus, Avian Pathogenic *E. Coli* (APEC) that causes avian colibacillosis. This disease may develop in different forms, such as: coligranuloma, cellulitis colisepticemia, airossacullitis, sinusitis, peritonitis, salpingitis, pericarditis, hepatitis, panophthalmitis and osteomyelitis; many species of *E. coli* species, which is commonly associated with digestive, respiratory, and septicemic problems in parrots kept in captivity (Ritchie *et al.*, 1994) [8]. Whereas APEC is known to have caused the poultry industry to suffer large financial losses and to have caused septicemia and respiratory diseases. Nevertheless, certain *E. Coli* categorization investigations on wild birds (Steele *et al.*, 2005 and Pedersen *et al.*, 2006) [13, 6] and captive psittacines have identified some degree of association between the disease and the particular pathotypes (Schremmer *et al.*, 1999; Saldenberg 2009) [11, 10]. There is ongoing debate regarding *E. coli* place in the normal microbiota of healthy pets who eat a regular diet consisting of grains, fruits, vegetables, and sprouts.

### Materials and Methods

An eleven-month-old, recently dead African grey parrot. The bird was presented with a history of relocation and exhibited reduced appetite, greenish diarrhea and sudden death. Gross lesions observed include pulmonary congestion with oedema, air sacculitis, pneumonia, severe hepatic and renal congestion, diffuse haemorrhage on proventriculus, haemorrhagic enteritis and engorgement of meningeal blood vessels, post-mortem carried out by the Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Mannuthy was the base study material. Impression smear examinations from the liver and lung were observed using the field staining technique. 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) [4, 7].

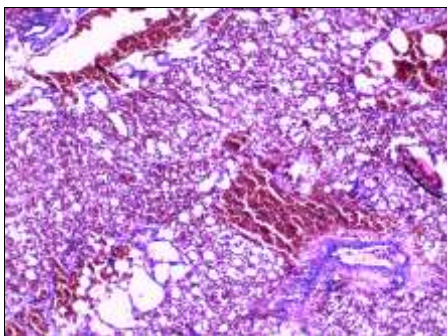
Organs with gross lesions were removed from birds and fixed in 10% neutral buffered formalin. After dehydration in a graded ethanol series and clearing with xylene, the sample material was embedded in paraffin and 5-um-thick sections were stained with Haematoxylin-Eosin stain for observation under the light microscope (Suvarna 2019) [14].

### Results and Discussion

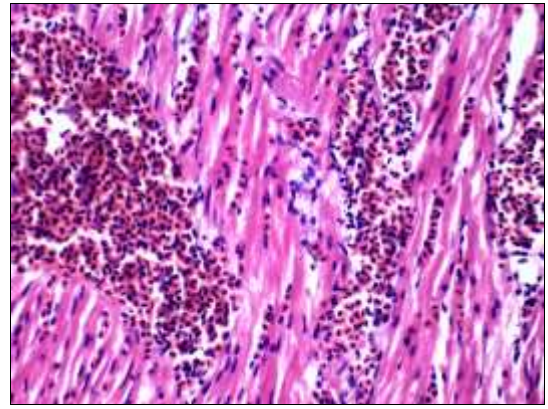
On impression smear examination of the liver and lung revealed clumps of numerous coccobacilli. In BHIA large, thick, greyish-white, moist, smooth colonies were isolated from the swab taken from the lungs and pericardium layer of the heart. On Gram staining organism appeared as Gram-negative rod-shaped bacteria. The isolated bacterium was confirmed to be *E. Coli* by culturing on selective and differential media. In MAC, the colonies appeared pink in colour suggesting lactose fermentation, which distinguishes *E. coli* and in EMB the colonies exhibited green metallic sheen.

*E. coli* was also identified from multiple organs in a study conducted on red-spectacled Amazon (*A. pretrei*) parrots (Correa *et al.* 2013) [2]. Asymptomatic psittacine from a number of species, including *Amazona spp.* and *Eupsittula spp.* in captivity, have also been found to contain enteropathogenic *E. Coli* (Saidenberg *et al.*, 2012) [9]. Avian colibacillosis aspects were investigated in a study conducted on a pet *A. aestiva* (Marietto-Goncalves *et al.* 2007) [5], in which *E. coli* was isolated from several organs and the vacuoles observed including lesions, which consisted of infiltration of mononuclear nucleated cells in kidney and heart, congestion in kidneys, liver, spleen and lungs, which are consisted with the findings in this study. *Colibacillosis* frequently causes the following lesions: salpingitis with intense follicle necrosis and mixed infiltrate; cellulitis with intense heterophilic infiltrate, multinuclear giant cells and fibronectic plaques coagulative liver necrosis, airossaculitis, granulomas, acute lung haemorrhage and congestion (Crespo *et al.* 2001, Andrade *et al.* 2006, Seeley *et al.*, 2014) [3, 1, 12].

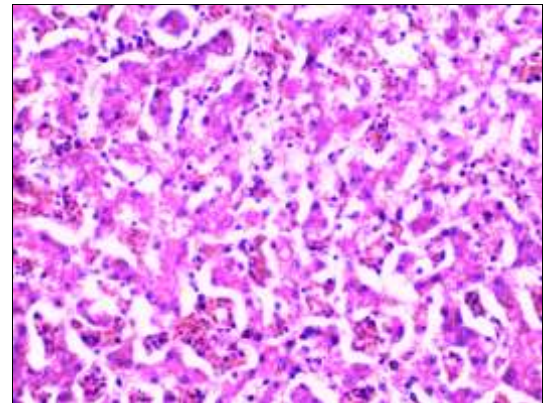
Histopathological examination revealed vasculitis and severe interstitial haemorrhage with mild inflammatory infiltrates in the lung (Fig. 1). In heart severe congestion, haemorrhage in between cardiac muscle fibres of epicardium with myocardial degeneration (Fig. 2). Liver shows a mild degree of hepatic degeneration with vacuolisation of hepatocytic cytoplasm (Fig. 3). Severe sinusoidal congestion with mononuclear cell infiltration. Spleen exhibits diffuse mononuclear cell infiltration with severe congestion and mild hemorrhage was observed (Fig. 4). The kidney showed severe swelling of cells with tubular epithelial degeneration and necrotic changes in the renal tubules (Fig. 5).



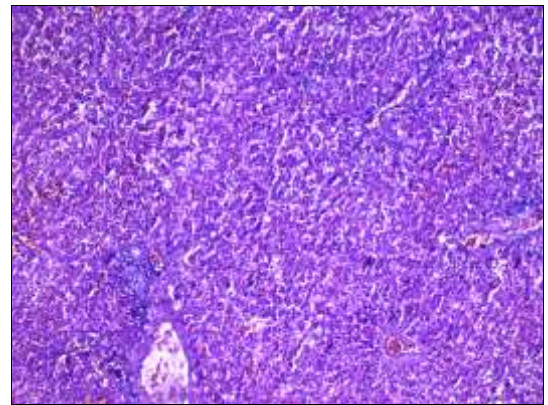
**Fig 1:** Lungs-severe interstitial haemorrhage with mild inflammatory infiltrates (H&E x 200)



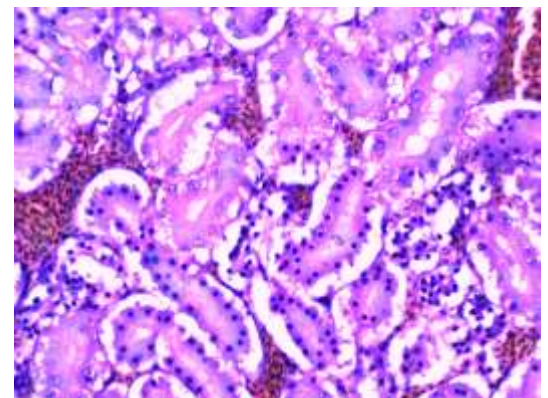
**Fig 2:** Heart-severe haemorrhage in between cardiac muscle fibers of epicardium with myocardial degeneration (H&E x200).



**Fig 3:** Liver-mild degree of hepatic degeneration with vacuolisation of hepatocytic cytoplasm. Severe sinusoidal congestion with mononuclear cell infiltration.



**Fig 4:** Spleen-diffuse mononuclear cells infiltration with severe congestion and mild hemorrhage were observed (H&E x100).



**Fig 5:** Kidney-cell swellings with tubular epithelial degeneration (H&E x200)



## Conclusion

A pet, *Psittacus erythracus* succumbed to *E. coli* infection exhibiting mild to moderate lesions and liver was found to be the most affected organ. vasculitis and severe interstitial haemorrhage with mild inflammatory infiltrates found in the lungs during the histopathological examination. Severe congestion, and haemorrhage in between cardiac muscle fibres of epicardium with myocardial degeneration. The liver and spleen exhibited signs of congestion, haemorrhage, neutrophil infiltration, and vacuolation. Swelling of cells with tubular epithelial degeneration were noticed in the kidney.

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