Short Communication

Histopathology, Cytology and Electron Microscopy Study of Turkey Pox

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Abstract

Turkey poxvirus was diagnosed in five of two-month-old turkeys of broad breasted white variety type. Clinically, turkey birds showed dullness, inappetence and lethargy. On necropsy, dead turkeys showed numerous circular to irregular size raised nodules (scab) of 1-3 cm in diameter on the skin of head, eyelids and around the beak. Histopathological examination of scab revealed hyperplasia of the epidermis and severe balloon degeneration with intra-cytoplasmic, eosinophilic inclusion bodies and sparse infiltration of inflammatory cells with the predominant population of heterophils. Cytological examination showed pink round bodies of inclusion bodies in clear vacuole. Transmission Electron Microscopy study of scab showed typical poxvirus morphology having oval shaped structure with dumbbell shaped dense core.

Key words: Avipox virus, Cytology, Histopathology, Transmission Electron Microscopy, Turkey

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Introduction

Avian pox viruses affect commercial poultry *viz.* fowl and turkey, as well as several other avian species and are the members of the genus *Avipoxvirus* of the family Poxviridae (Tripathy and Reed, 2008). Avipoxvirus genus includes fowl pox, turkey pox, pigeon pox, quail pox and canarypox as major viral strains (Singh *et al*. 2003). Turkey poxvirus represents the type species of the genus avipoxvirus (Mathews, 1982). Pox diseases in chickens and turkeys are characterized by the development of proliferative lesions, ranging from small nodules to spherical wart-like masses on the skin (cutaneous form /dry pox), comb, wattle and other non-feathered part of the body (Riper and Forrester, 2007; Tripathy and Reed, 2008).

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The avian pox rank among the earliest poultry disease that has identified. Heusinger (1844) described the external (gross lesions) features of the disease. Subsequently, Bollinger (1873) and Borrel (1904) described the correlation between the histological lesion and inclusion body, a characteristic feature of the disease. A detail description of inclusion bodies and confirmation avian poxvirus was demonstrated by Woodruff and Goodpasture (1930). The detail reports and studies on gross pathology, histopathology and electron microscopy has been described in avian and wild birds in world literature. The pathology of fowlpox has been well described worldwide (Riper and Forrester, 2007; Tripathy and Reed, 2008; Banyai *et al*., 2015). In India, a detail description on the clinical sign, lesion distribution and histopathology of avian pox and isolation of virus have been described (Sawale *et al*., 2012). Singh *et al.* (2003) isolated and characterized Indian isolates of turkey pox virus along with electron microscopic features of the virus.

Although pathology of avipox has been described in world literature, the study on turkey pox is meagre. Hence, present communication reports on the occurrence of pox in turkey of broad breasted white variety type and its cytology, pathology and Transmission Electron Microscopy (TEM) study.

Case History

Five dead turkeys of broad breasted white variety type of two months age were presented from the Department of Poultry Science, College of Veterinary Science, Rajendranagar to the Department of Veterinary Pathology for necropsy. The detail necropsy of dead turkeys was conducted and gross lesions were recorded. Turkey pox was suspected on the basis of the clinical signs and gross lesions observed. The scab from the skin as well as other visceral organs like liver and kidneys were collected and fixed in 10 % neutral buffer formalin for 72 hours, processed and embedded in paraffin blocks. Section of 5 µm was taken on slides and stained with haematoxylin and eosin (H & E). A small piece of scab ($0.5mm^3$) was preserved in 2.5 % glutaraldehyde prepared in 0.1M phosphate buffer saline for Transmission Electron Microscopy (TEM). Transmission Electron Microscopy was performed as per the method described by Lakshman (2016). Scab of dead turkeys, as well as other affected turkeys (six), were collected. An impression smear was prepared from the cut surface of scab, fixed with absolute methanol and stained with the standard protocol of Giemsa-Leishman stain. The Giemsa-Leishman staining was performed by pouring a few drops of stain till overlaying of smear and kept for one minute. Then an equal quantity of distilled water was added on smear containing stain and mixed properly by dropper and kept for 15 minutes. The smear was then washed with tap water, air dried and observed under the light microscope.

Clinically, turkey birds showed dullness, inappetence and lethargy before death. The total mortality was 3.33 (5 out of 150 turkey birds) per cent and the flock was un-vaccinated against turkey poxvirus. Necropsy

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of the dead turkeys showed numerous circular to irregular size raised nodules of 1-3 cm in diameter on the skin of the head, eyelid and around the beak. Lesions were primarily confined to non-feathered parts of the body *viz.* head and beak (Fig. 1).

Fig. 1: Turkey bird showing nodular growth on head, and around nostril

Liver and kidneys showed vascular congestion with prominent ureter due to urate deposition. Histopathological examination of scab revealed hyperplasia of the epidermis and severe balloon degeneration with intra-cytoplasmic, eosinophilic inclusion bodies (Fig. 2). At few places, a section of the skin showed few colonies of bacteria (Fig 3) as well as numerous heterophilic and sparse lymphocytic infiltration.

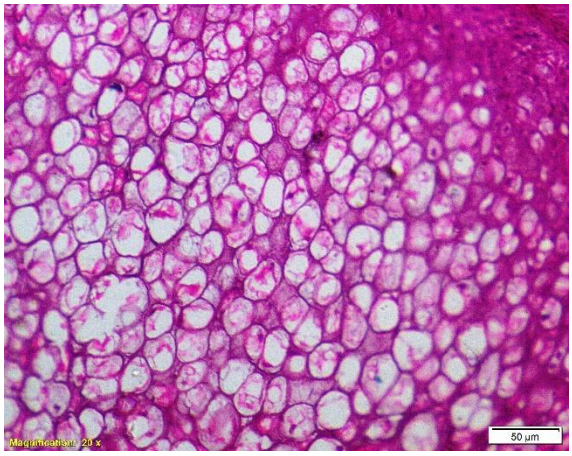

Fig. 2: Section of skin scab showing severe balloon degeneration with intra-cytoplasmic, eosinophilic inclusion bodies (HE X 200)

Fig. 3: Section of skin scab showing severe balloon degeneration with eosinophilic inclusion bodies and necrosis with bacterial with intra-cytoplasmic colonies (Arrow) (HEX200)

Section of kidney showed coagulative necrosis and swelling of tubular epithelium with narrowing of the lumen. Liver showed severe vascular congestion.

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Cytology of impression smear from scabs (five dead and one ailing bird) stained with Giemsa-Leishman stain revealed numerous vacuole containing pink bodies (inclusion body) (Fig. 4).

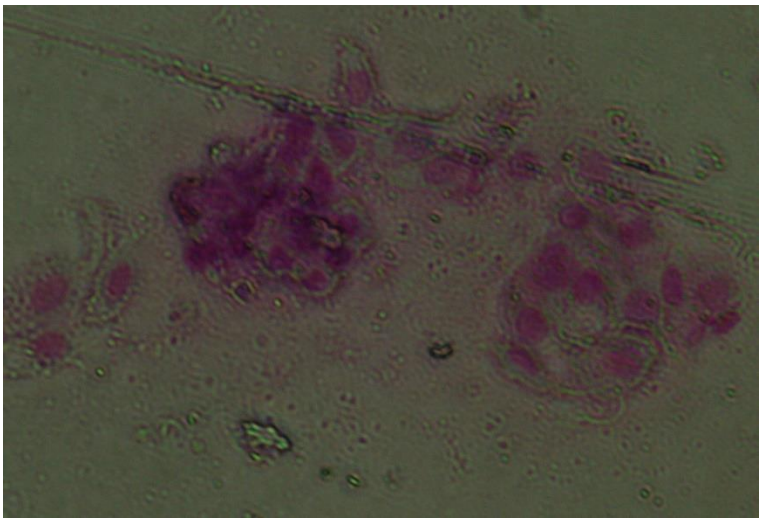

Fig. 4: Impression smear from cut surface of scab showing numerous vacuoles containing pink inclusion body (HEX200).

Transmission Electron Microscopy study of scab showed typical poxvirus morphology having oval shaped structure (Fig. 5) with dumbbell shaped dense core (biconcave) and surrounded by a double-layered envelope.

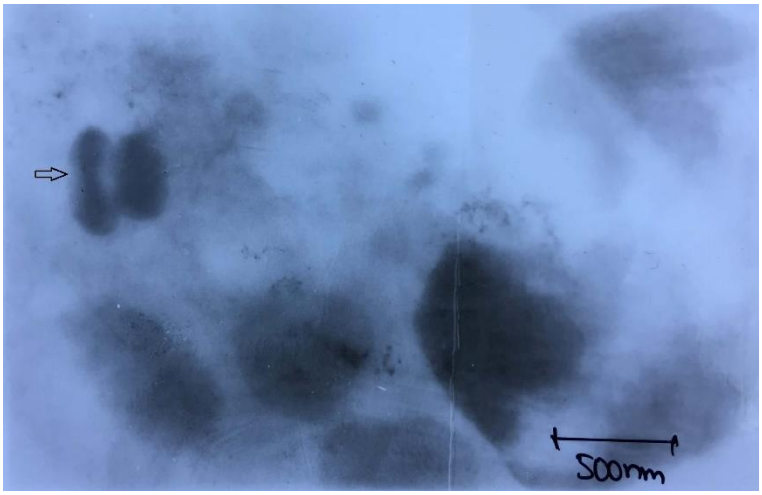

Fig. 5: Transmission Electron Microscopy of scab showing dumbbell shaped viral particles in cytoplasm (Arrow) (Magnification-38600x)

Result and Discussion

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Turkey pox was diagnosed based on gross, histopathology, cytology and electron microscopy. Although diseases due to fowl pox in chickens among the avipox genus have been reported, reports on the occurrence of turkey pox were scanty in published literature. In the present investigation, a total of 3.33 (5 out of 150 turkey birds) per cent mortality was reported due to turkey poxvirus. Although mortality in the present case study is low, it has resulted into losses to farm in terms of feed consumed till the death of turkey without any output/ egg production and loss of birds due to mortality. The mode of transmission of disease in the present case study is unknown. However, it could be due to transmission through damaged skin, misquote/ vector bite and contact of infected birds (inhalation) (Tripathy and Reed, 2008; Weli and Tryland, 2011). The gross lesion *viz.* circular to irregular size raised nodules of varied size on the skin of head, eyelid and around beak and histopathological lesions of ballooning degeneration with intracytoplasmic eosinophilic inclusion are characteristic features of pox disease including turkey pox and are akin to those observed by Riper and Forrester (2007), Tripathy and Reed (2008), Weli and Tryland (2011) and Banyai *et al*. (2015).

Transmission Electron Microscopy study of slices made from scab showed typical pox virus morphology having oval shaped structure with dumbbell shaped dense core (biconcave) and are akin to those observed by Singh *et al*. (2003).

In conclusion, a detail gross and histopathological features of turkey pox along with cytological and Transmission Electron Microscopy studies were described. Cytological examination of impression smear from scab gives a quick diagnosis of turkey pox and can be used for routine diagnosis and was complementary to histopathological and electron microscopy techniques.

Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

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