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Pathomorphological studies on staphylococcal pneumonia in a male golden jackal

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Abstract

A male golden jackal was presented to the Department of Veterinary Pathology, Veterinary College and Research Institute, Namakkal for the post mortem examination by Forest Range Officer, Namakkal. On necropsy, the heart showed dilatation with severe engorgement of coronary blood vessels. Trachea, bronchi and bronchiolar lumen were filled with whitish frothy fluid and mucosa showed congestion. Lungs were dark red, firm and had diffuse miliary grey nodules in all lobes. On section, the cut surface showed multiple miliary grey areas with oozing of reddish frothy fluid and cut pieces from these areas sank in to water. On histopathological examination, lung showed severe congestion, edema, varying degrees of haemorrhage and infiltration of neutrophils. Thickening of alveolar septa with inflammatory exudates and bronchopneumonia were also observed. Pleura showed severe thickening with mononuclear cell infiltration. *Staphylococcus* species could be isolated from the heart blood swab and lung swab. The present study underlines the pathological features of “Staphylococcal pneumonia” in a golden Jackal.

Keywords: Golden jackal, pneumonia, pathology, *Staphylococcus* spp.

Introduction

The golden jackal is a medium-sized predator and omnivore found in the southern parts of the Palearctic, South Asia and Northeastern Africa. Presently, the jackal population is restricted to a few clusters and divided into seven sub-areas based on criteria like connectivity and isolation. The decline in their population is mainly due to habitat loss resulting from changes in human agro-pastoral activities, leading to reduced day-cover availability and possibly a diminished food base (Moehlman and Hayssen, 2018; Negi, 2014) ^[6, 7]. Jackals are highly vulnerable to diseases via spread by free-ranging as well as wild dogs. They can share the same environment and scavenging behaviors with the overlapping populations of wild canids and stray dogs, which facilitates severe spillover (Bojarska *et al.*, 2026) ^[4]. In wild canids, stress, malnutrition, environmental exposure, and immunosuppression may predispose the animals to opportunistic bacterial infections.

Bacterial pneumonia remains one of the most common clinical conditions in dogs with acute or chronic respiratory illness. There is a complex relationship between viral respiratory diseases, environmental factors, and the development of bacterial and mycoplasmal pneumonia in dogs (Dear, 2020) ^[4]. Among the various bacterial agents, *Staphylococcus aureus* is a common commensal bacterium that survives within the nasal passages, throat and on the skin of humans and a wide variety of animals. The organism produces severe suppurative and necrotizing lesions in the lungs due to the production of necrotizing toxin and rapid inflammatory response. *S. aureus* can spread via direct contact or indirectly mediated by fomites. It can also be transmitted zoonotically via direct contact with animals or animal products including raw meats (Kadariya *et al.*, 2014) ^[5]. It can also be maintained in the environment in manure, water, or the air (Smith *et al.*, 2010) ^[10]. Among the infections caused by *Staphylococcus* organisms in dogs, the respiratory infections such as pneumonia and bronchitis can be particularly severe. Many strains have zoonotic potential, moving between humans and animals, including livestock, pets, and wildlife. Besides human, animals also have

the potential to harbor novel strains of *S. aureus* and it may transmit to the human population, or conversely, humans may also transmit strains of *S. aureus* to other animal species (Price *et al.*, 2012) [9]. The pneumonic condition is usually associated with opportunistic invasion by *S. aureus* or other coagulase-positive staphylococcal organisms following stress, immunosuppression, trauma, parasitism, or concurrent respiratory infection. The pneumonia induced by *S. aureus* is a serious but relatively uncommon condition with a high case fatality rate. It often complicates viral infections viz. influenza. *S. aureus* produces a series of necrotising exotoxins that induce a marked neutrophil response resulting in suppurative tissue necrosis (Hayashida *et al.*, 2009) [3]. Currently, there are limited publications available on diseases affecting Jackals in India and the present article describes the pathology of Staphylococcal pneumonia in a golden jackal.

Materials and Methods

Case History

A male Dhole was presented to the Department of Veterinary Pathology, Veterinary College and Research Institute, Namakkal for post mortem examination which was submitted by the Forest Range Officer, Forest Range, Namakkal with a history of being found dead near Neikkaranpatty village, Mohanur block, Namakkal district of Tamil Nadu.

Necropsy Examination

Necropsy was performed as per the standard procedure and the gross lesions were recorded. The representative tissue pieces from the organs viz. lungs, liver, kidney and heart were collected in 10% neutral buffered formalin.

Histopathological Examination

The tissues were processed as per the standard histological technique. The tissue sections were cut at 3-5 μ thickness and stained by the Haematoxylin and Eosin staining technique (Bancroft *et al.*, 1992) [1].

Cultural Examination

Heart blood swab and lung tissues were collected aseptically in the sterile container for microbiological examination (Watts *et al.*, 1990) [12].

Results and Discussion

On necropsy, the carcass was in poor body condition (Fig.1) with scanty subcutaneous fat and visible mucous membranes were congested. Grossly, the heart showed dilatation with severe engorgement of coronary blood vessels. The trachea, bronchi and bronchiolar lumen were filled with whitish frothy fluid mixed with blood clots and mucosa showed congestion (Fig.2). The lungs were dark red, firm and had diffuse miliary grey nodules in all lobes (Fig.3). The cranial and middle lobes of lungs revealed haemorrhagic patches. On the section, the cut surface showed multiple miliary grey areas with oozing of reddish frothy fluid and the cut pieces from these areas sank into the water. The visceral pleura showed thickening with mild fibrin deposition. These post mortem findings are in line with previous finding of Vieson *et al.* (2012) [11] who observed rubbery, mottled, dark to bright red coloured lungs accompanied by severe hemothorax and areas of lung collapse in dogs with streptococcal pneumonia. The gross examination of liver and kidney revealed congestion (Fig.4). The stomach was empty and the gastric mucosal folds showed congestion. The small intestine contained a little amount of brownish contents and the intestinal mucosa showed thickening. The lumen of the large intestine was also empty.

On histopathological examination, the lung showed severe congestion, edema and necro-haemorrhagic pneumonia characterized by varying degrees of haemorrhage and extensive infiltration of neutrophils. The interalveolar septa of lungs were thickened with inflammatory exudates, inflammatory cells and necrotic debris (Fig. 5). The bronchiolar epithelium showed desquamation as well as necrosis and bronchopneumonia (Fig.6) were also observed. The pleura showed severe thickening with mononuclear cell infiltration which indicative of pleuritis. Vieson *et al.* (2012) [11] observed the severe suppurative like changes and hemorrhagic bronchopneumonia characterized by diffuse alveolar neutrophilic infiltration, abundant hemorrhage and edema, with chains of gram positive cocci shaped bacteria in dogs with bacterial pneumonia. The liver and kidney showed congestion on histopathological examination. The cultural examination of heart blood and lung swab samples was carried out by using selective media. The inoculation of swabs on mannitol salt agar yielded golden yellow pigmented colonies suggestive of suggestive of *Staphylococcus* species. Further, microscopic examination of bacterial colonies revealed Gram positive cocci arranged in clusters, consistent with the morphology of *Staphylococcus* species (Fig. 7 & 8). The outbreaks of hemorrhagic pneumonia were frequently reported in farmed foxes in the eastern region of Hebei Province and the bacteria isolated and identified in the pneumonia foxes, includes *E. coli*, *Pasteurella* spp., *Pseudomonas* spp. *Streptococcus* spp. and *Staphylococcus* spp. (Zhang *et al.*, 2025) [13]. *Streptococcus* spp. was the most common bacteria associated with canine respiratory disease followed by *Staphylococcus* spp. (Kadariya *et al.*, 2014; Nisha *et al.*, 2020) [5, 8]. Based on the gross lesions, histopathological and cultural examination, the present case was confirmed as “Staphylococcal pneumonia”.

The severe pneumonic lesions observed in the lungs were consistent with the pathogenic effects of the toxin produced by *Staphylococcus* spp. and inflammatory mediators. The organism produces various exotoxins and enzymes that contribute to tissue destruction, abscess formation, and systemic toxemia. The presence of necro-haemorrhagic pneumonia with extensive neutrophilic infiltration, edema and pleuritis supported the diagnosis of bacterial pneumonia. The systemic congestion in the visceral organs suggested progression toward septicaemia and toxemia. The stress associated with existing environment, nutritional deficiency and concurrent infections may have predisposed the jackal to opportunistic bacterial invasion.



Fig 1: Golden Jackal carcass with fair body condition and rough hair coat



Fig 2: Lungs: Firm, dark red with presence of diffuse miliary grey nodules



Fig 3: Tracheal lumen contained frothy exudate mixed with blood clots



Fig 4: Liver showing congestion

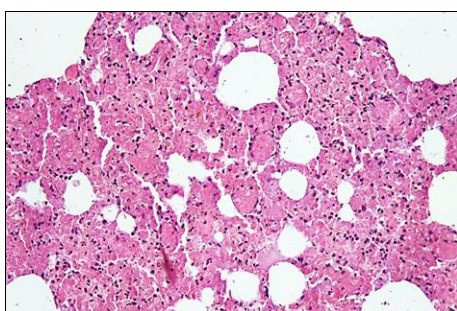


Fig 5: Lung showing edema, thickening of alveolar septa with inflammatory exudates and bronchopneumonia - H&E x100

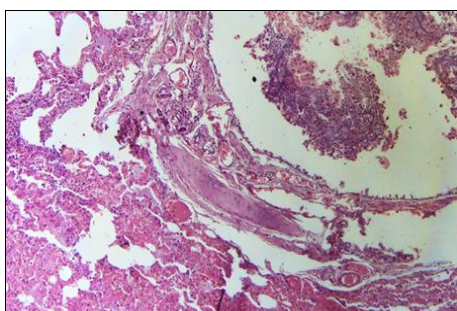


Fig 6: Lung showing thickened visceral pleura with MNC infiltration - H&E x100

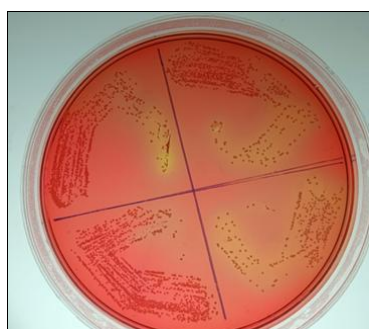


Fig 7: Mannitol Salt Agar - Golden yellow pigmented colonies surrounded by yellow halo zone

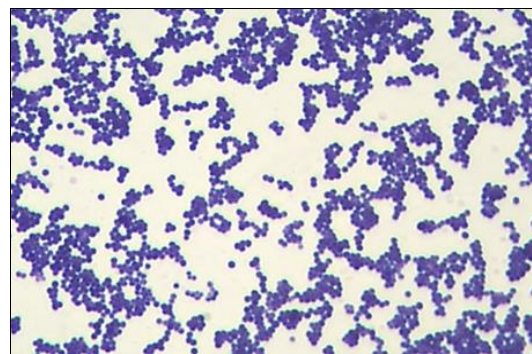


Fig 8: Gram (+) ve cocci with cluster like arrangement – Gram's stain x 1000

Conclusion

Based on gross pathological, histopathological and bacteriological findings, the case was diagnosed as staphylococcal pneumonia in a male golden jackal. The infection resulted in extensive pulmonary damage and systemic toxic alterations leading to death.

Conflict of Interest

Not available

Financial Support

Not available

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