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Aspergillus Fumigatus Infection in a Golden Eagle (*Aquila chrysaetos*)

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검독수리에서 *Aspergillus fumigatus* 감염증

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요 약 : 동물원에서 사육중인 검독수리(*Aquila Chrysaetos*)가 구토증세를 보이다 약 10 여 일간 물과 사료를 절폐하였고 전신적 삭쇄, 안구에는 염증성 삼출물로 덮여 실명, 한쪽날개가 쳐지며 호흡곤란으로 폐사하여 부검의뢰 되었다. 부검 소견상 폐와 기낭에 회백색의 육아종성 결절이 다수 존재하였다. 기낭은 비후되어 있었고 일부는 균사가 자라 청색을 띄는 병변도 관찰되었다. 병리조직학적으로 병변은 육아종성 괴사였으며, 병소에는 곰팡이의 균사와 소포가 관찰되여 곰팡이성 폐렴과 기낭염이였다. 병변의 배양 결과 *Aspergillus fumigatus*로 동정되었다. 본 예는 맹금류인 검독수리에서의 *Aspergillus* 감염 증례이다.

Key words : golden eagle, granuloma, *Aspergillus fumigatus*

Introduction

Aspergillus species are opportunistic fungal pathogen that are ubiquitous in our environment, growing as saprophytes in decaying organic material. Inhalation of airborne conidia is the principle mode of exposure[12]. Lesions in avian species are commonly confined to the lungs and air sacs, although infections of oral mucosa, trachea, brain, eye, skin, bone, liver, kidney[5] and nasal passage[3].

Aspergillosis, caused by infection with *Aspergillus fumigatus* and less commonly by other *Aspergillus* sp., is a prevalent and costly respiratory disease of poultry[5,6]. And perhaps all birds, including wild and caged, should be considered as potential hosts susceptible to *Aspergillus* infection[1,4,8,10,11,13,16].

Acute outbreak of young birds shows high morbidity and high mortality causing economic loss. However, older poults are seem to be less susceptible due to their increased resistance although they are constantly exposed from the environment[5]. *Aspergillus* sp. usually cause disease only under conditions of intensive exposure, state of immunosuppression, or host-defense compromise, such as stress, prolonged treatment with antimicrobials[9].

Aspergillosis is rarely found in raptor reported in the literature[4]. This case is associated with aspergillosis in raptor, a golden eagle, at Chonju zoo caused by *A. fumigatus*.

Case

A approximate 11-year old golden eagle was housed in an outdoor pen with 6 other eagles in Chonju Zoo. This eagle had shown vomition following stop eating for 10 days and progressively weight loss, lethargy, and dyspnea with its mouth open. Clinical examination by a veterinarian failed to reveal the underlying problem. The bird was found dead and was submitted to the Veterinary Diagnostic Laboratory,

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Fig 1. Eye. The yellow caseous exudates cover the cornea, causing the blindness.

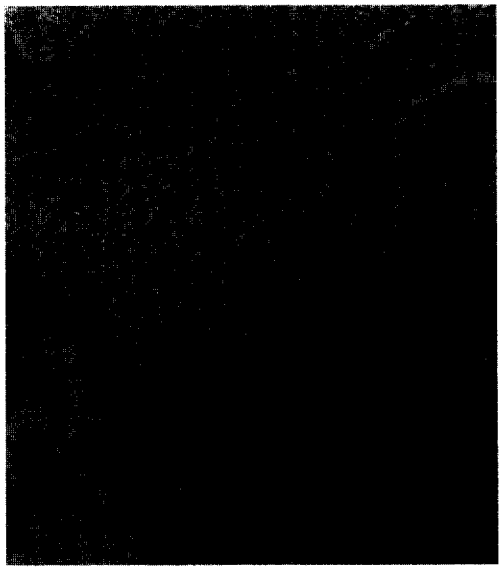

Fig 2. Lung. The masses were granulomatous with a central area of necrosis containing heterophils surrounded by macrophages, lymphocytes and some fibrous tissue. HE, × 100.

Chonbuk National University, for necropsy.

Grossly, the bird was in poor body condition with severe emaciation and the yellow cheesy exudates covered bilaterally on the cornea causing blindness (Fig 1). The significant gross lesions were multiple greyish-white nodules on lung and caseous plaques on thickened air sac membranes. Some caseous foci of air sacs appeared green color. The digestive tracts were empty. There were no other visible lesions.

Small pieces of lung, and air sac were fixed in 10% neutral buffered formalin, and embedded in paraffin. Tissue sections were stained with hematoxylin and eosin (HE) and Periodic Acid-Schiff (PAS) for demonstrated fungal hypae and then examined under light microscope.

Histologically, the lung masses were granulomatous with a central area of necrosis containing heterophils surrounded by macrophages, lymphocytes and some fibrous tissue (Fig 2). Minute black granules, carbon particle, infrequently appeared in the connective tissue. The wall of air sacs were thickened with necrotizing lesions containing numerous septate, branched fungal hypae (Fig 3). The organisms broke out into air sac lumen and several conidial heads were observed. Using PAS stain, the hyphae were well observed within the necrotic lesions and air sac lumen (Fig 4).

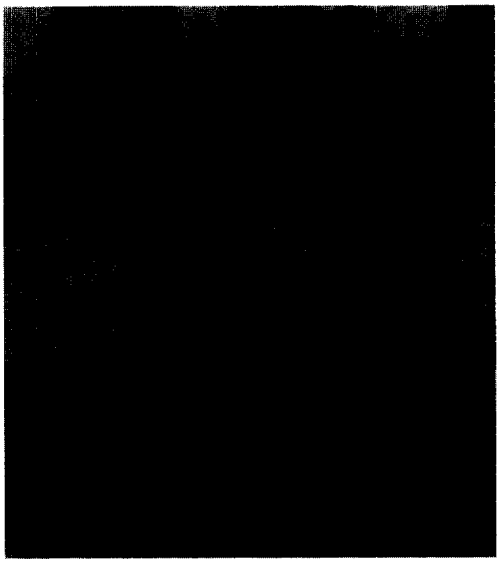

Fig 3. Air sac. The wall of air sac are thickened and granulomatous lesion contains branched septate hypae, and several conidial head in the air sac lumen. HE, × 200.

The conidiophore was smooth-walled (Fig 4, inset).

For microbiological examination, samples showing gross lesions were cultured on Sabrouraud dextrose agar (Difco, Detroit, MI). Colony spreaded rapidly

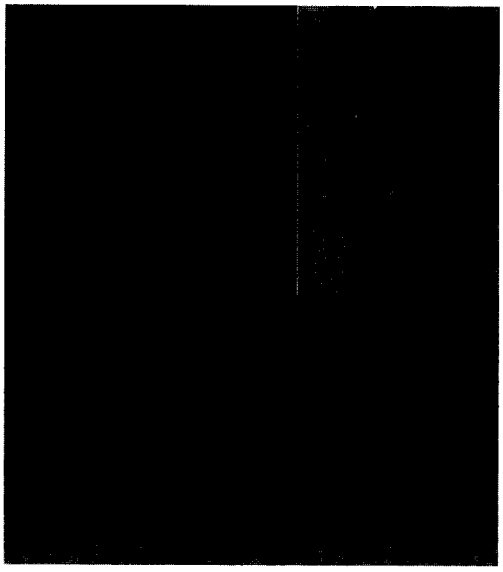

Fig 4. Air sac. Note the hyphae of *Aspergillus* with strong positive reaction. PAS, 200. Inset: Fruiting head of *Aspergillus fumigatus* is seen in the air sac lumen. PSA, ×400.

over the surface. Colony, initially white, became velvety and tinged bluish green, which was consistent with *Aspergillus fumigatus*[2].

Discussion

This mycotic respiratory infection was typical case of inhalation exposure, which was involved the lower respiratory tract, including the lung and air sacs. Postmortem and histologic examination of the Golden eagle revealed multifocal caseous necrosis admixed with fungal elements and granulomatous lesion throughout the lungs and air sacs. The visible greenish-gray mold growth on the walls of air sacs indicated that fungi sporulated in advanced lesions[12]. These findings were severe mycotic air sacculitis and pneumonitis.

Acute outbreaks may occur in which there are high morbidity and high mortality, particularly in young bird[5,7]. In this case, one bird in a flock became affected while others have remained healthy so far. This suggested that aspergillosis should not be infectious from one individual bird to another[4]. Factor that predisposes to aspergillosis seems to be stressors associated with confinement-rearing and age to increase susceptility[9].

It may be difficult to differentiate aspergillosis from other chronic respiratory tract diseases. When the disease has progressed clinical signs which presented were not often of a respiratory nature[4]. In the eagle of this report, clinical examination by a veterinarian failed to reveal the underlying problem. Clinically, respiratory distress was only encountered in terminal stages. In raptor, unilateral drooping of a wing and repeated vomition due to pathology of the anterior air sacs was found[4].

In this cases, definitive diagnosis was made on the basis of culture and histologic results. *Aspergillus fumigatus* was identified in culture and histologically in specimens. In the zoo situation, diagnosis may indicate the need for changes in environmental conditions to prevent disease in other birds. It is recommended that shredded bark and other forms of decaying vegetable matter should be excluded from the vicinity of all susceptible birds[4].

Conclusion

A approximate 11-year golden eagle (*Aquila chrysaetos*) had shown vomition following stop eating for 10 days, and progressively weight loss, lethargy, drooping of a wing, dyspnea and subsequently died. Gross necropsy reveals multiple granulomatous nodules on long and air sac. The air sacs were thickened and some cascous foci appeared green color. Microscopically, the nodules contained numerous septate, branching fungal hyphae. The conidial heads of fungi were observed in inner membrane of air sacs. This case was typical mycotic air sacculitis and pneumonitis in a raptor, golden eagle, at Chonju zoo and the cultured fungus was identified as *Aspergillus fumigatus*.

Acknowledgments

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