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Research Article

Assessment and Clinical implication of Aspergillosis in GYR Falcons (*Falco rusticolus*)

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Abstract

A study was conducted for the comparative assessment and clinical evaluation of two different anti-fungal agents against aspergillosis in GYR falcons. Aspergillosis is the most common fungal infection with highest rate of mortality among birds of prey especially in falcons. GYR falons and hybrid GYR falcons are more susceptible to aspergillosis. Aspergillus genus is an opportunistic pathogen which primarily affects the avian respiratory apparatus, including lungs, air sacs and syrinx and occasionally nervous signs. 24 GYR falcons presented in Doha Falcon Clinic with symptoms like progressive emaciation, weakness, lethargy, inability to fly, poor performance in exercise and training were selected for the study and grouped in to two according to age and body weight. Diagnosis were made by radiographic examination and confirmatory diagnosis were done by endoscopy of abdominal cavity, the lungs and air sac (Coelioscopy). Itraconazole were administered at the dose rate of 15-20 mg/kg q24h for 21 days in group 1 and Voriconozole at the dose rate of 12.5 mg/kg q12h for first three days and continue q24h for 18 days in group 2 with supportive therapy. The birds were re-examined after one month for the effect and recovery of treatment. The birds treated by both therapeutic agents showed positive results and these findings indicated that Itraconazole and Voriconozole can be used against Aspergillosis in GYR falcons as primary treatment with better management practices.

Keywords: GYR Falcons; Aspergillosis; Coelioscopy; Anti-Fungal Agents

Introduction

Falcons are birds of prey in the genus *Falco*, which includes about 40 species. Falcons are widely distributed on all continents of the world except Antarctica. The GYR falcon (*Falco rusticolus*), the largest of the falcon species has been valued as a hunting bird. The GYR falcon has long associated with humans, primarily for hunting and in the art of falconry.

Falconry is an ancient sport that has been practiced since preliterate times. Falconry is practiced worldwide, although it is considered to be a rare sport. Strongholds of the sport exist in Britain, the United States, Central Asia, and several Middle East countries and North-West Frontier Province of Pakistan.

Aspergillosis is considered the most common systemic mycosis in birds [1] and the most important cause of death in captive falcons [2]. *Aspergillus fumigatus* is the most common infective agent, with *A. flavus*, *A. terreus,* and *A. niger* apparently share the same clinical importance in raptors held in captivity [3].

Increased concentration of spores in the environment may predispose a falcon to aspergillosis. The major predisposing factors like poor ventilation, warm environment, Humidity [4], poor sanitation [5] may increases spore load in environment. Factors impairing immunity of falcons also predispose to avian mycosis especially aspergillosis. They include inadequate diet [6,7], overcrowding [8], starvation, thermal discomfort, toxicosis [9] quarantine or capture of wild falcons [10], long term steroids and medication [11] and change of ownership.

Major route of infection for *A. fumigatus* is inhalation [12]. Since spores enters through inhalation, the primary infection sites are air sacs, mainly posterior thoracic and abdominal air sacs prior to lung epithelia [13]. When there is heavy load of spores or the falcon

has an impaired immune response, the innate defence mechanisms fails and aspergillus forms as plaques. These plaques or necrotic debris in the respiratory tract can obstruct the trachea or bronchi and fill up the air sacs [12]. Hyphae may fill the lumen and penetrates the air sacs and causing superficial necrosis of adjacent organs [14]. Macrophages ingest and carry spores to other organs through blood and lymphatic stream [15].

Clinical manifestations depend on the infective dose, the spore distribution, pre-existing diseases, and the immune response of the host bird [16]. Avian aspergillosis is often classified as acute or chronic. Acute aspergillosis is caused by inhaling higher level of spores while chronic aspergillosis associated by immune suppression [17]. Even though aspergillosis is a respiratory disease it may affect other organs also, Nasal aspergillosis causes exudative rhinitis [14], Aspergillus blepharitis and dermatitis involving the eyelids and the head have been described in peregrine falcon x GYR falcon [10]. Neurological signs also seen in some birds due to aspergillosis [18]. The owner trained raptors may not show respiratory signs at the earlier stages of aspergillosis but may show low performance during hunting and flying. Later stages of aspergillosis falcons show respiratory signs like panting, weakness, anorexia, progressive emaciation, greenish discoloration of faeces and poor flying performances.

The objective of the study was to assess clinical implication of two different anti-fungal agents namely, Itraconazole and Voriconozole against aspergillosis in GYR falcons.

Materials and Methods

24 GYR falcons presented in Doha Falcon Clinic with symptoms like progressive emaciation, weakness, lethargy, inability to fly, poor performance in exercise and training were selected for the study. Diagnosis were made by radiographic examination and confirmatory diagnosis were done by endoscopy of abdominal cavity, the lungs and air sac (Coelioscopy).

The birds were grouped in to two T1 and T2 according to age and body weight. T1 were treated using anti-fungal agents Itraconazole and T2 with Voriconozole, respectively. Itraconazole were administered at the dose rate of 15-20 mg/kg q24h for 21 days in group 1 [19] and Voriconozole at the dose rate of 12.5 mg/kg q12h for first three days and continue q24h for 18 days in group 2 [20] with supportive therapy.

Figure 1: Radiographic images of Aspergillosis in falcons.

Figure 2: Laperoscopic images of Aspergillosis in lung osteum of falcons.

Blood chemistry of each group were done at beginning and end of study. Body weight of birds were recorded on fortnightly basis.

Result and Conclusion

The falcons in both groups treated using aforesaid therapeutic agents showed positive results during laparoscopic examination, one month after the therapy. Most cases given a complete successful result after treatment, but birds with higher rate of infection needed second course for complete recovery. The haematological values are given in table 1and fortnight body weight are given in table 2.

Parameters	Experimental groups	
	T1	T2
Differential leucocyte count		
Heterophils	69	71
Lymphocytes	29	28
Monocytes	2	1
Blood Chemistry†		
AST (U/L)	70	59
CK (U/L)	400	387
UA (umol/L)	162	268
GLU (mmol/L)	17.5	17.9
Ca^{++} (mmol/L)	2.24	2.17
P (mmol/L)	0.28	0.62
TP (g/L)	28.5	29.5
ALB (g/L)	18	16.5
GLOB (g/L)	10.5	13
K^+	3.1	3.35
Na^+	150	150

Table 1: Haematological values of experimental groups.

† Average of 12 values.

On perusal of the data, it could be found that there was no significant difference ($P > 0.05$) between the body weight of birds in two experimental groups at the beginning and end of experiment. The body weight of falcons increased in both groups, from the beginning of the experiment. These findings indicated that Itraconazole and Voriconozole can be used as therapeutic agent against Aspergillosis in GYR falcons as primary treatment with better management practices. Both the agents given a 100% recover.

Parameter		T1	T2
Body weight (Mean ± SE)	Initial	1026 ± 25.91	1097 ± 10.88
	Final	1157 ± 33.88	1143 ± 12.81
	Overall	1091.5 ± 11.48	1120 ± 9.98

Table 2: Initial and final average body weight (gm).

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