

# An overview of avian aspergillosis

## Abstract

Aspergillosis is one of the most common problems in commercial and backyard poultry farming usually seen in birds of 7-40 days of age, mainly due to poor management practices. It is a non contagious fungal disease of avian species comprising of chickens, turkeys, and less frequently ducklings, pigeons, canaries, geese, and many other wild and pet birds. Etiology in poultry is a fungal species involving *Aspergillus fumigatus*, *A. flavus*, *A. niger*, *A. glaucus* and *A. terreus*, *A. fumigatus*. Inhalation of a number of small, hydrophobic fungal spores (conidia) causes the condition. After infective spores invade tracheal, nasal, bronchial and air sac epithelium, they penetrate the respiratory tissue and reproduce, thus causing granulomas. Treatment is generally not effective and prevention is the best way of controlling this disease. Good management practices like sanitation; adequate ventilation and disinfection need to be adopted for control.

**Keywords:** aflatoxin, aspergillosis, *Aspergillus fumigatus*, ochratoxin

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## Introduction

Aspergillosis is a non contagious fungal disease of avian species comprising of chickens, turkeys, and less frequently ducklings, pigeons, canaries, geese, and many other wild and pet birds. It usually is a disease of lower respiratory system occurring in immuno compromised birds or when they are exposed to large number of spores and stress being one of the main predisposing factors responsible for development of disease.<sup>1</sup> It is one of the most common problems due to management problems in commercial and backyard poultry.<sup>2</sup> *Aspergillus* spp can penetrate egg shells and thus infecting the embryo. Aspergillosis is of two types either acute or chronic form. Acute aspergillosis occurs in young birds causing high morbidity and mortality. The chronic form is usually sporadic with lesser mortality and affecting older birds, with a compromised immune system.<sup>2</sup> Factors responsible for predisposition to disease involve poor sanitation; poor ventilation as well as food contamination that promote fungal growth.<sup>2</sup> *Aspergillus* spp secrete secondary metabolites such as Aflatoxin, a type of mycotoxin produced by *Aspergillus flavus* and *Aspergillus parasiticus* and ochratoxin which is produced by *Aspergillus ochraecus* that affect poultry when they consume contaminated feed.<sup>3</sup>

## Etiology and epidemiology

Aspergillosis in poultry is caused by a fungal species involving *Aspergillus fumigatus*, *A. flavus*, *A. niger*, *A. glaucus* and *A. terreus*, *A. fumigatus* being a common cause of the disease. These are common soil saprophytes growing on organic matter in warm (>25°C) and humid environments and damaged eggs in hatchery.<sup>4</sup> High mortality rates are seen in chicks and poults that inhale large numbers of spores during hatching in contaminated incubators or when placed on mold-bearing litter. In older birds, infection is caused primarily by inhalation of spore-laden dust from contaminated litter or feed or dusty range areas.

## Transmission

Aspergillosis affects birds other animals and humans. It is reported in domestic birds like poultry, duck, and quails as well as in wild birds.<sup>2</sup> Inhalation of conidia or spores from contaminated feed, fecal material, soil and contamination of egg in ovo, infects the developing

embryo. The small non-expanding lungs and nine air sacs constitute a primary nidus for infection because the air (or conidia) reaches the caudal air sacs before it passes through those parts of the lungs in which the gas exchange takes place.<sup>5</sup> Higher body temperature facilitates fungal growth. Other contributory factors include chronic stress, unsanitary conditions, overcrowding, malnutrition, vitamin deficiencies especially vitamin A and overuse of certain medications (corticosteroids) as well as respiratory irritants (disinfectant fumes and aerosol sprays).

## Pathogenesis

Aspergillosis is caused by inhalation of a number of small, hydrophobic fungal spores (conidia) into the respiratory tract. After infective spores invade tracheal, nasal, bronchial and air sac epithelium, they penetrate the respiratory tissue and reproduce thus initiating granulomas at this site. Then they are disseminated hematogeneously to the other tissues like brain, pericardium, bone marrow, kidney and other soft tissues. Tissue invasion creates an inflammatory condition and inflammatory response with heterophils, lymphocytes, monocytes and some giant cells infiltrating the lesion and produce lesion.<sup>6</sup>

## Clinical signs

Dyspnea, hyperpnea, somnolence and other signs of nervous system, anorexia, emaciation, and increased thirst may be seen. Lungs are most frequently involved in chicks or poults up to 6wk old. Pulmonary lesions are characterized by white to yellow plaques and nodules a few mm to several cm in diameter; occasionally, mycelial masses may be seen within the air passages. The plaques and nodules also may be found in the syrinx, air sacs, liver, intestines, and occasionally the brain. An ocular form is seen in chickens and turkeys as mycotic keratitis, in which large plaques may be expressed from the medial canthus.<sup>7</sup>

## Diagnosis

The fungus can be demonstrated by culture or by microscopic examination of fresh preparations. One of the plaques is teased apart and placed on a suitable medium, usually resulting in a pure culture of the organism. Histopathologic examination using a special

fungus stain reveals granulomas containing mycelia.<sup>8</sup> Differential diagnoses include infectious bronchitis, Newcastle disease, infectious laryngotracheitis, mycobacteriosis, colibacillosis, other mycoses (eg, ochroconosis, zygomycosis), and nutritional encephalomalacia.<sup>9</sup>

## Treatment

Treatment for Aspergillosis is not effective because the drug used does not reach the fungus that is walled off by the bird's inflammatory response and therefore, isolated from the blood stream. Only systemic drugs are used. Treatment of aspergillosis involves the use of one or more systemic antifungal agent. Drugs which are commonly used include itraconazole, ketoconazole, clotrimazole, miconazole, fluconazole and Amphotericin B. Itraconazole being a choice of treatment for the disease.<sup>10</sup>

## Conclusion

Aspergillosis has no effective treatment and prevention by vaccination is not commercially practicable. Thus, control depends on reduction in exposure to the fungus and associated risk factors. *Aspergillus fumigatus* in young chicken can be controlled by hatchery sanitation. Moldy litter or feed should be avoided as a method of prevention. Poultry house and litter should be treated with antifungal compounds.<sup>11</sup> Moldy feed should be removed, bulk feed container should be cleaned, old litter should be removed from house and replaced with new. Hatching equipment and air ducts should be cleaned, disinfected and well monitored. Contaminated hatchery should be fumigated with formaldehyde or thiabendazole.<sup>12</sup>

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## Conflicts of interest

Authors declare that there is no conflict of interest.

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