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MYCOTIC INFECTIONS IN BIRDS I:
ASPERGILLOSIS

Patrick Redig, DVM, PhD
College of Veterinary Medicine
University of Minnesota, St. Paul, MN

ASPERGILLOSIS

A comprehensive overview of this disease in birds in general and raptors in particular and modes of treatment is available in recently published works3,8.

Several species of aspergillus may be involved (A. niger, A. terreus, A. nidulans, A. glaucus, & A. flavus) in any of the common forms of this disease. In most clinical presentations among captive companion and falconry birds. A. fumigatus is by far the most commonly encountered organism. However, the occurrence of these others can lead to some of the variations seen in pathogenesis and response to treatment. Additionally, available serological tests are highly specific to A. fumigatus and would not necessarily detect antibodies formed in response to one of the other species.

The route of infection is inhalation thereby rendering the respiratory system the main target organ. Direct deposition on exposed vulnerable surfaces may also occur. Among parrots and occasionally raptors, the upper respiratory system (URS) is affected often (sinuses, larynx, and syrinx). The most serious disease occurs with infection of the lower respiratory system (lungs and airsacs – LRS). Spores in the LRS can migrate widely throughout the coelomic cavity by means of the ramifying and interconnecting airsac system that reaches into every part of the body. Consequently, lesions may be found in the pericardium on the kidneys, in the mesenteries and among the vertebral bodies of the spinal column.

While the respiratory system provides an ideal environment in which the thermophilic, oxyphillic aspergillus fungi can grow, the organism is an opportunist and may colonize superficial damaged epithelial and mucosal tissues. Mycotic keratitis due of A. fumigatus has been reported and this author has on several occasions found A. fumigatus colonizing skin wounds, surgical and otherwise, covered by a bandage.

Some species of birds are more susceptible than others and certain circumstances are more prone to encouraging the development of aspergillosis. African Greys (Psittacus erythicus) and Blue-fronted Amazons (Amazona aestiva) have a reputation for developing aspergillosis. While both have been encountered with notable frequency to have LRS infections, the greys appear to have an additional proclivity to express sinusitis. Among raptors, arctic and northern species maintained in temperate zones in captivity exhibit the highest incidence. These include gyrfalcons (Falco rusticolus), goshawks (Accipiter gentilis) and rough-legged hawks (Buteo lagopus). The highest incidence is seen among juvenile, captive-reared gyrfalcons. Other sensitive raptor species include immature red-tailed hawks golden eagles, and bald eagles with lead poisoning. Among waterfowl, birds caught up in oil spills, arctic species (e.g. eiders) maintained in captivity, and swans with lead poisoning are at risk. Lastly, several species of penguins associated with zoological collections, are prone to develop aspergillosis.

Novel situations, whether capture and confinement in captivity (either with benevolent intentions and handling) or from injury, as well last post-fledging, pre-independence stages of development during the heat of late summer are high risk times of the year for sensitive species. Apparently, very slight alterations in established external environment or routines3 induces a degree of immune system compromise that leads to development of disease from ambient spore exposure.

DIAGNOSIS OF ASPERGILLOSIS

Upper respiratory system aspergillosis differs from lower respiratory system aspergillosis in the approach to both diagnosis and treatment. Typically presenting as a chronic sinusitis, with or without inflammation and enlargement of the nares, there is usually external evidence of the disease. Etiologic diagnosis is best made by superficial biopsy or culturing and cytology of sinus flushes. Owing to the small mass of antigen present, the white cell count is only mildly elevated and serology is usually negative. Other URS presentations such as laryngeal mound or syringal infections can be detected by direct observation (laryngeal mound) or endoscopic examination (for syringal aspergillosis) in those birds with tracheas sufficiently large to accept a rigid endoscope (250 grams and up).

For lower respiratory system disease, endoscopic examination of the airsacs is the single most useful tool for diagnosing aspergillosis. The results are immediate and it provides the clinician with an unambiguous means of assessing the overall condition of the patient as well as the opportunity to collect material that may be cultured and/or examined histopathologically for definitive diagnosis. As other agents, especially some bacteria, are capable of inducing respiratory granulomas6, endoscopic visualization accompanied by sample collection is invaluable in establishing an accurate picture. The anesthesia required for endoscopy is not contraindicated despite the respiratory distress many birds exhibit at the time of evaluation. The relaxation of anesthesia and the high oxygen environment typically relieves their distress and improves the membrane color immediately. The procedure should include bilateral airsac examination and tracheal exam.

Other procedures that enhance overall evaluation include a CBC (white cell counts are typically elevated significantly, with pronounced heterophilia accompanied by toxicity of heterophils, and mild monocytosis) radiographs (VD and lateral), and deep tracheal culture or lavage.

Serological methods (ELISA methods for antibody detection and antigen capture) along with electrophoresis are adjunct methods to establishing a diagnosis. The former are useful for general screening of individuals or flocks, but they are highly subject to interpretation and should not be used as the sole means of diagnosis. Electrophoresis is useful in that some birds exhibit a characteristic signature pattern for beta and gamma proteins that are characteristic for aspergillosis. In addition, both antibody detection and electrophoresis can be used as a means of monitoring progress in patients undergoing treatment.

TREATMENT OF ASPERGILLOSIS

An overview of antifungal agents, their modes of action, dosage recommendations, and uses are provided by Orosz7. In general, some form of treatment should be instituted upon the first suspicion that aspergillosis is present, while
additional diagnostic work is completed. Itraconazole is a good choice.

Amphotericin B, introduced in 1958, remains the standard of comparison for all other antifungals and is the mainstay of treatment in most protocols, human and avian. While notably toxic in mammals, amphotericin B is quickly eliminated and has no described long-lasting toxicity in birds in routine use. It is administered by direct intratracheal installation, intravenous administration, and by nebulization. Note that Amphotericin B precipitates in the presence of sodium salts intravenous administration, and by nebulization. Note that Amphotericin B precipitates in the presence of sodium salts and should never be reconstituted or diluted in saline. Amphotericin B precipitates in the presence of sodium salts intravenous administration, and by nebulization. Note that Amphotericin B precipitates in the presence of sodium salts and should never be reconstituted or diluted in saline.

The triazoles are a class of fungistatic antifungal agents. Commonly used triazoles are itraconazole, miconazole & enilconazole (topical treatments) and clotrimazole (nebulized). Voriconazole® (Pfizer) is a fluconazole derivative that is undergoing evaluation in human protocols, but is untested in birds. Itraconazole is the most frequently used of the azoles. In graminivorous birds, its absorption and activity is enhanced by acidification in 0.1N HCl prior to administration.

Terbinafine HCl (Lamasil®), a fungicidal agent, has been recommended for treating aspergillosis is a third class of agents now in use. Anecdotal reports are favorable, but its overall utility is not yet established. A most recent development is the introduction of the echinocandins, of which capsofungin (Cancidas® - Merck Sharp & Dohme) is the agent currently under evaluation. An inhibitor of glucan synthase, an essential enzyme in cell wall synthesis of fungi, it is fungicidal. It’s specific site and mode of action is the killing of Aspergillus spp at branch points and continuing it well into the fall (up to 120 days) when cooler rather prevails and the birds have undergone juvenile maturation stages.

CONCLUSION
Aspergillosis is the most challenging medical problem affecting avian species. There are many tools available for diagnosis and treatment, but no formulaic protocols that will guarantee success. Each case must be evaluated on its own merits and it is up to the clinician to select the proper tools and apply them effectively in order to achieve success.

REFERENCES


