ASPERGILLOSIS
(Brooder Pneumonia; Mycotic Pneumonia; Pneumomycosis)

DEFINITION

Aspergillosis is an acute or chronic disease, primarily affecting the respiratory system. Peritoneal, visceral and systemic infections can also occur. The agent is *Aspergillus fumigatus*. Aspergillosis occurs frequently in turkeys, chickens, and game birds. This condition has also been reported in penguins, raptors, migratory waterfowl, psittacines and zoologic specimens, such as flamingos. All species of birds probably are susceptible. Aspergillosis was first described in a wild duck in 1833 and in turkeys as early as 1898. There are some other species and genera of fungi that may cause similar disease syndromes.

EPIDEMIOLOGY

1. Embryos. *Aspergillus fumigatus* can penetrate egg shells under ideal growth conditions and thus infect the embryos. Such eggs will often appear green when candled (the embryo will be dead). Infected embryos may hatch with well developed lesions.

2. Chicks and poultts. If infected eggs break in the hatchery, large numbers of spores are released which contaminate the hatchery environment and air systems can lead to severe outbreaks in very young birds (less than 3 weeks of age). Eggs punctured for in-ovo injection are particularly susceptible to contamination. Even low-level contamination of hatchers or air systems can result in mortalities of 50% or greater when in-ovo injection is used.

3. Adults. Infection usually follows inhalation of large numbers of spores from heavily contaminated feed, litter or environment. Conjunctival infections may occur from heavy exposure to airborne spores following traumatic injuries. It is believed that healthy birds resist infection but that resistance can be overwhelmed by massive exposure combined with depressed host defenses. Debilitated and overcrowded birds are most susceptible. Market age tom turkeys and turkey breeders are commonly affected.

4. *Aspergillus fumigatus* is normally present in litter and feed. Enormous numbers of spores can be produced under ideal conditions. Sporulating colonies of *Aspergillus fumigatus* are blue-green and can often be observed grossly.

5. Infections in the brain, posterior chamber of the eye or other visceral tissues result from systemic invasion from the respiratory tract.

CLINICAL SIGNS

1. Dyspnea, gasping, cyanosis and accelerated, labored breathing [Fig. 1: Aspergillosis; AAAP] frequently are observed. Rales do not usually accompany these respiratory diseases. Other signs include diarrhea, anorexia, somnolence, progressive emaciation, dehydration and increased thirst.

2. Morbidity is variable. Mortality is high in clinically affected birds. Increased mortality will be noted in affected flocks during loadout, hauling and following insemination. Affected birds often die during or just after handling especially if held by their legs.

3. Signs of central nervous system disturbance may occur in a small percentage of the birds if there has been spread to the brain. Signs often include ataxia, falling, pushing over backwards, opisthotonos, paralysis, etc.

4. A gray-white opacity may develop in one or both eyes when there is eye infection. Ocular discharge occurs when the conjunctiva is infected and there can be corneal ulceration. A large mass of exudate typically accumulates in the medial canthus under the third eyelid.
ASPERGILLOSIS

LESIONS

1. Mycelial growth with sporulation may be apparent as fuzzy gray, blue, green or black material (sporulating fungus) on air sac lesions or in the main bronchi of the lungs.

2. Yellow or gray circumscribed nodules or plaques in the lungs [Fig. 2; Aspergillosis; AAAP], air sacs bronchi or trachea [Fig. 3; Aspergillosis; UC Davis] (usually the syrinx); less often in the peritoneal cavity, liver, brain or at other sites. In mature birds two patterns of air sac infection are found: disc-like plaques in the recurrent bronchi of the caudal thoracic and/or abdominal air sacs or markedly distended air sacs containing copious fluid and soft fibrinopurulent exudate.

DIAGNOSIS

1. The signs and gross lesions of aspergillosis are very suggestive of the diagnosis which can be confirmed by microscopic demonstration of fungus in fresh preparations made from the lesions or in histologic sections.

2. Microscopic examination reveals septate, branching hyphae within lesions. Hyphae can be seen in fresh preparations cleared with 10% KOH or stained with lactophenol cotton blue. If fungus is grossly visible in the lesions, the typical fruiting bodies [Fig. 4; Aspergillosis; AAAP] and spores can be easily found. In histologic sections, special stains (methenamine-silver, PAS, Gridley) are useful for demonstrating fungi in tissues. Nodules in the lungs usually appear as granulomas containing fungal hyphae.

3. Using sterile technique, the fungus can be cultured by tearing a nodule or plaque open and putting it on fungus media. Aspergillus will usually grow on blood agar in 24-48 hours. Sabouraud's dextrose agar [Fig. 5; Aspergillosis; AAAP] is a more selective medium. Since aspergillus spores are common laboratory contaminants, growth of only a few colonies may not be sufficient for a definitive diagnosis. For confirmation, tissue invasion should then be demonstrated.

4. Typical lesions of aspergillosis are unlike those of other avian respiratory diseases except pulmonary granulomas associated with complicated Mycoplasma gallisepticum infection. Histopathologic differentiation is usually easy.

5. Another fungus, Dactylaria gallopava, can cause lesions in the lungs or brain of young chickens and turkey pouls. Signs and lesions resemble those caused by aspergillosis. The two fungi can be differentiated by culture. Numerous giant cells are characteristic of microscopic brain lesions caused by D. gallopava.

CONTROL

1. Collect clean eggs. Disinfect or fumigate eggs before setting. Do not set cracked eggs or eggs with poor shell quality.

2. Thoroughly clean, disinfect and fumigate incubators and hatchers. Inspect air systems and change air filters regularly in hatcheries. Monitor hatchery environment for mold contamination.

3. Use only dry, clean litter and freshly-ground, mold-free feeds. Store feeds and litters properly so as to inhibit growth of mold. Make sure feed bins and feed lines are kept clean, dry and free of mold growth. Do not permit feed to cake in feeders. Avoid wet litter under or around the waterers or feeders. Mold inhibitors may be added to feed to control fungus growth and prevent infection; however, this will add expense.

4. Optimize the ventilation and humidity in the poultry house to reduce air-borne spores. Humidity should be kept in the mid-range, neither too low nor too high. Alternating wet and dry conditions are an ideal situation for Aspergillus. The fungus multiplies during the wet period producing abundant spores which then become aerosolized when conditions become dry.
ASPERGILLOSIS

TREATMENT

1. If aspergillosis is diagnosed in a flock, cull clinically affected birds and remove any contaminated feed and litter. Clean and disinfect the house and then spray it with 1:2000 copper sulfate solutions or other fungicide and allow it to dry.

2. Valuable captive birds can be treated with Nystatin or Amphotericin-B or other anti-mycotic agents. Often antibiotics are given simultaneously to prevent secondary bacterial infection. Intravenous fluids may also be required. Ketoconazole, Miconazole and related drugs have been found effective for treating individual birds but are too expensive for commercial flocks.