

ASPERGILLOSIS---DACTYLARIOSIS

SLIDE STUDY SET #9

A CONTINUING EDUCATION PROGRAM PREPARED

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ASPERGILLOSIS-DACTYLARIOSIS^A

TWO FUNGUS DISEASES OF POULTRY

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Aspergillosis

Aspergillosis is a fungus disease of poultry that has been reported in many avian species. The earliest reference made by Chute (4), in his chapter on fungal infections in Diseases of Poultry, was to the report of Schutz (1884), who observed that infection in the lungs was established following inhalation of aspergillus spores. Although this disease can be caused by other Aspergillus spp., Aspergillus fumigatus is encountered most often. Flock mortality as high as 50% has been reported.

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Signs of the disease vary according to the tissue infected, age of the bird, and avian species involved. The fungus usually infects air sacs, lungs, eyes and brain, although other tissues may be infected. Respiratory infections produce dyspnea, gasping, and accelerated breathing. Eye infections usually are unilateral and begin with lacrimation, followed by a conjunctivitis that may become chronic and characterized by a yellow, cheesy plaque beneath the nictitating membrane. There may be ulcerations of the cornea. Infection of the brain usually produces encephalitis with ataxia, incoordination, and/or torticollis (7).

Gross lesions of the air sacs and lungs vary from small, yellowish plaques, to yellow nodules from 1 mm to 7 mm in size. Occasionally, larger, thickened plaques with a greenish fur-like growth of mold on the surface are on the air sacs or the thoracic walls. Gross brain lesions are usually circumscribed areas that range in color from white to yellow.

Microscopically, infected lung tissues have lesions of focal pneumonia, multiple areas of necrosis, and granulomas. The mycelia may penetrate the walls of the alveoli and bronchioles. Lesions in the air sacs and on the inner surface of the thorax may show mycelia producing conidiophores with conidia. In infected brain sections, stained with methenamine silver, the mycelia generally spread from individual foci into the surrounding tissue and show characteristic dichotomous branching. The diameter of the hyphae in tissues range in size from 2.4 to 4.8 microns.

Aspergillosis can be a hatchery-borne disease which results

from infected hatching eggs and/or contaminated hatchers. Respiratory signs in day-old chicks, as a result of aspergillosis, is called "brooder pneumonia."

The fungus grows optimally on Sabouraud dextrose agar at 28 C as a white fuzzy growth developing into a flat blue-green colony. Older cultures darken with age. Most aspergillus strains will not grow on mycobiotic agar because they are sensitive to cycloheximide. Microscopically, the mycelium is hyaline. Spores are spherical, green, and have a rough surface. The fungus has been isolated from most types of material commonly used as litter. The fungus is ubiquitous and the spores are widely distributed in nature (1).

The diagnosis of aspergillosis is made by the history, clinical signs, gross and microscopic lesions and isolation and identification of the organism.

Dactylariosis

Dactylariosis is a fungus disease of turkey poults and young chickens. Mortality has been reported as ranging from less than 1% to 20%. This disease presents a diagnostic problem, in differentiating it from aspergillosis, as well as other diseases with neurological signs. (8)

The disease was first reported in turkey poults in 1962 by Bierer (6) in South Carolina and was caused by a thermophilic fungus species now named Dactylaria gallopava (2, 13, 14). Dactylariosis was reported in turkeys in South Carolina again in 1971 (3) and in Maryland by Stein in 1972 (12). The fungus was

isolated from 5-week-old chicks in Australia and reported by Connole in 1967 (5). The first known incident of this disease in chickens in the United States was in Indiana in 1971 and was reported by Ranck et al (9, 10, 11). The disease has since been reported in broiler flocks in Georgia by Waldrip et al (15).

The most consistent signs of infections with D. gallopava are those of encephalitis, ie: torticollis, ataxia, incoordination, tremors and leg paralysis. Eye opacities have also been reported in turkey poults.

The most consistent gross lesions are found in the brain. These lesions range from a diffuse type of infection involving one lobe to abscesses confined to specific areas. Lesions have been found in the cerebral hemispheres, optic lobes, cerebellum and brainstem. The color of the lesions vary from hues of grayish brown or yellowish brown to reddish tan. The brain lesions in chickens are yellowish, while those in turkeys are dark yellow brown to a reddish tan. It appears the brain lesions in turkeys vary in color according to the vascularity of the brain. Granulomatous lesions in the liver and air sacculitis have also been reported.

Microscopically, the affected brain tissues have massive necrosis with many giant cells. In methenamine silver stained sections, mycelial elements are scattered randomly throughout the tissues. The hyphae are smaller in diameter than those of Aspergillus spp. and do not show dichotomous branching. In unstained sections, the mycelia of D. gallopava have a pale yellow

pigment indicating a dematiaceous nature.

Dactylaria gallopava, is neurotropic. Neurological signs and brains lesions have been consistently found in both natural and experimental infections. It grows on Sabouraud dextrose agar at 37 C as a brownish, velvet-like colony that causes the surrounding media to turn a reddish color on fresh media or brown color on older media. It will not grow on mycobiotic agar. Microscopically, the mycelia are yellowish-brown with small, oval, two-celled, dark olive green or brownish spores. The fungus has been found in hot springs in the United States and coal spoils in England. The fungus has been isolated from old sawdust. Sawdust was used as the litter in houses with naturally infected flocks.

Dactylariosis has been reproduced with spore suspensions by inoculating chickens intracerebrally, via the maxillary sinuses, and via the posterior thoracic air sac. Turkey poults have been infected intracerebrally, intranasally, intratracheally and via the thoracic air sacs.

The diagnosis of dactylariosis is made by observing the clinical signs of encephalitis (incoordination, tremoring, torticollis), gross and microscopic lesions, and isolation of the organism.

The disease should be suspected in young birds that show neurological signs ---- especially if sawdust is used as litter.

Differential Diagnosis

Clinical signs of dactylariosis may be confused with aspergillosis, avian encephalomyelitis, avian encephalomalacia, Arizonosis, Newcastle disease, toxicities, mycoplasmosis or possibly salmonellosis.

Probably the most difficult differentiation would be the diagnosis between aspergillosis and dactylariosis.

Characteristic Differences Between Aspergillosis and Dactylariosis in Poultry

	Aspergillosis	Dactylariosis
Agent	<u>Aspergillus fumigatus</u>	<u>Dactylaria gallopava</u>
Avian Species Affected	Many	Reported in Chickens and Turkeys
Signs	Usually Respiratory, also Conjunctivitis and/or CNS	Usually CNS, Can Infect Eyes and Air Sacs
Gross Lesions		
Brain	White to Yellow, Circumscribed	Yellow to Reddish Tan Diffuse
Air Sacs	Small Yellow Plaques to Nodules	Small Yellow Plaques
Lung	Nodules-Pin Head to Size of a Pea	?
Eye	Lacrimation, Yellow Pellet	Lacrimation, Conjunctivitis
Mycelium in Tissues		
	Dichotomous Branching	Random Growth
	Hyphae 2.4 - 4.8u Diameter	Hyphae 1.2 - <2.4u Diameter
Fungus in Nature		
	Ubiquitous	Hot Springs, Coal Spoils, Sawdust

Colony Growth on SAB	Fuzzy, White Changing to a Blue-Green Color	Brown Velvety Surrounded by a reddish color in Fresh Media
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Mycelium	Hyaline	Dematiaceous
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Spores	Spherical, Green, Rough-Surfaced	Oval, two-celled Brown
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Mycotoxin	In Some Strains	Unknown
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Dactylariosis may be misdiagnosed as aspergillosis, especially if culture attempts are not made. An incident has occurred in which a combined infection of aspergillosis and dactylariosis was recognized in a flock of turkey poults.

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Slide Set

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1. Conjunctivitis and swelling of eyes of chicks that were experimentally inoculated with Dactylaria gallopava via the left maxillary sinuses. Similar lesions are found in birds with ocular aspergillosis which may progress to form a yellow caseous plaque or a corneal ulcer.
2. Nodular lesions of aspergillosis involving the air sacs and lung of a 7-week-old turkey poult.
3. Plaques and nodules of aspergillosis in the lungs of a prairie chicken.
4. Plaques and nodules aspergillosis on the thoracic wall and air sacs of a swan.
5. Rounded plaques in an air sac showing the growth of a greenish-blue colony that sometimes is present in aspergillosis.
6. Yellowish, coalescing plaques in the air sacs of a turkey poult experimentally inoculated with D. gallopava.

7. Gross granulomatous liver lesions of dactylariosis in a chicken fourteen days post inoculation. Chick was inoculated with D. gallopava at one-day-old via the left posterior thoracic air sac.
8. Chickens with the clinical signs of dactylariosis. Lateral recumbency, circling and tremors are commonly observed.
9. Neurogenic torticollis in a turkey poult caused by dactylariosis. Similar signs are found in birds with aspergillosis when the brain is invaded.
10. Gross lesions in the frontal lobe of each cerebral hemisphere showing the whitish circumscribed lesions of aspergillosis in a two-week-old leghorn chicken.
11. Gross lesion of the right cerebral hemisphere showing the pale yellow, diffuse lesion of dactylariosis in a turkey poult.
12. Gross lesion of dactylariosis in the left cerebral hemisphere with swelling and pale yellow color.
13. Pale yellowish, granulomatous, circumscribed areas of aspergillosis in the brains of one-week-old broiler chicks.
14. Lesions of dactylariosis in brains of turkey poults five days following air sac inoculations. The brain of the poult at left almost entirely affected, brain in the middle with only one small area affected, and brain to the right showing the diffuse pale yellow discoloration of the right cerebral hemisphere.

15. Circumscribed area of aspergillosis in the brain showing the typical dichotomous branching. Gridley stain X 25.
16. Tissue reaction in the cerebrum of a broiler chick showing massive necrosis with many giant cells caused by D. gallopava. Hematoxylin and eosin stain X 500.
17. Early tissue reaction in cerebrum with a natural infection in broiler chicks caused by D. gallopava. Mycelium phagocytized by giant cells. H & F combined with methenamine silver stain. X 500.
18. Brain section from a two-week-old turkey poult with a natural infection caused by Aspergillus fumigatus. Branched mycelial elements are present at the periphery of a localized lesion. Methenamine silver stain. X 125.
19. Brain section from a two-week-old chicken with a natural infection caused by D. gallopava. Mycelial elements randomly present throughout the cortical tissue. Methenamine silver stain. X 500.
20. Brain section from a two-week-old turkey poult with natural infection of aspergillosis showing the dichotomous branching. Methenamine silver stain. X 500.
21. Growth of colony of A. fumigatus on Sabouraud dextrose agar in a petri dish.
22. Growth of colony of D. gallopava on Sabouraud dextrose agar in a petri dish.
23. Characteristic conidiophore of A. fumigatus. X 300.
24. Mycelium and characteristic spores of D. gallopava. X 500.

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