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NOCARDIOSIS
In A Dog

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In the last decade considerable attention has been focused on fungous granulomatous diseases of domesticated animals. It is not only the economic and death losses caused by these fungous diseases that have aroused the livestock owner and veterinarian but of greater significance is the interest stimulated in these organisms as a public health hazard.

It is obvious from a survey of the recent literature on the granulomatous diseases that education, investigative studies, and the development of newer diagnostic tools have resulted in more frequent recognition of these diseases. This does not necessarily mean a greater incidence of infectious granulomatous diseases.

Nocardia asteroides was not reported in domesticated animals until Balozet and Pernot recovered it from a dog in 1936 (2). The first canine case of nocardiosis in the United States confirmed by cultural examination was reported by Bohl et al from Ohio in 1953 (5). Since that time other cases of nocardiosis in dogs have been reported from other areas of the United States (2,7,8,9,10).

In an effort to emphasize the importance of establishing a definite diagnosis in all animals that succumb to a granulomatous disease the following case is recorded.

CLINICAL FINDINGS

In October of 1956 a five month old German Shepherd female was admitted to the Iowa State College Veterinary Clinic with a history of having had distemper and losing weight over a period of several days. Catarrhal conjunctivitis, temperature of 103.0 degrees F., mild diarrhea, and dyspnea were noted. A leucocyte count of 35,800 per cubic millimeter was found. Radiographic examination of the thoracic cavity revealed an unidentifiable mass in the ventral part of the thorax which obscured the heart shadow and displaced the lungs dorsally and posteriorly.

PATHOLOGICAL FINDINGS

Three days after admittance the dog died. Necropsy examination revealed hemothorax, hemorrhagic pleuritis with granulomatous villose like proliferations mediastinal parietal pleura thickened three to four times, atelectasis of ventral lobes of the lungs, granulomatous pneumonia, and bronchial lymph nodes enlarged 10 to 12 times. Histopathologic examination of the affected tissues showed a purulent granulomatous inflammation. Hematoxylin-eosin, Gram's, Giemsa's,
and Gomori's methenamine-silver nitrate stains of tissue sections revealed typical hyphae of *Nocardia asteroides* as beaded, interlacing, and irregular branching structures (Fig. 1).

![Fig. 1. Gram stain of tissue section of bronchial lymph node. Note the beaded, interlacing, and irregular branching hyphae.](image)

**CULTURAL FINDINGS**

The genus Nocardia is a member of the family Actinomycetaceae which are filamentous fungus-like organisms characterized by branched non-septated hyphae during the early stages of growth and later fragmentation into coccoid and bacillar bodies. They are Gram positive and most forms do not produce any aerial hyphae (6).

The members of the genus Nocardia are distinguished from the Actinomyces by their obligate aerobic requirements and their weak ability to take an acid-fast stain. Pigments are produced by the mycelia and are of some taxonomic significance (6).

Smears made from the bronchial lymph nodes and the granulomatous lesions in the lungs revealed a fine, branched, Gram-positive, filamentous organism. No acid-fastness could be demonstrated with the Ziehl-Neelsen stain. Sabouraud's dextrose agar, glycerin infusion agar and blood agar were streaked from various points in the lungs and lymph nodes. Barely perceptible pinpoint colonies were observed on all three media after 24 hours incubation at 37 degrees C. under aerobic conditions. Smears from the media stained with Gram's stain and methylene blue stain showed the same fine, branched filamentous organism observed on direct smears from the tissue. The organism was obtained in pure culture.

At 48 hours the hyphae appeared to have segmented, but their general outline was still discernible. By 72 hours the segmentation spores had separated so that pleomorphic coccoid and cocccobacillary forms were observable.

In a week the mycelia had reached the peak of growth and were abundant, mealy and much-folded (Fig. 2). An orange-buff pigment was produced after 2 weeks incubation. Pigmentation appeared in a shorter period of time on subculture.

Abundant growth and pellicle formation occurred in both litmus milk and gelatin. No changes were produced in either media. Growth from the litmus milk was weakly acid-fast.

On the basis of the above information, a diagnosis of nocardiosis was made and a subculture was submitted to the Mycology Unit of the Communicable Disease Center at Chamblee, Georgia. The identification of *Nocardia asteroides* was confirmed on the basis of its acid-fastness in litmus milk, its inability to produce aerial spores and its pathogenicity for guinea pigs (1).

*N. asteroides* is pathogenic for the rabbit and guinea pig, but not for mice (6, 11).

**DISCUSSION**

Nocardiosis has been reported in the dog, cat, and man and probably other mammals are susceptible. The distribu-
Fig. 2. Mealy, folded growth of Nocardia asteroides on Glycerin Infusion Agar (1) and Egg Medium (2).

1. The mode of entrance of the organism into the body has not been established (11). The respiratory and alimentary tracts, and minute breaks in the skin and mucous membranes have been suggested as sites of entry (12).

*Nocardia asteroides* has a notable predilection for the lungs and the central nervous system. Cutaneous and subcutaneous tissues are frequently involved. Furthermore, nocardiosis may affect other tissues of the body.

A tentative diagnosis of nocardiosis can be made on the finding of characteristic gross and microscopic lesions. Stained tissue sections reveal interlacing, irregular, and beaded hyphae in areas of liquefaction necrosis typical of Nocardia. Hemorrhagic pleuritis with villose-like proliferations and hemothorax are very suggestive lesions of nocardiosis. However, a definite diagnosis of nocardiosis can only be made by the isolation and identification of *Nocardia asteroides*.

It is important to distinguish between the anaerobic Actinomyces and the aerobic *N. asteroides* because of the great difference in therapy of the skin and subcutaneous lesions caused by these two organisms. Surgical drainage and intensive sulfonamide therapy is the treatment of choice in this type of nocardiosis (3).

The writers emphasize that in every case of granulomatous diseases of animals a concerted effort should be made for a definite diagnosis. Furthermore, the handling and disposal of infected tissues must be made with the utmost care, because of the dangerous and insidious nature of these disease processes in man.

**SUMMARY**

1. A canine case of nocardiosis has been presented with histopathological and cultural findings.
2. The differential diagnosis of nocardiosis is emphasized, because of the difference between the therapy of skin and subcutaneous forms of nocardiosis and actinomycosis.

**BIBLIOGRAPHY**

Histopathological changes were aplasia of the bone marrow and varying degrees of epithelial damage to the mucosa of the small intestine. The workers did not find inclusion bodies in epithelial cells of small intestine to be a consistent characteristic of the disease. No inclusions were found in cells of lymphoid tissue.


SOME EFFECTS OF IONIZING RADIATIONS ON ANIMALS. The effects of ionizing radiations are the same on all animals. The median lethal dose for most domestic animals is about 500 roentgens in a single exposure. Doses much greater will produce death in a matter of a day due to disturbances of electrolytes and water in the body.

The radiation syndrome involves three phases. The first is a gastrointestinal upset. The second is a progressive fall in the leucocyte count and the third is the damage done to radiosensitive tissue. The most important damaged tissue is the hematopoietic tissue. Damage is also noted in the germinal epithelium, lens of the eye, and the skin.

Causes of death are secondary bacterial infection from damage to the protective mechanism of the body and hemorrhage into the tissues.

Fall-out contaminating food and water constitute another hazard of internal exposure as well as external. Of fission products entering the body, strontium and iodine are considered the most critical because both are secreted in the milk and are a hazard to man.

Adams, E. W. Some effects of ionizing radiations on animals. The Tuskegee Veterinarian. 1:14-17 (Nov. 1956).

The cardinal rule in teaching behavior to a dog, whether it is merely puppy house training, the training of a bird dog or advanced police work, is to make sure that the dog understands what is wanted of him.