Nasal Nocardiosis in a Calf

Kimimasa TAKAHASHI, Noriko TODA, Norihide KAKICHI1, Takuo SAWADA2, Toshinori SAKO3, Hidekazu KOYAMA3, Naoyuki TAKEMURA3, Shinichi KAMATA3 and Masahiro SUGIYAMA

Departments of Veterinary Pathology, 1) Hygiene, 2) Microbiology, and 3) Internal Medicine, Nippon Veterinary and Animal Science University, 1–7–1, Kyonan-cho, Musashino, Tokyo 180–8062, Japan

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ABSTRACT.  Nasal nocardiosis was found in a female Japanese Black calf, 11 months of age.  Macroscopically, the posterior half of the left nasal passage was completely obstructed by yellowish brown caseous substance and the mucosa was irregularly thickened.  In the brain, a few soft brown foci were present in the olfactory bulb and frontal lobe.  Microscopically, there were closely packed granulomas in the nasal cavity and brain.  The lesions were characterized by a center of cellular debris surrounded by epithelioid macrophages, neutrophils, lymphocytes and multinucleated giant cells of the Langhans type.  Special stains revealed the presence of a large number of filamentous branching gram-positive, partially acid-fast organisms in these epithelioid cells and giant cells, and in cellular debris.—KEY WORDS: calf, nasal cavity, nocardiosis.

Nocardiosis is a disease caused by aerobic, gram-positive, partially acid-fast, branching actinomycetes which are normally soil inhabitants and are saprophytes on decaying vegetation.  The bacteria cause suppurative and pyogranulomatous reactions in immunosuppressed hosts or vegetation.  The bacteria cause suppurative and pyogranulomatous reactions in immunosuppressed hosts or vegetation.

N. asteroides accounts for the majority of nocardial infections in animals.  Nocardiosis, which is characterized by localized cutaneous granulomatous abscesses and/or pyothorax and granulomas in the thoracic cavity, is most frequently seen in dogs and cats [4].  Nocardiosis is less common in other species, but occasionally causes pneumonia or some extrapulmonary lesions in nonhuman primates [6, 8, 10], horses [1] and marine mammals [11], and abortion and pneumonia in swine [5, 7].

In cattle, nocardial infection results in chronic granulomatous mastitis [9], and rarely is associated with abortion [12].  So far, however, no nasal lesion due to nocardial infection has been described.

A female Japanese Black calf, 11 months of age, exhibited purulent nasal discharge, snuffling respirations and loss of appetite together with mild fever almost for 3 months.  At the later stage a veterinarian was aware that the left nasal passage was badly obstructed by a space-occupying soft mass.  Despite repeated administration of antibiotics after the onset of the symptoms, the condition did not improve.  Eventually, the animal was exsanguinated via the left common carotid artery and subjected to necropsy.

At necropsy, complete obstruction of the posterior half of the left nasal passage by lots of yellowish brown caseous substance made it difficult to recognize the contour of the turbinates (Fig. 1).  The nasal septum was pressed by the caseous contents and curved toward the opposite side.  The contents were so fragile that they got out of shape when transverse sections of the nose were made.  The remaining nasal mucosa of the left side was irregularly thickened and covered with suppurative discharge.  On the other hand, there were no apparent changes in the opposite nasal cavity except for mild storage of cloudy viscous liquid.  In the brain, a few small soft brown foci were present in the olfactory bulb and frontal lobe.  No gross lesions were recognized in the trachea and lung, although the retropharyngeal lymph nodes were moderately enlarged.

The nasal cavities were sectioned transversely at the 3 different levels of the vestibulum, 2nd and 5th molar tooth.  Several tissue samples were taken from each nasal section, fixed in 10% neutral buffered formalin and decalcified in an equal mixture of 10% neutral buffered formalin and 10% formic acid.  Tissue samples from the lungs, liver, kidneys, proventriculus, abomasum, intestine, pancreas, adrenal gland, thyroid, bone marrow, spleen, lymph nodes, brain, and spinal cord were also fixed in 10% neutral buffered formalin.  Following fixation, the tissues were embedded in paraffin wax, sectioned at 5 µm, and stained with hematoxylin and eosin (HE) for microscopic observation.  Additional serial sections of the nasal tissues were also stained with Gram’s method for bacteria, Gomori’s methenamine silver for fungi and Wade-Fite-Matsumoto’s method for acid-fast bacteria.  Histologically, closely packed granulomatous lesions were found in the nasal mucosa of the ventral meatus, turbinates and septum throughout the left nasal passage (Fig. 2).  The lesions occupied a large area of the lamina propria, and they destroyed part of the adjacent compact or cancellous bones.  Typical granulomas were characterized by a center of cellular necrosis surrounded by epithelioid macrophages, neutrophils, and lymphocytes, frequently with multinucleated giant cells of the Langhans type along with thin fibrous connective tissue at the periphery (Fig. 3).  In the lesions close to the mucosal surface, partially disrupted granulomas were often noted.  The lesions in the olfactory bulbus and frontal lobe consisted of a few granulomas similar to those seen in the nasal mucosa.  Short to long branching, filamentous organisms, 0.8–1.0 mm in diameter, were observed within central necrotic foci and within many epithelioid macrophages and multinucleated giant cells of the Langhans type in the lesions of the nasal mucosa and brain under methenamine silver stain (Fig. 4).  The organisms were gram-positive and
partially acid-fast. Some were fine, thin, straight rods, and others were slightly longer and curved or bent with or without enlargement of one end. A diagnosis of nocardiosis was made on the basis of the morphological and staining characteristics of the organism and histological features. In the retropharyngeal lymph nodes, an increase in the number of lymphocytes in the paracortical area was evident, but no granulomatous lesions were found. Other microscopic lesions included intestinal catarrh, interstitial nephritis and ischemic necrosis in the gluteal muscle.

*Corynebacterium* sp., *Candida* sp. and glucose-nonfermentative rods were isolated from samples of the nasal mucosa. Unfortunately no attempt was made to isolate *Nocardia* sp. from any of the samples.

Granulomatous lesions in the mucosa of bovine nasal cavity may be induced by the following four causes: bacterial, mycotic, parasitic and allergic [2]. *Actinobacillus lignieresii* causes granulomatous inflammation not only of the oral tissues, but also of the nasal cavity in cattle. Microscopically, the lesions have “club-shaped structures” enclosing gram-negative bacilli which are surrounded by a collection of granulocytes, macrophages, epithelioid cells, and multinucleated giant cells of the Langhans type (arrows), neutrophils, and lymphocytes aggregating around a necrotic center (N). HE. × 400.

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Fig. 1. Cross section of the nasal cavity made at level of the second to third molar teeth. Nasal meatus of the left side is completely obstructed by purulent caseous contents. × 2.5.

Fig. 2. A typical granuloma showing central necrosis (N) in the submucosa. HE. × 65.

Fig. 3. Higher magnification of the granuloma of Fig. 2. Epithelioid cells, multinucleated giant cells of the Langhans type (arrows), neutrophils, and lymphocytes aggregating around a necrotic center (N). HE. × 400.

Fig. 4. Filamentous branching organisms in a necrotic area. Gomori’s methenamine silver. × 900.

Since filamentous branching organisms could be demonstrated in all granulomatous lesions of the nasal cavity
and brain, it is evident that they are causative of the present disease. It seems likely that the cerebral lesions resulted from a spread of the organisms through the ethmoid. This case is readily distinguishable from the above mentioned diseases based on the histology of the lesions and morphology of the causative organisms. The morphology and staining property of the organisms corresponded with those of the genus *Nocardia*, although their strain was not specified. The bacteria and fungi isolated from the intranasal substance seem to be normal inhabitants of the oral or nasal cavity, and not to be pathogens in the present granulomatous lesions. No histologic changes suggestive of immunosuppression were observed in this case.

REFERENCES