

Actinomyces viscosus Isolation from the Skin of a Cat

Koenhemi, L.,^{1*} Sigirci, B.D.,² Bayrakal, A.,¹ Metiner, K.,² Gonul, R.,¹ and Ozgur, N.Y.²

¹ Istanbul University, Faculty of Veterinary Medicine, Department of Internal Medicine, Avcilar-Istanbul, 34320, Turkey.

² Istanbul University, Faculty of Veterinary Medicine, Department of Microbiology, Avcilar-Istanbul, 34320, Turkey.

* **Corresponding Author:** Dr. Lora Koenhemi, Istanbul University, Faculty of Veterinary Medicine, Department of Internal Medicine, Avcilar-Istanbul, Turkey 34320. Tel: +902124737070/17090, Email: lomekoh@istanbul.edu.tr

ABSTRACT

Actinomyces is an aerobic or microaerobic, Gram-positive, non-acid fast, filamentous, diphtheroidal rod or coccobacillus-shaped bacteria. Actinomycosis is seen mostly as a dental disease of cattle, however it also occurs in other animal species such as dogs, cats, cows, goats and horses. This report describes a 1 year-old, female, mixed-breed, indoor cat which developed a purulent exudate around the interdigital area for 6 months. Despite various antibacterial treatments the skin lesions of the cat deteriorated. Anamnesis revealed that cat did not show any sign of pruritis however was eating a special diet for dermatologic disorders. The only sign on physical examination was a purulent exudate seen in the interdigital area. Hematological and biochemical profiles were within normal limits. Skin scrapes were negative for parasites and fungi. From the wound swab, *Actinomyces viscosus* was identified. According to the antibiotic susceptibility test, the isolate was susceptible to amoxicillin and amoxicillin/clavulanic acid. The cat received amoxicillin/clavulanic acid (8.75 mg/kg BID, IM) for a week. After the treatment, there was no discharge around the interdigital area. This case is of interest since *Actinomyces viscosus* has been rarely encountered in the skin of cats. Veterinarians should include *A. viscosus* in the differential diagnosis in case with dermal purulent discharge.

Keywords: *Actinomyces viscosus*; Cat; Feline; Dermatology.

INTRODUCTION

The genus *Actinomyces* comprises aerobic or microaerobic, Gram-positive, non-acid fast, filamentous, diphtheroidal rod or coccobacillus-shaped organisms. Gross *et al.* (1) described actinomycosis from contaminated penetrating wounds, such as grass awns, quills, cactus spines, and other foreign bodies. Classically, actinomycosis is a disease of cattle, but it also occurs in other animal species including dogs, cats, cows, goats, horses and in humans (2). Infection may become pathologic due to the creation of suitable environment that is conducive to the replication of previously existent commensal organisms, penetrating foreign body or those introduced into the wound secondarily to grooming (1), poor oral hygiene, dental/periodontal disease, trauma and following oral surgical procedures (3).

Foil (4) described actinomycosis of the skin and underlying connective tissue, bone associated with puncture wounds especially bite wounds, migrating plant foreign bodies, or rarely severe periodontal disease with osteomyelitis. Routes of dissemination of the infection are lymphatic and hematogenous (2).

The causative organisms include a number of species of *Actinomyces*, most frequently *Actinomyces viscosus* that are normal inhabitants of the oral cavity of cats and dogs (4). The agent which causes pyogranulomatose infections have been identified as a pathogen in pets since 1972 (5).

Thoracic (6), intra-abdominal (7), intraperitoneal (8), and cutaneous or subcutaneous forms (9-11) have been reported. Rarely pathogenic agents have been isolated from central nervous system, lacrimal duct, prostate, mammary gland,

ovary, liver, kidney, bladder, joints, skin and bone as well as endocardium and pericardium (12). The most common clinical features of cutaneous and subcutaneous actinomycosis which is uncommon in cats and dogs include abscess formation, cellulitis, draining fistulous tracts, and ulcerated dermal and subcutaneous nodules. There are characteristic sulfur granules in draining sinuses. The most common form of disease is seen in the head, neck, thorax, abdomen and distal parts in dogs, distal extremities and abdomen in cats (1). It has been reported that canine interdigital actinomycosis is especially likely to result from foxtail foreign body (*Hordeum murinum*) penetration or introduced into a wound by grooming (13). Free roaming cats are more often affected simply because they have access to the fields where *Hordeum* spp. is abundant.

This report is to the best knowledge of the authors the first report to describe an interdigital actinomycosis caused by *Actinomyces viscosus* in the skin of a cat.

CASE REPORT

A 1 year-old, female, mixed, indoor cat presented to our clinics with a 6 month history of a purulent exudation around the interdigital area in the left hind leg. According to the anamnesis this was the only dermatological problem in this cat. Anamnesis revealed that referring veterinarian gave cat the a special diet for this lesion. Despite different antibacterial treatments the skin lesions continued to deteriorate. On physical examination only a purulent exudation was seen in interdigital area. Hematological and biochemical profiles were within normal limits. Skin scrapes for parasitological examination revealed negative results.

A swab of the wound was inoculated in Nutrient Agar containing 7% sheep blood and Nutrient Broth containing horse serum and incubated microaerobically at 37°C for 48 hours. Gram staining was performed from the cultures and conventional bacteriological methods were used for the identification (14). The antibiotic susceptibility pattern of the isolate was investigated by use of Kirby-Bauer disc diffusion method according to National Committee for Clinical Laboratory Standards (15). For this purpose, antibiotic discs comprising amoxicillin (25 µg), amoxicillin/clavulanic acid (20 µg), cefoperazone (75 µg), ceftriaxone (30 µg), chloramphenicol (30 µg), ciprofloxacin (5 µg), enrofloxacin (5 µg), erythromycin (15 µg), gentamicin (10 µg), linkomycin (10

µg), neomisin (30 µg), penicillin G (10 units), ampicillin/sulbactam (10 µg), tetracycline (30 µg) (Oxoid, Hampshire, England) were used.

Plucked hairs and scraped scales were examined for fungal elements by direct microscopy in 10% potassium hydroxide and were inoculated on Sabouraud Dextrose Agar (SDA) with chloramphenicol and actidione and Dermatophyte Test Medium (DTM). The plates were incubated at 25°C for 3 weeks (16).

β-hemolytic, small and smooth colonies were observed as pure cultures on the blood agar plates after 24 hours of incubations. Gram staining of the colonies revealed Gram positive coccobacilli. The isolate according to biochemical properties was identified as *Actinomyces viscosus* (Table 1). The examination of plucked hairs and scraped scales for fungal elements was negative. At the end of the incubation period fungal growth was not observed.

According to antibiotic susceptibility tests, the isolate was susceptible to amoxicillin and amoxicillin/clavulanic acid (Table 2), which it received at 8.75 mg/kg BID IM, for a week. According to the owner, the patient's condition seemed

Table 1: Biochemical properties of the isolate

Gram staining	Gram positive	Gram staining	Gram positive
Oxidase	-	Arabinose	-
Catalase	+	Dulcitol	-
Motility	-	Fructose	+
O-F test Reaction	Oxidative	Galactose	+
	Fermentative	Glucose	+
	Unreactive	Inositol	-
Hemolysis	-	Inulin	-
Methyl Red	+	Xylose	-
Indol	-	Lactose	+
Nitrate	+	Maltose	+
Citrate	-	Mannitole	-
Urease	-	Mannose	+
Lysin oxidation	+	Mellibiose	+
Arginin oxidation	-	Rafinose	+
Ornithin oxidation	+	Rhamnose	-
Gelatinase	-	Ribose	-
Phenylalanine	-	Salicin	-
Growth on 6,5%NaCl	-	Sellobiose	-
CAMP	-	Sorbitole	-
Malonate	-	Sorbose	-
Esculin	+	Sucrose	+
Acid from Adonitol	-	Trehalose	-

- : Negative, +: Positive

to improve within the next few days. A week later there was no discharge in the interdigital area of the cat.

Table 2: Antibiotic susceptibilities of the isolates

Antimicrobial agent	S	I	R
Amoxicillin (25 µg)	S		
Amoxicillin/Clavulanic acid (30 µg)	S		
Ampicillin/Sulbactam (20 µg)	S		
Cefoperazone (75 µg)			R
Ceftriaxone (30 µg)			R
Chloramphenicol (30 µg)			R
Ciprofloxacin (5 µg)			R
Enrofloxacin (5 µg)			R
Erythromycin (15 µg)			R
Gentamycin (10 µg)			R
Linkomycin (2 µg)			R
Neomycin (30 µg)			R
Penicillin (10 units)			R
Tetracycline (30 µg)			R

S: Susceptible; I: Intermediate susceptible; R: Resistant

DISCUSSION

The most common locations of actinomycosis are neck, abdomen, thorax, and other areas such as mandible, endocardium. Also rare features of *A. viscosus* can be isolated from central nervous system, prostate, ovary, liver, kidney, bladder, joints, skin, bone, endocardium, and pericardium in human being (12). Bestetti *et al.* (9) isolated *A. viscosus* from the inflammatory tissues of a 3 year old female domestic cat which had a suppurative granulomatous lesion of the tail and sacral area which penetrated into the epidural space, causing paraplegia. The present case report is to the best knowledge of the authors the first case describing *A. viscosus* isolated from interdigital area of a cat.

Murakami *et al.* (10) have identified *A. viscosus* from the left inframandibular region of a male 4 year-old cat. The organisms in the abscess stained positive by the Gram's and was identified by the immunoperoxidase method. On the physical examination there was no wound on the surface of the skin abscess. Therefore they reported that the infection was probably endogenous occurring as a result of a previously reported stomatitis.

Isolation of *A. viscosus* rare in cats and dogs with an increased incidence in hunter dogs (17). Kirpenstejin *et al.* (2) isolated *Actinomyces* spp. from cutaneous lesions in 27 (60%) dogs out of 45 dogs. Of the 27 *Actinomyces* spp., *A. viscosus*

was isolated in 11 (41%) of dogs. Also the authors reported that skin wounds and tissue injuries probably resulted in a suitable environment for bacterial reproduction.

In present case, interdigital actinomycosis developed in a cat. Although we did not find any evidence on clinical examination we hypothesized that a foreign body might have resulted in the purulent exudation. Because of the meticulous nature of cats there is a reduced possibility for penetration of thorny plants and therefore clinically thorny plant wounds are rarely seen. The findings in this case should prompt clinicians to consider different kinds of bacteria such as *Actinomyces viscosus* as the differential diagnosis of skin diseases in cats with purulent exudate.

CONFLICT OF INTERESTS

No conflicts of interest have been declared. This case report was presented at the 10th National Internal Medicine Congress, Kapadokya, Turkey

REFERENCES

- Gross, T.L., Ihrke, P.J., Walder, E.S. and Affolter, V.K.: Skin diseases of the dog and cat: clinical and histopathologic diagnosis. Blackwell Science Limited, UK. pp 272-275, 2005.
- Kirpenstejin, J. and Fingland, R.B.: Cutaneous actinomycosis and nocardiosis in dogs: 48 cases (1980-1990). JAVMA. 201:917-920, 1992.
- Actinomycosis 2011 Available at: <http://www.gopetsamerica.com/dog-health/actinomycosis.aspx>. Accessed June 2012.
- Foil, C.S.: Nodules, ulcers and draining tracts in the cat differential diagnosis and clinical features of important causes. In: II Congresso Internacional de medicina Felina, Rio de Janeiro, 14-17 July 2001.
- Georg, L.K., Brown, J.M., Baker, H.J. and Cassell, G.H.: *Actinomyces viscosus* as an agent of actinomycosis in the dog. AVJR. 33:1457-1470, 1972.
- Davenport, A.A., Carter, G.R. and Patterson, M.J.: Identification of *Actinomyces viscosus* from canine infections. J Clin. Microbiol. 1:75-78, 1975.
- Sharman, M.J., Goh, C.S., Kuipers von Lande, R.G. and Hodgson, J.L.: Intra-abdominal actinomycetoma in a cat. J. Fel. Med. Surg. 11:701-705; 2009.
- Kawamura, N., Shimada, A., Morita, T., Murakami, S., Azuma, R., Fujiwara, M. and Fujiwara, A.: Intraperitoneal actinomycosis in a cat. Vet. Rec. 157:593-594, 2005.
- Bestetti, G., Bühlmann, V., Nicolet, J. and Fankhauser, R.: Paraplegia due to *Actinomyces viscosus* infection in a cat. Acta Neuropathologica. 39:231-235, 1977.
- Murakami, S., Yamanishi, M.W. and Azuma, R.: Lymph node abscess due to *Actinomyces viscosus* in a cat. J. Vet. Med. Sci. 59:1079-1080, 1997.

11. Koutinas, C.K., Papazoglou, L.G., Saridomichelakis, M.N., Koutinas, A.F. and Patsikas, M.N.: Caudal mediastinal abscess due to a grass awn (*Hordeums* spp.) in a cat. *J. Fel. Med. Surg.* 5:43-46, 2003.
12. Zylber, L.J. and Jordan, H.V.: Development of a selective medium for detection and enumeration of *Actinomyces viscosus* and *Actinomyces naeslundii* in dental plaque. *J. Clin. Microbiol.* 15:253-259, 1982.
13. Brennan, K.E. and Ihrke, P.J.: Grass awn migration in dogs and cats: a retrospective study of 182 cases. *J. Am. Vet. Med. Assoc.* 182:1201-1204, 1983.
14. Quinn, P.J., Carter, M.E., Markey, B.K. and Carter, G.R.: *Clinical Veterinary Microbiology*. Harcourt Publishers Limited, 1999.
15. Clinical and Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing; Sixteenth Informational Supplement. CLSI document M100-S16 [ISBN 1-56238-588-7]. Clinical and Laboratory Standards Institute, Pennsylvania USA 2006
16. De Hoog, G.S., Guarro, J., Gené, J. and Figueras, M.J. (eds): *Atlas of Clinical Fungi*, 2nd ed. Utrecht, The Netherlands and University Rovirai Virgili, Reus, Spain: Centraal bureau voor Schimmelcultures, pp:39-42, 2000.
17. Medleau, L. and Hnilica, K.A.: *Small animal dermatology: A color atlas and therapeutic guide*, Saunders Elsevier, p. 50-51, 2006.

CORRECTION

In error, in an article published in Volume 69 (1), 2014, entitled: "Heart Base Abscess Caused by *Prevotella oralis* in a Dog", one of the authors was omitted. Dr. Emmanuel Loeb's name has now been added with details of his affiliation.

The name of the article and the list of authors now reads:

Heart Base Abscess Caused by *Prevotella oralis* in a Dog

Joseph, R.,¹ Ohad, D.,² Dank, G.,³ Blum, S.,⁴ Loeb, E.⁵ and Milgram, J.¹

¹ Hebrew University Jerusalem, Koret School of Veterinary Medicine, Department of Surgery, Jerusalem 91905, Israel.

² Hebrew University Jerusalem, Koret School of Veterinary Medicine, Department of Cardiology, Jerusalem 91905, Israel.

³ Hebrew University Jerusalem, Koret School of Veterinary Medicine, Department of Oncology, Jerusalem 91905, Israel.

⁴ Kimron Veterinary Institute, Department of Veterinary Bacteriology, Beit Dagan 50250, Israel.

⁵ Kimron Veterinary Institute, Department of Veterinary Pathology, Beit Dagan 50250, Israel.