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Case Report

CHLAMYDOPHILA FELIS INFECTION IN CATS – CLINICAL CASES

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Summary: Cats, infected with *Chlamydophila* felis, formerly known as *Chlamydia psittaci*, can present many different clinical signs.

The study included eleven domestic shorthaired cats presented at our clinic between 2003 and 2005. The physical examination and hematology was performed in all patients, thoracic radiographs in two cats and FeLV/ FIV test was performed in 5 of 11 cats. Clearview Chlamydia MF test (11/11) and Chlamydia Direct IF test (5/11) were performed in oropharyngeal swabs. Specific antibodies against *Cp. felis* were determined in serum or plasma of 5 cats using indirect immunofluorescence test.

Most of them (9/11) were presented with mild clinical signs (conjunctivitis (4/11), acute nasal discharge (3/11), intermittent chronic recurrent nasal discharge (3/11), coughing (2/11)) and without any changes in hematology. Two cats were presented with acute and severe clinical signs of lower respiratory tract involvement and systemic signs of infection, marked changes on thoracic radiographs and elevated WBC count.

Based on our study we conclude, that *Chlamydia sp.* can be considered primary or secondary pathogen, which can potentially cause severe signs of respiratory tract infection in cats, especially in younger animals. The infection in cats could be successfully treated using doxycycline.

The results using different laboratory tests confirmed the possible infection with *Cp. felis.* It is not excluded that possible cross-reaction between different chlamydial antigen can occur.

Key words: Chlamydia infections - diagnosis; pathology, clinical; serodiagnosis – methods; cats

Introduction

Chlamydophila felis (*Cp. felis*), formerly known as Chlamydia psittaci, is one of the most important etiologic factors of feline conjunctivitis. *Cp. felis* is an obligate intracytoplasmic parasite, a coccoid bacterium with a rigid lipid-containing cell wall, which is similar in structure and content to the wall of gram-negative bacteria. *Cp. felis* contains nuclear DNA and RNA but cannot replicate and survive autonomously in the environment (1).

The cycle of *Cp. felis* is specific, with intracellular and extracellular phases producing unique forms of the organism: elementary bodies, initial bodies and reticulate bodies. Elementary bodies, which are supposed to be the infectious form, are released from ruptured infected cells and can survive in the environment for up to one week at room temperature. Elementary body enters a new host cell by endocytosis and forms a membrane-bound phagosome, where it forms initial body, a specialized reproductive noninfective form of the organism. Initial bodies undergo intracellular division by means of budding and double fission, followed by a period of rapid growth and finally form a reticulate body. A reticulate body is a large, metabolically active membrane bound population of initial bodies, which are differentiating and maturing towards infective elementary bodies, which are released from the host cell (1, 2).

Cp. felis may persist on conjunctival and upper respiratory epithelium as resident flora. Transmis-

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sion from one cat to another is usually by direct contact and with infective occular secretion (1).

Cats, infected with *Cp. felis*, can present many different clinical signs, such as conjunctivitis, nasal discharge, and other signs of upper respiratory tract disease. Clinical signs are influenced by the age of the cat, immunocompetence, the tissue inoculated and the volume of the inoculum (1, 2, 3).

When conjunctivitis occurs, the signs are profuse serous ocular discharge with chemosis, hyperemia of the palpebral conjunctiva, and blepharospasm. One or both eyes can be affected. In case of unilateral conjunctivitis, spread of clinical signs to the unaffected eye can be expected within 5-21 days. If occular discharge starts to change its character than we can suspect that other resident and transient opportunistic bacterial organisms may be present in conjunctiva (1, 4).

Signs of respiratory tract disease are much less common. They include intermittent recurrent nasal discharge, sneezing, coughing and in severe cases possible lower respiratory tract involvement can be expected (1, 2). These signs are usually present in young cats in the age between 5 weeks to 9 months (5).

Diagnosis of *Cp. felis* infection can be performed using different diagnostic procedures, based on either isolation of the infectious organism, amplification of chlamydial DNA by polymerase chain reaction (PCR), or detection of anti-chlamydial antibodies by immunofluorescence Assay and enzime-linked immunosorbent assay (ELISA). The PCR showed to be the most sensitive assessment, even more than isolation itself. Serology was of limited use in predicting which cats were infected (3, 6, 7).

Material and methods

The study included eleven domestic shorthaired cats from nine different owners presented on our clinic between 2003 and 2005. They are in-and outdoor living cats of different age and of both sexes.

Physical examination and hematology

In all eleven patients physical examination was performed. Blood for CBC and white blood cell differential count was taken from vena jugularis. Blood tests were performed using the automated laser hematology analyser (Technicon H*1, Bayer, Germany) with species-specific software (H*1 Multi-Species V30 Software).

Other diagnostic procedures

In two cats with severe systemic disease and signs of lower respiratory tract disease thoracic radiographs were performed.

Detection of feline leukemia virus antigen and antibodies against feline immunodeficiency virus was performed in 5 of 11 cats using rapid ELISA test (Feline Leukemia Virus Antigen/Feline Immunodeficiency Virus Antibody Test Kit®, IDEXX, Westbrook, Maine, USA). The test is used for the simultaneous detection of feline leukemia virus (FeLV) antigen and antibodies to feline immunodeficiency virus (FIV) in serum, plasma or whole blood.

Diagnosis of chlamydial infection

1. Detection of chlamydiae antigen.

Clearview Chlamydia MF test (Clearview Chlamydia MF, Unipath Limited® Bedford, United Kingdom) was performed in oropharyngeal swabs of all eleven cats. This test is a rapid immunoassay for the direct genus specific qualitative detection of *Chlamydia trachomatis* (*C. trachomatis*) antigen.

Chlamydia Direct IF test (Chlamydia Direct IF, Biomerieux® Lyon, France) was performed on oropharyngeal swabs of five cats. It enables detection of *Chlamydia* antigen using two different monoclonal antibodies, one directed against the antigen of the genus *Chlamydia*, and the other against the species *C. trachomatis*.

2. Detection of antibodies against *Chlamydophila felis.*

Specific antibodies against Cp. felis were determined in serum or plasma of 5 cats using indirect immunofluorescence test (Feline Chlamydia IgG IFA KIT, Fuller Laboratories® Fullerton, CA USA). This test provides detection and quantitative determination of IgG class antibodies against *Cp. felis*. Titer 1: 40 was considered as a margin titer.

Treatment

All patients were treated with doxycycline per oral or with inhalation of the drugs.

Results

Four of eleven patients were younger cats (6 to 12 months old) and seven of them were older (from 2 to 13 years old), five female and six male. Six cats

Table 1: Clinical signs, age and test results for cats infected with chlamydial infection

Patient			Diagnostic test - Chlamydia			Other tests	Outcome (in months)	
Nr.	Clinical signs	Age/Sex	ORLs[1]	ORLs[2]	Serum[3]	FeLV/FIV	Follow up	Without clinical signs
1	Dyspnea	6 m /F	Pos	Pos	1: 320	-20	12	12
*2	Sneezing and coughing	1 y / M	Pos	Pos	ND	ND	12	10
*3	Coughing 1 month, febrile	6 m /F	Pos	Pos	1:320	-20	12	10
**4	Occasional sneezing and coughing, inapetence	2 y / M	Pos	ND	Neg	-20	12	12
**5	Intermittent recurrent nasal discharge for2-3 years	6 y/ M	Pos	Pos	1:160	Neg/Neg	12	12
6	Inapetence, vomiting, occasional coughing	2 y / M	Pos	ND	ND	ND	4	4
7	Coughing 1 week, sneezing	6 y / M	Pos	ND	ND	ND	18	12
8	Coughing, ocular discharge	7 m /F	Pos	ND	ND	ND	3	3
9	Intermittent recurrent nasal discharge for 2-3 years	13 y /F	Pos	Pos	1:40	-20	18	10
10	Sneezing, occular discharge	12 y/M	Pos	ND	ND	ND	12	12
11	Sneezing, inapetence	13 y/F	Pos	ND	ND	ND	6	2

Legend:

ORLs oropharyngeal swab

1 Clearview Chlamydia MF test (Clearview Chlamydia MF, Unipath Limited® Bedford, United Kingdom)

2 Chlamydia Direct IF test (Chlamydia Direct IF, Biomerieux® Lyon, France)

3 Feline Chlamydia IgG IFA KIT (Fuller Laboratories® Fullerton, CA USA)

m month

y year

F female

M male

Neg negative

Pos positive

ND not done

* the first owner

** the second owner

were fully vaccinated against feline rhinotracheitis, calici virus infection, panleukopenia (Felocell CVR®, Pfizer, New York, USA) and feline leukemia virus infection (Leukocell 2®, Pfizer, New York, USA), but none of them received vaccination against Cp. felis.

Most of them (9/11) were presented without signs of systemic illness. Clinical signs of these cats included conjunctivitis (4/11), nasal discharge of acute onset (3/11), intermittent chronic recurrent nasal discharge (3/11), and coughing (2/11). Only one cat has previously been treated for these problems and it responded well to three consecutive daily inhalations with Terramycin/LA® (oxytetracycline 200mg/ml, Pfizer, Amboise, France). Every inhalation lasted for 30 minutes, with 2.0 ml of Terramycin/LA® dissolved in 3.0 ml of injectable water.

All of these cats had unremarkable complete blood count and differential white blood cell count. Three of nine patients without systemic clinical signs of infection were tested for FeLV and FIV and were negative.

Another two cats were presented with acute and severe clinical signs of lower respiratory tract involvement and systemic signs of infection. The first patient was 6 months old female and fully vaccinated mainly indoor cat with dyspnea. CBC was within reference limits. Thoracic radiographs revealed extensive bilateral alveolar infiltrations (Figure 1). The second patient was 7 months old female outdoor non-vaccinated cat presented in febrile state with cough of one-month duration and conjunctivitis. This patient had elevated WBC count of $27x10^9/L$

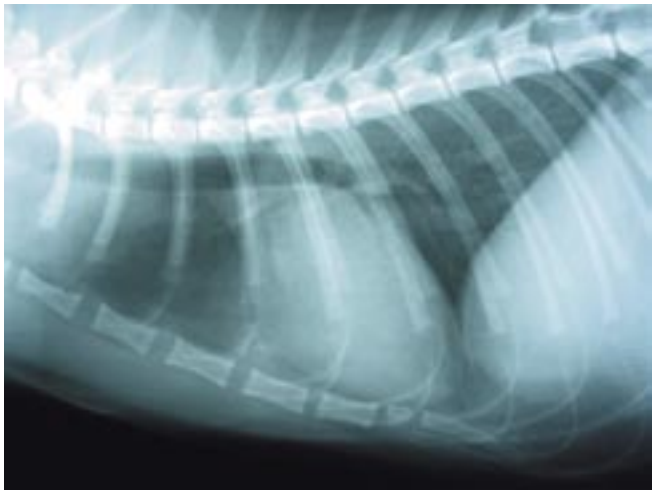

Figure 1: Thoracic radiographs of cat with dyspnea at time of diagnosis

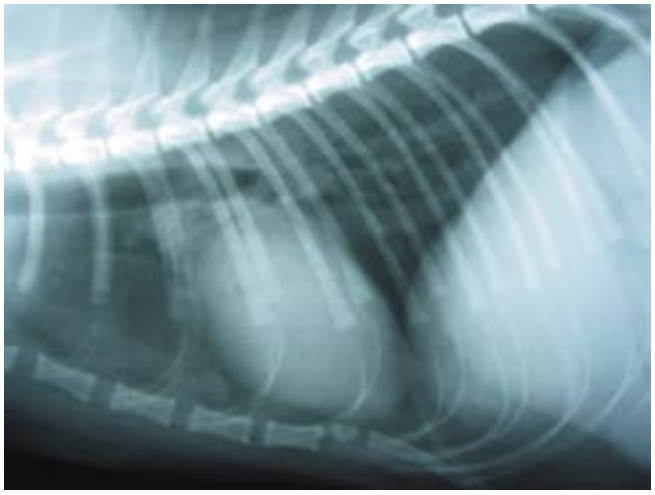

Figure 2: Thoracic radiographs of cat with dyspnea during treatment

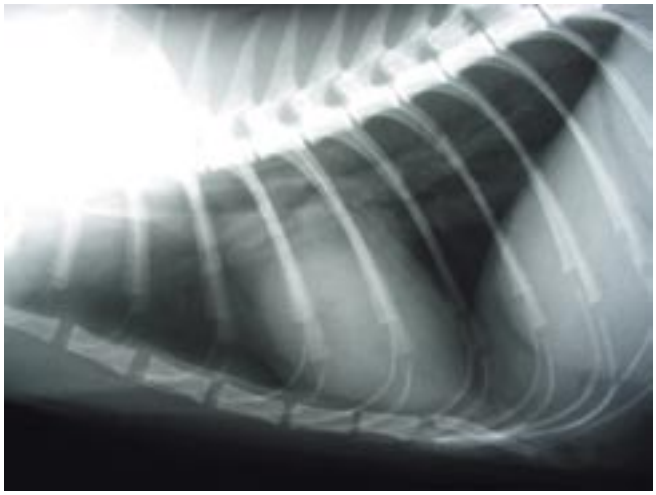

Figure 3: Thoracic radiographs of cat with dyspnea after completed therapy

(reference 5.5-19.5x109/L) and radiographic changes showing generalized interstitial infiltrations of lungs. Both cats were tested for FeLV and FIV and were negative.

All eleven patients were successfully treated with doxycycline (5 mg/kg b.w. /day for 3 weeks). They showed rapid clinical improvement shortly after therapy was instituted. The majority remained without any clinical signs of respiratory infection for 3 to 18 months, depending of follow up. Results of clinical examinations are presented in table 1.

Discussion

According to literature, the most common clinical sign, associated with *Cp. felis* infection, is unilateral or bilateral conjunctivitis (8). Clinical signs of upper respiratory tract disease and systemic signs, especially in adult cats, are considered to be less common (9). The first report about chlamydiosis in cats in Slovenia was in 1994. There were 30% positive reactors in direct immunofluorescence test (Chlamydia Direct IF, Biomerieux® Lyon, France) and 40% positive reactors in indirect immunofluorescence test (Chlamydia Psittaci spot, Biomerieux® Lyon, France) of 10 clinical suspected cats. Most of them had conjunctivitis (8/10) and rhinitis (5/10), three of them had pneumonia (10). In the next study between 1994 and 1997 the 38 cats were tested using direct immunofluorescence test (Chlamydia Direct IF, Biomerieux® Lyon, France), indirect immunofluorescence test (Chlamydia Psittaci spot, Biomerieux® Lyon, France) and enzyme immune test (Clearview Chlamydia MF, Unipath Limited® Bedford, United Kingdom). In this period in cats with acute symptoms upper respiratory tract of 57.7% immunoreactive cats were found. In two breeds acute chlamydiosis was confirmed . Pathoanatomical and pathohistological lesions were also performed. In conjunctival swabs chlamydiae were presented in 22.2%. In 1997 thirteen breeders of cats were tested with microimmunofluorescence and all owners were seronegative to *Cp. psittaci* (11).

In group of our patients with *Cp. felis* infection, conjunctivitis appeared not to be the most frequent presenting problem. Clinical signs of upper and lower respiratory tract disease, such as coughing, nasal discharge and sneezing were much more common. The nature and severity of clinical signs in *Cp. felis* infection are influenced by the age of infected cat (1).

All treated cats responded well, even two, which were most severely affected (signs of lower respirato-

ry tract involvement with systemic signs) were young cats 6 months of age. However, despite the young age and severe clinical condition, they responded extremely well to per oral antibiotic therapy with doxycycline, with improvement of clinical signs in about 2-3 days after beginning of treatment. The infection in cats could be successfully treated using doxycycline in water solution inhalation of the drugs, too.

Chlamydial infection in group of our patients was diagnosed using three different diagnostic procedures. The presence of *Chlamydia sp.* antigen was detected in all eleven oropharyngeal swabs using Clearview Chlamydia MF test and in five oropharyngeal swabs (5/5) using Chlamydia Direct IF test.

The presence of chlamydial antigen confirmed the diagnosis of chlamydial infection. The tests that we were using in our study are not specific for *Cp. felis*. Detection of *Cp. felis* specific antibodies was performed in 5 of 11 cats using Feline Chlamydia IgG IFA KIT test. Four of five cats had specific IgG antibodies (titer 1:40 to 1:320). The highest titer (1: 320) was observed in two cats with signs of systemic illness. The results confirmed the possible infection with *Cp. felis*. Possible cross-reaction between different chlamydial antigens is not excluded. PCR or other more specific tests should be done to confirm the *Cp. felis* antigen.

Due to possible zoonotic potential of *Cp. felis*, owners of patients with chronic disease or those, showing severe disease, were advised to visit their medical practitioner for serologic diagnostics of *Cp. felis* infection. Two of the owners responded to our advice and both of them were tested negative for the presence of specific antibodies against *Cp. felis*.

Based on our study we conclude, that Chlamydia sp. can be considered primary or secondary pathogen, which can potentially cause severe signs of respiratory tract infection in cats, especially in younger animals.

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OKUŽBA MAČK Z BAKTERIJO CHLAMYDOPHILA FELIS – KLINIČNI PRIMERI

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Povzetek: Mačke, okužene s Chlamydophila felis, poprej imenovano Chlamydia psittaci lahko kažejo različne klinične znake.

V študijo je bilo vključenih 11 mačk, ki so se na naši kliniki zdravile med letoma 2003 in 2005. Pri vseh je bil opravljen klinični pregled in hematološka preiskava. Dvema mačkama smo rentgensko slikali prsni koš, pri petih pa je bil opravljen tudi test FeLV/FIV. Clearview Chlamydia MF test (11/11) in Chlamydia Direct IF test (5/11) smo izvedli na žrelnih brisih. Specifična protitelesa proti antigenu Cp. felis pa smo dokazovali v serumu ali plazmi petih živali s testom posredne imunofloure scence.

Pri večini (9/11) mačk so bili le blagi klinični znaki okužbe (konjunktivitis (4/11), akuten nosni izcedek (3/11), ponavljajoči se kronični nosni izcedek (3/11), kašelj (2/11)), in sicer brez odstopanj v hematoloških parametrih. Pri dveh mačkah so bili prisotni akutni in resni klinični znaki spodnjega dihalnega trakta z izraženimi sistemskimi znaki okužbe. Rentgenske slike prsnega koša so potrdile izrazite bolezenske spremembe na pljučih in povišano število levkocitov.

Na podlagi študije lahko sklepamo, da je Chlamydia sp. primarni ali sekundarni povzročitelj okužbe pri mačkah. Še posebej pri mladih živalih lahko izzove resne znake okužbe celotnega dihalnega trakta. Zdravljene z doksiciklinom je običajno uspešno.

Rezultati različnih uporabljenih laboratorijskih metod potrjujejo možnost okužbe s Cp. felis, pri čemer ne moremo izključiti morebitne navzkrižne reaktivnosti z drugimi vrstami klamidij.

Ključne besede: klamidija infekcije - diagnostika; patologija, klinična; serološka diagnostika – metode; mačke