



DEMODEX CATI AND FELINE IMMUNODEFICIENCY VIRUS CO-INFECTION IN A CAT

P. T. ILIEV, G. ZHELEV, A. IVANOV & P. PRELEZOV

Department of Veterinary Microbiology, Infectious and Parasitic Diseases,
Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria

Summary

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A case of co-infection due to *Demodex cati* and feline immunodeficiency virus in a cat is described. A 5 year-old neutered male cat was presented to the Small Animal Clinic at the Faculty of Veterinary Medicine, Trakia University with lethargy, diarrhoea, pyrexia, anorexia, adipsia, skin lesions, intense itching and alopecia. Parasitological, mycological and serological examinations were carried out. Adult *D. cati* mites and antibodies against FIV were detected. A proper therapy with an endectocide, antibiotic and antihistamine drug was prescribed. The improvement of the general condition was observed after a month of treatment. Later, the disease recurred twice and the animal was humanely euthanased for medical reasons and at the owner's request.

Key words: cat, *Demodex cati*, demodicosis, feline immunodeficiency virus (FIV)

Parasitic skin diseases are an important part of feline dermatology in general. There are several main types of mange in the cat including otodectosis, notoedrosis, cheyletiellosis and demodicosis. Ear otodectosis is the most prevalent among cat population in some Balkan countries such as Greece (Sotiraki *et al.*, 2001), Romania (Cozma *et al.*, 2013) and Albania (Knaus *et al.*, 2013). In contrast, demodicosis is considered a rare disease in cats (Kano *et al.*, 2012) and few cases have been reported. Foley (1995) described feline demodicosis as the least commonly diagnosed disease associated with mites in cat.

The medical records of 1407 cats with dermatologic diagnoses at the Cornell University teaching hospital have revealed the presence of 9 cats infested by demodectic mites (Scott *et al.*, 2012). Cases of this disease have also been reported by Guaguere *et al.* (2004); Lowenstein *et al.* (2005); Neel *et al.* (2007); Beale (2012); Kano *et al.* (2012); Cozma *et al.* (2013); Silbermayr *et al.* (2013); Bizikova (2014). In contrast, the feline roundworm *Toxocara cati* is one of the most prevalent intestinal helminths in cats worldwide.

Feline demodicosis is caused by *Demodex cati*, *Demodex gatoi* and an un-

named species. *Demodex gatoi* inhabits the superficial skin layer and, in contrast to the others, it is highly contagious and easy transmittable (Silbermayr *et al.*, 2013). Deep follicular-dwelling *D. cati* is considered to be a normal commensal of cat skin but the normal habitat of *D. gatoi* is unknown (Medleau & Hnilica, 2006). Demodicosis due to *D. cati* is usually triggered by an underlying systemic disease including feline immunodeficiency virus (FIV) infection (Lowenstein *et al.*, 2005). FIV is a retrovirus and appears to infect both CD4⁺ and CD8⁺ lymphocytes as well as macrophages (Hirsh & Zee, 1999). It is followed by progressive immune suppression and increased host susceptibility to opportunistic infection (Teixeira *et al.*, 2012). The virus is excreted with the saliva and the most important route of transmission is probably through bites, therefore male cats with outdoor access, which are most likely to fight, are most frequently infected with FIV (Hirsh & Zee, 1999).

Demodicosis due to *D. cati* is manifested in two clinical forms. Localised demodicosis is self-limiting and characterised by presence of variably pruritic lesions comprising alopecia, patchy erythema, scaling and crusting (Scott *et al.*, 2001). Lesions usually involve the eyelids, the skin around the eyes, affect the head and the neck (Medleau & Hnilica, 2006). *Demodex cati* may also be the cause of a ceruminous otitis externa (Beale, 2012). Generalised disease is rare and lesions are found primarily on the head but could be identified on the neck, trunk and limbs (Scott *et al.*, 2001).

Case presentation. The case refers to a 5 year-old neutered male domestic cat, weighing 4 kg, presented to the Small Animal Clinic because of lethargy, diarrhoea, anorexia, adipisia, skin lesions, in-

tense itching and self-induced alopecia which have progressively worsened over about 1-year period. The cat was not vaccinated and lived indoor but also had access to outside areas. Cat was previously treated locally with neomycin and prednisolone (Cortizeme[®], Virbac), subcutaneously with dexamethasone (Dexafort[®], Intervet) and a unknown injectable antibiotic in another veterinary clinic but without satisfactory outcome.

The physical examination was made by following the routine protocol. An inspection and body temperature measurement were also carried out. For parasitological examination, swab samples from both ear canals and deep and superficial scraping from the lesions were mixed with lactic acid, mounted on glass slides and coverslipped for microscopic observation. Demodectic mites were identified by morphometrical characteristics of adult forms described by Lowenstein *et al.* (2005). The faecal sample was processed by standard salt flotation technique. It was also assayed for presence of protozoan species by immunochromatographic rapid test (RIDA[®]QUICK *Cryptosporidium/Giardia/Entamoeba* Combi test, R-Biopharm) according to the manufacturer's instructions.

Hairs and crusts from affected areas were cultivated aerobically on Mycosel agar (BD, USA), at temperature of 27 °C for 3 weeks.

Blood serum was assayed for presence of FIV antibodies and feline leukaemia virus (FeLV) antigen by Anigen Rapid FIV Ab/FeLV Ag Test (BIONOTE, Inc.) and *Toxoplasma gondii* antigen by Quickening Feline *Toxoplasma gondii* antigen test – Toxo Ag (Quicking Biotech Co., Ltd.), both according to the manufacturer's instructions.

Doramectin (Dectomax[®], Zoetis) at a dose of 300 µg/kg was subcutaneously applied once weekly for 8 weeks. A systemic antimicrobial therapy was performed orally by amoxicillin and clavulanic acid tablets (Synulox[®], Zoetis) at a dose of 12.5 mg/kg divided into two doses per day for 3 weeks. Cetirizine (Zyrtec[®], UCB Pharma S.A) tablets were also orally administered at dose of 2.5 mg once a day. A control examination was performed 1 month after treatment.

Physical examination revealed the presence of lesions consisting of alopecia with scaling, crusting and excoriations on the face (Fig. 1) and the back (Fig. 2). A mild waxy debris was present in both ear canals. The cat was febrile and the rectal temperature was 39.8 °C. The swab specimen was negative for *O. cynotis*. No *Cheyletiella* and *Notoedres* mites were discovered after deep and superficial skin scraping but adult *D. cati* mites were present (Fig. 3). Their body length was about 200 µm (Fig. 4). Faecal examination revealed the presence of *T. cati* eggs. No positive reactions of antigen test for *Giardia*, *Cryptosporidium* and *Entamoeba we-*



Fig. 1. Crusts and excoriations on the face of the patient.

re recorded. The mycological observation was also negative for dermatophytes. Blood serum reacted positively for FIV antibodies and negatively for FeLV and *Toxolasma* antigens.



Fig. 2. A large skin lesion on the back.

The skin scraping performed 1 month after treatment with Dectomax[®], Synulox[®] and Zyrtec[®] showed no presence of mites and improved general condition. Faecal flotation also affirmed the lack of *T. cati* eggs. A year later, the disease recurred but the clinical manifestation was more severe than the previous episode. The same treatment was prescribed and all clinical signs resolved again. The new recurrence of signs appeared 6 months later. The general condition has progressively worsened. The cat was increasingly lethargic and anorectic, with profuse diarrhoea, weight loss, inflammation of the gingivas, respiratory symptoms and behavioural abnormalities. No treatment was applied and the cat was humanely euthanised for medical reasons and at the owner's request.

Feline demodicosis caused by *D. cati* is a rare infection in cats. *D. cati* is considered to be a cat skin commensal (Medleau & Hnilica, 2006). Demodicosis due to *D. cati* is usually triggered by an underlying systemic disease such as diabe-

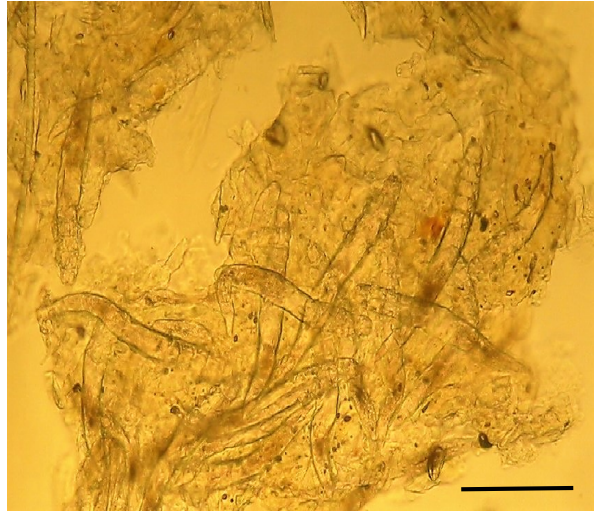


Fig. 3. *Demodex cati* after deep skin scraping (bar=100 μ m).



Fig. 4. Adult of *Demodex cati* (bar=100 μ m).

tes mellitus, FIV and FeLV infections, hyperadrenocorticism, systemic lupus erythematosus, squamous cell carcinoma *in situ*, chronic upper respiratory tract infection and toxoplasmosis (Lowenstein *et al.*, 2005). In our case, the cat turned

out to be positive for FIV infection. FIV is followed by progressive immune suppression and increased host susceptibility to opportunistic infection (Teixeira *et al.*, 2012). The virus is excreted with the saliva and the most important route of

transmission is probably through bites (Hirsh & Zee, 1999). In our case the cat resided indoor but had also an access to outside areas. In addition, vaccination has not been performed before. According to the owner, the first clinical signs had appeared 1 year before and persisted with several remission periods. In our opinion, the cat was infected several years ago. It is very likely because the infection develops very slowly (Hartmann, 2012). Moreover, the previous treatment has been inadequate. Prolonged treatment with prednisolone and dexamethasone is contraindicated in viral infections because of their anti-inflammatory effect but they were probably applied to stop the pruritus. Furthermore, no acaricide drug has been prescribed. Dectomax[®] was included in the therapy (active against both mites and helminths). Dexamethasone and Cortizem[®] were replaced with a second generation antihistamine Zyrtec[®], which also has an antipruritic effect but does not induce immunosuppression. In our case the cat was itchy, which is not a typical sign of *D. cati* infestation. According to Lowenstein *et al.* (2005) the itching in this disease varies from absent to extreme, and is probably due to secondary skin infection by opportunistic agents. The lesions responded well to the treatment with Dectomax[®] and the control scraping was negative at the end of therapy. Later, we observed two acute periods of the disease and the FIV syndrome was completely manifested. This clinical manifestation was also observed by Kanzaki & Looney (2004) who reported that during the progression of FIV infection to the terminal AIDS-like phase, the cats develop AIDS related complex symptoms, opportunistic infections, neoplasia and neurological abnormalities which may eventually lead to death. Similarly to our case, Mircean *et*

al. (2013) observed a multiple-infection with *D. cati*, FIV, *Toxoplasma gondii* and *Microsporium canis*. The authors reported that as a consequence of poor clinical evaluation, the owner choosed euthanasia two weeks later. In the terminal stage of our case, the cat was increasingly lethargic and anorectic, lost weight, had inflammation of the gingiva, respiratory symptoms and behavioural abnormalities. Treatment was not applied and the cat was humanely euthanised.

In conclusion, we recommend timely vaccination of all cats with age-appropriate vaccines and avoiding direct contacts with stray cats. In addition, all cats diagnosed with *D. cati* should be additionally tested for feline immunosuppressive viral infections such as FIV and FeLV.

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Correspondence:

Petar T. Iliev
Department of Veterinary Microbiology,
Infectious and Parasitic Diseases,
Faculty of Veterinary medicine,
Trakia University,
6000 Stara Zagora, Bulgaria
tel: +359 42 699 587
e-mail: petyo_todorow@abv.bg