

# THERAPEUTIC EFFICACY OF TOPICAL TREATMENT WITH SELAMECTIN AND SAROLANER AGAINST NOTOEDRIC MANGE IN A DOMESTIC CAT: CASE REPORT

## EFICACITATEA TERAPEUTICĂ A TRATAMENTULUI TOPIC CU SELAMECTINĂ ȘI SAROLANER ÎMPOTRIVA RÂIEI NOTOEDRICE LA O PISICĂ DOMESTICĂ: PREZENTARE DE CAZ

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### ABSTRACT | REZUMAT

The genus *Notoedres* includes more than 40 species and can produce a severe or even fatal disease in felids. Typical lesions include alopecia, scales, crusts, and lichenification of the skin mostly on the head but can also extend to the legs and genital area. An 18 months-old female, European domestic cat was referred to the Department of Parasitology and Parasitic Diseases clinic of Cluj-Napoca, Faculty of Veterinary Medicine, due to dermatological problems, intense pruritus, and head shaking. A complete clinical examination was performed, followed by skin scrapings, crust collection, and 10% KOH digestion of crusts, aiming a morphological identification of detected mites. Physical examination revealed the presence of pruritus during the consultation and severe blepharitis, thick crusts, and lichenification on the ear pinna and forelimbs, lesions consistent with notoedric mange. Collected mites were morphologically identified as *Notoedres cati* based on the oval idiosoma with concentric striations and setae on the dorsal side, the long pedicel with a terminal sucker on the first two pairs of legs, and the dorsal position of the anus surrounded by rounded spines and setae. Treatment with 15 mg selamectin and 2.5 mg sarolaner applied as a spot-on formula (Stronghold Plus, Zoetis) in two doses at 28 days apart was done. After one-month, dead mites were detected by microscopic examination and after two months, the cat was negative for the presence of *Notoedres* mites or any other ectoparasites. In conclusion, the combination of selamectin and sarolaner (Stronghold Plus, Zoetis) represents an efficient alternative for the treatment of notoedric mange in cats.

**Keywords:** Cat, *Notoedres*, mange, *Otodectes*, Stronghold Plus

Genul *Notoedres* include mai mult de 40 de specii, acestea putând provoca leziuni severe, chiar și fatale felinelor. Leziunile tipice sunt reprezentate de alopecie, scuame, cruste și lichenificare, în special în regiunea capului, dar și la nivelul membrelor și în zona genitală. O pisică în vârstă de aproximativ 18 luni s-a prezentat la Departamentul de Parazitologie și Boli Parazitare din cadrul Facultății de Medicină Veterinară din Cluj-Napoca din cauza unor probleme dermatologice și prurit intens. S-a realizat examenul clinic al pacientului, urmat de racleul cutanat, recoltarea crustelor și digerarea acestora în KOH 10% pentru identificarea morfologică a acarienilor. Examenul clinic a relevat prezența unei blefarite severe, prezența unor cruste groase și lichenificare la nivelul pavilioanelor auriculare și a membrelor anterioare, leziuni considerate a fi caracteristice râiei notoedrice. Acarienii au fost identificați morfologic ca fiind *Notoedres cati*, pe baza idiosomei ovale cu striatii concentrice și setae în zona dorsală, prezența unui pedicel lung cu ventuză terminală la primele două perechi de membre și poziția dorsală a anusului, înconjurat de spini bonți și setae. Pisicii i s-a administrat un tratament cu 15 mg selamectină și 2,5 mg sarolaner (Stronghold Plus, Zoetis), aplicat spot-on. Au fost aplicate două doze, la interval de 28 de zile. După o lună de la prima consultație, la examenul microscopic s-au detectat acarieni morți, iar după două luni nu au mai fost puși în evidență acarieni *Notoedres* nici alți ectoparaziți. În concluzie, combinația de selamectină cu sarolaner (Stronghold Plus, Zoetis) reprezintă o alternativă terapeutică eficientă pentru tratamentul râiei notoedrice la pisici.

**Cuvinte cheie:** Pisică, *Notoedres*, râie, *Otodectes*, Stronghold Plus

Notoedric mange is an uncommon contagious disease of felines, caused by the obligate burrowing mites of genus *Notoedres* (family *Sarcoptidae*) (12). The genus *Notoedres* includes more than 40 species, most of them described from micromammals (9). In some hosts, such as squirrels or felids, it can produce a

severe or even fatal disease (3, 7, 17). In felines, the typical lesions include alopecia, scales, crusts and lichenification of the skin, mostly on the head but can also extend to the legs and genital area (5, 7). Even though the species name suggests a cat parasite, notoedric mange was reported from more than 15 animal hosts and can be transmitted to humans by direct contact with infested cats, manifesting intense pruritus and papular lesions on arms and legs (4). Even though *Notoedres cati* has a worldwide distribution among

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felines, including Europe, data regarding its prevalence, epidemiology, and genetic diversity are limited (7). Even though there are several products available for the treatment of various types of mange in cats, only two products are registered for the treatment of *Notoedres cati* in Romania: Prazimec-C, Biovet (praziquantel and abamectin) and Advocate for small cats and ferrets, Bayer (Imidacloprid and Moxidectin). However, some off-labeled molecules like macrocyclic lactones, (eprinomectin, moxidectin, and selamectin) demonstrated high efficacy in treating notoedric mange in domestic cats (7, 8, 10).

The present paper describes a severe case of notoedric mange in a cat from Romania and its evolution after successful new therapeutical treatment with a combination of selamectin and sarolaner (Stronghold Plus, Zoetis).

## MATERIALS AND METHODS

An 18 months-old female, European domestic cat from Mânău (Maramureş county) was referred to the Department of Parasitology and Parasitic Diseases clinic of Cluj-Napoca due to dermatological problems, intense pruritus, and head shaking. A complete clinical examination was done. Skin scrapings were performed and cleared in lactophenol, followed by a microscopical examination. Crusts were collected and digested in 10% KOH, centrifuged for 3 minutes and the sediment was examined using an optical microscope (Olympus BX61). Detected mites, by both skin scraping and digestion, were morphologically identified using specific morphological descriptions (20) and photographed using Cell<sup>^</sup>F software and a DP72 camera (Olympus Corporation, Japan).

Inside the ear canal, excessive dark brown cerumen was observed, collected, and analysed using a cotton swab, rolled on a glass slide, in a drop of lactophenol, and further microscopically checked. Faeces were also collected, from three consecutive days, and tested for the presence of endoparasites using a salt flotation method (22) and the Baermann's method (21). The cat was treated with 15 mg selamectin and 2.5 mg sarolaner applied as a spot-on formula (Stronghold Plus, Zoetis) in two doses, 28 days apart. The environment was also treated using Draker 10.2, Verbi, Italy (10g cypermethrin, 2g tetramethrin, and 10g piperonyl butoxide) in a dilution of 10 ml to 1 l of water. For the detected protozoans, 2.5% toltrazuril (30mg/kg, Baycox, Bayer) was administered orally, once daily for three days with repetition after one week. The patient was checked again twice, at one-month intervals. Verbal consent of the owner was obtained in order to use these data, as the ethical approval was deemed unnecessary according to our national regulations.

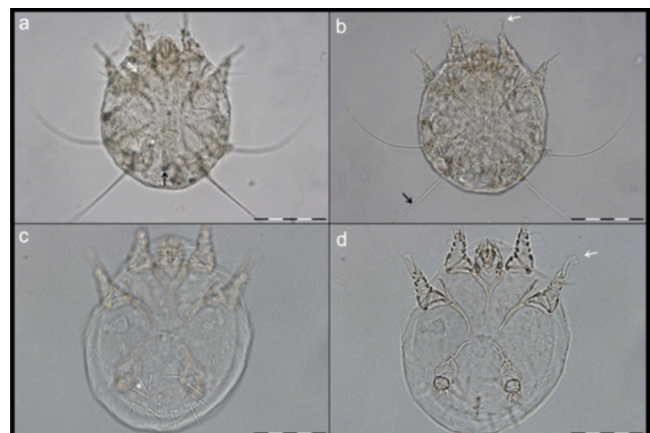
## RESULTS AND DISCUSSIONS

Physical examination revealed severe blepharitis accompanied by purulent secretions. Thick crusts and lichenification were detected on the ear pinna and forelimbs (Fig. 1. a, b, c), lesions that are typical for notoedric mange (16). Anamnesis revealed that the symptoms appeared with about one month before the medical consultation. Initially, intense pruritus was the only symptom. After several days, crusts were observed on the head and neck, especially on the ears and face. Crusts were collected by both superficial and profound skin scrapings, from different areas (ears, head, neck, and forelimbs). Eggs, larvae, and adult mites of *Sarcoptidae* family were detected in the skin scrapings and in the KOH digestion. They were morphologically consistent with *Notoedres cati* (Fig. 2) as the adults presented an oval, almost round idiosoma with concentric striations and setae on their dorsal side (Fig. 2. a, c). On the first two pairs of legs in both female and male adults, there was a long pedicel with a terminal sucker (Fig. 2. b, d). Female mites presented longer bristles on the third and fourth pairs of legs (Fig. 2. b) and the dorsal anus surrounded by rounded spines and setae (Fig. 2. a, c). The examination of the ear cerumen revealed an infestation with *Otodectes cynotis* mites. Besides the cutaneous lesions, the cat was in a good general state, without fever or other clinical modifications, even though severe symptoms or even death were previously reported by other authors (15, 18). Flotation revealed the presence of nematode eggs (*Toxocara cati* and *Toxascaris leonina*) and oocysts (*Isospora* spp.). Baermann's test was negative. One day after the antiparasitic treatment, the owner reported that the cat eliminated round 5-6 cm in length worms, several times in one day. After two days, an evident improvement in the behaviour of the cat with the reduction of scratching was observed, but the owners referred to the GPD (general practitioner doctor) due to cutaneous lesions on their hands, legs, and chest, consisting of small red bumps (Fig. 3) and severe itching. Local treatment with 25% benzyl benzoate lotion (Bioeel®) for several days until the pruritus stopped was recommended. In other published cases, intense itching and small red bumps on different regions of the body of the owners were also reported (4,18), highlighting the importance of cautioning the owners while handling cats and advising them to wash all inanimate objects that were in contact with the infested cats, even though the disease is self-limiting (6,18). The first check-up after one month showed the presence of dead mites and a very good general condition. After two months, the cat was negative for the presence of *Notoedres* mites or any other ectoparasites. Usually, the best way for feline mange control is prevention which can be achieved by avoiding the

contact of healthy cats with infected or feral cats (12). Cats from rural areas should also be treated and vets should advocate the importance of prevention to control the spreading of the disease. Notoedric mange in cats could be more frequent in rural cats (personal observation), but as classic epidemiological studies on mange variety and outbreaks are very rare (7), this disease will continue to be considered as "rare" due to underdiagnosed cases. Even though treatment can be challenging, notoedric mange can be successfully treated, especially in its incipient form (7). Several studies reported successful treatment of notoedric mange using macrocyclic lactones such as ivermectin at 200 µg/kg body weight for four doses, unmentioned brand (18), selamectin (15 mg for cats < 2.3 kg, 45 mg for cats < 6.8 kg, and 60 mg for cats 6.8–9.0 kg) (Stronghold®, Zoetis) single administration (2) or combinations of various molecules: imidacloprid 10% and moxidectin 1% spot-on (Advocate/Advantage® Multi, Bayer) (8) or 8.3 % w/v, (S)-methoprene 10 % w/v, eprinomectin 0.4 % w/v, and praziquantel 8.3 % w/v (Broadline®, Boehringer Ingelheim) (10). The combination of selamectin and sarolaner (Stronghold Plus®, Zoetis) was used off-label, for the first time in the treatment of notoedric mange, with high efficacy. However, a second dose applied after 28 days seemed to be necessary as mites were still present, even though dead. Diagnosis of notoedric mange is easy, especially when typical lesions are present. The easiest method used for diagnosis is skin scraping and examination under the microscope, which is facilitated by the high burden of mites usually reported (7). However, in the cases where lesions are not evident and there are just a few mites in a skin sample, molecular diagnostic should be considered in order to increase the sensitivity (7). The use of molecular methods for the diagnosis of notoedric mange has many gaps as up to now, it is still not completely known if *N. cati* is similar among different hosts, such as cats, rabbits, and lynxes (7). As there are only two nucleotide sequences of *N. cati* available in the GenBank, more references and data are needed to understand this relationship (7, 11). Even though it is considered a rather rare type of mange, to figure out the epidemiology of *N. cati* infestation, more data regarding the actual host range and distribution is needed. Mange by *N. cati* has been reported from a wide variety of animals (reviewed in Foley et al., 2016) such as domestic cats (12), white-nosed coatis (*Nasua narica*) (19), European rabbits (13), bobcats (*Lynx rufus*) (15, 18), and humans (4). In Romania, just one case of notoedric mange in a golden hamster (1) was published, even though it is known that notoedric mange is present among domestic cats in the country. To the best of our knowledge, we present in this paper a new alternative for the treatment of notoedric mange in domestic cats.



**Fig 1.** Clinical manifestations of *Notoedres cati*. a. Eyelid swelling; b. The presence of crusts and lichenification of the ears and forelimbs, purulent eyes secretions; c. Presence of crusts on the ear pinna



**Fig. 2.** Morphological aspects of *Notoedres cati* mites. a. Concentric striations (White arrow), setae (white asterisk), and dorsal position of the anus (black arrow) of the mites; b. Presence of a long pedicel with a terminal sucker (white arrow); c. Morphological aspect of the dorsal part of a larvae with long setae and spines



**Fig. 3.** Cutaneous lesions consisting of small red itching bumps developed by the owners of a European cat with notoedric mange



## CONCLUSIONS

Selamectin and sarolaner (Stronghold Plus®, Zoetis) represent a highly efficient alternative for the treatment of notoedric mange in cats. We would like to advocate the importance of further studies on the occurrence of notoedric mange in animals, especially considering the fact that the variety of species that could act as a source of infection is not completely known yet. Moreover, epidemiological studies on the distribution and host range of *Notoedres cati* are essential in controlling the disease and preventing transmission to humans.

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