

Case report

Treatment of a biting louse infestation caused by *Heterodoxus spiniger* with sarolaner in one dog

Heterodoxus spiniger による刺咬性シラミ症を
サロラネルにより治療した犬の一例

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Abstract: A 1-year-old male dog was diagnosed with a biting louse infestation caused by *Heterodoxus spiniger* and was treated successfully with a single 2.5 mg/kg body weight oral dose of sarolaner. After treatment, there was a rapid improvement of the skin lesions and pruritus. The dermatological examination was within normal limits and lice were absent on day 28. To the authors' knowledge, this is the first published report of the use of an isoxazoline to treat a biting louse infestation caused by *H. spiniger* in a dog.

Key words: amblycera, isoxazoline, pediculosis

要約: *Heterodoxus spiniger* による刺咬性シラミ症と診断された1歳齢の雄犬において、サロラネル 2.5 mg/kg を用いた単回の経口投与にて良好な治療成績を得た。投与後、急速な皮膚病変と掻痒の改善が認められた。治療後 28 日目の時点でも、皮膚検査の結果は基準範囲内であり、シラミは検出されなかった。本報告は、筆者の知る限り *Heterodoxus spiniger* による刺咬性シラミ症と診断された犬に対してイソキサゾリンを用いて治療を実施した初めての報告である。

キーワード: イソキサゾリン, シラミ症, マルツノハジラミ亜目

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Introduction

H. spiniger is a biting louse belonging to the order Phthiraptera, the suborder Amblycera, and the family Boopiidae⁷⁾. Originally an ectoparasite of kangaroos and wallabies in Australia and New Guinea, the louse probably transferred first to ancient wild dogs, then to other wild and domestic animals

in all continents (with the exception of Europe and Antarctica), following European colonization. Its current geographic distribution is almost entirely restricted to the area located between the latitudes of 40°N and 40°S. Although it usually infests domestic dogs (*C. familiaris*), it can be also found on a diverse range of quadruped host species^{5, 12, 17)}. *H. spiniger* is an obligate parasite of canids. It is also the intermediate host to several helminth parasites of dogs including the cestode *Dipylidium caninum*, and the filarid nematode, *Dipetalonema reconditum*¹⁸⁾. Molecular detection studies also found DNA of *Anaplasma platys* and *Acinetobacter* spp. in this louse^{3, 13)}.

Biting lice can cause intense pruritus and secondary

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Movie 1 is available at the supplementary materials on the website on J-stage.

bacterial skin infection (pyoderma) in dogs. They accumulate under mats of hair and around the ears and body openings. Dermatological lesions include scaling (seborrhea sicca), erythema, papules, ulcers, crusts, and alopecia. The patient's coat is often dirty, matted, and ill-kempt. Affected animals are often restless. Diagnosis is confirmed by skin scraping or acetate tape preparation, followed by microscopic lice identification. Lice are susceptible to many parasitocidal agents, including permethrin, fipronil, imidacloprid, and macrocyclic lactones^{9, 15}.

The recent introduction of the isoxazoline class in veterinary medicine has resulted in apparently effective and safe treatment of many canine ectoparasitic diseases, including the extra-label treatment of the more common sucking louse infestation caused by *Linognathus setosus*¹¹.

To the authors' knowledge, no previous publications have reported the efficacy of isoxazolines against biting lice. We report the treatment of a naturally acquired biting louse infestation caused by *H. spiniger* with a single oral dose of sarolaner in a 1-year-old dog.

Case Details

A 1-year-old, intact male, mixed breed dog was presented in Lima, Peru for severe pruritus (9/10 on the visual analog scale)⁸. The owners had noticed the presence of ectoparasites, and reported that the dog was last treated with an ectoparasiticide 6 months prior to presentation. On physical examination, the dog was bright and alert. The body condition score was 2/5. The examination of the oral cavity revealed moderately pale oral mucosa. The capillary refill time was 3 seconds. The respiratory rate (25 breaths per minute), the heart rate (100 beats per minute) and the rectal temperature (38.8°C) were within normal reference ranges. The dermatological examination revealed localized erythematous maculopapular eruption with crust were observed on the ear pinnae. Moderate extensive alopecia, lichenification, and hyperpigmentation were seen in parts of the lesion. Furthermore, periocular areas were edematous. Scales and alopecia were observed on the back, and on the ventral abdomen (Fig. 1a). Large number of lice moving rapidly all over the coat were also observed (see Movie 1). The serum biochemistry profile was within normal reference ranges. A complete blood count revealed regenerative anemia, due to the high values of MCV

(RBC 1.67×10^6 ; HGB 4.3 g/dl; HCT 14.1%; MCV: 85 fL; MCH 26 pg; MCHC 33 g/dl), leukocytosis (WBC $25 \times 10^3 \mu\text{l}$), and neutrophilia ($16.7 \times 10^3 \mu\text{l}$). The results of a SNAP 4D× Plus (Filariasis, Ehrlichiosis, Lyme disease and Anaplasmosis) were negative. There was no evidence of haemoparasites in the blood smear.

The microscopic examination of a skin cytology sample, using a semiquantitative scale⁴, showed 2+ cocci, and was negative for yeast. The microscopic examination of an acetate tape preparation confirmed the presence of large, slender, yellowish adult female and male lice. Their bodies were covered with large and numerous setae. Between 1 to 4 eggs were also observed in some of the females. The lice were preserved in 70% alcohol and cleared in 10% potassium hydroxide (KOH) solution. They were identified as *H. spiniger* based on morphological keys described by Kéler¹⁰, Tuff²¹, and Price¹⁸ (Fig. 2). The main morphological characteristics were:

- Underside of head with two long and robust backward projecting spine-shaped processes.
- Clubbed antennae.
- Prothorax distinctly narrower than the head.
- Tarsi end in two claws.
- Females have broadly rounded genital papilla apically with a ninth median tergal plate.
- Males have a copulatory organ with a pair of spines in the vesica.

The dog was treated with a single dose of sarolaner (Simparica™, Zoetis, NE, USA), administered orally at 2.5 mg/kg body weight (within the labelled dosage range of 2 to 4 mg/kg) on day 0¹⁴. Additionally, topical therapy with 3% chlorhexidine shampoo (Hexadene Spherulites®, Virbac, São, Paulo, Brazil) was established once weekly. The following day, the owners reported that no live lice could be observed. No adverse effects from the oral dose of sarolaner were reported. During the first week following treatment, the pruritus decreased to 2/10 on the visual analog scale. By the second week post-treatment, the pruritus had disappeared completely. During the second week post-treatment, a coproparasitological test was performed to rule out the presence of *D. caninum*. It was negative for endoparasites. At the recheck appointment on day 28, the color of the oral mucosa was within normal limits on physical examination. The dermatological examination revealed complete hairgrowth in the previously alopecic areas. There were no scales, ulcers or crusts (Fig. 1b).



Fig. 1. a. Appearance of the dog on presentation (day 0). A and B. Alopecia and scaling in both periocular areas and at the base of both ear pinnae. C and D. Ulcers and crusts on both inner pinnae. E. Alopecia on the ventral abdomen. F. Alopecia on the right flank. b. Appearance of the dog on day 28. Absence of skin lesions. Complete hairgrowth in the previously alopecic areas.

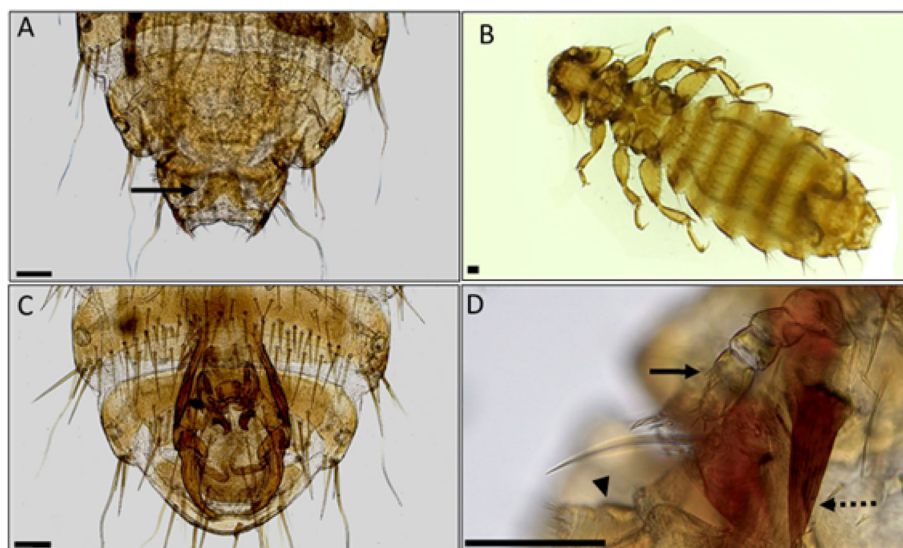


Fig. 2. *Heterodoxus spiniger* A. 10X dorsal view of female terminalia, ninth median tergal plate (arrow). B. 4X ventral view of female. C. 10X ventral view of male copulatory organ. D. 40X ventral view of the head, antennae (head arrow), maxillary palps (arrow) and spine-shaped processes (dotted arrow). Bars: 100 μ m.

Lice were absent. A complete blood count was within normal reference ranges. Another complete blood count was repeated 6 months post treatment. It was within normal reference ranges. The patient continued taking sarolaner every month. At that time, the patient was still free of cutaneous lesions and pruritus.

Discussion

Pediculosis is defined as an infestation caused by host-specific sucking or biting lice. Dogs can be parasitized by one species of sucking louse (*Linognathus setosus*) and two species of biting lice (*Trichodectes canis* and *H. spiniger*)^{9, 19}. Infestations caused by *H. spiniger* can occur at any age and showed an ability to prosper both in the rainy and dry seasons¹⁶⁻²⁰. A higher prevalence is seen in short-haired dogs, this would help the attachment to the epidermis¹⁷.

No studies have been carried out regarding the configuration and distribution of dermatological lesions caused by *H. spiniger*. However, alopecia on the flanks and abdomen, as well as scales in base of both ear pinnae, would indicate that the itching is distributed in the body.

Ectoparasitic infestations—including those caused by lice—should always be included in the differential diagnosis of canine pruritus. In the present case, pruritus and dermatological lesions were completely eliminated by the ectoparasitocidal treatment, making a diagnosis of concurrent cutaneous adverse food reaction or canine atopic dermatitis unlikely.

There are no drug sensitivity studies against *H. spiniger*. Nevertheless, several topical and systemic parasitocidal agents are reported to be effective against lice infestations in dogs: permethrin, fipronil, imidacloprid, and macrocyclic lactones. These treatments require multiple applications or administrations^{9, 15}. A long-acting oral drug such as fluralaner provides an advantageous alternative to reduce stressful handling for both pets and owners. In a recent Norwegian study, 14 dogs diagnosed with sucking louse infestation caused by *Linognathus setosus* were treated with a single dose of oral fluralaner. No adverse effects were observed in any dog. Lice were effectively eliminated within 28 days post-treatment (100% efficacy)¹¹.

Severe infestations in dogs could lead to anemia, because *H. spiniger* feeds on the skin and the blood of hosts¹. This likely explains the pale oral mucosa

found on physical examination and the regenerative and reversible anemia diagnosed in the patient. We elected to treat our patient with another member of the isoxazoline class of drugs: sarolaner. Sarolaner exerts activity against invertebrates by blocking GABA-activated chloride channels¹⁴. A single oral dose of minimum dose of 2.0 mg/kg body weight of sarolaner provides safe and effective control of fleas and common species of ticks infesting dogs for at least 1 month^{2, 6, 22}. The administration of this medicine rapidly reduced the amount of lice in the patient and therefore the consequent loss of blood, resulting in a continuous improvement observed in subsequent controls.

This case report describes a case of naturally acquired biting louse infestation caused by *H. spiniger* that was successfully and safely treated with a single 2.5 mg/kg body weight oral dose of sarolaner. Further prospective and controlled studies are indicated to document the efficacy of isoxazolines against biting lice.

Conflict of interest

None of the authors have any conflicts of interest (financial, personal or other) to disclose.

References

- 1) Agarwal, G.P., Chandra, S. and Saxena, A.K. 1982. *J. Appl. Entomol.* 94: 134–137.
- 2) Becskei, C., Cuppens, O. and Mahabir, S.P. 2018. *Vet. Dermatol.* 29: 203–e72.
- 3) Brown, G.K., Martin, A.R., Roberts, T.K. and Dunstan, R.H. 2005. *Aust. Vet. J.* 83: 101–102.
- 4) Budach, S.C. and Mueller, R.S. 2012. *Vet. Dermatol.* 23: 426–e80.
- 5) Changbunjong, T., Buddhironawatr, R., Suwanpakdee, S., Siengsanon, J., Yongyuttawichai, P., Cheewajorn, K., Jangjaras, J., Sangloun, C. and Ratanakorn, P. 2009. *Southeast Asian J. Trop. Med. Public Health.* 40: 435–442.
- 6) Cherni, J.A., Mahabir, S.P. and Six, R.H. 2016. *Vet. Parasitol.* 222: 43–48.
- 7) Durden L.A. 2019. pp. 79–106. *In: Medical and Veterinary Entomology* (Mullen, G.R. and Durden, L.A. eds), Academic Press, New York.
- 8) Hill, P.B., Lau, P. and Rybnicek, J. 2007. *Vet. Dermatol.* 18: 301–308.
- 9) Hnilca, K.A. and Patterson, A.P. 2017. pp. 164–

165. *In: Small Animal Dermatology: A Color Atlas and Therapeutic Guide*, (Hnilca, K.A. and Patterson, A.P. eds), Elsevier, St. Louis, Missouri.
- 10) Kéler S. 1971. *Aust. J. Zool.* (supplement number 6): 1–126.
- 11) Kohler-Aanesen, H., Saari, S., Armstrong, R., Péré, K., Taenzler, J., Zschiesche, E. and Heckerroth, A.R. 2017. *Parasit. Vectors.* 10: 426.
- 12) Kounououlos, L. and Contos, P. 2019. *Environ. Archaeol.* 24: 1–14.
- 13) Kumsa, B., Socolovschi, C., Parola, P., Rolain, J.M. and Raoult, D. 2012. *PLoS One.* 7: e52377.
- 14) McTier, T.L., Chubb, N., Curtis, M.P., Hedges, L., Inskeep, G.A., Knauer, C.S., Menon, S., Mills, B., Pullins, A., Zinser, E., Woods, D.J. and Meeus, P. 2016. *Vet. Parasitol.* 222: 3–11.
- 15) Miller, W.H., Griffin, C.E. and Campbell, K.L. 2013. pp. 284–342. *In: Muller & Kirk's Small Animal Dermatology*, (Miller, W.H., Griffin, C.E. and Campbell, K.L. eds), Elsevier, St. Louis, Missouri.
- 16) Oke, P.O., Apaa, T.T. and Oke-Egbodo, B.E. 2016. *J. Agric. Vet. Sci.* 9: 72–76.
- 17) Opeyemi, O.A., Babamale, O.A., Shittu, O., Mohamma, M.U. and Ugbomoiko, U.S. 2019. *Anim. Res. Int.* 16: 3265–3272.
- 18) Price, M.A. and Graham, O.H. 1997. *USDA Agric. Res. Serv.* 1849: 7–11.
- 19) Taylor, M.A., Coop, R.L. and Wall, R.L. 2016. *Veterinary Parasitology*. West Sussex, UK: Willey-Blackwell.
- 20) Torres-Chable, O.M., Baak-Baok, C.M., Cigarroa-Toledo, N., Zaragoza-Vera, C.V., Arjona-Jimenez, G., Moreno-Perez, L.G., Medina-Perez, P., Machain-Williams, C. and Garcia-Rejon, J.E. 2017. *Southwest. Entomol.* 42: 408–418.
- 21) Tuff D.W. 1977. *Tex. J. Sci.* 28: 145–159.
- 22) Woods, D.J. and McTier, T.L. 2018. pp. 295–318. *In: Ectoparasites Drug Discovery Against Moving Targest*, (Meng, C.Q. and Sluder, A.E. eds), Wiley-VCH, Weinheim, Germany.