

Biting and bloodsucking lice of dogs—treatment by means of a neem seed extract (MiteStop®, Wash Away Dog)

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Abstract Dogs infested with lice belonging either to the group of Mallophaga (hairlings, i.e., *Trichodectes canis*) or Anoplura (bloodsucking lice, e.g., *Linognathus setosus*) were washed with the neem seed preparations MiteStop® or Wash Away Dog. It was found that a single treatment with one of these products killed both motile stages and those developing inside eggs (nits) being glued at the hair. In both cases the product had been left for 20 min onto the hair before it was washed away just with normal tap water.

Introduction

As other animals (horses, cattle, poultry), dogs can be parasitized both by bloodsucking lice and by so-called biting lice. Although mass infestations only occur in badly kept animals, dogs in families also may be infested and may suffer—often not recognized—from symptoms like

restlessness, itching (pruritus), loss of hair, heavy scratching, rubbing, and biting at infested areas. In some infestations, severe local scarification may occur, or even an outbreak of anemia can be found due to the activity of bloodsucking lice. While biting lice are rather active when roaming through the hair, infestations with bloodsucking lice are in general only detectable if one looks at the basis of hair, where the lice feed on the skin and are attached at the hair by the help of their typical claws. In both cases—Mallophaga and Anoplura—transmission from dog to dog occurs practically exclusively by hair-to-hair contact, when dogs play with each other, since the biting and bloodsucking lice only survive for a few hours far away from their hosts and thus avoid dropping down from a host (e.g., Martini 1946; Lane and Crosskey 1993; Rommel 2000; Eckert et al. 2008; Mehlhorn and Mehlhorn 2008). These often hidden infestations that are more common than believed make it necessary—especially in dog-rearing facilities—to inspect from time to time the hair of the dogs, to comb them intensively, or to be aware of symptoms cited above that indicate an infestation. This seems also desirable due to the fact that especially specimens of *Trichodectes canis* may be involved in the transmission of the most common dog tapeworm *Dipylidium caninum*, which in addition is the most common among human kids (Mehlhorn 2008).

Of course, there exists a long list of excellently active and, for a long time, working chemical anti-insect products being officially registered for dogs (Eckert et al. 2008; Hansen and Londershausen 2008; Mehlhorn and Mehlhorn 2008). However, many people—at least about 40% of the total of dog owners—do not like chemical compounds on their dogs, since these animals often have close body contact with humans and their kids. Therefore, there is a permanent wish for non-toxic and, if possible, natural

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remedies to keep away nasty insects and/or ticks from the bodies of family dogs. Since in several publications it was shown that a neem seed extract (diluted in tap water or in shampoo) is very active to kill mechanically specimens of tick species and of many insect groups, these extracts were tested in the present study on their activity against biting (*T. canis*) and bloodsucking lice (*Linognathus setosus*) (Abdel-Ghaffar et al. 2009, 2010, 2011; Al-Quraishy et al. 2011a, b; Walldorf et al. 2011; Schmahl et al. 2010; Semmler et al. 2011).

Materials and methods

Dogs

Ten dogs (in the hands of private owners) were diagnosed to be infested either with *T. canis* or *L. setosus*, when inspecting the hair with the help of a magnification glass and/or microscopical inspection of cut-off hair. Large dogs were selected for treatment with MiteStop[®], small dogs for the treatment with Wash Away Dog. The reason was that it is much more difficult to shampoo larger dogs with Wash Away Dog than smaller ones, while MiteStop[®] is sprayed rather easily onto the hair of a large dog.

Products

MiteStop[®] is a concentrate which is obtained by extraction of neem tree seeds according to the formulation of the university spin-off company Alpha-Biocare GmbH (Düsseldorf, Germany). Prior to use, this extract was freshly diluted at a concentration of 1:33 with normal tap water. The product Wash Away Dog contains 10% of the neem tree seed extract plus 90% fine shampoos, which are also the basis of the anti-lice shampoo Wash Away Louse[®] for humans.

Test

After diagnosis of the parasitization, four dogs were treated with MiteStop[®], where the 1:33 dilution of the product was brushed onto the hair until they were completely wet. Fifty milliliters of the extract (about 1.5 liter ready-to-use product) was sufficient to treat a large dog with rather short hair. The smaller dogs were shampooed with 50–100 ml of the product Wash Away Dog after the hair had been made slightly wet. Both products were left on the dogs for 20 min and then removed by washing off just with normal tap water (heated or not).

Results

The dogs except one had been infested either with *T. canis* (Figs. 1, 2) or *L. setosus* (Figs. 3, 4, and 5). One dog,



Fig. 1 Light micrograph of a dog hairling (*T. canis*). Note the broad head and the rather thick antennae

however, was infested with both species, but only a few specimens had been occasionally detected.

T. canis

The female specimens observed ranged from 1.6 to 1.9 mm in length, while the males were somewhat shorter. Both, however, were characterized by their very broad head showing rather thick antennae consisting of three segments (Figs. 1, 2). The females glue their eggs (they produce in

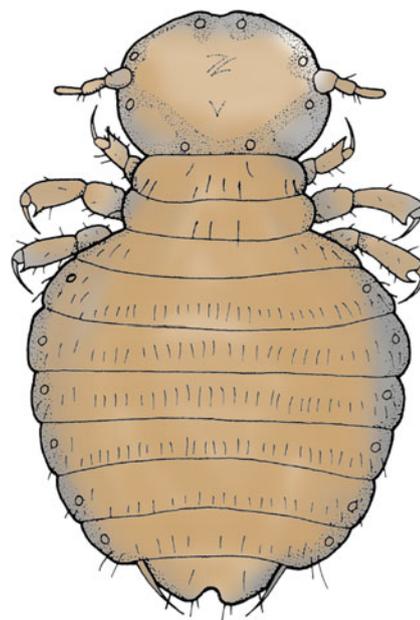


Fig. 2 Diagrammatic reproduction of *T. canis*

Fig. 3 Light micrograph showing a female of the bloodsucking louse *L. setosus*



total about 20 during their lifespan of 2–3 months) at the bases of hair. Inside those so-called nits, the first larva is developed within 5–8 days, which after hatching start feeding at the skin with the help of their mandibles. They are as the adults dorsoventrally

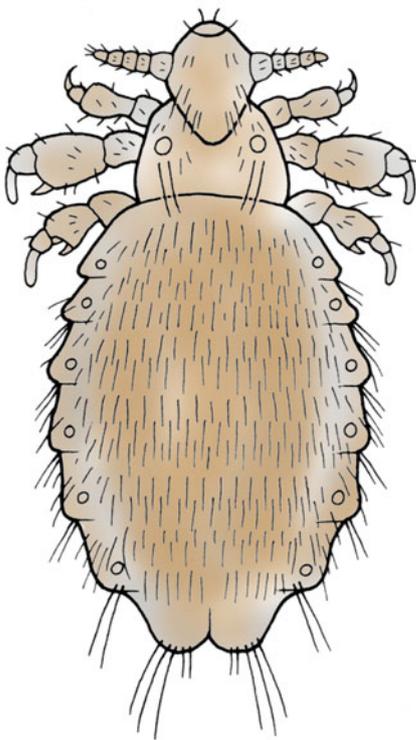


Fig. 4 Diagrammatic representation of *L. setosus*



Fig. 5 Light micrograph of an egg of *L. setosus* at a hair of a dog

flattened, appear yellow brownish, and reach via 3 molts the adult stage within 3 weeks. With the help of their six feet each being provided with a single claw, the developmental stages remain firmly attached to the hair of their host (Figs. 1, 2).

L. setosus

This bloodsucking louse, which may reach as an adult female a length of up to 2.5 mm (Figs. 3, 4, and 5), has also three larval stages before entering the adult status. The larvae hatch within 8–10 days from their ovoid nits that are glued at the bases of hair reaching maturity about 3 weeks later. All stages suck blood. Therefore, infestations of dogs can be diagnosed by dark fecal compounds when being combed while standing on a white towel. Since all stages suck blood, mass infestations (especially in the case of immune-suppressed or very young dogs)

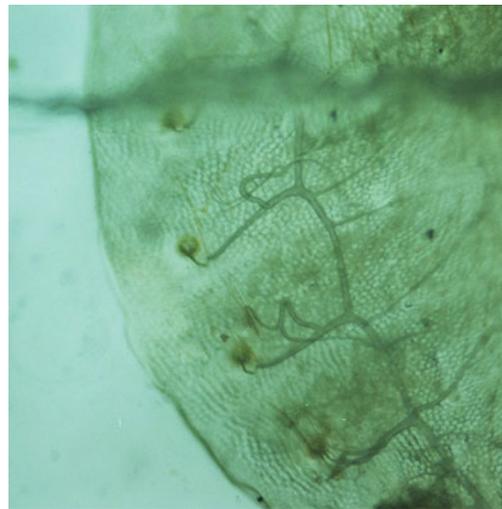


Fig. 6 Light micrograph of the spiracles and the twisting tracheoles of a female *L. setosus* louse. The products which are both very liquid enter the outer spiracle, pass until the end of the tracheoles, and block there the oxygen uptake of the body cell. This introduces death mechanically within minutes

might introduce symptoms of anemia. The attachment to hair is very strong, since the two tarsal claws at the terminal end of the feet can be closed to a ring-like system. The females produce during their 6-week-long life span 3–10 eggs per day. Thus, infestations with such bloodsucking lice can be very high in numbers in a rather short time.

The reports of the owners about the efficacy of both products that were based on the same neem seed extract were convincing, since in all cases it was said that a single treatment stopped the infestation with hairlings respectively with bloodsucking lice. This was proven by brushing and inspecting the animals on day 1 after treatment and on days 7–10 after treatment. This indicates that both products also stopped the development of larvae in the nits. Since some of the owners feared that some developmental stages had dropped down from their dog's body and might reenter from the layer, they repeated the treatment 10 days after the first one. This stabilized the security of the treatment.

Discussion

Dogs may be infested by very host-specific lice of two types.

1. Biting lice belonging to the group of Mallophaga (the name comes from Greek: *mallos* = wool, hair; *phagein* = feeding by gnawing) with the species *T. canis* (name comes from Greek: *trichos* = hair, *dectes* = biting and Latin: *canis* = dog).
2. Bloodsucking lice belonging to the group Anoplura (name comes from: *anoplos* = without weapon, *ura* = tail; meaning that these bloodsuckers have no visible piercing systems). The extremely host-specific dog species, which seldom, but occasionally, might be found on the body of the dog's owner too, is named *L. setosus* (name comes from Greek: *linon* = string, hair-like, and Latin: *setosus* = with bristles, setae).

Both species are only rarely found in German house dogs, since most of them are well kept and are in general not allowed to roam free and thus cannot get into contact with straying dogs, which are also extremely rare in Germany due to the activities of the town administrations. Furthermore, about 30–40% of the owners use chemical insecticides to kill fleas, which are active for 6 weeks and also kill lice (Eckert et al. 2008; Hansen and Londershausen 2008; Mehlhorn and Mehlhorn 2008). In addition, anti-worm treatment using avermectines also kills many species of insects that attack dogs. Therefore, in general, the occurrence of lice on dogs is not common and only found in families, where no chemical insecticides are used.

Nevertheless, these lice occur and harm the health of infested dogs especially when they are very young and/or suffer from an immune suppression (which often also supports infestation with *Sarcoptes scabiei* and/or *Demodex folliculorum* Mehlhorn 2008; Eckert et al. 2008). These cases must be treated too. The neem seed extract, which was used in the treatment described in this paper, has been shown previously that it acts against a broad spectrum of mites, ticks, and insects including human head and body lice as well as animal hairlings and featherlings (Abdel-Ghaffar and Semmler 2007; Abdel-Ghaffar et al. 2010; Schmahl et al. 2010; Al-Quraishy et al. 2011a, b). Therefore, it is not astonishing that the activity of these products also helps to control the two lice types of dogs. Since there is no pharmacological killing of the lice but just mechanical suffocation of the lice by blocking the oxygen uptake at the terminal ends of the breathing system (tracheoles) (Fig. 6), there is no danger given neither for the dogs nor for humans, who use the same extract in human anti-lice shampoos. Thus, there is another proof that nature may help to control disease and/or infestation (Semmler et al. 2010).

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