Successful treatment of mite infestation in two desert mountain adders *Bitis xeropaga* (Squamata: Viperidae) with Afoxolaner (NexGard®)

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In herpetoculture, infestation of animals with ectoparasites – especially mites – are unfortunately a common problem. These are mites from the family Macronyssidae (Acari: Mesostigmata: Gamasina), which parasitize reptiles. The most prevalent mite species found in snakes is *Ophionyssus natricis*, which is encountered worldwide in terrarium collections (Orlova et al. 2024).

Fig.1: *Ophionyssus natricis* , adult ©Dack9

During regular routine inspections of the animals, a snake mite infestation is usually identified quickly: the mites can be seen as small, pale to deep dark red (blood-engorged) dots.

The preferred locations are at the edges of the scales and under the scales, as well as around the eyes – anywhere the snake's skin is thinnest – so the mites can cut it open and drink the blood that seeps out (Reinert & Brandstätter 1993). It is also often observed that the snake restlessly wanders around the terrarium and rubs against objects to scratch itself.

Mites are usually introduced with new arrivals, feeder animals, or transport containers. In addition, snake mites are extremely mobile and can quickly infest or reinfest other terrariums or enclosures.

In the terrarium, mites usually find excellent conditions for reproduction: relatively constant temperatures, fairly high humidity, and a host animal that is always present. The life cycle of the mites is very short and, under optimal conditions (20 °C to 30 °C and 75 % humidity), is completed in just 7 to 14 days (Wozniak & DeNardo 2000). They pass through five developmental stages. After a substantial blood meal, the females lay between 15 and 25 eggs in the substrate if conditions are favorable. After approximately one to four days, the larvae hatch, molt after 14 to 48 hours, and develop into protonymphs, which then actively seek out the host and begin to feed on blood. The next developmental stage is the deutonymph, from which the adult mite then emerges.

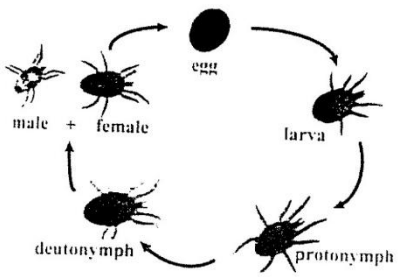

Fig. 2: Life cycle of *Ophionyssus natricis,* Wozniak & DeNardo 2000

Only the protonymph and adult stages feed on blood. However, mites are capable of surviving for extended periods without food. The total lifespan of a mite in the terrarium is about 20 days (Reinert & Brandstätter 1993).

An infestation with snake mites can cause serious health problems for the host snake. The most common issues include dehydration, lethargy, stunted growth, refusal to eat, and in severe cases, anemia and difficulty shedding. Additionally, there is a risk of diseases that can be transmitted, as well as secondary infections.

Therefore, prompt treatment of the affected animals is necessary. This includes both treating the snake itself and cleaning and disinfecting the terrarium. For example, a water bath is a quick first-aid measure that often washes off many, but by no means all (!) mites from the snake's body. Some snake owners also use an oil emulsion (e.g., with 2% olive oil) to suffocate the mites with the remaining oil film. Unfortunately, such oil baths often subsequently cause shedding problems.

Topical acaricides (mite-killing agents) such as Frontline® are also used in the treatment of snake mites. For example, Frontline® spray is applied to disposable gloves, and then the snake is rubbed down with them. Overall, this procedure is stressful for the animal and, in the case of venomous snakes, also quite dangerous.

Insecticides such as Ardap® have proven effective for disinfecting terrariums. However, it is important to note that commonly used insecticides can potentially be harmful to reptiles and should only be recommended with caution for the control of snake mites.

A very elegant method of controlling snake mites is the use of predatory mites. The predatory mite *Cheyletus eruditus* is now commercially available for this purpose under the name Taurrus® (Schilliger et al., 2013). However, this method takes a bit longer to show results and is difficult to use in dry desert terrariums, as the predatory mites prefer higher humidity.

A new generation of acaricides shows promising potential for the safe and effective control of mites in snakes. They can be administered orally via feeder animals, do not cause any side effects, and eliminate the need to treat the animals' environment (Fuantos-Gámez et al. 2020; Gobble, 2022; Mendoza-Roldan et al., 2023).

This refers to afoxolaner, an isoxazoline compound that has been used in veterinary medicine for dogs and cats for a long time and is marketed in Germany under the name NexGard®.

So far, there are two studies in which afoxolaner has been successfully used in various snake species, such as pythons and different types of colubrids (Fuantos-Gámez et al.,

2020; Mendoza-Roldan et al., 2023, with a sample size of n=81). The dosage used was 2.0 and 2.5 mg/kg body weight. The related compound fluralaner has also already been successfully tested in a study on 20 royal pythons, *Python regius* (Gobble, 2022).

In the case presented here, a mite infestation was found in two terrariums, each inhabited by one female and one male *Bitis xeropaga*.

Fig. 3: A snake mite under the scale of a male *Bitis xeropaga*.

It can be assumed that when you first notice the mites, their spread in all life stages throughout the terrariums is already quite advanced.

Treating venomous snakes always poses a particular challenge, as handling these snakes is inherently risky. This makes simple oral treatment especially appropriate in such cases.

The two small vipers were weighed, and a NexGard® 11 mg chewable tablet for dogs was divided as many times as necessary to obtain an amount corresponding to approximately 2.5 mg/kg of body weight. Fortunately, the therapeutic margin of afoxolaner is very wide – the 11 mg tablet is recommended for dogs weighing 2 to 4 kg, which corresponds to a range of 2.75 to 5.5 mg/kg of body weight.

The medication was then placed inside the mouth of a feeder mouse and administered to the small adders.

During the daily check, no mites could be observed on the snakes as early as the third day. Even after four weeks, the animals were still free of mites and have remained so to this day.

Since afoxolaner provides protection for over four weeks, this treatment effectively interrupts the life cycle of the mites in the terrarium, causing all mites present to die off during this period. As a result, it is not necessary to clear out, clean, or disinfect the terrariums.

No side effects were observed during the 4-week observation period.

Afoxolaner has proven to be highly effective in this case for treating snake mites in the dwarf puff adders *Bitis xeropaga*. The treatment is stress-free for both the patient and the keeper and so far has shown no side effects.

Therefore, when treating snake mites in highly dangerous venomous snakes such as mambas, cobras, or large puff adders, the minimally invasive approach with afoxolaner should definitely be considered.

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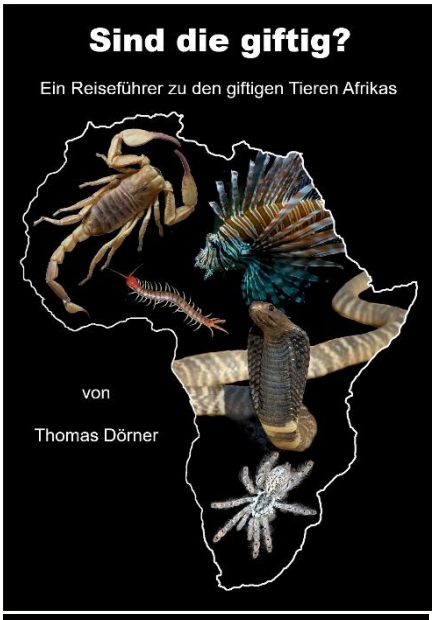

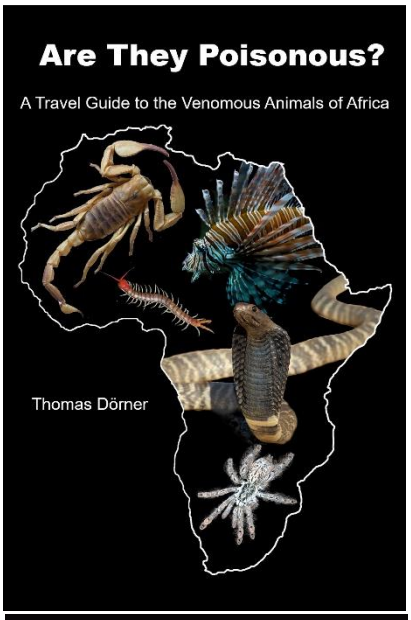

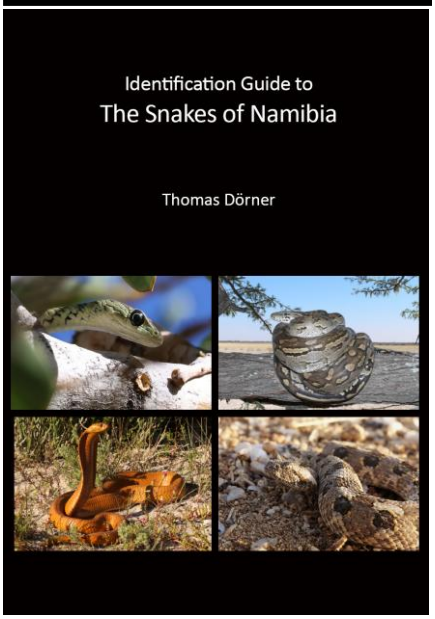

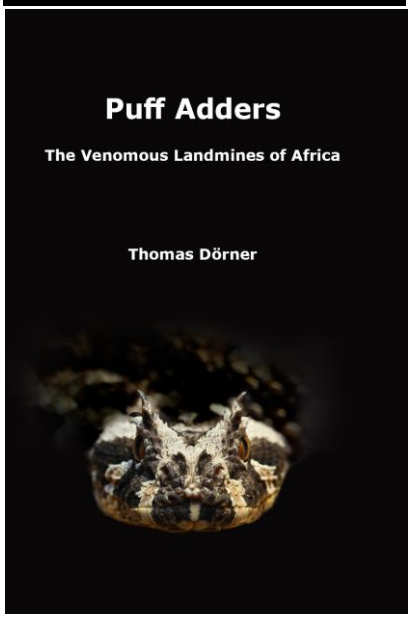

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