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## 56th INTERNATIONAL CONGRESS

organizzato da  certificata ISO 9001:2000 

**RIMINI 1st-3rd June 2007**  
PALACONGRESSI DELLA RIVIERA DI RIMINI



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In: 50° Congresso Nazionale Multisala SCIVAC, 2005 – Rimini, Italia

## **Flea Control in Veterinary Dermatology**

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Flea bite hypersensitivity is the most common hypersensitivity and one of the most common skin diseases in small animal practice. It is caused by salivary proteins of the flea injected during the bite. There is some evidence, that intermittent flea exposure may be more likely to cause allergic signs than constant flea exposure. Classically, this allergy is characterized in the dog by pruritus and crusted papules. Sites affected include the infamous tailbase and dorsolumbar area, but also thighs, inguinal area and ventrum. Any itchy skin disease predominantly affecting the caudal half of the body should be considered to be most likely flea bite hypersensitivity.

In the cat, FBH is the most common skin disease and can present as either military dermatitis, noninflammatory alopecia, or as all subsets of the eosinophilic granuloma complex. An insect control is thus the most important diagnostic trial in cats presenting with any of these clinical signs.

### **Diagnosis**

Diagnosis of flea bite hypersensitivity is confirmed by response to a flea control trial. Intradermal testing and serum testing have also been recommended, but will not identify all animals with FBH and (with a negative result) may actually increase the client's reluctance to embark on flea control. We do not use any of these tests in our diagnosis of FBH in the dog and cat. If you want to perform a good flea control trial you need to know about the life cycle of the flea and the various available products.....

### **Flea life cycle**

To formulate a perfect flea control, we need to intimately know about the life cycle of the flea and the habits of the different stages. The life cycle may be completed in as little as 12 days and may take as long as 190 days. Ideal temperature is 21-26° C, high humidity is ideal. Eggs are laid on the host 1-2 days after a meal. They are nonsticky and thus fall off. Eggs hatch in about a week under ideal conditions, humidity below 50% destroys the eggs. Larvae are small (2-5mm) and semitransparent with a whitish body and a yellow to brown head. They are quite active, feed on organic debris and flea excrement. They can move several feet from where they hatched and are negatively phototactic and positively geotactic. Thus, they tend to hide underneath furniture indoors (where a fogger does not reach!). Moisture below 50% again causes dessication, high temperature kills them, low temperature prolongs the development. Larvae grow and molt twice over a period of 5-11 days. The third larva spins a cocoon of silk, which is moist and white but becomes coated with debris (camouflage). It goes through 2 molts within the cocoon in 8-9 days. The preemerged adult in the cocoon is the most resistant stage to insecticides (is not destroyed by conventional pyrethrins or organophosphates). It can sit in that cocoon for up to 174 days. It hatches within seconds (!) and jumps towards the suspected host upon proper stimulation (vibrations, physical pressure, changes in light intensity, carbon dioxide and heat). Adults can survive several days before taking a blood meal of approximately 5 minutes duration. Within 48 hours of this meal the female will start laying eggs. Only 3-18 eggs will be laid at a time, but a female can lay up to 2000 eggs in her lifespan of up to a year. The gut epithelium of the adult proliferates within the first 36 hours after feeding to sustain the high metabolic rate (the microvilli go from 3 to 60 µm) and the flea is then metabolically dependent and has to feed regularly from then on for at least every 3-4 days.

### **Flea bite hypersensitivity - Treatment**

Treatment recommendations will vary significantly with individual situations and the first distinction we have to make is if the pet is a confirmed flea allergic pet, if we suspect flea bite hypersensitivity and want to prove it with an insect control trial or if the pet shows no sign of discomfort at all, but has some fleas.

- *Suspected flea bite hypersensitivity*

Aggressive flea control is needed for 4-6 weeks. If there is no improvement, we most likely don't deal with a flea bite hypersensitivity. If there is significant improvement or remission, we established a diagnosis and need to discuss long term therapy strategies with that particular owner. We usually recommend the frequent use of an adulticide in combination with an insect growth regulator in the environment to quickly lower the flea pressure.

- *Confirmed flea bite hypersensitivity*

Ideally we recommend an insect growth regulator/insect development inhibitor on a permanent basis (systemically, topically or in the environment) and an adulticide as needed. The second option is an adulticide only, in which case we need to switch products very quickly at the first sign of recurrence of the disease indicating possible development of resistance.

- *No flea bite hypersensitivity present*

In these cases we do not recommend flea control as a permanent flea exposure is less likely to induce flea bite hypersensitivity than an off and on flea control of an owner not pressed for compliance by an itchy pet. If there is client desire to commence some sort of flea control, than insect growth regulators or development inhibitors are recommended.

In the last ten years, new, reasonably safe and effective products have come on a market which already has an abundance of products for flea control with varying safety and efficacy. As veterinarians, we are in the best position to advise clients on a flea control program tailored to their specific needs that considers their personality and life style as well as their pet's little peculiarities. A major reason for failure of flea control programs is owner compliance. They are either unwilling, not educated properly, too sloppy or simply not physically able to do what we ask them to do for whatever reason. Choosing the right protocol and educating the owners properly, taking the time and possibly using our nursing staff, hand outs and white boards will greatly increase our chance of success. Another reason for failure may be resistance of the organism to the products used. Resistance will always develop to any product, the question is thus not if, but rather when. In essence we speed up evolution and create resistant fleas by putting pressure on the population when using products for flea control. However, there are ways to delay this development of resistance. The first possibility is to combine different flea products, as it is much less likely that an individual flea gets resistant to two drugs at the same time. This approach is called integrated flea control and is getting more and more popular all over the world. The second possibility is to switch products quickly when signs of resistance occur and kill the resistant flea with another effective product before it has time to multiply in big numbers.

### **Insect growth regulators/development inhibitors**

These products are typically either chitin inhibitors or insect growth hormone analogs. They can be given systemically (lufenuron), topically (pyriproxifen, methoprene) or applied in the environment (pyriproxifen, methoprene, fenoxycarb, ciromazine).

#### *Lufenuron*

- convenient (monthly orally in dogs, every month orally or every 6 month as injection in cats)
- environmentally safest
- expensive in multi-pet households

#### *Environmental sprays containing a combination of an adulticide (pyrethroid or pyrethrin) and a growth regulator*

- indoors every 6-12 months
- work-intensive
- comparatively safe and effective
- expense varies
- foggers more convenient, but do not cover more than at the most 2 rooms/can, insecticide on shelves and furniture, areas underneath furniture not covered
- sprays less convenient and more work-intensive, but insecticide only where needed
- used in all rooms with pet access
- carpeted areas, crevices and corners as well as areas underneath furniture most important

### **Adulticides**

- sprays (pyrethrines/pyrethroids, fipronil)
- spot-ons (fipronil, imidacloprid, selamectin)
- tablets (nitenpyram)

#### *Pyrethrines/Pyrethroids*

- repelling
- quick knock-out
- work-intensive
- soak animal
- rare but possible toxicities
- daily to weekly application

*Fipronil*

- water-proof (not shampoo proof!)
- convenient, as only every 2-4 weeks
- no repelling action
- expensive in large animals
- viable egg production possible
- spot-on formulation easier to apply, but less effective

*Imidacloprid*

- convenient, as only every 2-4 weeks
- easy
- not water proof
- viable egg production possible

*Selamectin*

- convenient, as only every 2-4 weeks
- easy
- water proof and to a certain degree shampoo proof
- other effects (heart worm prevention, dewormer, eliminates many other mites)

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*Nitenpyram*

- daily to every other day oral application
- no significant adverse effects
- absolutely water proof
- viable egg production does not seem possible

We now will use all this knowledge to establish some possible protocols in different situations:

**Scenario I:**

We have a young family with both parents working, a one year old and a four year old child, one cat and one dog. Both animals are indoors and outdoors, the dog has a confirmed flea bite hypersensitivity, but at the moment is not really bad yet, as flea season has not even started.

*Considerations:*

- We would like to keep any potential of toxicities to the minimum as the small kids will be in close contact with the animals and the floors on a regular basis.
- We will also try to minimise the workload, as two working parents with young kids typically are pressed for time.
- Costs may or may not be of utmost relevance depending on the particular situation.

**Scenario II:**

A retired couple comes in with a one year old German Shepherd Dog. One of the owners is an ex-policeman and now works the dog extensively, going to obedience and agility classes and trials regularly. The dog lives outdoors and sleeps in a kennel. Tail base pruritus is present since 4 weeks, but no fleas or flea dirt can be found.

*Considerations:*

- Owners seem to be fairly dedicated to the dog and are not pressed for time.
- The dog lives outdoors, so indoor treatment is not needed.
- There is regular contact to other dogs on a larger scale.
- The diagnosis has not been established beyond doubt.
- Costs may be a consideration

**Scenario III:**

Two young professionals living in a fairly fashionable suburb in an expensive townhouse. They have a Maltese and an Old English Sheep dog, the latter has tailbase pruritus seasonally in summer and fleas are found on examination on the dog. Owners and dogs go to their beach house surfing on the week ends, during the week the dogs are inside at night and outside the rest of the time, when the owners are working.

*Considerations:*

- Diagnosis of flea bite hypersensitivity not confirmed beyond doubt, but extremely likely.
- Finances are most likely not the major concern.
- Dogs exposed to water on regular basis.
- Time to perform flea control may be the limiting factor.