FLEA CONTROL ON PETS IN SOUTHERN AFRICA

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ABSTRACT: Briggs O.M. Flea control on pets in Southern Africa Journal of the South African Veterinary Association (1986) 57 No. 1, 43-47 (En) St. Francis Veterinary Hospital, 157 Main Road, 7800 Heathfield, Republic of South Africa.

Aspects of the biology and life-cycle of the flea which are important to the practising veterinarian are discussed. The "cat flea", Ctenocephalides felis is the most prevalent species on dogs and cats in those parts of the world where it has been surveyed. Whether the flea is a temporary or permanent obligatory parasite is still a controversy. The insecticides and product formulations available for flea control in South Africa are reviewed with emphasis on the systemic agent, fenbithion. Practical protocols for flea control on dogs and cats are proposed.

Key words: Ctenocephalides felis, flea control, insecticides.

The flea is the most common parasite found on cats and dogs along the coast of Southern Africa. These areas have been compared to the Southern United States where it has been stated that flea-bite allergy is the most frequent cause of skin conditions in pets22 and indeed the most common cause for the presentation of dogs to the Veterinarian24. Once a dog is allergic to flea saliva6, prolonged, severe pruritus ensues33 which can prove refractory to hypsensitization13,21. The side effects from long term corticosteroid therapy20,22 intensifies the need for flea control. Fleas, however, are not always seen by clients on their pets, and it may prove exasperating to explain the aetiology of the pruritus and alopecia.

The absolute control of fleas is often elusive and requires constant attention. However, the goal is necessary since besides causing flea-allergy dermatitis, the flea is allergic to flea saliva6, prolonged, severe pruritus ensues33 which can prove refractory to hypsensitization13,21. The side effects from long term corticosteroid therapy20,22 intensifies the need for flea control. Fleas, however, are not always seen by clients on their pets, and it may prove exasperating to explain the aetiology of the pruritus and alopecia.

The adult flea is a temporary or permanent obligatory parasite is still a controversy. The insecticides and product formulations available for flea control in South Africa are reviewed with emphasis on the systemic agent, fenbithion. Practical protocols for flea control on dogs and cats are proposed.

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The absolute control of fleas is often elusive and requires constant attention. However, the goal is necessary since besides causing flea-allergy dermatitis, fleas carry the common cat and dog tapeworm, Dipylidium caninum29,49, which is also an occasional parasite of man48. The cat and dog fleas are also the chief cause of the intense pruritus seen in children sensitized to flea bites48. Occasionally, fleas serve as vectors for plague and murine typhus42. The presence of fleas on pets indicates an insufficient ectoparasite control regimen in that the pet is susceptible to cheyletiellosis, pediculosis, otodectic otitis, scabies, and even babesiosis from ixodid infestation. In order to adequately advise the public on flea control, the practitioner requires a basic knowledge of the life-cycle and biology of the flea and the formulations and toxic effects of the available insecticidal agents.

**BIOLOGY AND LIFE-CYCLE (Fig. 1)**

**Egg**

Gravid females usually jump off the pet and lay eggs in cracks or crevices in the floor of the house48. However, sometimes eggs are laid on the pet and can just be visible to the naked eye44,48. These fall off the pet25 and may appear as tiny, glistening white specks on the examination table – often amongst other evidence of infestation such as flea faeces and epidermal scales. The characteristic "pop" elicited by bursting the egg gently with a fingernail impresses the pet owner no less than the demonstration of haemoglobin on dissolving the comma-shaped flea faeces in a drop of water.

**Larva and pupa**

Larvae are active and avoid light by remaining in cracks and crevices29. The cocoons are formed in crevices and become camouflaged by dirt and dust48. These stages thus may develop in the house without the owner being aware. It is also the larval and pupal stages which are temperature and humidity sensitive resulting in fleas being more common in coastal areas. Ideal relative humidity is 70–80%25 and ideal temperature is 18–35°C48. Altitude is another factor (ideal is less than 1 800 m49 resulting in the paucity of fleas in households on the Witwatersrand.

**Adult**

The adult flea is a brown, laterally compressed, wingless, insect48. The head with its conspicuous eyes is used to differentiate between the "cat" flea, Ctenocephalides felis and the "dog" flea, Ctenocephalides canis49. C. felis is the most common species found on dogs in the United Kingdom18, the United States29, Puerto Rico45, the Western Cape (O.M. Briggs, unpublished data) and the Transvaal24. Although fleas have been noted to drink water30,45, the adult must partake of a blood meal to survive34,38,45. The adult flea hatches from the cocoon and jumps onto the host using its specialized, powerful legs49. The host’s epidermis is penetrated by the flea’s maxillae. A tube, the epipharynx, enters the capillary vessels and draws up blood while saliva from the maxillae is deposited in the surrounding tissue35. This procedure causes minimal damage to the skin35. It is the allergic response to a hapten contained in the flea saliva45 which results in persistent pruritus19,23,35 known as flea allergy dermatitis24,25,44.

Fleas require a period of between two and ten minutes to engorge45. This intricate and relatively lengthy procedure occurs most easily at night. On people, fleas bite only the ankles during the day but the whole body at night48. It would seem therefore, that the adult fleas leave the host during the day time. However, this clinical observation is not supported by research13,27. The controversy21,29 as to whether the adult is a temporary or permanent obligatory parasite needs to be examined urgently as this strongly influences our approach to flea control.
control. Should environmental conditions not be ideal, or if a host is not available, the adults can remain alive in the cocoons for up to a year. Stimuli to emerge may be either seasonal (increase in humidity) or host related (vibration, warmth, characteristic odour and casting a shadow). This explains why on entering a building which has been vacant for months, man can be attacked by large numbers of blood-thirsty fleas, these being newly hatched adults seeking their first blood meal. Reproduction of the flea is stimulated by oestrogens and corticosteroids in the peripheral circulation of the host. This may explain the individual variation in the extent to which a host attracts fleas.

PARASITICIDAL AGENTS

These compounds are widely used and a large number are available in South Africa. They are cholinesterase inhibitors and toxic doses cause acute poisoning of the central nervous system and neuromuscular junctions in mammals with resultant death due to asphyxia. Cats are particularly susceptible, exhibiting salivation, vomiting, diarrhoea and muscle fasciculations on intoxication. Trade names of registered products are listed in the Index of Veterinary Specialities and can also be obtained from the Department of Agriculture. Examples of organophosphates used in flea control are dichlorvos, quinhiophos, fenchlorphos, and malathion. Dichlorvos impregnated collars have been shown to cause both a local cervical dermatitis and a systemic anticholinesterase toxicity in cats. Atropine sulphate and the oximes (Toxogonin and 2-PAM) are antidotal.

Carbamates

These non-organophosphate anticholinesterases are less toxic to mammals than the organophosphates. A 5–8% carbaryl powder is commonly used against fleas on cats and dogs. Atropine sulphate is advised in the treatment of toxicity and 2-PAM is contra-indicated.

Chlorinated hydrocarbons

All the chlorinates are practically insoluble in water and therefore have a long residual action. Some, such as DDT and dieldrin are considered to be virtually indestructible and have been withdrawn. For the same reason the use of the rest of this group has been severely curtailed. Lindane (gamma BHC) on its own is not registered for pets, however, it is available for use on dogs in combination with amitraz, an insecticide developed for tick control. The main clinical signs of acute intoxication are increased irritability, tremor, followed by tonic-clonic convulsions, which indicate that the principal site of action is the central nervous system.

Plant derivatives

These are the oldest pesticides known. Pyrethrins are volatile oils of chrysanthemum flowers and are so safe that they can be used on neonates and even some exotic pets. Pyrethrins are widely used on pets and in premises often in the new microencapsulated form allowing controlled release for residual action. Where a pet owner is averse to the use of pesticides, these botanical derivatives can be offered as a more "natural" alternative. Emesis, gastric lavage, fluid therapy and diazepam or barbiturate control of convulsions are advised in the treatment of toxicity.

Pyrethroids

Synthetic pyrethrins are new effective flea control compounds of low mammalian toxicity. Examples are allethrin, and resmethrin.

Growth regulators

Methoprene is the commonly used growth regulator in the United States. It prevents fourth instar larvae from undergoing metamorphosis into adults and is often used in combination with an adulticide on premises as an effective control of both larvae and adults. It is of such low toxicity that it is fed to cattle as a fly control remedy.

Combinations

Additive effects, potentiation between two or more ingredients and improved formulations will make the use of combinations more attractive. In this way it is possible to a) provide both "knockdown" and residual effect, b) reduce the toxicity of any single component, and c) provide for ease of application. An example of this is the dog collar which combines amitraz against ticks with lindane against fleas. In contrast, for lindane to be effective against both ticks and fleas on its own, it would be so concentrated as to preclude its registration.

PRODUCT FORMULATIONS

Dips and rinses

These have both "knockdown" and residual effect if used every week. The disadvantages (time consuming, odiferous, and frequently expensive) are outweighed by the consistently excellent control of a wide range of ectoparasites. Some dogs develop a dry coat with repeated dipping. A more concentrated, smaller volume can be applied as a "sponge on" to obviate this. Many of these are schedule 4 due to mammalian toxicity and thus not freely available to the public.

Shampoos

The combination of a shampoo with an insecticide is
convenient and aesthetically attractive to pet owners. However, since the insecticide is washed off by the shampoo, it has no residual effect and the owner becomes frustrated by the flea control failure.

**Powders**
These are usually non-toxic and relatively effective if used sufficiently frequently (up to every 48 h). On neonates and debilitated pets where the owner is motivated to spend time, it is a convenient and effective control method.

**Aerosols**
These are quick and convenient. However, apart from the microencapsulated aerosols which are not yet available here, they have poor residual action and are even potentially toxic.

**Microencapsulated products**
Small nylon or polyurea capsules contain insecticide for slow, regular release. This method of stabilizing the insecticide provides an exceptionally good residual effect of low oral toxicity. Pyrethrins are encapsulated for use on pets and diazinon for premises.

**Oral products**
Cythioate is available as a schedule 4 pesticide. In dogs, it is effective, convenient and safe although too expensive in this country for use in any but the smallest of breeds. It is recommended at half strength for cats and the absence of documented side-effects makes it convenient especially in long-haired cats or those allergic to collars. However, consumer resistance to oral administration of insecticides is a disadvantage. Other oral preparations found to be ineffective are brewer's yeast, vitamin B₁₂, ethanolamine and garlic.

**Impregnated collars**
These are still extremely popular due to their ease of application and low mammalian toxicity. However, most owners seeking flea control advice have already found collars ineffective. No collar can provide a large dog with protection over its whole body. For cats and small dogs, frequent collar changes may provide sufficient flea control.

**Impregnated plastic strips**
Plastic permits long-term, and hence safe, release of toxic compounds such as dichlorvos. Although these are primarily for the control of flies, if placed above the whelping area, they provide a safe flea control remedy in neonates. Pleasant packaging has served to reduce the unattractiveness.

**Pour-ons**
A prepacked concentrated pesticide is applied along the coat from the nose to the tail and down the legs. Suitable volumes and concentrations are available in this country for corresponding sizes. A product containing 4% chlorpyrifos and 4% permethrin is registered in South Africa for dogs only and should not be applied more than once a month. The ease of administration (compared with dipping), residual effect and relative safety may make this a popular pesticide.

**Spot-on**
Insecticide applied topically in small volumes is absorbed percutaneously and secreted onto the skin over a period of time. Currently only fenothion, an organophosphate, is recommended. It is an effective flea control remedy in dogs and cats although Halliwell does not recommend its use in this species. The dose for dogs has been given as 20 mg/kg administered every week, every 2–3 weeks or every 3 weeks. A dose of 60 mg every 3 weeks has been recommended for cats. Recently, Archer & Cox in North America found almost 100% effective flea control for 24 days in dogs at a dose of 8 mg/kg.

Fenthion is registered in South Africa as "Tiguvon spotton" for cattle and "Bayopet spotton" for dogs and cats. Bayopet spotton is marketed in tubes of different concentrations and volumes to provide for species and body mass variations. The correct tube or tubes selected according to these instructions give approximately half the previously recommended dose. The minimum interval between applications is given as 2–3 weeks in dogs and 4 weeks in cats. The lower dose and longer interval renders the Bayopet regime safer though possibly less effective than the previously recommended one.

Since Bayopet may not be effective in areas of high flea infestation, veterinarians may find it necessary to continue to dispense the cattle preparation. Veterinarians may sell stock remedies; however, it is a contravention of the law to decant and sell from the original container without the full instructions being transferred. Risks involved in decanting and redispensing the cattle formulation are minimised by careful, correct labelling as for a schedule 4 drug.

Small volumes of this potent insecticide may cause severe toxicity. Cholinesterase levels remain depressed for a long time in a case of toxicity. In the event of oral overdose, evacuation of the gastrointestinal tract followed by the administration of activated charcoal orally and atropine and toxogonins intravenously, has been advised. To be cutaneously absorbed, the drug must be placed directly on the skin. Any placed on the hair, is ineffective. Blood levels are maintained for only 24 h. Thereafter it is thought to enter the fat and to be excreted onto the skin surface in sebum. Fenthion is not advised in greyhounds or in pets under 6 months or over 12 years. Nor is it advised in pets that are debilitated, pregnant or nursing. It has been suggested to keep children away from the pet for 24 h after application and to beware of fumes in an enclosed space. Concurrent use of other insecticides should be limited to non-anticholinesterase and non-systemic agents.

Fenthion has the advantage of convenient use, prolonged systemic effect and a possible repellent effect against fleas. This latter effect is especially important in preventing flea allergy dermatitis in that the flea is repelled before depositing the hapten contained in its saliva. Repelled fleas may then attack humans in the vicinity to obtain their blood meal. This temporary inconvenience is far outweighed by the benefit of having the normal life cycle so effectively disrupted.

**PRACTICAL PROTOCOLS**

**Dogs**

* a) Large and medium sized breeds:
  For fleas alone, fenthion is the most convenient. An effective dose in the author's experience is 20 mg/kg every
14 days. Where ticks are also encountered, a pour-on or dip should be used which kills both parasites. Ticks alone are best prevented by dips. Owners must be warned to avoid the use of other anticholinesterase pesticides concurrently with fenthion.

b) Small breeds
Regular changes of insecticide impregnated collars provide a safe and effective flea control regime in the author’s opinion. Owners should keep a diary of collar changes and rather change a collar early than rely on manufacturer's claims of efficacy. Regionally, fleas have developed resistance to insecticides and owner’s reports assist in finding the best collar for the area.

Cats
a) Short-haired breeds
Frequent, diarized collar changes have been found the most satisfactory flea control method in the author’s practice. Clients have to be warned that collars applied too loosely are easily removed by cats. The collar has to fit snugly and the excess cut off. Where a cat is particularly obstinate, it may be necessary to apply a lighter non-impregnated collar until this is ignored and then introduce the insecticidal collar.

b) Long-haired breeds
Flea control can be exasperating in these cats. If collars do not suffice, oral products or spot-on must be used. Warn clients to take the luxuriant hair coat into account when judging the weight. Dips are to be avoided in cats whose strong cleaning instinct may result in oral intoxication.

Pups and kittens
Regular powdering of the mother and her offspring combined with impregnated plastic strips placed near or hung above the whelping area have been found the most effective and convenient in the author’s practice.

Environmental control
a) Bedding
Foggers are canned aerosols providing inexpensive, convenient fumigation. Bedding can be placed in a room to be fumigated.

b) Home
However diplomatic the veterinarian has to be, it is essential to broach the subject of indoor flea control. Professional exterminators are able to provide long residual control (up to six months) due to thorough application and penetration of unexposed areas. For many clients, foggers used on a monthly basis are a less expensive and as effective a method. Vacuuming cracks, crevices and corners removes the live, partially activated and dead parasites.

c) Yard
This is not impossible to treat. Malathion, as a 0.5 to 5% spray or a 4% dust is available at garden centres and co-operatives. Particular attention should be paid to the pet’s favourite sleeping spots (often following the sun around the house as the day progresses).

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