

Comparison of the activity of selamectin, imidacloprid and fipronil for the treatment of cats infested experimentally with *Ctenocephalides felis felis* and *Ctenocephalides felis strongylus*

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Abstract

Twenty adult, domestic short hair cats were randomly allocated into four groups of five cats and housed in separated cages. Each cat was infested with 25 fleas *Ctenocephalides felis felis* and 25 *Ctenocephalides felis strongylus* and 2 days later (day 0) the cats in group 1, 2 and 3 received a spot on application of selamectin, imidacloprid or fipronil, respectively, while the cats in group four were not treated. The cats were combed 48 h later, the fleas were removed, counted and their subspecies were determined. All the cats were reinfested with the same number of the two subspecies of fleas on days 7, 14, 21, 29 and 35. The efficacy of each treatment was calculated 48 h after each infestation. The mean number of fleas on the control cats was 16.4 *C. f. felis* and 13.4 *C. f. strongylus*. The three treatments were effective for the first 31 days for *C. f. felis* and for the full 37 days for *C. f. strongylus*. Over the first 31 days, the efficacy of selamectin ranged from 89 to 100% and 85 to 100% against *C. f. felis* and *C. f. strongylus*, respectively, the efficacy of imidacloprid ranged from 76 to 100% and 92 to 100% and the efficacy of fipronil ranged from 98 to 100% and 97 to 100% against *C. f. felis* and *C. f. strongylus*. There were no significant differences between the control of *C. f. felis* and *C. f. strongylus* by the three products.

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Keywords: *Ctenocephalides felis felis*; *Ctenocephalides felis strongylus*; Cat; Fipronil; Imidacloprid; Selamectin

1. Introduction

The most common flea of dogs and cats in Europe and USA is *Ctenocephalides felis felis* (Chesney, 1995; Franc et al., 1998; Menier and Beaucournu, 1998; Visser et al., 2001; Cadiergues et al., 2000; Akucewich et al., 2002; Durden et al., 2005). In a large part of Africa *Ctenocephalides felis strongylus* is the main species (Dipeolu and Ayoade, 1982; Costantini et al., 1988; Beaucournu and Menier, 1998; Horak et al., 2004). Most of the time, efficacy of flea treatments are assessing by using *C. f. felis*. That is why it appeared interesting to compare the sensitivity of *C. f. felis* and *C. f. strongylus* to three active ingredients.

2. Materials and methods

Twenty adult, domestic short hair cats (13 males, 7 females), between 3 and 4-year-old, weighing 1 day before treatment from 2.86 to 8.11 kg were used. They were infested 2 days before treatment (D 2) and allocated randomly into five groups of four on Day 0 using the number of live fleas

Table 1
Efficacy (%) of fipronil, selamectin and imidacloprid spot on formulations on *Ctenocephalides felis felis* and *Ctenocephalides felis strongylus*

Efficacy	D2 (%)	D9 (%)	D16 (%)	D23 (%)	D31 (%)	D37 (%)
Fipronil						
<i>C. f. felis</i>	98.44*	100.00*	100.00*	100.00*	100.00*	100.00*
<i>C. f. strongylus</i>	96.72*	100.00*	100.00*	100.00*	100.00*	100.00*
Imidacloprid						
<i>C. f. felis</i>	100.00*	99.05*	93.65*	96.67*	76.00*	75.79*
<i>C. f. strongylus</i>	100.00*	100.00*	100.00*	100.00*	100.00*	100.00*
Selamectin						
<i>C. f. felis</i>	89.06*	100.00*	100.00*	100.00*	97.33*	96.84*
<i>C. f. strongylus</i>	100.00*	100.00*	100.00*	100.00*	100.00*	100.00*

* Significantly ($p < 0.05$) different from untreated control cats.

present on each cat on D0. The mean number of live fleas in each group on D0 was between 25.4 and 26. Each cat was housed in a stainless steel cage. They were fed with a dry ration which like water was provided ad libitum. They were acclimatised for 8 days before being infested with the fleas.

The strain of *C. f. felis* originated from a wild strain, harvested from a cat, which had been maintained at the laboratory since 1990. The strain of *C. f. strongylus* was originally harvested from a dog of the Ivory Coast and had been maintain on cats since 2004 (Yao et al., 2006). For each experimental infestation, 25 unfed, young adult (3–7 days old) *C. f. felis* and 25 unfed, young adult (3–7 days old) *C. f. strongylus* were placed on each cat. The cats were infested with the same number of fleas 2 days before the application of the treatment and 7, 14, 21, 29 and 35 days after the treatment.

The cats were treated with the unit label dose of each formulation respecting the laboratories recommendations. For each product, the unit label dose of solution was applied topically by first parting the hair on the neck between the shoulders and applying the formulation directly on a single spot on the skin. Cats of group 1 were treated with a fipronil spot on (Frontline chat1, Me´rial) at a dosage of 6–13 mg/kg; the cats in group 2 were treated with an Imidacloprid spot on (Advantage 401 or Advantage 801 depending on the weight of the cat, Bayer) at a dosage of 11–12 mg/kg; the cats of group 3 were treated with a selamectin spot on (Stronghold 45 mg1, Pfizer), at a dosage 6–12 mg/kg; and the fourth group was an untreated control group.

Forty eight hours after the first treatment and 48 h after each infestation, the cats were carefully combed with a finetoothed metallic comb. The species of the fleas collected were identified microscopically and not replaced on the cats on days 2, 9, 16, 23, 31 and 37.

The efficacies of the treatments were calculated by comparing for each species the arithmetic mean flea count of each treated group with the mean count of the untreated group, using the formula of Abbott (1987). The data were analysed by using analysis of variance. The percentage flea recoveries on the control cats were compared by using a chi-squared test. Differences were considered significant at $p < 0.05$.

3. Results

3.1. Activity against *C. f. felis*

The results (Table 1, Fig. 1) show that the experimental infestations with *C. f. felis* were

successful, with the mean percentage recovery of *C. f. felis* on the control cats 48 h after each flea deposition ranging between 50.4 and 84%.

Two days after treatment only the imidacloprid formulation showed complete efficacy (100%). This was no longer the case by Day 9 and a constant decrease of efficacy was observed to D37.

Selamectin spot on was less than 90% effective 2 days after the treatment. Thereafter it protected cats from reinfestation with *C. f. felis* for 3 weeks with an efficacy of 100%. During weeks 4 and 5 the protection was roughly 97%.

Two days after the treatment, fipronil was 98% effective. From then on, the fipronil formulation protected cats from reinfestation with an efficacy of 100% for the 5 weeks remainder of the trial.

All treatments controlled the flea infestations significantly for the duration of the trial. A significant difference appeared at D37 ($p < 0.05$) between fipronil

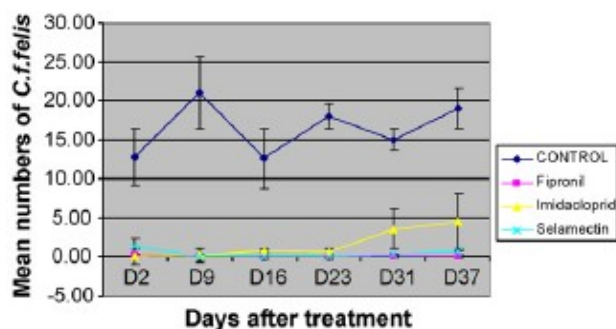
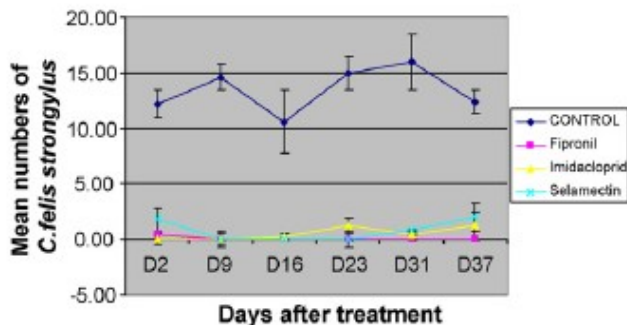


Fig. 1. Mean (S.D.) of *Ctenocephalides felis felis* counts. D0 = treatment.



and imidacloprid (Newman Keuls test). But there were no significant differences between fipronil and selamectin and selamectin and imidacloprid ($p < 0.05$).

3.2. Activity against *C. f. strongylus*

The results show that the experimental infestations with *C. f. strongylus* were successful, with the mean percentage recovery of *C. f. strongylus* on the control cats 48 h after each flea deposition ranging between 42.4 and 64%. The rates of recovery were not significantly different between the two subspecies of fleas ($p < 0.05$) (Fig. 2).

Only imidacloprid formulation was 100% effective 2 days after treatment, fipronil achieved 97% and selamectin 85%. For the remainder of the trial the control of reinfestation was excellent (100%) in the group treated with fipronil. The efficacy remained between 92 and 100% in the groups treated with the other active ingredients.

All treatments controlled the flea infestations significantly for the duration of the trial and

there were no significant differences between the three treated groups.

4. Discussion

It is the first recorded study performed with artificially bred *C. f. strongylus* the main species of flea in a large part of Africa. It was conducted in accordance with Good Clinical Practice.

There were no significant differences in the sensitivity of the two subspecies of *C. felis* to the three formulations of different active ingredients: fipronil imidacloprid and selamectin. These results are interesting for people working in Africa. The formulations tested on the subspecies *C. f. felis* could be used on *C. f. strongylus*. These results are similar from those obtained on the species *C. canis* and *C. felis* with the three same licensed formulations (Cadiergues et al., 2001).

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