

Insecticide Efficacy of Medicines During Cats Flea Infestations in Tyumen

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Abstract.- The paper presents the results of therapeutic efficiency of Komfortis, Foresto and Fitoelita medical agents used during flea infestation among domestic cats. For the study, the animals were divided into three groups 10 animals each. Clinical, hematologic and special research methods were conducted during the study. Blood sampling included three stages: before insecticides treatment, intermediate interval of 15 days, and the final stage. It is found that Komfortis and Foresto have 100% therapeutic efficacy at all stages of flea development and possess a long-lasting action during flea infestation. The morphological blood analysis showed that the proposed medical agents have no toxic or side effects.

Key words- flea infestations, cats, aphaniptera, ctenocephalides, *Ctenocephalides felis*, insecticides

I. INTRODUCTION

From time immemorial people began to domesticate wild animals and throughout many generations they are kept by people genetically isolated from external pathogens. At present, every pet owner is trying to breed and protect his animal from contagious and noncontagious diseases. However, lack of knowledge and mass media on simple preventive measures results in widespread occurrence of infectious and invasive diseases, including flea infestation among dogs and cats [5, 10, 15-17].

Flea infestation of domestic cats is one of the urgent problems studied by modern veterinary science, but, despite the achieved success of parasitic pharmacy in their elimination, fleas are widely spread and represent danger to cats, dogs and others house carnivorous animals kept in close contact, as well as owners and people contacting them [1, 2, 12, 13, 16, 17].

To prevent the distribution of flea infestations it is necessary to account and ensure continuous epizootic control over timely medical and preventive measures to eliminate the focus of disease [2, 3].

Today the veterinary science employs various antiparasitic agents different in their form, chemical composition, mode of administration and price. However, despite the variety of insecticidal agents created to fight against flea infestations, some current flea species are resistant to some classes of insecticides containing two and more active drug substances [4, 11, 14].

The resistance level may be high to exclude the possibility of any further use of either medical agent. There are known cases when the resistance of parasitic arthropods is developed even at the stage of testing a new medicine prior to its industrial output [6].

In this regard the efforts of experts are aimed not only to the creation of new medicinal compounds with a different mode of action, but also to the search of such insecticide strategy, which could prevent the formation of resistant types of parasitic arthropods.

Thus, it is critical to develop new medical agents, mainly complex ones containing several active drug substances. This combination is advantageous since various active substances cause synergistic impact on all stages of flea development.

II. RESULTS AND DISCUSSION

During the study it was noted that Komfortis and Foresto have high insecticidal effect reaching 98-100%. The insecticide efficacy was considered within a month, every 5 days from the moment of applying the medicines.

It shall be noted that the number of dead imagos was sharply increasing from the first to the tenth day of the study in test groups. The maximum mortality rate was on the 5th day of observations, where for the first group this made – 34.28%, and for the second – 29.30%. During the following observation the quantity of fleas in test groups was reducing.

The therapeutic efficacy of applied medical agents made 100% in the first group on the 25th day of observation and in the second group on the 30th day. The smallest number of parasites per one infected specimen was observed with Komfortis – 45.8.

The analysis of insecticidal activity of the control group showed that the efficacy of the medical agent was indicated

only at the time of drug administration, during the interim periods the number of fleas was minimum, the maximum mortality rate was observed on the 20th day and made 18.24%.

The highest invasiveness per one specimen of the control group made 102.5, which indicates the progressive growth of fleas at all control points. All results are shown in Table 1.

TABLE 1. INSECTICIDE EFFICACY DURING CATS FLEA INFESTATION IN TYUMEN

Assessment period	First test group Komfortis agent (n=10)		Second test group Foresto collar (n=10)		Control group Fitoelita shampoo (n=10)	
	Amount of detected fleas	%	Amount of detected fleas	%	Amount of detected fleas	%
1st day	144	31.44 ± 0.67	121	25.69 ± 0.71	157	15.31 ± 0.76
5th day	157	34.28 ± 0.58	138	29.30 ± 0.69	104	10.15 ± 0.54
10th day	112	24.45 ± 0.52	124	26.33 ± 0.52	161	15.71 ± 0.48
15th day	29	8.52 ± 0.42	68	12.31 ± 0.37	130	12.68 ± 0.65
20th day	6	1.31 ± 0.34	39	8.28 ± 0.29	187	18.24 ± 0.44
25th day	0	0 ± 0.25	11	2.34 ± 0.21	133	12.97 ± 0.76
30th day	0	0 ± 0.28	0	0 ± 0.17	153	14.93 ± 0.51
Total	458		471		1025	
Infection intensity	45.8		47.1		102.5	

The study of therapeutic efficacy of Komfortis, Foresto and Fitoelita during flea infestation of cats did not reveal any negative impact on their organism, there were no toxicoses and gastrointestinal upsets.

The hematologic study showed that during the primary blood sampling a minor increase of white blood cells was noted among all groups of animals.

After the use of insecticidal agents, the follow-up tests were performed at interim intervals. The first and the second groups are characterized by the decrease of indicators to the minimum, while the control group – by the increase in leukocytes to $7.98 \pm 0.41\%$, eosinophils to $2.68 \pm 0.46\%$, other indicators remained unchanged.

At the final stage of blood sampling from the groups exposed to Komfortis and Foresto the animals were fully recovered, the blood values fell within physiological range, the indicators of the control group did not change drastically from primary tests at the beginning of a therapy. All results are shown in Table 2.

The hematologic blood changes of cats with flea infestations demonstrate that at different invasiveness the values do not change considerably from physiological range.

Thus, the hematologic study made it possible to confirm that the treatment with such medical agents does not exert pathogenic impact on blood values, which fall within physiological range.

III. MATERIALS AND METHODS

The study was performed during 2014-2017 at a vivarium of the Institute of Biotechnology and Veterinary Medicine of the Northern Trans-Ural State Agricultural University. The experimental part was conducted at the laboratories of the All-Russian Research Institute of Veterinary Entomology and Arachnology – branch of Tyumen Research Center, SB RAS and the veterinary clinics of Tyumen.

Thirty animals were picked for the study (different breed, age, nutritional state) thus forming three equal groups (n=10).

Komfortis was applied to the first test group, Foresto – to the second, and Fitoelita shampoo – to the third control group.

Komfortis is an insecticide released as pills for oral use, it contains spinosad – 53.33%, is active towards fleas parasitizing dogs and cats. The mechanism of action involves the activation of n-cholinergic receptors of parasitic arthropods, causes nervous strain, muscle cramps, tremors and paralyses leading to the death of insects [7].

Foresto is an insect-acaricidal collar, it contains imidacloprid – 1.25 g and flumethrin – 0.56 g. The mechanism of imidacloprid action is based on the interaction with acetylcholine receptors of ectoparasites. It causes neurotransmission disorder resulting in complete paralysis leading to the death of ectoparasites. Flumethrin is a pyrethroid insecticide affecting voltage-sensitive sodium channels, it blocks nerve conduction resulting in spasm causing motor reflex of arthropods leading to death [8].

Fitoelita is an insecticidal shampoo, it contains permethrin – 0.3%, blocks neurotransmission of peripheral nerves ganglion leading to death through paralysis of flea adult and larval phases [9].

The following special methods were used: hair combing (to define the number of alive and dead fleas) (Fig. 1), flea counting

in Dawn Professional Dawn solution (Fig. 2), microscopic study (to define flea viability) (Fig. 3), hair print using acetate bands (to detect fleas and products of their activity) (Fig. 4). The obtained results were processed statistically via Statistica Ultimate Academic Bundle.

Table 2. The main hematologic changes of blood during cats flea infestation in Tyumen

Indicator	Leucocytes, 10 ⁹ /l	Eosinocytes, %	Band neutrophils, %	Segmented neutrophils, %	Lymphocytes, %	Monocytes, %
Blood test at the beginning of study						
First group Komfortis	7.61 ± 0.41	2.38 ± 0.45	2.41 ± 0.38	37.68 ± 1.26	31.87 ± 0.29	2.13 ± 0.33
Second group Foresto	7.64 ± 0.44	2.42 ± 0.38	2.40 ± 0.21	37.62 ± 1.62	31.81 ± 0.25	2.15 ± 0.39
Control group Fitoelita	7.55 ± 0.39	2.44 ± 0.42	2.40 ± 0.21	37.65 ± 1.64	31.86 ± 0.28	2.12 ± 0.38
Interim blood test on the 15th day						
First group Komfortis	6.81 ± 0.42	1.86 ± 0.52	1.38 ± 0.33	36.22 ± 1.26	27.45 ± 0.34	1.61 ± 0.35
Second group Foresto	6.93 ± 0.38	1.97 ± 0.49	1.42 ± 0.36	36.28 ± 1.28	28.16 ± 0.32	1.89 ± 0.29
Control group Fitoelita	7.98 ± 0.41	2.68 ± 0.46	2.14 ± 0.31	37.15 ± 1.12	31.64 ± 1.12	1.64 ± 0.32
Final blood test on the 30th day						
First group Komfortis	6.24 ± 0.51	0.82 ± 0.34	0.28 ± 0.12	35.46 ± 0.66	26.14 ± 0.29	1.25 ± 0.31
Second group Foresto	6.28 ± 0.49	0.86 ± 0.42	0.34 ± 0.15	35.51 ± 0.69	26.17 ± 0.26	1.54 ± 0.28
Control group Fitoelita	8.14 ± 0.53	2.74 ± 0.38	2.15 ± 0.22	37.02 ± 1.16	31.42 ± 1.24	2.49 ± 0.29

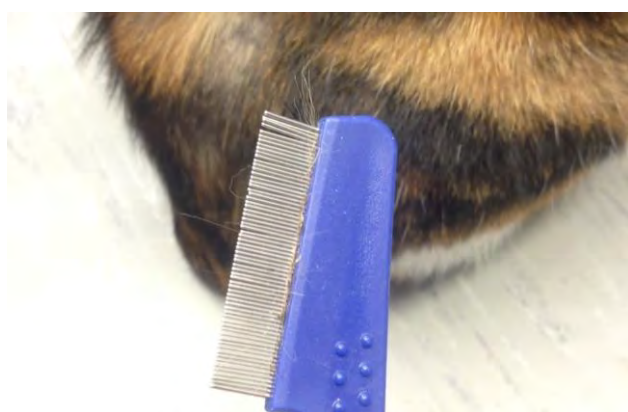


Fig. 1. Collection of fleas and eggs during combing

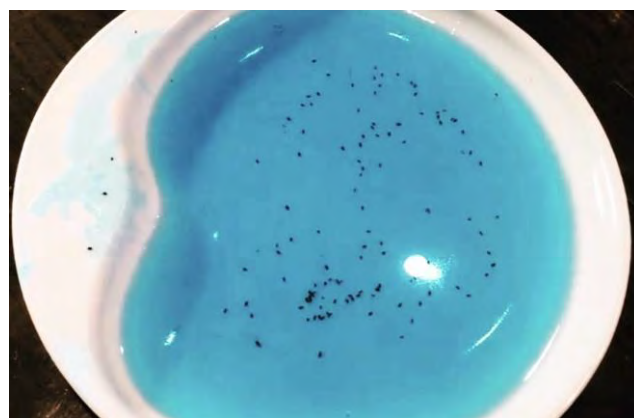


Fig. 2. *Ctenocephalides felis* in Dawn Professional Dawn solution after combing

The dosage of Komfortis pills was selected individually taking into account animal weight prior to treatment. Komfortis

was applied at a dose of 50 mg/kg. The insect-acaricidal Foresto collar was used as per instructions for cats (38 cm). The medical agents were applied once only for test groups. The insecticidal Fitoelita shampoo was used at the rate of 1 ml/kg, its application was repeated after 10 days as per the manufacture's recommendations.

The efficiency of applied medical agents during flea infestations of domestic animals was assessed following the results of clinical, hematologic and special trials, and estimation of infestation intensity.

The blood tests were analyzed via the Abacus Junior 5 (Vet), sampling was done on the first day, further periods were broken into interim stages of 15 days.

The flea infestation was validated using the special study of hair and skin cover of all groups of animals before treatment and after the application of insecticidal medicines.



Fig. 3. *Ctenocephalides felis* under microscopic study



Fig. 4. Hair print with *Ctenocephalides felis*

IV. CONCLUSIONS

The efficacy of using such insecticidal medical agents as Komfortis and Foresto collars as the therapy of cats' flea infestations makes 100%.

The application of such insecticides allows facilitating and reducing the length of treatment of pets.

Further observation of patients after treatment did not reveal any reinfestation cases, which indicates its long-term action and serves an excellent preventive method.

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