

## FLEA CONTROL CHALLENGES: RUMORS AND REALITY

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Flea control has always been difficult, and the advent of modern monthly flea control products has made the job easier. Flea control products with excellent month-long activity against fleas and/or their eggs have had a tremendous impact on flea control, but in certain cases flea control still seems problematic for some pet owners. Consequently, veterinary practices continue to get cases in which it appears that the flea control product that they sold failed to work. In fact, it is often not possible for the veterinary clinic to get to the root cause of all of these cases. Flea biology and its interaction with the environment and flea hosts is complex, and it is not feasible for veterinary staff to conduct in-home investigations. The series of cases presented here illustrate real examples of challenging flea control situations, in which owners continued to see fleas on treated pets. By understanding the results of these investigations, you and your staff can see how complicated flea infestations can become, and why simply blaming product performance is not a solution.

### Essentials for Understanding Flea Biology and Flea Control

Before examining these cases, there are some facts about flea biology and flea control that are essential if difficult flea cases are to be understood.

- *Ctenocephalides felis felis*, the “cat flea”, is as an adult an obligate parasite that is metabolically and reproductively bound to its host.<sup>1-3</sup> This revelation dramatically changed how we attempt to manage fleas; by applying products to and on our pets in an attempt to control reproduction and “break the life-cycle”, rather than focusing on the environment.<sup>4-6</sup>
- Once on a preferred host, cat fleas begin feeding within minutes, and soon thereafter begin breeding. A female flea can begin laying eggs within 24-48 hours of jumping onto a host. In a few days a female flea can lay 40-50 eggs per day.<sup>2</sup>
- Flea eggs roll off the host, and larvae typically hatch in 3-5 days. Larvae are the most sensitive stage of the flea, requiring flea feces for nutrition, protection from direct sunlight, temperature in the range of 45 F to 90 F, and relative humidity in the range of 50% to 85%.<sup>7,8</sup>
  - Most larvae do not survive to become adult fleas.
  - The rate of flea development is temperature dependent. Development from eggs to fleas can occur in less than three weeks at 85 F, and can take 7 to 12 weeks at 65 F.<sup>7,8</sup>
  - New fleas will develop and emerge where pets or other flea hosts spend most of their time, because this is where most eggs are deposited and larvae require flea feces for nutrition.
- Common hosts for *C. felis* include cats, dogs, opossums, raccoons, domestic rabbits, and hedgehogs.<sup>7,8</sup> Squirrels and birds are not hosts for cat fleas.
  - Feral cats, opossums, and raccoons move throughout neighborhoods, leaving flea eggs behind.
  - These “urban wildlife” hosts for the cat flea often seek shelter under covered protected areas, and where they rest they leave behind flea eggs and flea feces.

With some indoor flea infestations, the number of fleas emerging into the home will increase substantially in the month after treatment of all pets with a monthly flea control product.<sup>5,6</sup> These are called “redline” homes, and in these cases pet owners will see more fleas on their pets, and possibly themselves, than before treatment. When confronted with increasing numbers of fleas, pet owners will inevitably conclude that the flea control product is not working at all. In fact, the fleas emerging into the home after the pets were treated came from eggs laid weeks before treatment. Those eggs will continue to develop into larvae, pupae, and adult fleas and the pet owners will continue to see new fleas on their pets until the source of these fleas is exhausted. Depending on the temperature, it can take three weeks to several months for the infestation to run its course.<sup>9-12</sup>

### Case Studies

The following case studies were selected from households involved in a field study performed in Tampa, Florida by the Kansas State University Flea Team (Dr. Dryden, a technician, and undergraduate and veterinary students) in the summer of 2009. Tampa is known to provide challenging conditions for assessing flea control products, because it has the ideal temperatures, humidity, habitat (sandy soil, vegetation consistent with a subtropical climate), and numerous untreated hosts for *C. felis* (feral cats, opossums, raccoons).

#### **Case #1: Hitch-hiker fleas and the indoors-only cats**

**Signalment:** Three permanently indoors cats, aged 3 years, 5 years, and 18 years.

**History:** All three cats had fleas at the initial examination. Flea counts on the two younger cats declined after treatment with FRONTLINE Plus, but flea counts on the older Persian cat continued to increase during the first three weeks

after treatment. Flea traps were placed on a throw rug in the dining room and on a rug at the foot of a couch on which the older cat liked to lie. Flea trap counts spiked one week after the cats were treated, and then abruptly declined to 1 or 0 for the remainder of the study. The source of fleas on the cats after day 7 was unknown and prompted further investigation.

**Examination of the pets:** At an examination on study day 39 the Persian cat had two fleas. This cat had poor dentition, as expected for her age and a bit of a rough hair coat.

**Examination of the premises:**

**Inside** – The home had all hardwood floors with a few throw rugs and was kept very clean. The white sofa in the living room, where the Persian cat enjoyed resting, had cat hair and flea dirt on a corner of a cushion. Under the cushion more flea dirt was visible.

**Outside** - The home had an attached screened lanai. Walking into the yard, the Flea Team immediately noticed two members of the “pack of cats” that frequented the yard.

**Diagnosis:** The opossums, raccoons, and the pack of cats were a source of flea eggs in the yard, where conditions were ideal for flea development. It was likely that fleas were jumping onto the owner and were subsequently carried into the home, where they found their preferred hosts, the cats.

**Conclusions and lessons learned:** The older Persian cat had the most fleas, because with her poor dentition and age she was an inefficient groomer of fleas. Because she spent much of her time lying on the sofa, she shed flea eggs and flea dirt (a crucial food source for flea larvae<sup>7,8</sup>) onto and into the carpet. Flea larvae were able to develop in the darkness under the cushion, and with the high relative humidity inherent to Tampa, FL. Vacuuming under the cushion likely contributed to the rapid decline in emerging fleas from the sofa, but vacuuming did not remove all flea eggs, as found by observing the large numbers of flea egg casings under the sofa cushion several weeks later.

This case illustrates that permanently indoor cats can and do get fleas, often from their owners. Cat fleas will jump onto people, and will bite people.<sup>7,8</sup> When a person carries flea into the home, they will eventually jump off the person, and if the indoors cat walks by, the flea will jump onto the cat, on which it will feed, reproduce, and remain until it is groomed off.<sup>2</sup>

**Case #2: Where are all these fleas coming from?**

**Signalment:** A one year-old, spayed female, Cocker Spaniel and a five year-old, spayed female domestic shorthair cat.

**History:** At the initial examination, there were no fleas on the cat and the dog had 40 fleas. Twenty fleas were collected in the flea traps. The cat was not included in the study, but it was treated with FRONTLINE Plus at the same time the dog was treated. In this home the flea trap counts initially increased (“red-line” home), but then decreased to zero as the indoors flea infestation ran its course. The flea counts on the dog, after initially declining, steadily increased, even as the indoor emerging flea counts (trap flea counts) declined. This prompted a thorough on-site investigation.

**Examination of the pets:** The dog was examined at 8 o’clock in the morning by the Flea Team. This was the time the Flea Team performed all of its examinations at this home, because of the homeowners worked. On initial inspection many fleas (33) were found crawling on the dog’s abdomen.

**Examination of the premises:** The homeowner showed the Flea Team a large tree hanging over a shed in the back yard, which, he explained, was home to a raccoon. Wooden lattice cover the sides of most of the deck, but one section of lattice had been removed to allow the dog access under the deck, where the dog could rest in the shade. The soil under the deck was sandy, which is typical for Tampa. Dr. Dryden explored under the deck and behind the shed, where the owner had discarded cut limbs from the tree. A few minutes later he found several fleas on his socks!

**Diagnosis:** The source of the dog’s fleas was the backyard. Fleas were developing under the deck, where the shaded sandy soil under the deck provided ideal conditions for flea development. The source of flea eggs was suspected to be the raccoon (s).

**Follow-up examination:** On day 60 of the study the Flea Team conducted the final examination. There were no fleas in the two traps placed in the home overnight, but the dog had 60 fleas on it!

**Conclusions and lessons learned:** The dog picked up a large number of fleas every time it went out to the backyard. The Flea Team concluded that the raccoon (probably raccoons; because is there really ever just one), used the area under the deck as shelter, so this became a flea infestation “hot-spot”. Treatment with FRONTLINE Plus stopped flea reproduction on the pets, and the indoor flea infestation ran its course. FRONTLINE Plus continued to kill new fleas that the dog picked up when it went out to the yard.

**Case #3: The “Deep Dive”**

**Signalment:** A 2 year-old, spayed female Jack Russell Terrier in an upstairs apartment and a 5 year-old, neutered male, small terrier-mix dog in a downstairs apartment. The apartments are in a detached dwelling and the dogs share the same yard and have access to both apartments.

**History:** At the initial examination there were 41 fleas on the upstairs dog, with just 6 fleas caught in the flea traps placed upstairs. Conversely, the downstairs dog had 9 fleas on it, and there were 22 fleas in the traps. During the month after

the first treatment with FRONTLINE Plus the flea counts in the traps in the upstairs apartment remained relatively low, but the upstairs dog still had several fleas on it (21-51 at different counts). In the downstairs apartment the flea counts in the traps increased after treatment (“redline” home), as did the flea counts on the dog. However, as is typical for “redline” homes, the flea counts in the traps and on the dog substantially declined by 28 days after the first treatment, indicating that the flea infestation in the apartment was running its course. However, flea trap counts on study day 45 increased considerably in both the upstairs and downstairs apartments. This was extremely odd and the Flea Team conducted a thorough investigation.

**Examination of the pets:**

Although the owner of the downstairs apartment indicated that no other pets visited their home, the Flea Team students reported finding two pit bull dogs at the home on their most recent visit (study day 45), when they placed flea traps in the home. The owner said that the dogs had just come over for the day. The students noted fleas on these visitor dogs, and they treated both dogs with FRONTLINE Plus.

**Examination of the premises:** Because the surge in flea trap counts, both upstairs and downstairs, was so unusual, at this point of the investigation the flea traps were examined under a dissecting microscope. The hypothesis that was tested was that a flea infestation running its course should consist of more male fleas than female fleas.

**Diagnosis:** The flea gender ratios in the flea traps from the upstairs apartment (primarily male) reflected an aged population. It was anticipated that the flea trap counts would subsequently decline as the flea population ran its course, and this was verified on subsequent flea trap counts performed on study days 60 and 74. The flea gender ratios in the flea traps from downstairs (primarily female) reflected an active infestation, with more female than male fleas. Also, most fleas in the traps downstairs had blood in them, including one gravid flea, indicating that they had been groomed off of an animal on which they had fed and subsequently had jumped into the flea traps.

**Follow-up examination:** Based on the microscopic examination of the flea traps, it was clear that there were different phenomena occurring upstairs and downstairs. Because the two pit bull dogs had been observed by the students and with the knowledge that fed and gravid fleas were being groomed off of animals that were probably untreated, the Flea Team again asked the family in the downstairs apartment about visitor pets, and other than the one-time visit by the pit bull dogs, they denied this. However, when the daughter was asked separately whether she had any concerns about whether the two visiting pit bulls might harm her little dog if left unsupervised, she replied, “Oh no, they know each other well and they get along great together.” As it turned out, these dogs belonged to the owner’s adult son, and in fact the dogs were over at the apartment frequently. On the same visit, the Flea Team learned from the resident of the upstairs apartment that he had gone out of town for six days before the flea trap was placed in his home on study day 45. While he was on vacation, he had left his dog at his sister’s home, which happens to be the home featured in case 2.

**Conclusions and lessons learned:** Treatment with FRONTLINE Plus stopped flea reproduction on the treated pets, upstairs and downstairs, and the original indoor flea infestations ran their course. However, a secondary infestation from flea eggs coming off of the son’s visiting, untreated dogs resulted in a second surge of emerging fleas downstairs and increased fleas on both the upstairs and downstairs dogs, which had free access to the downstairs apartment.

**Summary**

It can be very difficult for veterinarians and clinic staff to solve many of the flea cases they are faced with, because they often do not, or cannot, have the information necessary to find the solution. But flea control cases are really like any other diagnostic challenge, and clinics can develop diagnostic skills that can be used to respond to the flea problems of their clients.

Questions to ask pet owners:

1. How many dogs and cats in the home? Other pets?
2. What products are you using?
3. Are all the dogs and cats being treated?
4. How are you applying the product?
5. How many hours do pets spend outside? Do not ask if the pet is an indoor or outdoor pet!
6. Where does each pet rest inside?
7. Where does each pet go outside?
8. Do you see neighbors’ pets in the yard?
9. Do you see feral cats, opossums, raccoons in the yard?
10. Do you have visitor pets in your home, or do you take your pets to other homes?

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