



## Editorial

 Tradition and innovation: Selamectin plus sarolaner. A new tool to control endo- and ectoparasites of cats—Studies from North America and Japan<sup>☆</sup>


The role of endo- and ectoparasites in the health and welfare of cats is well recognized worldwide; consequently, parasite treatment and prevention are one of the cornerstones of feline preventive health care. Indeed, indoor and outdoor cats can become infected with parasites at any point in their lives. They may become infected while roaming in the environment, through contact with infected cats (including wild felids) and other animals, or through predation. Since many of these parasites are also zoonotic, prevention of infestation not only benefits cats, but protects the health of their human companions.

The most common ectoparasite found on cats worldwide is the cat flea (*Ctenocephalides felis*). Fleas can be found on any cat but are especially prevalent on stray cats and owned cats with outdoor access. Fleas cause disease ranging from subclinical and mild signs to life-threatening anemia, especially in the young, the old, and cats that are already severely debilitated. Many cats develop flea allergy dermatitis, an uncomfortable disease characterized by pruritus, hair loss, and miliary dermatitis. In addition, fleas are an important intermediate host for the tapeworm, *Dipylidium caninum*, and a vector for hemoplasmas, *Bartonella* spp., and *Rickettsia felis*. Ear mites (*Otodectes cynotis*) are also a common and highly contagious ectoparasite of cats causing pruritus, with infestations being most common in kittens. In severe cases, secondary bacterial otitis and aural hematoma may occur.

Traditionally, there has been more concern about tick infestations in dogs than cats and control of ticks on cats has always been more difficult than control of other ectoparasites. Ticks not only cause direct irritation and debilitation to cats through blood loss, but they are vectors of important diseases. There are fewer licensed drugs for tick control in cats than for other ectoparasites. In addition, other methods, such as keeping animals exclusively indoors and daily inspection and removal of ticks, are not very practical. Even cats that live indoors can be infested with ticks brought inside by other pets or humans. With the increased knowledge about tickborne pathogens transmitted to cats there has been increased awareness about the need to protect cats against these parasites and the diseases they carry. The limited scientific data available on tick infestations in North America shows that cats are infested predominantly by three tick species: *Ixodes scapularis*, *Dermacentor variabilis*, and *Amblyomma americanum*. In the southcentral United States, *Amblyomma americanum* is the predominant tick species and it is a vector for *Cytauxzoon felis*, the causative agent of cytauxzoonosis, a disease that is often fatal. *Ixodes scapularis* has been shown to transmit *Borrelia burgdorferi* sensu stricto (the causative agent of Lyme disease) and *Anaplasma phagocytophilum* to cats. While the issue of whether *B. burgdorferi* causes clinical disease in cats is still under

discussion, clinical disease associated with *A. phagocytophilum* is well established. Both pathogens may cause clinical or subclinical disease in humans. *Dermacentor variabilis* is also a vector for *C. felis*, as well as tularemia (caused by *Francisella tularensis*) which may be severe or life-threatening in both cats and humans, and the potentially deadly Rocky Mountain spotted fever (caused by *Rickettsia rickettsi*) in humans. In Japan, *Haemaphysalis longicornis* is the most common tick species on cats although other *Haemaphysalis* spp., *Ixodes* spp., and *Rhipicephalus sanguineus* can be found. *Haemaphysalis longicornis* is a vector for pathogens that infect both humans and cats, such as *A. phagocytophilum*, *Anaplasma platys*, *Ehrlichia* spp., *Babesia gibsoni*, and *Rickettsia japonica* (the cause of Japanese spotted fever). This tick is also a vector for a *Flavivirus* which causes tick-borne encephalitis and the emerging zoonotic *Phlebovirus* which causes severe fever with thrombocytopenia syndrome in humans. *Ixodes* spp. in Japan are known to transmit *A. phagocytophilum* and *B. burgdorferi*, while *R. sanguineus* transmits *Ehrlichia* spp. and *A. platys*.

Two of the most common endoparasites in domestic cats worldwide are hookworms and roundworms. The most common ascarid of cats is *Toxocara cati*, the feline roundworm. This parasite may cause subclinical infections in adult cats but young cats or cats with moderate to heavy parasite burdens may show clinical signs such as a pot-bellied appearance and general ill health. The feline hookworm, *Ancylostoma tubaeforme*, is less common than *T. cati* but no less important. While subclinical infections can also occur with *A. tubaeforme*, this parasite can cause anemia, inappetence, and weight loss, especially in young and juvenile cats. Both nematodes are zoonotic to humans, causing cutaneous and visceral *larva migrans* with dermatologic, respiratory, ocular, and gastrointestinal disorders.

Heartworm disease caused by *Dirofilaria immitis* is vectored by various mosquito species. The disease is endemic in many parts of the world such as the United States, South America, Japan, Australia, and central and Mediterranean Europe. Although cats are susceptible to *D. immitis* infection, prevalence is likely underestimated compared with dogs and the clinical signs of heartworm disease are different. In cats, the primary pathology occurs in the lungs (heartworm-associated respiratory disease) and lesions can occur even if adult worms never develop. The intense inflammatory response to the arrival and death of immature heartworms in the lungs causes signs such as coughing and dyspnea and sometimes sudden death. Even cats kept indoors are susceptible to infection; therefore, it is recommended that all cats living in heartworm endemic areas receive a heartworm preventive.

In this *Veterinary Parasitology* supplement, a collection of articles

<sup>☆</sup> This article is published as part of a supplement sponsored by Zoetis.

highlights the ability of a new topical combination antiparasitic (selamectin plus sarolaner) to treat and prevent important endo- and ectoparasites of cats. Selamectin topical solution has been available since 1999 for the treatment and prevention of fleas, prevention of heartworm disease, and the treatment of *O. cynotis*, *T. cati*, and *A. tubaeforme* in cats. Sarolaner is a novel isoxazoline with potent acaricidal and insecticidal activity. The addition of sarolaner broadens the efficacy of the combination product (Revolution® Plus/Stronghold® Plus, Zoetis) to include several important tick species infesting cats. A broad-spectrum product is especially important since cats are commonly infested with more than one endo- or ectoparasite.

The studies in this supplement show that monthly topical application of Revolution® Plus/Stronghold® Plus was safe and highly effective in treating and controlling natural infections of *A. tubaeforme* and *T. cati* in cats presented as veterinary patients. A monthly topical application of the product was also well-tolerated and highly effective against fleas in cats under natural field conditions and the signs of miliary dermatitis were reduced. In addition, a single application was highly effective for the treatment of ear mites in naturally infected cats.

Four papers show the efficacy of Revolution® Plus/Stronghold® Plus against *I. scapularis*, *D. variabilis*, *A. maculatum*, and *A. americanum* in cats. This new product prevented re-infestation by *A. maculatum* for 4 weeks and *D. variabilis* for 5 weeks. The onset of activity against *I. scapularis* was rapid, with kill of existing infestations within 12 h. In laboratory and field studies in Japan, Revolution® Plus/Stronghold®

Plus was safe and effective against *H. longicornis* and fleas. In addition, the product was safe and effective in the prevention of heartworm disease and the treatment of roundworm infections in naturally infected cats visiting veterinary hospitals.

Cats are not always the most cooperative patients for administration of treatments, whether in the veterinary hospital or at home. Therefore, everyone, including the cat, prefers cat-friendly products with ease of application. Reducing the stress of a treatment is important for success. Revolution® Plus/Stronghold® Plus provides the ability to treat multiple infestations with a simple-to-apply, quick-drying, small-volume, monthly topical solution and should help improve client adherence to the recommendations of veterinarians and reduce disease risk for both cats and humans.

#### Conflict of interest

Zoetis supported the editorial assistance provided by Dr. Susan Little and Dr. Domenico Otranto.

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