

Flea & Tick Control: Current Options

Craig Datz, DVM, MS, DABVP, DACVN
University of Missouri



You have asked...
What are some current flea and tick treatment options and their mechanisms of action?

The expert says...

Ectoparasite control has come a long way from bathing and dipping. Before the mid-1990s, few products reliably controlled flea and tick infestations. The development of effective adulticides, larvicides, and insect-growth regulators led to veterinarians, staff, and owners increasingly expecting products to kill 100% of fleas and ticks on pets and in the environment after a single application. Communication about the life cycle and control of parasites, both indoors and outdoors, was sometimes ignored in favor of quickly dispensing a product.¹ In the past 5 to 10 years, reduced efficacy or resistance has been reported, but scientific confirmation is lacking.²

To manage increasingly complex flea and tick infestations, veterinarians should be familiar with both the life cycles of the parasites and properties of various parasite control drugs and compounds. Following is a brief overview of several products available in the United States. Unless otherwise noted, these options are associated with minimal toxicity in mammals.

Veterinarians should be familiar with the life cycles of parasites and properties associated with parasite-control drugs and compounds.

MORE ►

Chloride Channel Activators

Selamectin

- Macrocytic lactone (ivermectin) that binds to glutamate-gated chloride channels in invertebrates, resulting in blockage of neurotransmission and paralysis
- Labeled for control of fleas and the American dog tick (ie, *Dermacentor variabilis*)
- Indicated for dogs and cats
- Available as spot-on application³

GABA-Gated Chloride Channel Antagonists

Fipronil

- Phenylpyrazole that blocks invertebrate GABA- and glutamate-gated chloride channels necessary for inhibition of nerve impulses, leading to hyperexcitability and neurotoxicity
- Labeled for control of fleas, ticks, chewing lice, and sarcoptic mites
- Indicated for dogs and cats
- Available as various spot-on products or topical spray⁴

Chitin Biosynthesis Inhibitors

Lufenuron

- Benzoylphenylurea derivative that acts as insect development inhibitor, preventing flea eggs from completing metamorphosis by blocking chitin production
- Labeled for control of flea populations by breaking life cycle at egg stage
- Indicated for dogs and cats
- Available in 3 forms: tablet for dogs (alone or with milbemycin oxime), liquid (suspension) for cats, and injection for cats⁵

Juvenile Hormone Mimetics

These insect growth regulators mimic juvenile hormones to prevent larvae from completing metamorphosis:

Pyriproxyfen

- Labeled for control of flea larvae and may affect adult fleas
- Indicated for dogs and cats
- Available combined with other compounds as spot-on applications, shampoos, topical sprays, collars, and premise sprays⁶

Methoprene ([S]-methoprene)

- Labeled for control of flea larvae
- Indicated for dogs and cats
- Available with other compounds as spot-on applications, shampoos, topical sprays, and premise sprays⁷

Nicotinic Acetylcholine Receptor Agonists

These furanicotinyl and chloronicotinyl (neonicotinoids) insecticides bind to postsynaptic nicotinic acetylcholine receptors, resulting in inhibition of cholinergic transmission and paralysis of parasites:

Dinotefuran

- Labeled for flea control
- Indicated for dogs and cats
- Available as spot-on application in combination with other compounds⁶

Imidacloprid

- Labeled for control of fleas and chewing lice
- Indicated for dogs and cats
- Available as spot-on application alone or combined with other compounds in various products or with flumethrin in a collar⁸

Nitenpyram

- Labeled for flea control
- Has very short residual activity compared with other oral treatments, such as spinosad
- Indicated for dogs and cats
- Available as a tablet⁹

These spinosyn derivatives (macrocytic lactone structure) activate nicotinic acetylcholine receptors, resulting in paralysis of parasites:

Spinetoram

- Labeled for flea control
- Indicated for cats
- Available as spot-on application¹⁰

Spinosad

- Labeled for flea control
- Indicated for dogs and cats
- Available as tablet alone or in combination with milbemycin oxime¹¹

Octopamine Receptor Agonist

Amitraz

- Triazapentadiene compound that is a central α -adrenergic agonist, resulting in stimulation of receptors and neurotoxicity in invertebrates; also binds with octopamine receptors to increase nervous system activity
- Labeled for tick control
- Indicated for dogs
- Toxic to cats and can cause adverse events in dogs if ingested
- Available alone (collar) or in combination with pyriproxyfen¹²

Sodium Channel Modulators

These pyrethroids prolong the opening of voltage-gated sodium channels in invertebrates, resulting in increased action potentials and neurotoxicity:

Cyphenothrin

- Labeled for control of fleas and ticks
- Indicated for dogs
- Toxic to cats if applied directly or through secondary exposure (eg, contact with recently treated dog) but low toxicity in most mammals
- Available as spot-on application in combination with other compounds¹³

Deltamethrin

- Labeled for control of fleas and ticks
- Indicated for dogs
- Toxic to cats but low toxicity in most mammals
- Available as collar¹⁴

Etofenprox

- Labeled for control of fleas, deer ticks, and mosquitoes
- Indicated for dogs and cats
- Available as shampoo and spray (dogs and cats), spot-on application (cats only), and is also an active ingredient in premise sprays and foggers¹⁵

Flumethrin

- Labeled for tick control
- Indicated for dogs and cats
- Available as flea and tick collar combined with imidacloprid¹⁶

Permethrin

- Labeled for control of fleas and ticks
- Indicated for dogs
- Toxic to cats if applied directly or through secondary exposure (eg, contact with recently treated dog) but low toxicity in most mammals
- Available as spot-on application alone or in combination with other compounds; also available as topical and premise sprays¹⁷

Phenothrin

- Labeled for control of fleas and ticks
- Indicated for dogs
- Toxic to cats if applied directly or through secondary exposure (eg, contact with recently treated dog) but low toxicity in most mammals
- Available as spot-on application in combination with other compounds¹⁸

Voltage-Dependent Sodium Channel Blockers

Indoxacarb

- Oxadiazine bioactivated with enzymes found in insects to block sodium channels, resulting in insect paralysis
- Labeled for flea control, but may also control flea eggs and larvae
- Indicated for dogs and cats
- Available as spot-on application alone (dogs and cats) and combined with permethrin (dogs only)¹⁹ ■ **cb**



See Aids & Resources, back page, for references & suggested reading.