

Ivermectin Use in Virginia Opossums

AT A GLANCE

- Ivermectin is an antiparasitic drug used in veterinary medicine to treat heartworms and various intestinal parasites.
- Dosage and frequency of treatment vary with the species of both host and parasite.
- Alternative antiparasitic drugs are needed for tapeworm infections.
- Recommended dosage for Virginia opossums is approximately 0.01-0.02 mg/lb.
- **BEWARE:** Other wildlife organizations are known to promote a dangerously high dosage that may have been responsible for the deaths of numerous animals.
- Healthy, releasable opossums do not necessarily need to be dewormed. Ridding them of parasitic organisms they may have established evolutionary relationships with may be harmful to their overall health and may impact their ability to thrive in the wild. For more information, please see our deworming advisory.

Mechanism of Action

Ivermectin is an antiparasitic drug of the avermectin class. It works by inducing paralysis and death in parasites by overstimulating the glutamate-gated chloride ion channels of their nervous systems. Since mammals do not possess ion channels of this kind, they are not affected by the drugs' mechanism of action at the proper dosages.¹

Uses

Ivermectin is used most often for the prevention and treatment of heartworms in dogs. It is administered once monthly in order to kill adult worms, but larval stages of heartworm are also vulnerable to ivermectin, as are botflies, mites, and intestinal parasites such as roundworms and hookworms. Ivermectin is not effective against tapeworms or other flatworms, so any opossums suffering from heavy flatworm loads would need to be treated with an alternative antiparasitic drug like fenbendazole, which has been shown to have synergistic effects with ivermectin.² (Please see our deworming advisory for fenbendazole dosing recommendations.)

Available Forms

Ivermectin products include oral drenches, topical pour-ons, injections, pastes, and chewables. Most forms are intended for use in livestock such as cattle, horses, sheep, and swine, and the chewable formulas are designed for the prevention and treatment of heartworms in dogs. These chewables, such as Iverhart, typically also contain other antiparasitic drugs like pyrantel, pamoate, and/or praziquantel. Though there are a variety of concentrations available, the 1% pure ivermectin solution (10 mg/ml) provides ease of dosing for smaller animals such as the opossum.

Safety & Efficacy Concerns

Drugs like ivermectin can affect mammalian chloride channels, though at a lower affinity. In certain breeds of dog such as Australian shepherds and collies, which have a particular gene mutation, ivermectin can be fatal. This can occur by the drug crossing the blood-brain barrier and overwhelming gamma-aminobutyric acid (GABA)-gated chloride channels that would ordinarily not be affected. Clinical signs of neurotoxicity include hypersalivation, difficulty breathing, convulsions, problems with vision, and coma. These symptoms are mentioned here because they can occur not just in susceptible animals like those mentioned above but also if excessively high dosages are given to normally non-susceptible animals.¹

Dr. Henness of the National Opossum Society (NOS) dismissed ivermectin as an antiparasitic option for opossums, citing the species' rapid gastrointestinal transit time as a barrier to ivermectin's efficacy.³ However, the alternative drug recommended by Dr. Henness, levamisole, is no longer readily available, and also, sufficient, reliable data on the GI transit time of the opossum is currently lacking.

Dosing in Domestic Species

Ivermectin dosing depends on the species of both host and parasite. Heartworm prevention products are effective at lower doses, while treatment for intestinal parasites may require higher doses. In all dog breeds, even those with genetic sensitivity, 6 mcg ivermectin per kilogram (0.0027 mg/lb) for heartworms is recommended.^{4,5}

Dosing for the treatment of intestinal parasites is more complex. Most ivermectin products for livestock are dosed at a rate of 200 mcg pure ivermectin per kilogram of bodyweight (0.09 mg/lb) and given only once per treatment. In humans, the recommended dosage is 150 mcg per kilogram (0.068 mg/lb), also taken in a single dose.⁶ Most dogs being treated for endoparasites can tolerate therapeutic doses at 200-400 mcg per kilogram (0.090-0.181 mg/lb) orally, but the aforementioned breeds with sensitivities have exhibited signs of toxicity at doses as low as 100 mcg/kg (0.045 mg/lb). In cats,

intestinal parasites may be treated at the same dosage as dogs (200-400 mcg/kg or 0.09-0.181 mg/lb) orally or subcutaneously, though several reports exist of toxicity seen in kittens at 300 mcg/kg (0.136 mg/lb).^{1,5}

Recommended Opossum Dosing

The opossum's metabolism is markedly slow relative to most placental mammals, which affects the way various drugs act on them.⁷ While dosages for domestic species are often the only references, there are no guarantees that such will yield safe, effective results in opossums. Therefore, patients should always be closely monitored after dosages are carefully administered.

We recommend giving the 1% ivermectin injectable solution (10 mg/ml) orally, with dosing per the following:

- Animals under 5 lbs: 0.010 ml ivermectin (usually prepared as 0.10 ml of ivermectin diluted with 1.00 ml of water for ease of deployment)
- Animals over 5 lbs: 0.015 ml Ivermectin (usually prepared as 0.15 ml of ivermectin diluted with 1.50 ml of water for ease of deployment)
- Administer as a single dose. If needed, another can be given 14 days after the first.
- Do not give more than 3 doses total, each 2 weeks after the last.

These dosages are based on direct rehabilitator experience and formulated to deliver approximately 0.01-0.02 mg ivermectin per pound of bodyweight. A favorite method to administer ivermectin is to inject the proper dosage into a grape for the opossum to have as a snack.

Rehabilitator Empirical Experience

Our recommended dosage is based on extensive, direct rehabilitator feedback. Deworming can be a stressful event for rehabilitators due to the potency of antiparasitic drugs, disparity of information available for opossums, and conflicting advice circling within wildlife rehabilitation communities. Geriatric or wounded opossums seem most likely to respond unfavorably to deworming, but these animals are also subject to the greatest health risks correlated with heavy parasitism. While some rehabilitators are reluctant to handle ivermectin, many have had success with the recommended dosages above, with or without other antiparasitic drugs such as Panacur or Drontal. Note that Panacur contains fenbendazole, which kills roundworms, hookworms, tapeworms, and whipworms, while Drontal relies on

praziquantel/pyrantel pamoate to kill hookworms, tapeworms, and roundworms. (Again, please see our deworming advisory for dosing recommendations about these types of antiparasitics.)

BEWARE: Improper Dosage Advisory

It has come to our attention that a fellow wildlife organization focused on opossum rehabilitation has been known to promote a *daily* dosage of 100-200 mcg/kg (0.045-0.090 mg/lb) using the ivermectin 1% solution injection as an oral treatment. This is comparable to the low end of doses recommended for cats and dogs, but in those animals, it is given only once for a treatment lasting at least one week, if not longer. Another opossum-centric organization recommends the same dosage of 0.090 mg/lb, but they describe this as a one-time treatment for a duration of two weeks.⁸ While there is some literature that advises a once daily dosage of this magnitude for opossums,² rehabilitator empirical evidence as well as comparison with proven, effective dosages for other species show this to be extremely unsafe and unnecessary. This dosage is roughly 2.25 to 9 times that which we recommend at 14 times the frequency. In addition to neurotoxicity concerns, such an aggressive regimen poses the risk of inducing a parasitic die-off so sudden that the opossum may experience intestinal or esophageal obstruction and/or suffocation.² According to recent rehabilitator accounts, several opossums died shortly after starting this type of therapy, notably older animals and/or those more heavily burdened with parasites.

The first of the organizations indirectly mentioned above, after having been advised of the dangers of their dosages, claimed they would correct their recommendations. As of the time of this publication, they have not. We strongly advise caution when seeking deworming dosage recommendations. Wherever possible, when administering drugs to opossums, elicit the advice of a trusted, experienced veterinarian. More research on deworming opossums is underway as we constantly seek to improve the standards of care for wildlife.

Sanctuari is always striving to keep its content current. If you have questions or additions you would like to ask or offer, contact us at sanctuari.org@gmail.com and reference the title of this piece.

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