

Anthelmintics in Pregnant and Breeding Dogs



DEFINITION

- Dogs are subject to both external and internal parasites, putting them at risk for communicable diseases, severe anemia, as well as other complications.
- Parasites most commonly indicated include ectoparasites, heartworm and intestinal parasites.
- The Companion Animal Parasite Council (CAPC) recommends administering year-round broad-spectrum parasite control with efficacy against heartworm, intestinal parasites, fleas, and ticks.
- Some parasite preventives are contraindicated for use in pregnant bitches, as they may cause developmental toxicity or prenatal mortality.
- Similar precautions may also exist for breeding studs and neonates.



ETIOLOGY/PATHOPHYSIOLOGY

- Ectoparasites – ticks are small arachnids in the order Ixodida and subclass Acarina, whereas fleas are insects forming the order Siphonaptera. Both are ectoparasites living by hematophagy and are vectors of a number of diseases. Tick and flea prevalence varies by region within North America.
- Ectoparasites generally acquire pathogens when feeding on infected reservoir hosts, transmitting pathogens and toxins during hematophagy.
- Heartworm (*Dirofilaria immitis*) is a parasitic roundworm that is spread from host to host through the bites of mosquitoes.
- The heartworm resides in the pulmonary arterial system causing damage to the lung vessels and tissues.
- Transmission of intestinal parasites may occur through ingestion of paratenic hosts, infective larvae or fleas, transmammary, transplacental transmission, or parasitic vectors.
- Pathophysiology of intestinal parasites varies widely but they live primarily as adults in the dog's intestinal tract.

- *Giardia*, the most common non-helminthic intestinal parasite, is a flagellated protozoan parasite that colonizes and reproduces in the small intestine, causing giardiasis.
- *Giardia* infection can occur through the ingestion of dormant microbial cysts in contaminated water, food, or feces.
- Neonates may have an increased risk of infection through physical interaction with (transmammary), or the ingestion of infective eggs disseminated by dams with postgestational infection or infected breeding studs still on premises.
- Transplacental transmission to the fetus can occur in some intestinal parasites; e.g., roundworms.



SIGNALMENT/HISTORY

- Ectoparasites can affect any breed and any age, though are most commonly found in dogs averaging 3–6 years and atopic breeds.
- Species-specific prevalence related to geographic distribution exists for ticks, intestinal parasites and heartworm.
- Heartworm is prevalent among medium to large breeds aged 3–8 years (outdoor dogs).
- Hookworm infection causes acute disease in neonates and young puppies, and chronic blood-loss anemia in mature dogs.
- Roundworm clinical disease is most severe in young puppies.
- Tapeworm and whipworms show no sex, breed, or age predilection.
- *Giardia* is seen primarily in young dogs.

Historic Findings

- Ectoparasites cause symptoms such as scratching or rubbing, licking, chewing or biting, skin abrasions, or pyoderma (caused by secondary bacterial infection).
- Heartworm-infected dogs are primarily asymptomatic until late in the course of disease.



CLINICAL FEATURES

- Clinical features of parasitic infection vary based on species and severity (parasite load).
- Visualization of parasite evidence (fleas, flea dirt, attached ticks, tick-feeding cavities, vomit, diarrhea, or perianal coat containing eggs or worms).
- Lesions or abrasions are primarily caused by self-trauma.
- Wide variation of gastrointestinal signs, including vomit, diarrhea, abdominal distention, weight loss, obstruction.
- Wide variation of associated parasitic-borne diseases.
- Heartworm infection can result in varying severity of cardiac and pulmonary abnormalities.
- Neonates are often at higher risk for increased severity of symptoms.



DIFFERENTIAL DIAGNOSIS

- Skin irritation can be caused by:
 - Food allergy
 - Atopy
 - Sarcoptic mange
 - Cheyletiellosis.
 - Primary keratinization defects
 - Drug reaction
- Diarrhea and vomiting can be caused by:
 - Diet change
 - Food intolerance or sensitivity
 - Bacterial infection
 - Viral infection
 - Toxins
 - Idiopathic hemorrhagic gastroenteritis
 - Small intestinal bacterial overgrowth (SIBO); also called antibiotic-resistant diarrhea
 - Lymphangiectasia
 - Infiltrative disease
 - Exocrine pancreatic insufficiency
 - Idiopathic inflammatory bowel disease
 - Histoplasmosis
 - Intestinal obstruction
 - Histiocytic ulcerative colitis
- Cardiopulmonary dysfunction
 - Pulmonary hypertension
 - Pulmonary bacterial, viral, or mycotic infection
 - Inflammatory lung disease
 - Acquired or congenital cardiac disease



DIAGNOSTICS

- Physical examination of skin, perianal coat, or feces for parasites, parasite dirt or resulting abrasions/lesions.
- Blood + fecal testing (large variation).



THERAPEUTICS

- Refer to *The 5-Minute Veterinary Consult Clinical Companion Canine and Feline Infectious Diseases and Parasitology* for specific therapies by parasite species.

Prevention

- Therapeutic precautions in pregnant/lactating bitches, breeding studs and puppies are indicated below.

TABLE 1.1.1. Parasite Preventive Charts

Commercial name	Active ingredient(s)	Indicated use	Dosage	Route	Pregnant and lactating bitch			Breeding stud	Puppy
					Unsafe	Safe	Safe		
Comfortis	Spinosad	Fleas	Spinosad (30 mg/kg PO)	Oral	Unsafe			NPA	14 Weeks
Program Tablets	Lufenuron	Fleas	Lufenuron 10mg/kg monthly PO	Oral	Safe			Safe	4 Weeks
Program Flavor Tabs	Lufenuron	Fleas	Lufenuron 10mg/kg monthly PO	Oral	Safe			Safe	4 Weeks
Vectra for Dogs and Puppies	Dinotefuran + Pyriproxyfen	Fleas	Available in 1.3, 2.0, 4.0 and 6.0ml sizes. Apply every month.	Topical	Unsafe			NPA	8 Weeks
NexGard	Afoxolaner	Fleas + Ticks	2.5 mg/kg monthly	Oral	NE			NE	8 Weeks
Activyl	Indoxacarb	Fleas	Available in 0.51 ml, 0.77 ml, 1.54 ml, 3.08 ml, and 4.62 ml sizes. The topical solution should be applied monthly as a single spot between the dog's shoulder blades.	Topical	Unsafe			NE	8 Weeks
Scalibor Protector Band	Deltamethrin	Ticks	Deltamethrin (4%); one collar every 6 months	Collar	Safe			Safe	12 Weeks
Preventic	Amitraz	Ticks		Collar	Safe			NPA	12 Weeks
Sentry Natural Defense	Peppermint + Cinnamon + Lemongrass + Clove + Thyme	Fleas + Ticks	Available in 1.5 ml, 3.0 ml, and 4.5 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	NPA			NPA	12 Weeks
Sentry Pro XFT	Etofenprox + Pyriproxyfen	Fleas + Ticks	The topical solution should be applied monthly as a single spot between the dog's shoulder blades.	Topical	Unsafe			NPA	12 Weeks
Bio Spot Flea & Tick Collar with IGR For Dogs	Propoxur + (S)-Methoprene	Fleas + Ticks	One collar every 5 months	Collar	Unsafe			NPA	12 Weeks

Seresto	Flumethrin + Imidacloprid	Fleas + Ticks	One collar every 8 months	Collar	NE	NE	7 Weeks
Bravecto	Fluralaner	Fleas + Ticks	25 mg/kg q 8-12 weeks	Oral	Safe	Safe	24 Weeks
Advantage II	Imidacloprid + Pyriproxyfen	Fleas + Chewing lice	Imidacloprid (10 mg/kg) and Pyriproxyfen (0.5 mg/kg) minimum	Topical	NPA	NPA	7 Weeks
Fiproguard	Fipronil	Fleas + Ticks + Chewing lice	Available in 0.67 ml, 1.34 ml, 2.68 ml, and 4.02 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	Safe	Safe	12 Weeks
Fiproguard Max	Fipronil + Cyphenothrin	Fleas + Ticks + Chewing lice	The topical solution should be applied monthly as a single spot between the dog's shoulder blades.	Topical	Unsafe	NPA	12 Weeks
PetArmor	Fipronil	Fleas + Ticks + Chewing lice	Available in 0.67 ml, 1.34 ml, 2.68 ml, and 4.02 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	Safe	Safe	8 Weeks
Certifect for Dogs	Fipronil + (S)-Methoprene + Amitraz	Fleas + Ticks + Chewing lice	Available in 1.70 ml, 2.14 ml, 4.28 ml, and 6.42 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	Safe	Safe	8 Weeks
Frontline Plus	Fipronil + (S)-methoprene	Fleas + Ticks + Chewing lice	Available in 0.67 ml, 1.34 ml, 2.68 ml, and 4.02 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	Safe	Safe	8 Weeks
Frontline Top Spot	Fipronil	Fleas + Ticks + Chewing lice	Available in 0.67 ml, 1.34 ml, 2.68 ml, and 4.02 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	Safe	Safe	8 Weeks

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TABLE 1.1. (Continued)

Commercial name	Active ingredient(s)	Indicated use	Dosage	Route	Pregnant and lactating		
					bitch	stud	Puppy
Parastar	Fipronil	Fleas + Ticks + Chewing lice	The topical solution should be applied monthly as a single spot between the dog's shoulder blades.	Topical	Safe	Safe	8 Weeks
Parastar Plus	Fipronil + Cyphenothrin	Fleas + Ticks + Chewing lice	The topical solution should be applied monthly as a single spot between the dog's shoulder blades.	Topical	Unsafe	Unsafe	Unsafe
Flea4X	Fipronil	Fleas + Ticks + Chewing lice	Available in 0.67 ml, 1.34 ml, 2.68 ml, and 4.02 ml sizes. Apply the entire contents in a single spot to the animal's skin.	Topical	Safe	Safe	8 Weeks
Bio Spot Defense Flea & Tick Control For Dogs	Etofenprox + (S)-Methoprene	Fleas + Ticks + Mosquitoes	The topical solution should be applied monthly as a single spot between the dog's shoulder blades.	Topical	Unsafe	N/A	10 Weeks
Heartgard Chewables	Ivermectin	Heartworm	Ivermectin (0.006 mg/kg) monthly PO	Oral	Safe	Safe	6 Weeks
ProHeart6	Moxidectin	Heartworm + Hookworms	0.05 ml of the constituted suspension/kg body weight (0.0227 ml/lb) every six months subcutaneously.	Injection	Safe	Safe	6 Months
Tri-Heart Plus Chewable Tablets	Ivermectin + Pyrantel	Heartworm + Roundworms + Hookworms	Ivermectin (0.006 mg/kg) and Pyrantel (5 mg/kg) monthly PO	Oral	Safe	Safe	6 Weeks
Heartgard Plus Chewable Tablets	Ivermectin + Pyrantel	Heartworm + Roundworms + Hookworms	Ivermectin (0.006 mg/kg) monthly PO	Oral	Safe	Safe	6 Weeks

IverhartPlus Flavored Chewables	Ivermectin + Pyrantel	Heartworm + Roundworms + Hookworms	Ivermectin (0.006 mg/kg) and Pyrantel (5 mg/kg) monthly PO	Oral	Safe	NPA	6 Weeks
Iverhart Max Chewable tablets	Ivermectin + Pyrantel pamoate + Praziquantel	Heartworm + Roundworms + Hookworms + Tapeworms	Ivermectin (0.006 mg/kg) and Pyrantel pamoate (5 mg/kg) and Praziquantel (5 mg/kg) monthly PO	Oral	Unsafe	NPA	8 Weeks
Trifexis	Spinosad + Milbemycin Oxime	Heartworm + Roundworms + Hookworms + Whipworms	Milbemycin oxime (0.5 mg/kg) and Spinosad (30 mg/kg) monthly PO	Oral	Safe	Safe	8 Weeks
Interceptor Flavor Tabs	Milbemycin Oxime	Heartworm + Roundworms + Hookworms + Whipworms	Milbemycin (0.5 mg/kg) monthly PO	Oral	Safe	Safe	2 Weeks
Drontic	Praziquantel	Tapeworm	Praziquantel (5.0 mg/kg) PO, SC, or IM minimum	Oral	Safe	Safe	4 Weeks
Cestex	Epsiprantel	Tapeworm	Epsiprantel (5.5 mg/kg PO)	Oral	Unsafe	NPA	7 Weeks
Nemex Tabs	Pyrantel Pamoate	Roundworms + Hookworms	Pyrantel pamoate (5 mg/kg PO)	Oral	Safe	Safe	6 Weeks
Virbantel	Pyrantel Pamoate + Praziquantel	Tapeworms + Roundworms + Hookworms	Pyrantel pamoate (5 mg/kg) and Praziquantel (5 mg/kg) PO	Oral	Safe	Safe	12 Weeks
Drontal Plus	Praziquantel + Pyrantel Pamoate + Febantel	Tapeworm + Roundworms + Hookworms + Whipworms	Praziquantel (5 mg/kg) and Pyrantel pamoate (5 mg/kg) and Febantel (25 mg/kg) minimum PO	Oral	Unsafe	NPA	4 Weeks
Safe-Guard Canine	Fenbendazole	Tapeworm + Roundworms + Hookworms + Whipworms	Fenbendazole (50 mg/kg x 3 days PO)	Oral	Safe	Safe	6 Weeks

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TABLE 1.1. (Continued)

Commercial name	Active ingredient(s)	Indicated use	Dosage	Route	Pregnant and lactating bitch	Breeding stud	Puppy
Dog Worms 3	Pyrantel pamoate + Praziquantel	Tapeworm + Roundworms + Hookworms + Whipworms	Small dogs (30mg tablets) - 6.0-12.0 lbs: 1 tablet, 12.1-25 lbs: 2 tablets Medium-Large dogs (114mg tablets) - 25.1-50 lbs: 1 tablet, 50.1-100lbs: 2 tablets, 100.1-150 lbs: 3 tablets, 150.1-200 lbs: 4 tablets		NE	NE	12 Weeks
Panacur C Canine Dewormer	Fenbendazole	Tapeworm + Roundworms + Hookworms + Whipworms	Fenbendazole (50 mg/kg x 3 days PO)	Oral	Safe	Safe	6 Weeks
Revolution	Selamectin	Fleas + Ticks + Heartworm + Roundworms + Hookworms	Selamectin (6 mg/kg) monthly TOPICAL	Topical	Safe	Safe	6 Weeks
Advantage Multi for Dogs	Imidacloprid + Moxidectin	Fleas + Heartworm + Roundworms + Hookworms + Whipworms	10% Imidacloprid and 2.5% Moxidectin topical spot-on	Topical	NPA	NPA	7 Weeks
Sentinel Flavor Tabs	Lufenuron + Milbemycin oxime	Fleas + Heartworm + Roundworms + Hookworms + Whipworms	Milbemycin (0.5 mg/kg) and lufenuron (10 mg/kg) monthly PO	Oral	NPA	NPA	4 Weeks

Trifexis	Spinosad + Milbemycin Oxime	Fleas, Heartworm, Roundworm, Whipworm, Hookworm	30 mg/kg Spinosad; 0.5 mg/kg Milbemycin oxime monthly	Oral	Safe	NE	8 Weeks
K9 Advantix	Imidacloprid + Permethrin	Fleas + Ticks + Mosquitoes + Chewing lice + Biting flies	Imidacloprid (10 mg/kg) and Permethrin (50 mg/kg) and Pyriproxyfen (0.5 mg/kg) minimum	Topical	NPA	NPA	7 Weeks
Vectra 3D	Dinotefuran + Pyriproxyfen + Permethrin	Fleas + Ticks + Mosquitoes + Lice + Sand flies + Mites	Available in 1.6ml, 3.6ml, 4.7ml, 8.0ml sizes	Topical	Unsafe	NPA	7 Weeks

NPA = No Problems Anticipated

NE = Not Evaluated



COMMENTS

- Companion Animal Parasite Council recommends year-round flea and tick control.
- Veterinarians are encouraged to evaluate new products not included in this chapter by reading the package insert or direct manufacturer consultation.

See Also

Canine Breeding Management.

Feline Pre-Breeding Examination and Breeding Husbandry.

Suggested Reading

Bowman, D.D., Barr, S.C. (eds) (2006) *Refer to The 5-Minute Veterinary Consult Clinical Companion Canine and Feline Infectious Diseases and Parasitology*. 1st edn. John Wiley & Sons.

<http://www.cpcvet.org/resource-library/parasite-product-applications-for-dogs>.

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