In dogs, parasites that infect the fetus transplacentally may cause life-threatening disease in the fetus and newborn. Transplacental transmission also allows vector-borne diseases to cycle when vectors are not active or present in a geographic area and can contribute to introduction and establishment of parasites where they previously did not occur. This mode of transmission is well-known for some parasites (eg, *Toxocara canis*) and more recently shown to occur with others (eg, *Leishmania infantum*).

1. **Toxocara canis**

   Puppies infected in utero by massive numbers of reactivated *T. canis* larvae in the bitch sometime after the 42nd day of pregnancy are at risk for obstruction and rupture of the intestine. Rupture can lead to peritonitis that may be exacerbated by continued release of eggs into the peritoneal cavity. Puppies can be presented with inappetence, depression, diarrhea, weakness, ascites, failure to thrive, cachexia, and signs similar to those of rickets (eg, difficulty rising, bowed limbs, stiff gait). Young adult worms may be found in the peritoneal cavity, bile ducts, and even the liver parenchyma. The typical pressure-sensitive, drum-shaped abdomen may occur as well. Puppies with large numbers of prenatal *T. canis* will have decreased erythrocyte numbers, mostly caused by severe internal bleeding from preadults.

**TOP 5 TRANSPLACENTAL PARASITIC INFECTIONS IN DOGS**

1. *Toxocara canis*
2. *Neospora caninum*
3. Babesiosis
4. Leishmaniasis
5. Dirofilarial microfilariae
migrating through the liver and intestinal rupture; when only moderately infected, puppies will show an increase in erythrocytes from the fifth week of life onward. Eosinophilia is observed in prenatally infected puppies beginning 7 days postpartum. Liver enzymes (ie, glutamate dehydrogenase [GLDH] and alanine transaminase [ALT]) are elevated at birth. Enzyme levels return to normal values 1 to 2 weeks postpartum. Prenatal infection almost guarantees that puppies will be infected with T. canis at birth.

Management

No anthelmintics are registered in the United States for prevention of transplacental transmission of T. canis. Macro cyclic lactones have demonstrated efficacy against reactivated larvae in pregnant dogs. Moxidectin reliably prevents T. canis infections in puppies after 2 SC applications on days 40 and 55 of pregnancy. Ivermectin and doramectin can also be efficacious at high dosages. Fenbendazole is labeled in the United Kingdom for prevention of transplacental transmission of T. canis but only when administered daily from day 40 of pregnancy until parturition.

2 Neospora caninum

When prenatally acquired, infection with Neospora caninum (ie, neosporosis) can result in a progressively worsening polyradiculitis, often leading to fatal paralysis. Signs can begin at 3 to 9 weeks of age and typically appear in dogs younger than 6 months of age presented with ascending paralysis of the limbs. Neosporosis is characterized by ascending paralysis associated with gradual muscle atrophy and stiffness that usually affects the pelvic limbs more than the thoracic limbs. Paralysis progresses to rigid contracture of the muscles of the affected limb. Occurring arthrogryposis is caused by scar formation in the muscles from lower motor neuron damage and myositis. Some puppies may develop joint deformation and genu recurvatum. Cervical weakness, dysphagia, megaesophagus, and death can occur. Dogs do not develop severe intracranial manifestations and maintain alert attitudes. They can survive for months with hand-feeding and care but remain paralyzed with associated complications.

Suppositions are that during gestation, the chronically and subclinically infected bitch develops parasitemia, which spreads transplacentally to the fetus, and successive litters may be born infected. However, transplacental transmission alone is unlikely to propagate N. caninum infection in dogs in nature. Most puppies in a litter have clinical manifestations; others may carry the infection subclinically, with reactivation occurring later in life because of immunosuppressive illnesses, administration of modified live virus vaccines, or glucocorticoids.

Management

Treatment will likely not lead to improvement in puppies already showing advancing paralysis or muscle contracture. However, if 1 puppy in a litter is diagnosed with infection, it is prudent to treat the entire litter with...
clindamycin, sulfadiazine, and pyrimethamine, alone or in combination. At this time, potential benefits of ponazuril on affected neonates are unclear.

3 Babesiosis
Both Babesia canis and Babesia gibsoni are known to be transmitted transplacentally in dogs. B canis, the species with a large intracellular trophozoite, was diagnosed in a litter of 3-week-old mastiffs that came from a tick-infested kennel housing ≈30 dogs. Clinical signs seen in the puppies included lethargy, poor body condition, pale and icteric mucous membranes, splenomegaly, tachycardia, heart murmur, anemia, and thrombocytopenia. The puppies responded well to treatment with intramuscular diminazene aceturate at 3 mg/kg. Organisms were not seen in the blood of the mother, although she was seropositive on an immunofluorescent assay.

B gibsoni, the species with the small intracellular trophozoite, has been transmitted experimentally to puppies in Japan. An adult female dog that had been experimentally infected 2 years before mating gave birth to 1 stillborn puppy and 4 living puppies, which died of congenital babesiosis between 14 and 39 days postpartum.

Management
Puppies typically respond well to treatment with antibabesial drugs (eg, imidocarb dipropionate, diminazene aceturate). An atovaquone and azithromycin combination reportedly is more effective for B gibsoni infections.

4 Leishmaniasis
Leishmania infantum (L chagasi) infection was identified in several thousand foxhounds throughout 18 US states and 2 Canadian provinces. Efficient sandfly vectors were not found, and transplacental transmission for canine leishmaniasis was suspected. Infected puppies can be presented with nonregenerative anemia, mild thrombocytopenia, mild hyponatremia, and signs of hepatocellular injury. Infected dogs typically have hyperproteinemia attributed to hypergammaglobulinemia. Urinalysis will often show proteinuria.
Management
Sodium stibogluconate can suppress and sometimes cure infection. However, although clinical improvement may occur, relapses are common, and chemotherapeutic elimination of *L. infantum* has not been consistently achieved with any drug tested to date.

Dirofilarial microfilariae
Puppies born to mothers with patent infections of the heartworm *Dirofilaria immitis* or heartworm’s subcutaneous relative *D. repens* outside North America will often have circulating microfilariae in their blood at birth. Although these infections in puppies are without direct medical significance, they can often be detectable at the time of a microfilarial test 6 months after birth. These microfilariae do not develop further and expire in 1 to 2 years if not first cleared by microfilaricidal therapy. Theoretically, these microfilariae could develop further if ingested by a mosquito and serve as a reservoir of infection for other dogs.

Management
Microfilariae-positive neonatal puppies should be started on heartworm preventive therapy and monitored to ensure the microfilariae clear as expected.

Conclusion
The infections discussed are common in the United States. Although few parasites infect dogs transplacentally, vertical transmission may allow for more widespread prevalence of these infections.

References
References continue on page 111.
Dirofilaria immitis
In a field study conducted in the United States, there were no
visible adverse reactions observed in 146 dogs administered CLARO™.

Adverse reactions:
In a field study conducted in the United States, there were no
directly attributable adverse reactions observed in 146 dogs administered CLARO™.

The following information is a summary of the complete product
description and is not comprehensive. Please refer to the
approved product label for complete product information prior to
use.

CAUTION: Federal (U.S.A.) law restricts this drug to use by or on
the order of a licensed veterinarian.

PRODUCT DESCRIPTION: CLARO™ contains 15.0 mg/mL
flunixin, 13.3 mg/mL terbinafine (equivalent to 15.0 mg/mL
terbinafine hydrochloride), and 2.0 mg/mL mometasone furoate.

Active ingredients include purified water, propylene carbonate,
mometasone furoate, ethyl alcohol, and polyethylene glycol.

INDICATIONS:
CLARO™ is indicated for the treatment of otitis externa in dogs
associated with susceptible strains of yeast (Malassezia
pachydermatis) and bacteria (Staphylococcus pseudintermedius).

DOSE AND ADMINISTRATION:
CLARO™ should be administered by veterinary personnel.

Administration is one dose (1 dropper) per affected ear. The
duration of effect should last 30 days. Clean and dry the external
ear canal before administering the product. Verify the tympanic
membrane is intact prior to administration. Clean the ear
after dosing may affect product effectiveness. Refer to product
label for complete directions for use.

CONTRAINDICATIONS:
Do not use in dogs with known tympanic membrane perforation
(see PRECAUTIONS).

CLARO™ is contraindicated in dogs with known or suspected
hypersensitivity to flunixin, terbinafine hydrochloride, or
mometasone furoate, the inactive ingredients listed above, or
similar drugs, or any ingredient in these medicines.

WARNINGS:
Human Warning: Not for use in humans. Keep this and all drugs
out of reach of children. In case of accidental ingestion by
humans, contact a physician immediately. In case of accidental
skin contact, wash area thoroughly with water. Avoid contact
with eyes. Humans with known hypersensitivity to flunixin,
terbinafine hydrochloride, or mometasone furoate should not
handle this product.

PRECAUTIONS:
Do not administer orally.

The use of CLARO™ in dogs with perforated tympanic
membranes has not been evaluated. The integrity of the
tympanic membrane should be confirmed before administering
the product. Removel the dog of hearing loss or signs of
verbal dysfunction are observed during treatment.

Use of topical corticosteroids has been associated with
dermatologic suppression and urologic hyporeflexia in dogs.

Use with caution in dogs with impaired hepatic function. The
safe use of CLARO™ in dogs used for breeding purposes,
during pregnancy, or in lactating bitch has not been evaluated.

ADVERSE REACTIONS:
In a field study conducted in the United States, there were no
directly attributable adverse reactions observed in 146 dogs administered CLARO™.

To report suspected adverse drug events and/or request a copy
of the Safety Data Sheet (SDS) or for technical assistance, contact
Bayer HealthCare at 1-800-422-9874.

For additional information about adverse drug experience
reporting for animal drugs, contact FDA at 1-888-FOI-SEPS or
online at http://www.fda.gov/AnimalVeterinary/SafetyHealth.

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