Monitoring
- CBC with platelets (baseline and before re-dosing)
- Renal function with electrolytes (baseline and before re-dosing)
- Urinalysis baseline and periodic)
- Liver function (baseline and periodic)
- Other adverse effects (volume overload/pulmonary edema, neurotoxicity, GI toxicity)
- Efficacy

Client Information
- Clients should understand the relative investigational nature of using ifosfamide in dogs or cats and accept the possibility of severe adverse effects due to its use.
- Owners should be instructed to avoid contact with animal's saliva or urine for at least 24 hours after dosing.

Chemistry/Synonyms
An alkylating agent structurally related to cyclophosphamide, ifosfamide occurs as a white, crystalline powder with a melting point of 40°C. It is freely soluble in water and very soluble in alcohol. A 10% solution in water has a pH between 4 and 7.

Ifosfamide may also be known as: MJF-9325, NSC-109724, Z-4942, *Ifex®*, *Asoifos®*, *Cuantil®*, *Duvaxan®*, *Fentul®*, *Holoxan®*, *Holaxane®*, *Ifex®*, *IFO-cell®*, *IFX®*, *Ifocris®*, *Ifolem®*, *Ifomida®*, *Ifos®*, *Ifosmixan®*, *Ifoxan®*, *Mitoxana®*, *Seromida®*, or *Troxanol®*.

Storage/Stability/Compatibility
Ifosfamide powder for injection should be stored at 20–25°C (68–77°F). It should be protected from temperatures greater than 30°C (86°F) as the drug may liquefy at temperatures greater than 35°C (95°F). Once reconstituted with sterile water for injection or bacteriostatic water for injection the solution is stable for 24 hours when refrigerated. (**Note**: one reference states that bacteriostatic water for injection containing benzyl alcohol caused the solution to become turbid at concentrations of ifosfamide greater than 60 mg/mL. No such incompatibility occurred when using bacteriostatic water for injection containing parabens.) The reconstituted drug is **compatible** with D_5W, normal saline, or lactated Ringer's and is stable for up to 24 hours when refrigerated. Ifosfamide is compatible and stable when mixed with mesna in D_5W or lactated Ringer's.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS: None

HUMAN-LABELED PRODUCTS:

Ifosfamide Powder: for IV infusion 1 g with 200 mg amps of Mesnex (mesna) in single dose vials; 3 g with 400 mg amps of Mesnex (mesna) in single dose vials; *Ifex®* (Mead Johnson Oncology); Ifosfamide (American Pharmaceutical Partners); (Rx)

Imidacloprid — See the listing in the Topical Dermatologic section in the appendix

IMIDOCARB DIPROPINATE

(i-***mid***-oh-karb) Imizol®

ANTIPROTOZOAL

Prescriber Highlights
- **Antiprotozoal useful against Babesia & related parasites**
- **Contraindications: Patients exposed to cholinesterase-inhibiting drugs (*e.g.*, pyridostigmine), pesticides, or chemicals**
- **Caution: Impaired lung, hepatic or renal function; safety in puppies, pregnant, lactating, or breeding animals has not been established**
- **Adverse Effects: Most common are pain during injection & mild cholinergic signs (salivation, nasal drip, & brief episodes of vomiting); less common: panting, diarrhea, injection site inflammation (rarely ulceration), & restlessness**
- **Not for intravenous administration**

Uses/Indications
Imidocarb is approved for use to treat *Babesia canis* infections (babesiosis) in dogs, but the drug may also be efficacious against *Ehrlichia canis* in this species. Imidocarb may be of benefit in treating Babesia and related parasitic diseases in a variety of domestic and exotic animals.

Imidocarb appears to be more effective against *B. canis* than *B. gibsoni*.

Pharmacology/Actions
Imidocarb is thought to act by combining with nucleic acids of DNA in susceptible organisms, causing the DNA to unwind and denature. This damage to DNA is believed to inhibit cellular repair and replication.

Pharmacokinetics
No specific information was located for this drug.

Contraindications/Precautions/Warnings
Do not use imidocarb in patients exposed to cholinesterase-inhibiting drugs, pesticides, or chemicals. The manufacturer states to consider risks versus benefits before treating dogs with impaired lung, hepatic, or renal function. Donkeys appear to be sensitive to the toxic effects of the drug.

Adverse Effects
Most commonly reported adverse effects in dogs include pain during injection and mild cholinergic signs (salivation, nasal drip and brief episodes of vomiting). Less commonly reported effects include panting, diarrhea, injection site inflammation (rarely ulceration), and restlessness. Rarely, severe renal tubular or hepatic necrosis have occurred. Imidocarb has reportedly caused an increase incidence of tumor formation in rats.

Horses given high therapeutic dosages (4 mg/kg) develop lacrimation, sweating, and serous nasal discharge for 30 minutes after treatment.

Do not administer intravenously.

Reproductive/Nursing Safety
Safety in puppies, pregnant, lactating, or breeding animals has not been established.

Overdosage/Acute Toxicity

Dogs receiving a dosage of 9.9 mg/kg (1.5X labeled dose) showed signs of liver injury (slightly increased liver enzymes), pain and swelling at the injection site, and vomiting. Overdoses or chronic toxicity may present with cholinergic signs (vomiting, weakness, lethargy, salivation) or adverse changes in liver, kidney, lung, or intestinal function. Treatment with atropine may be useful to treat cholinergic signs associated with imidocarb.

The LD-50 in horses is reportedly 16 mg/kg.

Drug Interactions

The manufacturer warns not use imidocarb in patients exposed to **cholinesterase-inhibiting drugs, pesticides,** or **chemicals**.

Laboratory Considerations

- Imidocarb IM injections may cause significant increases in **creatine kinase** (**CK**).

Doses

- **DOGS:**

For treatment of babesiosis:

a) 6.6 mg/kg IM or SC; repeat dose in 2 weeks (Package Insert; *Imizol*®—Schering)

b) 5–6.6 mg/kg IM or SC; repeat in 14 days or 7.5 mg/kg IM or SC once. A single dose of 6 mg/kg the day following a dose of diminazene at 3.5 mg/kg has also been shown to clear the infection. (Taboada and Lobetti 2006)

For treatment of Ehrlichiosis:

Note: A study (Eddlestone, Neer et al. 2005) demonstrated that imidocarb was not effective (alone) in clearing *Ehrlichia canis* from the blood of experimentally infected dogs.

a) 5 mg/kg IM or SC; repeat in 14–21 days or 5 mg/kg IM repeat in 84 days (Greene and Watson 1998)

b) In particularly severe cases, imidocarb at 5 mg/kg SC (in a single injection or two injections 15 days apart) with doxycycline at 10 mg/kg/day for 28 days (Sainz 2002)

For treatment of hepatozoonosis (*H. canis*):

a) 5 mg/kg IM or SC; every 14 days until parasitemia clears. Usually 1–2 injections are sufficient. (Macintire 1999)

- **CATS:**

For treatment of *Cytauxzoon felis*:

a) 5 mg/kg IM every 2 weeks (Lappin 2000)

b) 2–5 mg/kg IM; generally repeated 7 days after initial dose. Efficacy not proven. Cholinergic effects can be mitigated by pre-treating with atropine. Must also give supportive therapy (IV fluids, prophylactic heparin, nutritional/nursing care, analgesia, and potentially transfusion) (Cohn 2006)

c) 5 mg/kg IM once and then 14 days later. (Greene, Meinkoth et al. 2006)

For treatment of recurrent Haemobartonellosis (*Mycoplasma haemofelis, Mycoplasma Haemominutum*):

a) Doxycycline is preferred, but in cats intolerant of doxycycline the following alternatives may be effective: imidocarb can be used at 5 mg/kg IM, SC every 14 days until able to maintain a normal PCV. Other optional treatment includes enrofloxacin at 5 mg/kg PO daily or marbofloxacin at 2.75 mg/kg PO daily. (Lappin 2002b), (Lappin 2006c)

- **HORSES:**

For treatment of equine piroplasmosis (*Babesia caballi; Babesia equi*):

a) 2.2 mg/kg IM will generally allow clinical signs to subside. To eliminate *B. caballi* inject 2 mg/kg IM once a day for 2 days. *B. equi* more difficult to eliminate; there has been some success reported when imidocarb is given at 4 mg/kg IM at 72 hour intervals for 4 doses. (Sellon 2004)

- **SHEEP:**

For treatment of babesiosis:

a) 1.2 mg/kg IM; repeat in 10–14 days (McHardy, Woolon et al. 1986)

Monitoring

- Efficacy
- Adverse effect profile

Chemistry/Synonyms

Imidocarb dipropinate is a diamidine of the carbanalide series of antiprotozoal compounds.

Imidocarb may also be known as 4A65 (imidocarb hydrochloride) and *Imizol*®.

Storage/Stability

The injection should be stored between 2°–25°C (36°–77°F) and protected from light.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS:

Imidocarb Dipropinate for IM or SC Injection: 120 mg/mL in 10 mL multi-dose vials; *Imizol*® (Schering-Plough); (Rx). Approved for use in dogs.

HUMAN-LABELED PRODUCTS: None

IMIPENEM-CILASTATIN SODIUM

(ih-me-***peh***-nem sye-la-***sta***-tin) Primaxin®

CARBAPENEM ANTIBIOTIC

Prescriber Highlights

- Broad spectrum antibiotic/deactivating enzyme inhibitor combination used for serious infections where a single agent is desired
- Contraindications/Cautions: Patients hypersensitive to it or other beta-lactams, patients with renal impairment (dosages adjustment may be required), CNS disorders (*e.g.*, seizures, head trauma)
- Adverse Effects: GI effects, CNS toxicity (seizures, tremors), hypersensitivity, & infusion reactions (thrombophlebitis)
- Too rapid IV infusions may cause GI toxicity or other untoward effects); Rarely: increases in renal or hepatic function tests; hypotension or tachycardia
- Separate dosage forms for IM or IV use
- Can be expensive

Uses/Indications

Imipenem may be useful in equine or small animal medicine to treat serious infections when other less expensive antibiotics are ineffective or have unacceptable adverse effect profiles.

Pharmacology/Actions

This fixed combination of a carbapenem antibiotic (imipenem) and an inhibitor (cilastatin) of dehydropeptidase I (DHP I) has a very broad spectrum of activity. Imipenem is generally considered to be a bactericidal agent, but may be static against some bacteria.