For emergency management of hypertension when the capabilities for using nitroprusside are unavailable:

a) 0.5 mg/kg PO q6h (if blood pressure not controlled, may add a beta-blocker (*e.g.*, atenolol) (Brown and Henik 2000)

■ **FERRETS:**

For hypertrophic cardiomyopathy:

a) 2–7.5 mg/kg PO twice daily; adjust as necessary. May result in heart block. (Williams 2000)

Monitoring

■ ECG/Heart rate
■ Blood pressure
■ Adverse effects

Client Information

■ Inform clients of potential adverse effects. Stress adherence to dosing regimen.

Chemistry/Synonyms

A calcium channel blocker, diltiazem HCl occurs as a white to off-white crystalline powder having a bitter taste. It is soluble in water and alcohol. Potencies may be expressed in terms of base (active moiety) and the salt. Dosages are generally expressed in terms of the salt.

Diltiazem may also be known as: CRD-401, diltiazemi hydrochloridum, latiazem hydrochloride, and MK-793; many trade names are available.

Storage/Stability/Compatibility

Diltiazem oral products should be stored at room temperature in tight, light resistant containers.

The powder for injection should be stored between 15–30°C. After reconstituting, discard after 24 hours. Diltiazem is **compatible** with D5W and sodium chloride 0.9% digoxin, bumetanide, dobutamine, dopamine, epinephrine, lidocaine, morphine, nitroglycerin, potassium chloride, sodium nitroprusside, and vasopressin. It is **incompatible** with diazepam, furosemide, phenytoin and thiopental.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS: None

The ARCI (Racing Commissioners International) has designated this drug as a class 4 substance. See the appendix for more information.

HUMAN-LABELED PRODUCTS:

Diltiazem Tablets: 30 mg, 60 mg, 90 mg, and 120 mg; *Cardizem*® (Biovail); generic; (Rx)

Diltiazem Tablet & Capsules Extended/Sustained Release: 60 mg, 90 mg, 120 mg, 180 mg, 240 mg, 300 mg, 360 mg and 420 mg; *Cardizem CD*® & *LA*® (Biovail); *Cartia XT*® (Andrx); *Dilacor XR*® (Watson); *Tiazac*® (Forest), *Diltia XT*® & *Taztia XT*® (Andrx); *Dilt-CD*® & *XR*® (Apotex); generic; (Rx)

Diltiazem Injection: 5 mg/mL in 5, 10 and 25 mL vials; 25 mg in single-use containers (carton of 6 Lyo-Ject syringes with diluent); *Cardizem*® (Biovail); generic; (Rx)

DIMINAZENE ACETURATE

(dye-***min***-ah-zeen ass-ah-***toor***-ate) Berenil®

ANTIPROTOZOAL

Prescriber Highlights

- Antiprotozoal agent used in several species for trypanosomiasis, babesiosis, or cytauxzoonosis
- Available in several countries, but not in USA

Uses/Indications

Diminazene is used to treat trypanosomiasis in dogs and livestock (sheep, goats, cattle), Babesia infections in dogs and horses, and cytauxzoonosis in cats. The drug is not commercially available in the USA, but is available and used in many countries.

Pharmacology/Actions

Diminazene's exact mechanism of action is not well understood. With Babesia, it is thought to interfere with aerobic glycolysis and DNA synthesis.

Diminazene may not completely eradicate the organism but because it is slowly metabolized, suppression of recurrence of clinical signs or prophylaxis can be attained for several weeks after a single dose.

Pharmacokinetics

Diminazene's pharmacokinetics have been investigated in several species. The drug is rapidly absorbed after IM administration in target species studied and distributed rapidly. High levels can be found in the liver and kidney. The drug appears to enter the CSF, but at levels significantly lower than that found in plasma in healthy animals. CSF levels are higher in infected dogs with African trypanosomiasis, probably due to meningeal inflammation. Diminazene apparently is metabolized somewhat in the liver, but identification and whether metabolites possess anti-protozoal activity is not known.

Elimination half-lives are reportedly widely variable. Reported values range from 10–30 hours in dogs, goats, and sheep, to over 200 hours in one study for cattle. Differences in assay methodology and study design may account for some of this variation, but even within an individual study in dogs using a modern assay (HPLC), wide inter-patient variability was noted.

Contraindications/Precautions/Warnings

Camels appear highly susceptible to the toxic effects of diminazene, and product labels may state the drug is contraindicated in camelids.

Adverse Effects

At usual dosages in domestic livestock, diminazene is reportedly relatively free of adverse effects. Adverse effects associated with therapeutic dosages of diminazene in dogs may include vomiting and diarrhea, pain and swelling at the injection site, and transient decreases in blood pressure. Very rarely (<0.1%) ataxia, seizures, or death have been reported.

Reproductive/Nursing Safety

Little information is available. Rats given up to 1 g/kg PO on days 8–15 demonstrated no teratogenic effects, but decreased body weights and increased resorptions were noted at the highest dose.

Diminazene is distributed into milk; safety for nursing offspring has not been established.

Overdosage/Acute Toxicity
Little information is available. Diminazene appears most toxic in dogs and camels. Dosages greater than 7 mg/kg can be very toxic to camels; dosages above 10 mg/kg IM in dogs can cause severe gastrointestinal, respiratory, nervous system, or musculoskeletal effects.

Drug Interactions
No significant drug interactions were identified.

Laboratory Considerations
No issues were noted.

Doses
Note: There is a multitude of protozoal diseases worldwide that may respond to diminazene. Depending on the species/strain (protozoan) and species of the patient treated, there may be local specific recommendations for chemotherapy treatment or prevention. The following should be used as general guidelines only.

- **DOGS:**

For treatment of Babesia:

a) 3.5–5 mg/kg IM, once for *B. canis*, repeat in 24 hours for *B. gibsoni*. Risk for neurotoxicity higher when total dosages are 7 mg/kg or higher. (Toboada and Lobetti 2006)

b) For small Babesia (Okinawa): 3.5 mg/kg IM; repeat once in 24 hours. (Brosey 2003)

c) For treatment of Babesia (South Africa): 4.2 mg/kg IM. Do not repeat within a 21-day period. (Miller, Swan et al. 2005)

For treatment of African trypanosomiasis:

a) 3.6–7 mg/kg IM every 2 weeks as needed to control relapse or reinfection. (Barr 2006b)

- **CATS:**

For treatment of cytauxzoonosis:

a) 3–5 mg/kg IM one time, tick control remains the best means of preventing disease as treatment attempts meet with little success. (Blagburn 2005a)

b) 2 mg/kg IM, repeat in one week. (Greene, Meinkoth et al. 2006)

- **HORSES, CATTLE, SHEEP, GOATS:**

For treatment of susceptible protozoal (Trypanosomes, Babesia) infections (West Africa):

a) In general, 3.5 mg/kg IM one time. Depending on susceptibility, dose can be increased to 8 mg/kg. Do not exceed 4 grams total dose per animal. (Label directions; *Berenil*®—Intervet West Africa)

Monitoring
- For Babesia infections in dogs monitoring would include surveillance for potential adverse effects of diminazene and signs for clinical efficacy, including monitoring serial CBCs. Severe cases may have elevated BUN or liver enzymes and hypokalemia.
- Current recommendation for determining "clearing" of the organism (*Babesia gibsoni*) is to perform a PCR test at 60 and 90 days post-therapy

Client Information
- Clients should understand that depending on the species treated, parasites may not be completely eradicated and that retreatment may be required

Chemistry/Synonyms
Diminazene aceturate is an aromatic diamidine derivative chemically related to pentamidine. One gram of diminazene is soluble in approximately 14 mL of water and it is slightly soluble in alcohol.

Diminazene aceturate may also be known as: diminazene diaceturate, or diminazeno; many international trade names are available.

Storage/Stability
Read and follow label directions for storage and preparation of each product used; diminazene powder, granules, or packets for reconstitution for injection should generally be stored in a dry, cool place out of direct sunlight. Once reconstituted, the solution's stability is temperature dependent; up to 14 days when refrigerated, up to 5 days at 20°C and only for 24 hours at temperatures above 50°C.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS: None in the USA.

Diminazene aceturate is available in many countries either alone, or in combination products (*e.g.,* with antipyrine), with the following trade names: *Azidine*®, *Azidin*®, *Babezeen*®, *Crede-Bab-Minazene*®, *Berenil*®, *Dimisol*®, *Dizine*®, *Ganaseng*®, *Ganasegur*®, *Pirocide*®, or *Veriben*®.

The FDA may allow legal importation of this medication for compassionate use in animals; for more information, see the *Instructions for Legally Importing Drugs for Compassionate Use in the USA* found in the appendix.

Withdrawal times may vary depending on the product, dosage, and the country where it is used. In South Africa, *Berenil*® (Intervet), has an animal slaughter withdrawal period of 21 days.

The JECFA of FAO/WHO has established the following maximum residue limit recommendations for diminazene in cattle: muscle (500 mcg/kg), liver (12000 mcg/kg), kidney (6000 mcg/kg), and milk (150 mcg/L).

HUMAN-LABELED PRODUCTS: None

DIMENHYDRINATE

(dye-men-***hye***-dri-nate) Dramamine®

ANTIHISTAMINE

Prescriber Highlights
- Antihistamine used primarily for prevention of motion sickness in dogs & cats; may be useful as an adjunctive treatment for feline pancreatitis
- Contraindications: Hypersensitivity to it or others in class.
- Caution: Angle closure glaucoma, GI or urinary obstruction, COPD, hyperthyroidism, seizure disorders, cardiovascular disease or hypertension; may mask clinical signs of ototoxicity
- Adverse Effects: CNS depression & anticholinergic effects. GI effects (diarrhea, vomiting, anorexia) are less common

Uses/Indications
In veterinary medicine, dimenhydrinate is used primarily for its antiemetic effects for vomiting and in the prophylactic treatment of motion sickness in dogs and cats. Dimenhydrinate may be useful as an adjunctive treatment for feline pancreatitis. As dimenhydrinate is often thought of as "half-strength diphenhydramine" it can be employed whenever a histmine-1 blocker is desired.