Contraindications/Precautions/Warnings
Domperidone should not be used when GI obstructions are present or suspected. Because domperidone is potentially a neurotoxic substrate of P-glycoprotein, it should be used with caution in those herding breeds (*e.g.*, Collies) that may have the gene mutation that causes a nonfunctional protein. Also see Drug Interactions.

Adverse Effects
Because plasma prolactin levels may be increased, galactorrhea or gynecomastia may result. Injectable products (now withdrawn) have been associated with arrhythmias in human patients with heart disease or hypokalemia. Rarely, somnolence or dystonic reactions have occurred in people.

Reproductive/Nursing Safety
Domperidone has been shown to have teratogenic effects when used at high doses in mice, rats and rabbits. The drug's effect of causing prolactin release may impact fertility in both females and males.

Domperidone has been used to increase milk supply in women. In rats, it enters milk in small amounts with approximately 1/500th of the adult dose reaching the pups.

Overdosage/Acute Toxicity
There is no specific antidote for domperidone overdose. Use standard decontamination procedures and treat supportively.

Drug Interactions
The following drug interactions have either been reported or are theoretical in humans or animals receiving domperidone and may be of significance in veterinary patients:

- **AZOLE ANTIFUNGALS** (**ketoconazole**, etc.): May increase domperidone levels
- **ANTICHOLINERGIC DRUGS**: May reduce the efficacy of domperidone
- **BROMOCRIPTINE/CABERGOLINE**: Domperidone may antagonize effects on prolactin
- **MACROLIDE ANTIBIOTICS** (**erythromycin, clarithromycin**): May increase domperidone levels
- **OPIOIDS**: May reduce the efficacy of domperidone
- **SUSTAINED-RELEASE** or **ENTERIC-COATED ORAL MEDICATIONS**: Domperidone may alter the absorptive characteristics of these drugs by decreasing GI transit times

Laboratory Considerations
- Domperidone may increase **serum prolactin** levels
- Domperidone may increase **ALT and AST**

Doses
- **DOGS:**

  As a prokinetic agent:
  a) 0.05–0.1 mg/kg PO once or twice a day. **Note:** Scant clinical experience; suggested dose based upon experimental data. (Hall and Washabau 1997)
  b) For vomiting due to gastritis: 2–5 mg (total dose) PO two to three times a day. (Bishop 2005)

- **CATS:**

  As a prokinetic agent:
  a) 0.05–0.1 mg/kg PO once or twice a day. **Note:** Scant clinical experience; suggested dose based upon experimental data. (Hall and Washabau 1997)

- **HORSES:**

  For fescue toxicity:
  a) 1.1 mg/kg PO daily 30 days before foaling (Cross and Adams 2001)
  b) 1.1 mg/kg PO once a day beginning at least 2 weeks prior to mare's due date (Valla 2003)

Monitoring
- Clinical efficacy

Client Information
- Because there are no approved products in the USA (at time of writing), clients should understand the investigational nature of this drug.

Chemistry/Synonyms
Domperidone maleate occurs as a white or almost white powder that exhibits polymorphism. It is very slightly soluble in water or alcohol.

Domperidone may also be known as domperidonum and R-33812. A common trade name is *Motilium*®, but many trade names are available internationally.

Storage/Stability
Domperidone tablets should be stored at room temperature and protected from light and moisture.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS: None

An equine gel (1%) form may be available in some countries.

HUMAN-LABELED PRODUCTS: None in the USA.

In Canada (10 mg tablet only) and in Europe, human oral tablets of 10 mg, suppositories and oral suspension may be available.

DOPAMINE HCL

(***doe***-pa-meen) **Intropin®**

ADRENERGIC/DOPAMINERGIC INOTROPIC AGENT

Prescriber Highlights
- **Catecholamine that at lower doses dilates the renal, mesenteric, coronary, & intracerebral vascular beds; at higher doses, systemic peripheral resistance is increased & hypotension treated**
- **Use in an "ICU" setting**
- **Contraindications: Pheochromocytoma, ventricular fibrillation, & uncorrected tachyarrhythmia**
- **Not a substitute for adequate reperfusion therapy**
- **Adverse Effects: Nausea/vomiting, ectopic beats, tachycardia, hypotension, hypertension, dyspnea, headache & vasoconstriction**
- **Avoid extravasation injuries**

Uses/Indications
Dopamine should be used only in critical care settings where adequate monitoring can be provided. It is used to correct the hemodynamic imbalances present in shock after adequate fluid volume replacement, and as adjunctive therapy for the treatment of acute heart failure. It has now been shown that low-dose dopamine for the treatment of oliguric renal failure is not efficacious in improving GFR in humans; its use for this purpose in dogs is unproven.

Pharmacology/Actions

Dopamine is a precursor to norepinephrine and acts directly and indirectly (by releasing norepinephrine) on both alpha- and beta$_1$-receptors. Dopamine also has dopaminergic effects.

At very low IV doses, 0.5–2 micrograms/kg/min, dopamine acts predominantly on dopaminergic receptors and dilates the renal, mesenteric, coronary, and intracerebral vascular beds. At doses from 2–10 micrograms/kg/min, dopamine also stimulates beta$_1$-adrenergic receptors. The net effect at this dosage range is to exert positive cardiac inotropic activity, increase organ perfusion, renal blood flow and urine production, but GFR does not appreciably improve. At these lower doses, systemic vascular resistance remains largely unchanged. At higher doses, >10–12 micrograms/kg/min, the dopaminergic effects are overridden by alpha effects. Systemic peripheral resistance is increased and hypotension may be corrected in cases where systemic vascular resistance is diminished; renal and peripheral blood flows are thus decreased.

Pharmacokinetics

Dopamine is not administered orally as it is rapidly metabolized in the GI tract. After IV administration, the onset of action is usually within 5 minutes and persists for less than 10 minutes after the infusion has stopped.

Dopamine is widely distributed in the body, but does not cross the blood-brain barrier in appreciable quantities. It is unknown if dopamine crosses the placenta.

The plasma half-life of dopamine is approximately 2 minutes. It is metabolized in the kidney, liver, and plasma by monoamine oxidase (MAO) and catechol-O-methyltransferase (COMT) to inactive compounds. Up to 25% of a dose of dopamine is metabolized to norepinephrine in the adrenergic nerve terminals. In human patients receiving monoamine oxidase inhibitors, dopamine's duration of activity can be as long as one hour.

Contraindications/Precautions/Warnings

Dopamine is contraindicated in patients with pheochromocytoma, ventricular fibrillation, and uncorrected tachyarrhythmias. It is not a substitute for adequate fluid, electrolyte or blood product replacement therapy. Dopamine should be used with caution in patients with ischemic heart disease or an occlusive vascular disease. Decrease dose or discontinue the drug should clinical signs occur implicating dopamine as the cause of reduced circulation to the extremities or the heart. The drug should be discontinued or dosage reduced should arrhythmias (PVC's) occur.

Cats are unlikely to benefit (and it may be detrimental) from low dose dopamine therapy for oliguric renal failure.

Adverse Effects

Most frequent adverse effects seen include: nausea and vomiting, ectopic beats, tachycardia, palpitation, hypotension, hypertension, dyspnea, headache, and vasoconstriction.

Extravasation injuries with dopamine can be very serious with necrosis and sloughing of surrounding tissue. Patient's IV sites should be routinely monitored. Should extravasation occur, infiltrate the site (ischemic areas) with a solution of 5–10 mg phentolamine (*Regitine®*) in 10–15 mL of normal saline. A syringe with a fine needle should be used to infiltrate the site with many injections.

Reproductive/Nursing Safety

In humans, the FDA categorizes this drug as category ***C*** for use during pregnancy (*Animal studies have shown an adverse effect on the fetus, but there are no adequate studies in humans; or there are no animal reproduction studies and no adequate studies in humans.*) In a separate system evaluating the safety of drugs in canine and feline pregnancy (Papich 1989), this drug is categorized as in class: ***B*** (*Safe for use if used cautiously. Studies in laboratory animals may have uncovered some risk, but these drugs appear to be safe in dogs and cats or these drugs are safe if they are not administered when the animal is near term.*)

It is not known whether dopamine is excreted in breast milk.

Overdosage/Acute Toxicity

Accidental overdosage is manifested by excessive blood pressure elevation (see adverse effects above). Treatment consists only of temporarily discontinuing therapy since dopamine's duration of activity is so brief. Should the patient's condition fail to stabilize, phentolamine has been suggested for use.

Drug Interactions

The following drug interactions have either been reported or are theoretical in humans or animals receiving dopamine and may be of significance in veterinary patients:

- **ALPHA-ADRENERGIC BLOCKERS** (*e.g.*, **prazosin**): May antagonize the vasoconstrictive properties of dopamine (high-dose)
- **ANESTHETICS, GENERAL HALOGENATED HYDROCARBON:** Use of halothane or cyclopropane with dopamine may result in increased incidences of ventricular arrhythmias
- **ANTIDEPRESSANTS, TRICYCLIC:** May potentiate adverse cardiovascular effects
- **BETA-BLOCKERS** (*e.g.*, **metoprolol, propranolol**): May antagonize the cardiac effects of dopamine
- **DIURETICS:** May potentiate urine production effects of low-dose dopamine
- **MONOAMINE OXIDASE INHIBITORS:** Monoamine oxidase inhibitors can significantly prolong and enhance the effects on dopamine
- **OXYTOCIC DRUGS:** May cause severe hypertension when used with dopamine
- **PHENOTHIAZINES:** In animals (species not specified), the renal and mesenteric vasodilatation effects of dopamine have been antagonized by phenothiazines
- **VASOPRESSORS/VASOCONSTRICTORS:** Use with dopamine may cause severe hypertension

Laboratory Considerations

Dopamine may:

- Suppress **serum prolactin** secretion from the pituitary
- Suppress **thyrotropin** secretion from the pituitary
- Suppress **growth hormone** secretion from the pituitary

Doses

The dosage of dopamine is determined by its indication (for more information refer to the pharmacology section above). Use an IV pump or other flow-controlling device to increase precision in dosing.

a) For adjunctive therapy for oliguric renal failure (usually for dogs only): Low doses (0.5–3 micrograms/kg/min) with diuretics (furosemide) are used to attempt to convert a patient from an oliguric state to a non-oliguric one (Cowgill and Elliot 2000)

b) For adjunctive therapy for acute heart failure (dogs): IV infusion of 1–10 mcg/kg/min (doses higher may increase peripheral vascular resistance and heart rate). Initially, a dose of 2 mcg/kg/min is usually used and titrated upward to desired clinical effect (improved hemodynamics) (Kittleson 2006a)

c) For treatment of severe hypotension/shock: (**Note:** Dopamine is not a substitute for adequate volume replacement therapy when indicated.) 1–3 mcg/kg/minute CRI (constant rate IV infusion); higher dosages of 3–10 mcg/kg/min CRI are in-

dicated if greater cardiotonic and BP support are indicated (Haskins 2000)

Monitoring
- Urine flow
- Cardiac rate/rhythm
- Blood pressure
- IV site

Client Information
- Dopamine should be used only in an intensive care setting or where adequate monitoring is possible

Chemistry/Synonyms
An endogenous catecholamine that is the immediate precursor to norepinephrine, dopamine (as the HCl salt) occurs as a white to off-white crystalline powder. It is freely soluble in water and soluble in alcohol. The injectable concentrated solution has a pH of 2.5–5.5 and may contain an antioxidant (sodium bisulfate). The pH's of the ready-to-use injectable products in dextrose range from 3–5.

Dopamine HCl may also be known as: ASL-279, dopamini hydrochloridum, and 3-hydroxytyramine hydrochloride; many trade names are available.

Storage/Stability/Preparation/Compatibility
Dopamine injectable products should be protected from light. Solutions that are pink, yellow, brown, or purple indicate decomposition of the drug. Solutions that are darker than a light yellow should be discarded. Dopamine solutions should be stored at room temperature (15–30°C).

After dilution in a common IV solution (not 5% bicarbonate), dopamine is stable for at least 24 hours at room temperature, but it is recommended to dilute the drug just prior to use. Dopamine is stable in solutions with a pH of less than 6.4, and most stable at pH's less than 5. It is oxidized at alkaline pH.

To prepare solution: Add contents of vial to either 250 mL, 500 mL, or 1000 mL of normal saline, D_5W, lactated Ringer's injection, or other compatible IV fluid. If adding a 200 mg vial (5 mL @ 40 mg/mL) to a one-liter bag, the resultant solution will contain an approximate concentration of 200 micrograms/mL. If using a mini-drip IV set (60 drops/mL), each drop will contain approximately 3.3 micrograms. In small dogs and cats, it may be necessary to use less dopamine so the final concentration will be less; in large animals, a higher concentration may be necessary.

Dopamine is reported to be physically **compatible** with the following IV fluids: D_5 in LRS, D_5 in half-normal saline, D_5 in normal saline, D_5W, mannitol 20% in water, lactated Ringer's, normal saline, and 1/6M sodium lactate. Dopamine is reported to be physically **compatible** with the following drugs: aminophylline, bretylium tosylate, calcium chloride, carbenicillin disodium, cephalothin sodium neutral, chloramphenicol sodium succinate, dobutamine HCl, gentamicin sulfate (gentamicin potency retained for only 6 hours), heparin sodium, hydrocortisone sodium succinate, kanamycin sulfate, lidocaine HCl, methylprednisolone sodium succinate, oxacillin sodium, potassium chloride, tetracycline HCl, and verapamil HCl.

Dopamine is reported to be physically **incompatible** with: amphotericin B, ampicillin sodium, iron salts, metronidazole with sodium bicarbonate, penicillin G potassium, and sodium bicarbonate. Compatibility is dependent upon factors such as pH, concentration, temperature, and diluent used; it is suggested to consult specialized references for more specific information.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS: None

The ARCI (Racing Commissioners International) has designated this drug as a class 2 substance. See the appendix for more information.

HUMAN-LABELED PRODUCTS:

Dopamine HCl for Injection: 40 mg/mL, 80 mg/mL and 160 mg/mL in 5 mL amps, 5, 10 and 20 mL vials & 5 mL and 10 mL syringes; *Intropin*® (Faulding); generic; (Rx)

Dopamine HCl in 5% dextrose for Infusion: 80 mg/100 mL (0.8 mg/mL), 160 mg/100 mL (1.6 mg/mL), 320 mg/100 mL (3.2 mg/mL) in 250 mL and 500 mL; generic; (Rx)

DORAMECTIN

(dor-a-*mek*-tin) Dectomax®

AVERMECTIN ANTIPARASITIC AGENT

Prescriber Highlights
- **Injectable (cattle, swine) & topical (cattle only) avermectin antiparasiticide**
- **Potentially useful for generalized demodicosis in small animals**
- **Manufacturer warns about using in other species**
- **IM injections may cause muscle blemishes**
- **Not labeled for female dairy cattle (20 months or older)**
- **Relatively long slaughter withdrawal times**

Uses/Indications
Doramectin injection is indicated for the treatment and control of the following endo- and ectoparasites in cattle: roundworms (adults and some fourth stage larvae)—*Ostertagia ostertagi* (including inhibited larvae), *O. lyrata, Haemonchus placei, Trichostrongylus axei, T. colubriformis, T. longispicularis, Cooperia oncophora, C. pectinata, C. punctata, C. surnabada* (*syn. mcmasteri*), *Bunostomum phlebotomum, Strongyloides papillosus, Oesophagostomum radiatum, Trichuris* spp.; lungworms (adults and fourth stage larvae)—*Dictyocaulus viviparus*; eyeworms (adults)—*Thelazia* spp.; grubs (parasitic stages)—*Hypoderma bovis*, *H. lineatum*; lice—*Haematopinus eurysternus*, *Linognathus vituli*, *Solenopotes capillatus*; and mange mites—*Psoroptes bovis*, *Sarcoptes scabiei*.

In swine the injection is labeled for the treatment and control gastrointestinal roundworms (adults and 4th stage Ascaris suum, adults and 4th stage *Oesophagostomum dentatum*, *Oesophagostomum quadrispinolatum* adults, *Strongyloides ransomi* adults, and *Hydrostrongylus rubidus* adults), lungworms (*Stephanurus dentatus* adults), mange mites (adults and immature stages *Sarcoptes scabeii var. suis*), and sucking lice (adults and immature stages *Haematopinus suis*)

The manufacturer states the doramectin protects cattle against infection or reinfection with *Ostertagia ostertagi* for up to 21 days.

Doramectin topical (pour-on) is approved for use in cattle and has a similar spectrum of action against a variety of endo- and ectoparasites, including biting lice.

Injectable doramectin has been used for treating a variety of nematode and arthropod parasites in companion animals, including generalized demodicosis in dogs and cats and spirocercosis in dogs.