Pyridostigmine injection is unstable in alkaline solutions.

It is reportedly physically **compatible** with glycopyrrolate, heparin sodium, hydrocortisone sodium succinate, potassium chloride, and vitamin B-complex with C. Compatibility is dependent upon factors such as pH, concentration, temperature and diluent used; consult specialized references or a hospital pharmacist for more specific information.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS: None

The ARCI (Racing Commissioners International) has designated this drug as a class 3 substance. See the appendix for more information.

HUMAN-LABELED PRODUCTS:

Pyridostigmine Bromide Tablets: 60 mg; *Mestinon*® (ICN); generic, (Rx)

Pyridostigmine Bromide Extended-Release Tablets: 180 mg; *Mestinon*® (ICN); (Rx)

Pyridostigmine Bromide Syrup: 12 mg/mL in 480 mL; *Mestinon*® (ICN); (Rx)

Pyridostigmine Bromide Injection: 5 mg/mL in 2 mL amps; *Mestinon*® (ICN); (Rx)

PYRIDOXINE HCL (VITAMIN B-6)

(peer-ih-*dox*-een)

NUTRITIONAL B VITAMIN, ANTIDOTE

Prescriber Highlights

- **Pyridoxine may be beneficial in the treatment of isoniazid or crimidine toxicity, or delaying cutaneous toxicity of *Doxil*® (liposomal doxorubicin)**
- **Overdoses may cause peripheral neuropathy**

Uses/Indications

Pyridoxine use in veterinary medicine is relatively infrequent. It may be of benefit in the treatment of isoniazid (INH) or crimidine (an older rodenticide) toxicity. Pyridoxine deficiency is apparently extremely rare in dogs or cats able to ingest food. Cats with severe intestinal disease may have a greater requirement for pyridoxine in their diet. Experimentally, pyridoxine has been successfully used in dogs to reduce the cutaneous toxicity associated with doxorubicin containing pegylated liposomes (*Doxil*®). Pyridoxine has been demonstrated to suppress the growth of feline mammary tumors (cell line FRM) *in vitro*.

In humans, labeled uses for pyridoxine include pyridoxine deficiency and intractable neonatal seizures secondary to pyridoxine dependency syndrome. Unlabeled uses include premenstrual syndrome (PMS), carpal tunnel syndrome, tardive dyskinesia secondary to antipsychotic drugs, nausea and vomiting in pregnancy, hyperoxaluria type 1 and oxalate kidney stones, and for the treatment of isoniazid (INH), cycloserine, hydrazine or Gyometra mushroom poisonings.

Pharmacology/Actions

In erythrocytes, pyridoxine is converted to pyridoxal phosphate and, to a lesser extent, pyridoxamine, which serve as coenzymes for metabolic functions affecting protein, lipid and carbohydrate utilization. Pyridoxine is necessary for tryptophan conversion to serotonin or niacin, glycogen breakdown, heme synthesis, synthesis of GABA in the CNS, and oxalate conversion to glycine. Pyridoxine can act as an antidote by enhancing the excretion of cycloserine or isoniazid.

Pyridoxine requirements increase as protein ingestion increases.

Pharmacokinetics

Pyridoxine is absorbed from the GI tract primarily in the jejunum. Malabsorption syndromes can significantly impair pyridoxine absorption. Pyridoxine is not bound to plasma proteins, but pyridoxal phosphate is completely bound to plasma proteins. Pyridoxine is stored primarily in the liver with smaller amounts stored in the brain and muscle. It is biotransformed in the liver and various tissues, and excreted almost entirely as metabolites into the urine. Elimination half-life in humans is approximately 15–20 days.

Contraindications/Precautions/Warnings

Weigh potential risks versus benefits in patients with documented sensitivity to pyridoxine.

Adverse Effects

Pyridoxine is generally well tolerated unless doses are large (see Overdosage). In humans, paresthesias and somnolence have been reported. Reduced serum folic acid levels have occurred.

Reproductive/Nursing Safety

While pyridoxine is a nutritional agent and very safe at recommended doses during pregnancy, very large doses during pregnancy can cause a pyridoxine dependency syndrome in neonates.

Pyridoxine administration at low dosages should be safe during nursing. Pyridoxine requirements of the dam may be increased during nursing.

Overdosage/Acute Toxicity

Single overdoses are not considered overly problematic, unless they are massive. Laboratory animals given 3–4 g/kg developed seizures and died. Dogs (Beagles) repeatedly given 3 gram oral daily doses developed uncoordinated gait and neurologic signs. Neuronal lesions were noted in sensory, dorsal root ganglia, and trigeminal ganglia. Signs generally resolved over a 2-month drug free period.

Drug Interactions

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

- **CHLORAMPHENICOL:** May cause increased pyridoxine requirements
- **ESTROGENS:** May cause increased pyridoxine requirements
- **HYDRALAZINE:** May cause increased pyridoxine requirements
- **IMMUNOSUPPRESSANTS** (*e.g.*, **azathioprine, chlorambucil, cyclophosphamide, corticosteroids**): May cause increased pyridoxine requirements
- **ISONIAZID:** May cause increased pyridoxine requirements
- **PENICILLAMINE:** May cause increased pyridoxine requirements
- **LEVODOPA:** Pyridoxine may reduce levodopa efficacy (no interaction when levodopa is used with carbidopa)
- **PHENOBARBITAL:** High dose pyridoxine may decrease phenobarbital serum levels
- **PHENYTOIN:** High dose pyridoxine may decrease phenytoin serum concentration

Laboratory Considerations

The following laboratory alterations have been reported in humans with pyridoxine and may be of significance in veterinary patients:

- **Urobilinogen in the spot test using Ehrlich's reagent:** Pyridoxine may cause false-positive results
- **AST:** Excessive dosages of pyridoxine may elevate AST

Doses

- **DOGS/CATS:**
  a) Dogs: For isoniazid (INH) toxicity: If quantity of INH ingested is known, give pyridoxine on a mg for mg (1:1) basis. If it is not known, give pyridoxine initially at 71 mg/kg as a 5–10% IV infusion over 30–60 minutes (some sources say it can be given as an IV bolus). Pyridoxine injection can usually be obtained from human hospital pharmacies. Do not use injectable B-complex vitamins. (Gwaltney-Brant 2003)
  b) To replace pyridoxine antagonized by crimidine ingestion: 20 mg/kg IV (Dalefield and Oehme 2006)
  c) Dogs: To delay the development of cutaneous toxicity (PPES; palmer-plantar-dyerythrodysesthesia) associated with doxorubicin containing pegylated liposomes (*Doxil*®): 50 mg PO three times daily during chemotherapy protocol period. (Vail, Chun et al. 1998)

Monitoring

- Other than evaluating efficacy for its intended use, no significant monitoring is required

Client Information

- Do not give more than prescribed by the veterinarian
- Contact veterinarian if animal develops any abnormal signs such as difficulty walking, using stairs, etc.

Chemistry/Synonyms

Pyridoxine (vitamin B6) is a water-soluble vitamin present in many foods (liver, meat, eggs, cereals, legumes, and vegetables). The commercially available form (pyridoxine HCl) found in medications is obtained synthetically. Pyridoxine HCl occurs as white or practically white, crystals or crystalline powder with a slightly bitter, salty taste. It is freely soluble in water and slightly soluble in alcohol.

Pyridoxine or Vitamin B6 may also be known by the following synonyms or analogs: adermine, pyridoxal, pyridoxal-5-phosphate, pyridoxamine, pirodoxamina, piridossima, piridoxolum, piridossina, *Aminoxin*®, and *Vitelle Nestrex*®.

Storage/Stability/Compatibility

Unless otherwise specified by the manufacturer, pyridoxine tablets should be stored below 40°C (104°F), preferably between 15–30°C (59–86°F), in well-closed containers protected from light.

Pyridoxine HCl injection should be stored below 40°C (104°F), preferably between 15–30°C (59–86°F), protected from light and freezing.

Pyridoxine HCl injection can be administered undiluted or added to commonly used IV solutions. It is reportedly **compatible** with doxapram when mixed in a syringe and with fat emulsion 10%. It is reportedly **incompatible** with alkaline or oxidizing solutions, and iron salts.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS:

No single ingredient pyridoxine products were located. There are a multitude of various veterinary-labeled products that contain pyridoxine as one of several ingredients.

HUMAN-LABELED PRODUCTS:

Pyridoxine Tablets: 25 mg, 50 mg, 100 mg, 250 mg, & 500 mg; *Vitelle Nestrex*® (Fielding), generic; (OTC)

Pyridoxine (as pyridoxal-5'-phosphate) Tablets (enteric-coated): 20 mg; *Aminoxin*® (Tyson); (OTC)

Pyridoxine HCl Injection: 100 mg/mL in 1 mL vials; generic; (Rx)

Pyridoxine is also an ingredient in many combination products (*e.g.*, B-Complex, multivitamins).

PYRILAMINE MALEATE

(pye-*ril*-a-meen) **Histall®, Equiphed®**

ANTIHISTAMINE

Prescriber Highlights

- Injectable antihistamine
- Contraindications: None noted
- Adverse Effects: HORSES: CNS stimulation (nervousness, insomnia, convulsions, tremors, ataxia), palpitation, GI disturbances, CNS depression (sedation), muscular weakness, anorexia, lassitude & incoordination
- Drug Interactions

Uses/Indications

Antihistamines are used in veterinary medicine to reduce or help prevent histamine mediated adverse effects; predominantly used in horses.

Pharmacology/Actions

Antihistamines (H_1-receptor antagonists) competitively inhibit histamine at H_1 receptor sites. They do not inactivate, nor prevent the release of histamine, but can prevent histamine's action on the cell. Besides their antihistaminic activity, these agents also have varying degrees of anticholinergic and CNS activity (sedation). Pyrilamine is considered to be less sedating and have fewer anticholinergic effects when compared to most other antihistamines.

Pharmacokinetics

The pharmacokinetics of this agent have apparently not been extensively studied.

Contraindications/Precautions/Warnings

The manufacturer indicates that the use of this product ". . . should not supersede the use of other emergency drugs and procedures."

Adverse Effects

Adverse effects in horses can include CNS stimulation (nervousness, insomnia, convulsions, tremors, ataxia), palpitation, GI disturbances, CNS depression (sedation), muscular weakness, anorexia, lassitude and incoordination.

Reproductive/Nursing Safety

At usual doses, pyrilamine is probably safe to use during pregnancy. Rats and mice treated with 10–20 times the human dose had an increased frequency of embryonic, fetal or perinatal death, but a study in pregnant women, showed no increase in teratogenic or fetocidal rates.

It is unknown if pyrilamine enters milk.