Maryland Poison Center
University of Maryland School of Pharmacy

ToxTidbits: Antidote Facts

1-800-222-1222

Pyridoxine

Pyridoxine (vitamin B6), a water-soluble vitamin, is an antidote used for isonicotinic acid hydrazide (isoniazid), *Gyromitra esculenta* mushrooms, hydrazine, methylated hydrazines, and ethylene glycol poisonings. All of these substances, except for ethylene glycol, can precipitate seizures by competitive inhibition of pyridoxal-5'-phosphate (P5P), which is involved in the production of γ-aminobutyric acid (GABA). This decreases GABA concentrations, leading to seizures. Seizure activity increases anaerobic metabolism, resulting in lactic (metabolic) acidosis.

Mechanism / Indications: Pyridoxine is metabolized by pyridoxal kinase to its active metabolite, P5P. P5P acts as a cofactor in converting glutamate to GABA. Thus, pyridoxine increases GABA synthesis. It is indicated for the prevention and treatment of seizures, metabolic acidosis and/or coma in poisonings caused by isoniazid, hydrazines and *Gyromitra esculenta* mushrooms. Pyridoxine is given in ethylene glycol poisonings to prevent the formation of oxalic acid. P5P converts the ethylene glycol metabolite glycolic acid to non-toxic compounds. When depleted, the toxic metabolite oxalic acid is formed.

Adverse effects / Contraindications: Pyridoxine may cause a sensory axonal neuropathy, decreased folic acid concentrations, headaches, and drowsiness when taken chronically or in massive single doses. Large intravenous doses (>1 g/kg) have precipitated seizures in animals. Pyridoxine is contraindicated in patients with hypersensitivity to pyridoxine or any of its components.

Dosing: The dose of pyridoxine should equal the dose of isoniazid taken, up to 5 g total. If the dose of isoniazid is unknown, 5 g of pyridoxine is an appropriate dose. The maximum dose is 5 g or 70 mg/kg in a child. It is administered at 0.5-1 g/min IV until seizures subside or a maximum dose is reached. If seizures persist, this dosing schedule may be repeated until seizures stop. If seizure activity ceases prior to finishing the initial dose, the remaining amount of pyridoxine should be infused. The same dosage applies to poisonings by *Gyromitra esculenta* mushrooms and hydrazines. For ethylene glycol poisonings, the pyridoxine dose is 100 mg/day IV.

Note: Pyridoxine has been reported to be in short supply in health care facilities. The Maryland Poison Center recommends that hospital pharmacies stock 10 g. While IV pyridoxine is inexpensive, Burda et al reported that 91.6% of hospitals inadequately stock enough pyridoxine to treat one 70 kg patient with 5 g. Hospitals that do not stock IV pyridoxine may give the oral dosage form, although this is not the preferred method. Reported adverse events resulting from administering inadequate doses include isolated and intractable seizures, hypotension, metabolic acidosis, rhabdomyolysis, and death.

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For more on pyridoxine:

- *Burda AM, Sigg T, Haque D, Bardsley CH. Inadequate Pyridoxine Stock and Its Effect on Patient Outcome. American Journal of Therapeutics 2007;14(3):262-264*
- *Howland MA. Antidotes in Depth: Pyridoxine. In: Nelson LS, Lewin NA, Howland MA et al, eds: Goldfrank's Toxicologic Emergencies. New York NY, 2011;845-848.*

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