Common Reversal Agents/ Antidotes in Small Animal Poisoning

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KEYWORDS

- Reversal agents • Antidotes • Poisoning treatment
- Small animal poisoning

Reversal Agent/Antidote	Toxicant/Main Indications	Comment(s)
N-acetylcysteine (Mucomyst)	Acetaminophen (paracetamol) overdose; can be tried for amanita mushroom toxicosis; sago palm toxicosis; xylitol toxicosis	Can be used orally (PO); Injectable (Acetadote) available; in addition, can also use SAMe
Flumazenil (Romazicon)	Benzodiazepines (diazepam, alprazolam, lorazepam, clonazepam) overdose	Can help reverse severe central nervous system (CNS) depression/coma; short half-life; repeat in 1 to 3 hours if needed
Pamidronate (Aredia)	Cholecalciferol; calcipotriene; calcitriol	Treats hypercalcemia and hyperphosphatemia; can cause transient azotemia, may require multiple doses
Cyproheptadine (Periactin)	Serotonin syndrome caused by serotonergic substances (5-hydroxytryptophan; selective serotonin reuptake inhibitors, tricyclic antidepressants)	Can be tried per rectum in animals that cannot take it PO; can repeat once in 8–12 hours

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Methocarbamol (Robaxin)	For tremor control in permethrin toxicosis in cats; can also be tried in cats/dogs for tremors resulting from other pyrethrins/pyrethroids	Not an anticonvulsant; works well in permethrin, metaldehyde, tremorgens, and strychnine toxicosis; injectable preferred; PO may be helpful for mild cases
Atipamezole (Antisedan)	To treat alpha-2-adrenergic agonist effects of amitraz, xylazine, clonidine, and brimonidine overdose	Atipamezole and yohimbine have alpha-2-adnergic antagonist properties; atipamezole more specific/ preferred
Fomepizole (4-methyl pyrazole; Antizol-Vet)	Ethylene glycol (antifreeze) toxicosis in dogs; some benefit if used within 3 hours of exposure in cats	Good safety margin; does not contribute to acidosis and CNS depression as ethanol does; can use ethanol as an alternative if fomepizole is not available
Calcium disodium EDTA (Calcium Disodium Versenate)	Lead, zinc, cadmium	Injectable; can cause gastrointestinal (GI) signs and nephrotoxicity; do not use if metal still present in GI tract
BAL (British antilewisite; Dimercaprol)	Lead, arsenic, mercury	Injection can be irritating and painful; difficult to obtain; helps remove lead from CNS
Atropine sulfate	For treating muscurinic signs in organophosphates and carbamate toxicosis; certain muscurinic mushrooms	Avoid atropinization (hyperthermia, tachycardia, mydriasis), not for treating nicotinic signs
2-PAM (Paralidoxime)	For treating nicotinic signs in organophosphate toxicosis in dogs, cats	Not useful for most carbamate toxicoses; most beneficial within 24 hours of exposure but may be useful beyond this time; discontinue after 3 doses if no benefit
D-penicillamine (Cuprimine)	Zinc, cadmium, lead, copper, mercury	Used PO; can cause GI signs; do not use when metal is still present in the GI tract
Digoxin immune Fab (Digibind)	Digitalis; cardiac glycosides	Expensive but rapid acting and efficacious; can be used in Bufo toad toxicosis
Deferoxamine (Desferol)	Iron chelator; useful in iron toxicosis	Urine color may turn wine color after chelation with iron
Succimer (2-3-dimercaptosuccinic acid; Chemet)	Lead poisoning in dogs, cats, birds	Used PO; anecdotal reports of renal failure in cats—monitor renal values when using in cats; can be used when object still present in the GI tract

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Yohimbine (Yobine)	To treat alpha-2-adrenergic agonist effects of amitraz, xylazine, clonidine, and brimonidine overdose	Shorter half-life and less specific than atipamezole; use yohimbine as a second choice if atipamezole is not available
S-adenosyl-L-methionine (SAMe; Denosyl)	General hepatoprotective agent; has been suggested as a supplement	Used as an aid in hepatic damage from various causes (mushroom, xylitol, cycad, acetaminophen, etc)
Naloxone (Narcan)	Opioids/opiates	Can help reverse respiratory/CNS depression; short half-life; repeat in 1 to 3 hours if needed
Vitamin K1 (phytonadione)	Anticoagulants (warfarin, brodifacoum, bromodiolone)	Parenteral use can cause allergic reaction; use PO for 2 to 4 weeks or more as needed; works better with fatty food and in divided doses
Pyridoxine (vitamin B6)	Isoniazid toxicosis in dogs	Difficult to obtain; can be used 1:1 ratio (dose of isoniazid:dose of pyridoxine); 5% to 10% IV infusion over 30 to 60 minutes; use in conjunction with diazepam to control CNS effects
Prussian blue	Thallium toxicosis	Used PO; difficult to obtain; thallium toxicosis no longer common
Leucovorin	Methotrexate overdose	Leucovorin is active form of folic acid; 25 to 250 mg/m^2 every 6 hours IV, IM for up to 72 hours
Intravenous lipid emulsion (Intralipid 10% or 20% solution)	For certain lipophilic drug toxicosis; potential for ivermectin, moxidectin and other avemectins; cholecalciferol and other vitamin D_3 analogue; amlodipine; baclofen,; diltiazem; lidocaine; nifedipine; verapamil; severe marijuana toxicois; permethrin toxicosis; bupropion; trazodone; phenobarbital and other barbiturates overdose; tricyclic antideprassants; propranolol	Case-control studies demonstrating efficacy and safety not available; 1.5 mL/kg (20% solution) as initial bolus followed by 0.25 mL/kg over 30 to 60 minutes, may have to repeat 2 or 3 times every 4–6 hours provided no hyperlipemia present; lack of efficacy; hyperlipidemia, hemolysis, embolism, infection potential adverse effects

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Glucagon (GlucaGen)	Used for treating hypoglycemia due to insulin overdose and hypoglycemia agents; beta-adrenergic agents, calcium channel blockers and tricyclic antidepressant overdose for atrioventricular block, bradycardia, and hypotension	Used IV bolus followed by constant rate infusion (CRI); 50 ng/kg IV bolus in 0.9% saline then 5 to 15 ng/kg/min as CRI
Methylene blue	To treat methemoglobinemia from aniline, nitrite, hydroxyurea, naphthalene, and local anesthetic agents	1% Solution injectable solution at 1.5 mg/kg IV, repeat once in 30 minutes if needed; do not give in cats as it can induce methemoblobinemia in cats
Hydroxycobalamin (Cyanokit)	Vitamin B_{12} precursor; used to treat cyanide toxicosis	Hydroxycobalamin combines with cyanide to form cyanocobalamin, which is excreted in urine; used for treating pernicious anemia in humans
Hyperbaric oxygen	Delivers 100% oxygen at pressure >1 atmosphere; used in carbon monoxide, hydrogen sulfide toxicosis; can be helpful for cyanide toxicosis	Hyperbaric chambers may be available in veterinary schools and in some advanced veterinary clinics
Silymarin (milk thistle)	Used as a hepatoprotective agent in acetaminophen and amanita mushroom toxicosis	Used within 48 hours of exposure; may have to be used for several weeks; 20 to 50 mg/kg/d PO
Acepromazine (PromAce)	To control hyperexcitation from amphetamine toxicosis and other similar stimulants; used for serotoneric drug overdose	Can cause hypotension; 0.02 to 0.1 mg/kg IV, IM, or SC; repeat as needed

FURTHER READINGS

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