

A REVIEW OF VETERINARY ANTIDOTES

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“Antidote” by definition is a remedy to counteract a poison. However, there is no consensus on where the term begins or ends. Classically speaking, an antidote acts specifically to prevent, counteract, reverse or relieve the action of a toxicant, *i.e.* the exact dose of poison counteracted by the same exact dose of antidote leads to no deleterious effect. But, contemporary usage of the term antidote usually refers to any substance that prevents or relieves the effects of a toxicant. Antidotes, like toxicants, are potentially harmful and should not be used indiscriminately; for as Paracelsus stated in the 18th century, “All substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy.”

Since an antidote is a remedy for a poison, the pharmacologic-therapeutic effects of various antidotes, including their mechanism of action, opens the door to further classification and definition. An antidote, which would have therapeutic efficacy on all toxicants, would be referred to as a universal antidote. However, no such antidote exists. There are no antidotes which work on all toxicants. However, chemical antidotes bind chemically with the toxicant or its active site. Mechanical antidotes prevent the absorption of a specific toxicant. There are also physiologic antidotes that therapeutically produce systemic effects opposite to those produced by the toxicant. There are specific antidotes, such as antitoxins, which act specifically on toxins.

Methods and protocols for toxicant decontamination of a suspected poisoned patient regardless of whether it is a food animal or companion animal should not be confused with the use of antidotes. Dilution, non-specific absorption, adjustments of pH, and other measures with natural or synthetic chemical substances, including some patent medicine preparations containing magnesium hydroxide, hydrogen peroxide and/or activated charcoal are often used in decontamination procedures. These substances, though still used, are usually applied after ingestion or exposure, but before absorption.

Just as antidotes are a remedy, some medicinal substances if given to a patient poisoned by a specific toxicant are detrimental and would cause retrogression. This could happen by interfering with protein binding of the toxicant by administering a drug with greater protein binding affinity, thereby releasing more free-toxicant. It could also happen by adjusting pH and reducing the charge on a toxicant so that it is more easily absorbed. The potential for adverse drug-toxicant interaction is real and must be considered when treating all poisoning cases.

In **Table 1**, we include most all of the antidotes presently available that could be beneficial in veterinary clinical toxicology. In addition, readers will note that the vast majority of these antidotes are “not approved veterinary drugs,” and therefore not labeled for use in animals. Hence, it must be stated that the extra label use of most of these drugs as antidotes does not imply any recommendation or even encouragement by the authors for non-judicious use. Extra label use of drugs in veterinary medicine is a serious consideration, and the taking of such a responsibility by an attending veterinarian should always be done with all due care and concern. Published works referencing information on antidotes and their use are cited in Table 1 and listed in **Table 2**.

The Animal Medicinal Drug Clarification Act of 1994 allows veterinarians to legally administer or prescribe any human or veterinary drug for extra label purposes. However, any liability associated with their use becomes the responsibility of the administering veterinarian. This is a particularly critical issue when assuring that no drug or toxic residues remain in the animal tissues when intended as a human or animal food source. Likewise, the veterinarian has a responsibility to assure a safe and wholesome food-animal enters the food chain. Therefore, the veterinarian must take into consideration poison residues and institute appropriate pre-harvest elimination times.

Clinical toxicology is ever changing due to the continually evolving array of potentially toxic substances, which in practice is frequently followed by the development of appropriate antidotal therapy. Because of this, safety precautions should always be taken, regardless of whether the patient is a food animal or a companion animal. Food safety and the quality assurance of

animal-produced food products can not be jeopardized. Proper steps in determining a risk assessment of both the toxicant and the antidote must be carried out.

The veterinarians and professional staff of the Food Animal Residue Avoidance Databank (FARAD) are readily available to assist veterinarians in determining appropriate withdrawal times for any extra label drugs used as antidotes. Some withdrawal times for commonly used extra label antidotes are well known and published; others are less so. Sodium nitrite and sodium thiosulfate administered to treat cyanide toxicosis have no withdrawal times; while methylene blue used for methemoglobin formation from nitrate, nitrite and chlorate poisoning does. Methylene blue currently has a withdrawal time of 180 days for meat and milk producing animals. However, withdrawal time can change as more relevant data is generated through controlled studies. Therefore, it is recommended that FARAD be contacted, either by telephone (888-873-2723) or by e-mail (farad~1Thcsu.edu or farad~ucdavis.edu), to determine the most current information on appropriate withdrawal times.

As our clinical toxicology experiences increase and our knowledge broadens, so will the standards of therapy and the clinical choices for which antidote and detoxification procedure may be most appropriate in any given situation. One must remember that it is always the attending veterinarian's responsibility to determine the most appropriate antidote for the situation, select its dose, and prescribe the treatment protocol. The veterinarian should always rely on his or her experience and knowledge with poisons and antidotes, as well as giving earnest consideration to the poisoned animal, the circumstances surrounding the exposure and the critical element of timeliness.

The ease of availability of human and veterinary pharmaceutical products, as well as chemical products, creates a perpetual problem. The manufacturing and marketing of these products are usually driven by economics. When there is little or no profit to be made with a new drug, there is usually little effort made to identify and market an antidote. The Food and Drug Administration (FDA) Center for Veterinary Medicine may apply regulatory discretion in the use of unapproved antidotes, especially in life-threatening situations, and thereby can allow legitimate manufacturers to produce and market such needed products. However, use of

unapproved antidotes can generate unwarranted risk, can become problematic, and is a high priority regulatory issue when illegal antidote residues are detected in food animals and their products. Therefore, antidotes must be used responsibly and in appropriate circumstances. In addition, the vast number of commercial company mergers, coupled with frequent changes in the names of pharmaceutical firms and their products, makes finding the best available source of a particular antidote challenging.

One may check on current availability of specific antidotes marketed as a pharmaceutical products by utilizing the vast resources of the internet, as well as the contact information in

Table 3. Following are internet sites that may be helpful:

- *PharminfoNet* (<http://oharminfo.com>) of the *Pharmlink-Pharmaceutical Information Network* (<http://pharminfo.com/pharmlink.html>) may be helpful in tracking down the current manufacturing and commercial availability of pharmaceutical products.
- *Chemfinder* (<http://www.chemfinder.com>) may locate chemical products used as antidotes.
- *The Physicians Desk Reference* (<http://www.pdr.net>), Medical Economics Inc., Montvale, NJ.
- *The Merck Index* (<http://www.merck.com>), Merck & Co., Inc, Whitehouse Station, NJ.
- *Compendium of Veterinary Products*, North American Compendium, Inc., Port Huron, MI.

The doses for antidotes listed in Table 1 are given as a guide. Many are derived from anecdotal experiences, some have been handed down through generations, and others are veterinary extrapolations of human manufacturer's recommendations. Remarkably, only a few have been confirmed by scientific investigations. However, all have histories of being successful at one time or another. **Table 4** provides literature sources for the use of such antidotes in veterinary medicine. It is our hope that judicious use of these antidotes will be of benefit in saving animal life, relieving animal suffering and conserving animal resources.

TABLE 1. VETERINARY ANTIDOTES, SOURCES, INDICATIONS AND DOSAGES

Antidote	Formulation	Source/References	Indication	Dosage
Acepromazine maleate Acetazine Acetopromazine Acetyl-promazine	<i>PromAce®</i> <i>Aceproject®</i> 10 mg/ml, 50 ml vial 5-, 10-, 25 mg tablets	Ft. Dodge Vetus 1, 2, 3	Neuroleptic, a blocker of a-adrenergic, post-synaptic dopamine receptors. Used to aid in the control of seizures associated with amphetamine, methamphetamine, 4-Methylimidazole, or metaldehyde poisoning, usually preceding use of barbiturate or other anticonvulsant. Contraindicated in organophosphate or strychnine poisoning.	0.03-0.05 mg/kg IV, IM; Dogs, Cats 0.1-0.2 mg/kg IV, IM; Swine 0.02-0.1 mg/kg IV, IM; Horses, Cattle 0.03-0.05 IV; Sheep 0.03-0.1 mg/kg IV; Goats 0.05-0.1 mg/kg IM; Sheep, Goats
Acetic acid (Dilute 4%-6%) Vinegar (5%) Ethanoic acid	40-60 mg/ml, 980-, 3800 ml	Generic Heinz 4, 5, 6	Hydrogen ion donor and generator of acyl-coenzyme A leading to formation of acylation conjugates. Used in the treatment of ammonia toxicosis; urea, carbon monoxide, hydrogen sulfide, and opiate poisoning as well as poisoning with metallic salts; arsenic, selenium, tin, thallium, antimony.	0.5-1 L/ animal/ PO; Sheep, Goats 5-7 ml/kg of a dilute solution 1:4 or 1:5 with water or 20% Dextrose PO; Cattle, Sheep, Goats
Acetylcysteine N-Acetylcysteine Acetylcysteine Sodium Mercapturic Acid NAC	<i>Mucosil-10®</i> <i>Mucosil - 20®</i> <i>Mucomyst®</i> 100 mg/ml, 4-, 10-, 30 ml vial 200 mg/ml, 4-, 10-, 30 ml vial	Dey Labs Apothecon (Bristol-Myers Squib) 7, 8, 9	Mucolytic, which reduces disulfide linkage restoring glutathione levels by acting as a S substitute in acetaminophen poisoning.	150 mg/kg IV, PO; Dogs 140 mg/kg IV, PO; Cats followed by 70-75 mg/kg q4h
Activated Charcoal (10%)	<i>Toxiban®</i> <i>D-Tox-Besc®</i> <i>UAA®</i> 1lb, 5 kg Granules 6.25% suspension, 240 ml	Vet-A-Mix AgriPharm Vedco 10, 11, 12, 13	Carbon absorbent which absorbs toxic substances and irritants, non-specific organics, thereby inhibiting absorption. Blocks enterohepatic recycling. Not effective for minerals (elemental, acids, salts, alkalis), nor oils. USP standardization with strychnine sulfate.	1.0-3.0 g/kg PO; Cattle, Sheep, Goats 0.5-1.65 g/kg PO; Horses 2-8 g/kg PO; Dogs, Cats
Aminophylline Theophylline ethylenediamine	<i>Theophylline®</i> 25 mg/ml, 10-, 20 ml vials) <i>Aminophylline®</i> 105 mg/5 ml vial	Dey Labs Roxane 14,15, 16	Bronchodilator, which is an alkaloid mixture containing theophylline which in turn acts as a competitive inhibitor of phosphodiesterase thereby increasing cyclic AMP levels. Used in the treatment of benzodiazepine type poisonings: flurazepam, midazolam, forazepam,	4-15 mg/kg PO, IV; q8-12h Horse 4-10 mg/kg PO, IV; q8-12h Dogs

			diazepam. Numerous drug interactions.	
Ammonium Acetate (Dilute 7%)	<i>Ammonium Acetate</i> ® 10-, 100 g vial	Sigma-Aldrich 4, 5, 6, 17	An acetic acid ammonium salt solution used in the treatment of cyanide, opiate, phosgene, and formaldehyde poisoning.	Dilute 1:20 with water. 0.23-1.1 mg/kg PO; Cattle, Horses 1.0-1.5 mg/kg PO; Dogs
Ammonium Molybdate Ammonium para-molybdenate	<i>Ammonium Molybdate</i> ® 5-, 20-, 100 g vial	Sigma-Aldrich 18, 19, 20, 21	Molybdenum salt that interacts with copper and sulfur metabolism. Used in the treatment of copper poisoning	100-500 mg/day/animal PO; Sheep, Cattle
Ammonium tetrathiomolybdate	<i>Molyphen</i> ® 25 mcg/ml, 10 ml vial <i>Ammonium Tetrathiomolybdenate</i> ® 1-, 10-, 50 g vial	Astellas Sigma-Aldrich 19, 20, 21, 22	Molybdenum salt that interacts with copper and sulfur metabolism. Used in the treatment of copper poisoning	1.7-3.4 mcg/day/animal SQ, IV; Sheep, Cattle
Amyl Nitrite Isoamyl Nitrite Isopentyl Nitrite Pentyl Nitrite Poppers	<i>Amyl Nitrite Aspirol</i> ® 0.18 and 0.3 ml pearls	Glaxo-Smith-Kline 23, 24, 25	A coronary vasodilator and generator of methemoglobin; treatment of cyanide, hydrogen sulfide, acrylonitrile, chloroform, iodine, nitrates and strychnine poisonings.	30-60 minute inhalation; Cattle, Horse 1.5-5 minute inhalation; Dogs
Antidigoxin Fab Frag (Sheep) Digoxin specific antibody fragment	<i>Digibind</i> ® 38 mg vial, lyophilized powder	Glaxo-Smith-Kline 26, 27	Neutralizes and binds with molecules of digoxin and digitoxin. Used in the treatment of poisonings by drug overdose or plants: Foxglove (<i>Digitalis</i>), Oleander (<i>Nerium</i>), Desert Rose or Azalea (<i>Adenium</i>), Corkscrew Flower (<i>Strophanthus</i>), Milkweed (<i>Asclepias</i>), English or Spanish Bluebells (<i>Hyacinthoides</i>), Rubber Vines (<i>Cryptostegia</i>), Star of Bethlehem (<i>Ornithogalum</i>), Bufo Toads (<i>Bufo</i>), Monarch Butterfly (<i>Danaus</i>), Digitalis, Digitoxin, Digoxin.	6-12 mg/kg (2 vials/10 kg) administered slowly IV; Dogs, Cats, Cattle, Horses Monitor serum K+ and administer when K+ is greater than 6.0 mEq/L. Monitor renal function.
Antitoxin Botulinin A, B, E Botulinin Antibody (Horse)	<i>Lioserio</i> ® 7500 IU A 5500 IU B 8500 IU E lyophilized powder	CDC 28, 29	Neutralizes and binds with molecules of botulinin toxin; treatment of botulism poisoning (<i>Clostridium botulinum</i>).	1-2 vials mixed in a 1:10 dilution with 0.9% normal saline and administered slowly IV and repeated every 2-4 hours as indicated; Cattle, Horses, Sheep, Dogs
Antitoxin Tetanus	<i>Tetanus Antitoxin</i> ® 1500-, 10000-, 15000 Units/vial	Generic Ft. Dodge Colorado Serum Durvet Intervet 30, 31	Neutralizes the toxin of <i>Clostridium tetani</i> poisoning.	10,000-50,000 Units SQ, IM, IV; Cattle, Horses 3,000-15,000 Units SQ, IM, IV; Sheep, Goats, Swine 1,500-20,000 Units in 50-250 ml 0.9% normal saline by slow intravenous drip; Dogs,

				<p>Cats</p> <p>Alternative dosage is 100-200 Units/kg slowly IV, administered in 250 ml of 0.9% normal saline.</p>
<p>Antivenin <i>Crotalidae</i> Antivenom FAB (Horse) Crotalidae polyvalent antivenin</p>	<p><i>Antivenin</i>® Lyophilized powder</p>	<p>Ft. Dodge APL</p> <p>32, 33, 34</p>	<p>Neutralizes poisonous snake venom (<i>Crotalidae</i>). Used in the treatment of snake bite by Rattlesnake (<i>Crotalus</i>), Copperhead and Water Moccasin (<i>Agkistrodon</i>), Bushmaster (<i>Lachesis</i>)</p>	<p>1-5 vials reconstituted and diluted in 100-250 ml of 0.9% normal saline and administered slowly IV and repeated every 2 hours as indicated. Smaller the victim, the larger the dose; Dogs, Cats, Cattle, Sheep/Goats, Horses</p> <p>Monitor for acute and delayed hypersensitivity.</p>
<p>Antivenin <i>Micrucus</i> Elapid polyvalent antivenin Antivenom FAB (Horse)</p>	<p><i>Antivenin</i>® Lyophilized powder</p>	<p>Weyth-Ayerst Protherics</p> <p>34, 35, 36, 37</p>	<p>Neutralizes poisonous snake venom (<i>Micrucus</i>) Coral Snakes</p>	<p>1-5 vials reconstituted and diluted in 100-250 ml of 0.9% normal saline and administered slowly IV and repeated every 2 hours as indicated. Smaller the victim, the larger the dose; Dogs, Cats, Cattle, Sheep/Goats, Horses</p> <p>Monitor for acute and delayed hypersensitivity</p>
<p>Antivenin <i>Latrodectus</i> Antivenom latrodectus (Horse)</p>	<p><i>Antivenin</i>® Lyophilized powder</p>	<p>Merck INH</p> <p>38, 39</p>	<p>Neutralizes Black Widow Spider (<i>Latrodectus</i>) venom.</p>	<p>1-2 vials reconstituted and diluted in 50-100 ml of 0.9% normal saline and administered slowly IV over a 1 hour period; Dogs, Cats</p> <p>Monitor for acute and delayed hypersensitivity.</p>
<p>Antivenin <i>Loxosceles</i> Antivenom loxosceles (Rabbit)</p>	<p><i>Antivenin</i>® Lyophilized powder</p>	<p>INH Protherics</p> <p>40, 41</p>	<p>Neutralizes Brown Recluse Spider (<i>Loxosceles</i>) venom.</p>	<p>1-3 vials reconstituted and diluted in 50-100 ml of 0.9% normal saline and administered slowly IV over a 1 hour period; Dogs, Cats</p> <p>Monitor for acute and delayed hypersensitivity.</p>
<p>Antivenin <i>Centruroides</i> Antivenom centruroides</p>	<p><i>Antivenin</i>® Lyophilized powder</p>	<p>APL INH</p>	<p>Neutralizes Scorpion (<i>Centruroides</i>) venom for treatment of serious</p>	<p>1-2 vials reconstituted and diluted in 50-100 ml of 0.9% normal</p>

		42, 43, 44, 45	stings which might produce respiratory failure.	saline and administered slowly IV over a 1 hour period; Dogs, Cats
Ascorbate Vitamin C Cevitamic	<i>Sodium ascorbate</i> ® 50 mg-, 100 mg-, 250 mg-, 500 mg-tablets, capsules, solution (100 ml vial)	Generic Phoenix Butler Vedco 46, 47, 48	Antioxidant, reducing agent which forms stable metal salts and will reduce methemoglobin, acidify urine, reduce chromium nephrotoxicity and copper induced hepatopathy; an important factor in microsomal enzyme metabolism. Used in treatment of various drugs, plants and metal poisonings; copper, iron, selenium, tellurium, chromium, cobalt, lead, arsenic, nitrate-nitrite, chlorates, aniline, hydrazine, hydroquinones, benzocaine, phenacetin, potassium permanganate, quinines, toluidine, sulfonamides, acetaminophen, Red Maple (<i>Acer rubrum</i>), Pig Weed (<i>Amaranthus</i>), Johnson Grass (<i>Sorghum</i>), Various Weeds and Feed Grain plants that have been stressed with drought or herbicide and thereby accumulate nitrates.	7.5-15 mg/kg IV, IM, SQ, PO; Cattle, Horses 10-25 mg/kg IV, IM, SQ, PO; Dogs, Cats 100 mg/kg IV, IM, SQ, PO; Rabbits, Rodents 100-200 mg/kg IV, IM, SQ, PO; Guinea Pigs 5-10 mg/kg IV, IM, SQ, PO; Swine, Sheep 2.5-5 mg/kg IV, IM, SQ, PO; Goats
Atipamezole HCL MPV-1248	<i>Antisedan</i> ® 5 mg/ml in 10 ml vial	Pfizer 49	Inhibitor of alpha-2-adrenergic receptor, competitive reversal agent for alpha-2-adrenergic agonist. Used in the treatment of medetomidine, xylazine, amitraz, midodrine, and phenylephrine overdose and poisoning.	50 mcg/kg IM q3-4h PRN; Dogs
Atropine Atropine Sulfate Tropine tropate d/-Tropyl tropate d/-Hyoscyamine Atropia	<i>Atropine</i> ® 0.54 mg/ml (1/120 grain) 100 ml vial 15 mg/ml 100 ml vial	Generic IVX Phoenix Neogen Butler 50, 51, 52	Anticholinergic used in the treatment of cholinergic poisonings; carbamate and organophosphate pesticides, chemical terrorist agents, various drugs and plants as well as to treat poisoning associated bradycardia-hypotension: Aldicarb, Fumarate, Bromophos, Carbaryl, Chlofenvinphos, Chlorpyrifos, Diazinon, Dicrotophos, Dioxathion, Disulfaton, Fensulfothion, Fenthion, Malathion, Methidathion, Methiocarb, Methomyl, Parathion, Profenphos, Propoxur, Terbufos, Tetraethyl pyrophosphate, Sarin,	0.1-2.0 mg/kg administer ¼ dose IV with the remainder SQ or IM; Cattle, Horse, Dog, Cat, Swine, Sheep, Goats, Birds, Reptiles, Rabbits, Rodents

			Soman, Tabun, VX, Paraxon, Tacrine HCL, Baclofen, Bethanechol chloride, Bisprolol, Chloroform, Nicotine, False Morel Mushroom (<i>Gyromitra</i>), Mower's Mushroom (<i>Panaeolus</i>), Common Toadstool Mushroom (<i>Gymnopilus</i>), Azaleas (<i>Rhododendron</i>), Carbolic Acid, Phenol, Benzene, Physostigmine, Nitrobenzene, Cyanides, Opium, Morphine	
Calcium Disodium Edetate Calcium-EDTA Edetate disodium calcium Edetate calcium sodium Versenate	<i>Calcium Disodium Edetate</i> ® 6.6% in water solution <i>Calcium Disodium Versenate</i> ® 20% in 5 ml vials <i>Calcium Edetate-Heyl</i> ® <i>Chelant</i> ® <i>Chelintox</i> ® <i>Ledclair</i> ®	Aldrich Riker 53, 54, 55, 56	Chelator of metals, by displacement of calcium, forms divalent or trivalent metal complexes that are non-ionic and soluble, used in the treatment of acute metal poisoning; lead, cobalt, copper, manganese, zinc and hexachlorobenzene poisoning.	25-50 mg/kg IV slowly PRN; Cattle, Sheep, Goats, Swine 60-75 mg/kg IV slowly PRN; Horses 25 mg/kg SQ, IV slowly PRN; Dogs, Cats, Rodents Animals should be monitored for kidney function and zinc levels.
Calcium Salts Calcium chloride	<i>Calcium Chloride 10%</i> ® 500 ml solution <i>Clearcal 50</i> ® 300 g gel tube	Generic Vedco 57, 58, 59, 60, 61, 62, 63	Ionic calcium, administered systemically as a calcium electrolyte source for poisonings which result in hypocalcemia and cardiac dysrhythmias often associated with hyperkalemia: Lead, Fluoride, Carbon tetrachloride, Ethylene glycol, Oxalic acid, Chlorinated hydrocarbons, Hydrogen fluoride, Hydrofluoric acid, Calcium channel blockers (Nifedipine, Nimodipine, Verapamil HCL, Bepridil HCL, and Diltiazem, Phosphine, Hypermagnesemia, Black Widow Spider bite (<i>Latrodectus</i>), Oxalates (<i>Halogenten</i> , <i>Rumex</i> , <i>Galenia</i>), Pimpernel (<i>Anagallis</i>), Pearl Millet (<i>Pennisetum</i>), Goosefoot, Lamb's-quarters, and Wormseed (<i>Chenopodium</i>)	25-125 mg/kg IV slowly PRN, PO; Cattle, Horses 20-30 mg/kg IV slowly PRN, PO; Sheep, Goats 20-60 mg/kg IV slowly PRN, Swine 5-50 mg/kg IV slowly PRN; Dogs, Cats All doses should be calculated based on deficit of elemental calcium: 1 g Calcium chloride =272 mg (13.6 mEq) Elemental calcium.
Calcium gluconate Calcium borogluconate	<i>Calcium gluconate 23%</i> ® 500 ml solution	Generic IVX Agri Pharm AgriLabs Aspen Bimeda Durvet	Calcium chloride is the preferred treatment source in cases of fluoride or calcium channel-blocker drug toxicoses because it ionizes more readily than other calcium sources. In such cases it is imperative that the clinical toxicologist closely	150-250 mg/lg IV slowly PRN, PO; Cattle, Horses, Sheep,

	<p><i>Cal-Nate 1069</i>[®] 500 ml solution</p> <p><i>Supreme Gel</i>[®] 300 g Gel Tube</p> <p><i>Kalcinate 9.3%</i>[®] 500 mg, 650 mg, 975 mg, 1 g Tablets</p>	<p>Phoenix Vedco Vet Tek Vetus Butler</p> <p>Biomeda</p>	<p>monitor serum calcium levels since excessive levels of calcium may be required to alleviate the hypocalcemic effects.</p> <p>Indications are the same as stated above.</p>	<p>Goats, Swine 25-150 mg/kg IV slowly PRN, PO; Dogs, Cats 50-100 mg/kg IV slowly PRN, PO; Birds</p> <p>1 g Calcium gluconate = 90 mg (4.5 mEq) elemental calcium.</p>
<p>Calcium Lactate</p> <p>Calcium-phosphate</p>	<p><i>Calcium lactate 13%</i>[®] 325 mg, 650 mg Tablet</p> <p><i>Cal-Lac</i>[®] 500 mg Capsule</p> <p><i>Calphosan</i>[®] 0.5% Calcium glycerophosphate 0.5% Calcium lactate Solution</p> <p><i>Cal-Pho-Sol</i>[®] 0.5% Calcium glycerophosphate 0.5% Calcium lactate Solution</p>	<p>Generic</p> <p>Bio Tech</p> <p>Glenwood</p> <p>Neogen</p>	<p>Indications are the same as those stated for the other Calcium salts with the exception of administration. This is an oral salt preparations.</p> <p>1 g Calcium lactate = 130 mg (6.5 mEq) elemental calcium.</p> <p>1 g Calcium glycerophosphate = 190 mg (9.5 mEq) elemental calcium.</p>	<p>40-250 mg/kg PO PRN; Cattle, Horses, Sheep, Goats 40-500 mg/kg PO PRN; Swine 30-150 mg/kg PO PRN; Dogs, Cats</p> <p>30-100 mg/kg IM, SQ, IV, PRN; Dogs</p>
<p>Cholestyramine Resin Polystyrene trimethylbenzylammonium</p>	<p><i>Lismo</i>[®] <i>Quantalan</i>[®] <i>Questran</i>[®] 4 g small resin granules, dispensed in 9 g packets.</p>	<p>Martindale</p> <p>Bristol-Myers Squibb</p> <p>64, 65, 66</p>	<p>Ion-binding resin, non-specific, which aids in the removal of various potentially toxic substances; Dicumoral-warfarin type anticoagulants, Digitoxin, Hexachlorobenzene, Lindane and other Organochlorine compounds, Tetracyclines, Penicillins, Phenobarbital, Thyroid hormones, Iron salts, Fat soluble vitamins (Vitamins A,D,E,K), Ionophores.</p>	<p>200-300 mg/kg PO; Dogs, Swine</p>
<p>Chlorpromazine Promazil Chlorderazin Chlorpromados Promacil Sanprom</p>	<p><i>Chlorpromazine</i>[®] <i>Thorazine</i>[®] 10-, 25-, 50-, 100-, 200 mg tablets 30-, 75-, 150 mg capsules 25 mg/ml, 1-, 2-, 10 ml vial</p> <p><i>Chlorazine</i>[®] <i>Promaz</i>[®]</p>	<p>Generic Glaxo Smith Kline</p> <p>67, 68, 69, 70</p>	<p>Neuroleptic, strong α-adrenergic receptor blocker of the postsynaptic mesolimbic dopaminergic receptors, used in the treatment of poisoning by monamine oxidase inhibitors, methamphetamines, and metaldehyde.</p>	<p>0.2-1.1 mg/kg IV; Cattle, Horses 0.55-4.5 mg/kg IV; Dogs, Cats 1.1-2.2 mg/kg IM; Cattle 1.1-4.0 mg/kg IM; Horses, Swine 1.1-6.6 mg/kg IM; Cats 2.2-6.6 mg/kg IM; Sheep, Dogs</p>

				Priapism may be an adverse effect.
Cyproheptadine HCL Triplennamine HCL (similar action)	<i>Periactin</i> ® 4 mg tablet 2mg/5 ml, 490 ml vial <i>Re-Covr</i> ® 20 mg/ml solution <i>PBZ</i> ® 25-, 50 mg tablets <i>PBZ-SR</i> ® 100 mg tablet <i>Pelamine</i> ®	MDS Ft. Dodge Phoenix Ciba-Geigy Major 71, 72	Potent piperidine antihistamine, acts by competing with histamine for H1 receptor sites, has mild anticholinergic and CNS depressant effect as well as moderate anti-serotonin activity. Used in the treatment of serotonergic drug overdose as well as plant poisonings: Amitriptyline, Amphetamine, Cisapride, Clomipramine, Dexfenfuramine, Fenfluramine, Fluoxetine, Hydroxytryptophan, Imipramine, Isocarboxazid, Lithium, Meperidine, Moclobemide, Paroxetine, Selegiline, Sertraline, Tranylcypromine, Tryptophan, Venlafaxine, Bladder Flower (<i>Araujia</i>), Bull Nettle (<i>Cnidoscopus</i>), St. John's Wort (<i>Hypericum</i>), Stonecrop (<i>Sedum</i>), Skunk Cabbage (<i>Symplocarpus</i>), Nettles (<i>Urticaceae</i>).	1.1 mg/kg PO q8-12h PRN; Dogs, Cats 1.0 mg/kg IM q6-12h PRN; Cattle, Horses, Sheep, Goats, Swine, Dogs, Cats 1.1 mg/kg PO q6-12h PRN; Dogs, Cats
Dantrolene Sodium Dantrium	<i>Dantrium</i> ® 20 mg reconstituted powder/vial	Proctor and Gamble 73, 74, 75	Acts directly on skeletal muscle, interfering with calcium metabolism and catabolic processes associated with generation of hyperthermia. Used in poisoning which might result in severe hyperthermia or malignant hyperthermia; Monamine oxidase inhibitors, halogenated hydrocarbons, atropine, dinitrophenol, metaldehyde, cocaine, amphetamines, spent Hops (<i>Lumulus</i>), Ergot alkaloids (<i>Claviceps</i>), Tall Fescue (<i>Festuca</i>), Jimson Weed (<i>Datura</i>), Ryegrass (<i>Lolium</i>)	2-3 mg/kg IV PRN; Dogs 0.5-2 mg/kg IV PRN; Cats 3.5-4.0 mg/kg IV slowly PRN; Swine 10-25 mg/kg IV slowly PRN; Horses Monitor hepatic function.
Dapsone Diaminodiphenylsulfone Diphenylsulfone	<i>Avlosulson</i> ® <i>Dapsone</i> ® 25-, 100 mg tablets	Wyeth-Ayerst Jacobus 76, 77, 78	Diphenylsulfone is an antimicrobial and leprostatic agent. Used in the treatment of bites from Brown Recluse Spider (<i>Loxosceles</i>), Wolf Spider (<i>Lycosidae</i>), and Funnel Web Spiders in general (<i>Dipluidae</i>).	2-3 mg/kg PO: Dogs Dose is reduced to half for 4 days following initial dose. Monitor hematologic homeostasis.
Deferoxamine Mesylate Desferrioxamine B DFM Myselate BA 33112	<i>Desferal</i> ® 500 mg, 2 g vials <i>Desferin</i> ® <i>DFO Mesylate</i> ®	Novartis Ciba	A naturally occurring chelator of tri-valent ions used in the treatment and decontamination of iron	5-15 mg/kg IV, SQ, IM PRN; Dogs, Cats 1 g Deferoxamine

BA 29837 DFO	250 mg/ml solution	79, 80, 81, 82	and aluminum poisoning as well as doxorubicin, paraquat, aminoglycoside and acetaminophen poisonings.	binds 85 mg ferric iron. Monitor renal function.
Dextrose Glucose DW	<i>Dextrose®</i> 2.5%-50% Solution	Generic 83	Glucose is used in the treatment of hypoglycemia which may result directly or indirectly from poisoning; Ethanol, Clonidine, Insulin, Salicylates, Sulfonylureas, Organophosphates, Phenformin, Metformin, Biguanides, Ackee (<i>Blighia</i>), Sneezeweed (<i>Helenium</i>), Desert Marigold (<i>Baileya</i>), Paperflowers (<i>Psilostrophe</i>), Sartwellia (<i>Sartwellia</i>), Periwinkle (<i>Catharanthus</i>), Balsam Apple and Pear (<i>Momordica</i>), Castor Bean (<i>Ricinus</i>), Bitterweed and Rubberweed (<i>Asteraceae</i>).	100-550 mg/kg IV, IP PRN; Cattle, Horses (5%-50% aqueous solution) 250-500 mg/kg IV, IP PRN; Sheep, Swine (5%-25% aqueous solution) 11-300 mg/kg IV, IP PRN; Goats (5%-25% aqueous solution) 500-1000 mg/kg IV, IP PRN; Dogs, Cats (2.2%-5% aqueous solution)
Diazepam Methyl Diazepam Diacepin Valium Apo-Diazepam E-Pam Diazemuls Vivol Meval Valrelease Novodipam	<i>Diazepam®</i> 5 mg/ml, 2-, 5 ml vials 1 mg/ml, 500 ml vial 5 mg/ml, 30 ml vial <i>Valium®</i> 5mg/ml, 2-, 5 ml vials	Generic Abbott Roche Roxane 70, 84, 85	Benzodiazepine, acts as anticonvulsant and anxiolytic by increasing GABA activity. Used in the treatment of seizures that may be caused by direct toxic effects or secondary to hypoxia or other metabolic or electrolyte disturbance; Isoniazid, Lithium, Salicylates, Theophylline, Caffeine, Theobromine, Amphetamines, Nicotine, Atropine, Aminopyridine, Lead, Metaldehyde, Cyanides, Fluoroacetate, Mycotoxins, Organochlorines, Organophosphates, Carbamates, Tricyclic Antidepressants, Strychnine, Cocaine, Opioids, Mefenamic Acid, Methylxanthines, Phenylethylamines, Ergot Alkaloids (<i>Claviceps</i>), Hemlock (<i>Cicuta</i>), Moonseed (<i>Menispermum</i>), Fly Mushroom (<i>Amanitia</i>), Buckeye (<i>Aesculus</i>), False Morel (<i>Gyromitra</i>).	0.5-2.0 mg/kg IV, IM PRN; Cattle, Sheep, Goats 0.5-50.0 mg/kg IV, IM PRN; Horses 0.5-10.0 mg/kg IV, IM PRN; Swine 0.5-5.0 mg/kg IV, IM PRN; Dogs 0.5-2.5 mg/kg IV, IM PRN; Cats 0.5-10.0 mg/kg IV, IM PRN; Rabbits 3-5 mg/kg IM PRN; Hamsters, Gerbils, Mice, Rats 0.5-3.0 mg/kg IM PRN; Guinea Pigs 0.5-2.0 mg/kg IV, IM PRN; Birds Monitor liver profile. There are numerous drug interactions.
Dimercaprol BAL British Anti-Lewisite 2,3 Dimercaptupropanol Dithioglycerol Dimercaprolum Sulfactin Hamburg	<i>BAL in Oil®</i> 100 mg/ml, 3 ml vial	Hynson, Westcott & Dumming Taylor 53, 86, 87, 88	Chelator of metal ions which form soluble sulfhydryl group-ion complexes that are eliminated in the urine; used for the treatment of gold, cobalt, antimony,	1-2 mg/kg IM qid PRN; Cattle, Horses, Sheep, Goats, Swine, Dogs, Cats Contraindicated in Cadmium poisoning,

			arsenic (except arsine), copper, mercury (except non-alkyl mercury), Bismuth, Chromium, Nickel, Tungsten, Zinc, and methyl bromide poisoning.	and much less effective in lead, selenium and thallium poisoning.
Diphenhydramine HCL Benzhydramine Banophen Allerdryl Benadryl Dihydrax Diphenacen Somninx Valdrene	<i>Benadryl®</i> <i>Diphenhydramine®</i> 12.5-, 25-, 50 mg tablets/capsules 50 mg/ml, 1-, 10 ml vials	Pfizer Generic 89, 90	Antihistamine, sedative, anticholinergic, antiemetic, reverses toxoid and toxin induced extrapyramidal effects. Used in the treatment of poisonings and drug overdose; Paclitaxel, Monosodium Glutamate, Antivenin, Haloperidol, Phenothiazine Derivatives and Tranquilizers (Acepromazine).	0.5-1.0 mg/kg IV, IM PRN; Cattle 0.5-2.0 mg/kg IV, IM PRN; Horses 1.0-5.0 mg/kg PO PRN; Dogs, Cats 0.5-4.0 mg/kg IV, IM PRN; Dogs 0.5-1.0 mg/kg IV, IM PRN; Cats
Dopamine 3-Hydroxytyramine	<i>Intropin®</i> <i>Inovan®</i> <i>Dopastat®</i> <i>Dopamine®</i> 40-, 80-, 160 mg/ml; 5-, 10-, 20 ml vials	Dupont Pfizer Generic 91, 92	Inotropic agent, norepinephrine precursor. Used for hypotension reversal in the treatment of some drug, plant and mineral poisonings; Dantrolene, Ethchlorovynol, Torsemide, Copper, Yew (<i>Taxus</i>), Autumn Crocus (<i>Colchicum</i>), Amanita Mushroom (<i>Amanita</i>).	1-20 ug/kg/min IV PRN; Dogs, Cats, Cattle, Horses Contraindicated in tachyarrhythmia. Numerous drug interaction and incompatibility.
Diphenylthiocarbazon Dithizone Phenyldiazene-carbothioic	<i>Dithizone®</i> 10-, 50 g vial	Sigma-Aldrich 2, 93	Chemical reagent with sensitivity for heavy metals forms a non-absorbable complex (Cobalt, Copper, Lead, Mercury, Thallium) used in the treatment of Thallium poisoning.	70 mg/kg PO; Dogs NOT for use in cats. May cause glycosuria and must protect from eye injury.
Edrophonium Chloride Antirex Enlon Reversol Tensilon	<i>Enlon®</i> 10 mg/ml, 15 ml vial <i>Tensilon®</i> 10 mg/ml, 10 ml vial	Baxter ICN 94, 95, 96	Synthetic quaternary ammonium compound that is a short acting competitive inhibitor of acetylcholinesterase. Used in reversing the effects of non-depolarizing neuromuscular blocking agents; Curare, Tubocurarine, Atropine, Ivermectin, Avermectins, Gallamine, Atracurium, Metocurine, Pancuronium Bromide, Vecuronium, Botulism (<i>Cl. Botulinum</i>), and as a secondary agent in the treatment of Coral (<i>Micrurus</i>) and Cobra (<i>Naja</i>) snake bite and Tetrodotoxin poisoning from Porcupine Fish (<i>Diodon</i>), Deadly Nightshade (<i>Atropa</i>), Jimson Weed (<i>Datura</i>), Henbane (<i>Hyoscyamus</i>), Mandrake (<i>mandragora</i>),	0.1-0.2 mg/kg IV slowly PRN; Dogs 0.05-0.125 mg/kg IV slowly PRN; Cats 0.5-1.0 mg/kg IV slowly PRN; Horses

			Jasmine (<i>Cestrum</i>), Bittersweet (<i>Solanum</i>), Ground Cherry (Chinese Lantern) (<i>Physalis</i>).	
Egg Whites	<i>Chicken Eggs</i> Average 36 g 11% Albumin	Generic	Natural clear colloidal protein (albumin) mass with unique physical- chemical characteristics; denatures, coagulates, and is heat sensitive, has good demulcent properties. Useful in the treatment of Mercury, Copper, Tin, Silver, Hydrogen Peroxide, Phenol, Picric Acid, Formaldehyde, Ether, Alcohol, Household Cleaners and Detergents and most other Corrosive Chemical poisonings.	1-2 egg whites/5-10 kg PO; Dogs, Cats, Calves, Foals, Lambs, Kids, Pigs Usually administered with milk.
Epinephrine Adrenalin Adrenaline Methylaminoethanolcatechol	<i>Epinephrine HCL®</i> 1:1,000 1mg/ml, 30 ml vial 1:10,000 0.1 mg/ml, 10 ml vial	Generic IVX Vedco Neogen Vet Tek AgriPharm Durvet Bimeda Butler AgriLabs Phoenix 97, 98	Positive inotrope, cardiovascular stimulant and bronchodilator. Used in the treatment of insect bite-induced anaphylaxis, insect bite poisoning, as well as drug-induced anaphylaxis, drug poisoning; b-blocker poisoning, Chloroquine, Vaccines, Fire Ants (<i>Solenopsis</i>), Africanized Bees or Honey Bees (<i>Apis</i>), Yellow Jackets (<i>Vespula</i>), Paper Wasp (<i>Polistes</i>), White Faced Hornets (<i>Dolichovespula</i>)	0.01-0.02 mg/kg (0.45- 0.9 ml 1:1,000/kg) IM, SQ PRN; Cattle, Horses, Sheep, Goats, Swine, Dogs, Cats 0.01-0.02 mg/kg (1:10,000) IV PRN; Dogs, Cats, Cattle, Horses, Sheep, Goats, Swine Usual large animal dose, 1:1000, is 1 cc /100 lbs. BW
Ethyl Alcohol Alcohol Ethanol Ethanolum Alcool	<i>Whisky®</i> <i>Vodka®</i> 100 proof = 50% ethanol	Generic 99, 100, 101	Competitive substrate for alcohol dehydrogenase. Used in the treatment of Ethylene Glycol and Methanol poisoning.	5.5 ml/kg as 20% solution in 5% Dextrose q4-6h IV for 5 treatments; Dogs, Cats Monitor electrolytes acid/base balance.
Etidronate Disodium Didronel	<i>Didronel®</i> 200-, 400 mg tablets <i>Didronel®</i> 50 mg/ml, 6 ml vial	Proctor & Gamble MGI 102	Bisphosphonate reverse the formation of hydroxyapatite crystals. Used in treatment of Vitamin D toxicoses; Cholecalciferol Rodenticides, Vitamin D, and Calcipotriene Poisonings.	5 mg/kg PO sid; Dogs 10 mg/kg PO sid; Cats Must monitor renal function.
Flumazenil Revex Flumazenilum Flumazepil Ro-15-1788 Ro-15-1788/000	<i>Romazicon®</i> 0.1 mg/ml 5-, 10 ml vial	Hoffman-LaRoche 103, 104, 105	GABA receptor antagonist. Used in the treatment of benzodiazepine poisoning and overdose; Diazepam, Alprazolam, Lorazepam, and Ethyl Alcohol poisoning.	0.01-0.2 mg/kg slowly IV PRN or 0.05 mg/kg/hour in IV drip; Dogs, Cats Total dose not to exceed 2 mg. Monitor for efficacy and seizure induction.
Folic Acid Folacin Folate Pteroylglutamic acid Vitamin B ₉	<i>Folvite®</i> 1 mg tablet <i>Folvite Sodium®</i> 5 mg/ml 10 ml vial	Lederle 106, 107	Vitamin B ₉ . Used as an adjunct treatment in Ethylene Glycol or Methanol poisoning and Pyrimethamine poisoning or overdoses.	4-10 ug/kg slowly IV, PO: Dogs, Cats, Horses Not to exceed 1 mg/day; Dogs, Cats, Foals.

			Theoretically Folic acid will enhance the elimination of formic acid associated with metabolism.	Not to exceed 2 mg/day; Adult Horses Does not taste good.
Fomepizole 4-Methylpyrazole 4-MP	<i>Antizol-Vet®</i> 5%:50 mg/ml, 30 ml vial <i>Antizol®</i> 666 mg/ml (1 g in 1.5 ml vial)	Orphan Medical 108, 109, 110, 111, 112, 113	Competitive alcohol dehydrogenase inhibitor. Used in the treatment of Ethylene Glycol and Methanol poisoning.	20 mg/kg IV; Dogs, Cats with reducing doses, 15 mg/kg at 12 and 24 hours and 5 mg/kg at 36 hours 125 mg/kg PO; Dogs, Cats Loading dose, followed by 35 mg/kg q12h PRN for 4 treatments. Must be initiated within 3 hours of ingestion. Monitor renal function.
Gelatin	<i>Knox Gelatin®</i> 85% collagen protein, 28 g pack <i>Jello®</i> 9% collagen protein, 49 g pack	Knox Kraft	Heterogeneous mixture of water-soluble proteins derived from natural collagen; absorbent (absorbs 5-10 times its weight), demulcent, stabilizer, thickener, textureizer, and hemostatic sponge. Insoluble in organic solvents. Used in the treatment of household chemical poisoning; aqueous cleaners, bases and alkalis.	3-6 g/kg PO; Dogs, Cats, Foals, Lambs, Kids, Pigs. (2 tblsp/5-10 kg) Not for use with aldehydes.
Glucagon	<i>GlucaGen®</i> 1 and 10 Units Lyophilized powder (1 mg = 1 Unit)	Novo 114, 115, 116	Small polypeptide hormone with glycemic and inotropic action. Used in the treatment of hypoglycemic and hypotension induced drug or plant poisoning, calcium channel-blocker or beta receptor blocker and tricyclic antidepressant overdose or poisoning; Insulin, Sulfonylureas, Procainamide, Quinidine, Ackee Fruit (<i>Blighia</i>), Propranolol, Verapamil, Sotalol, Imipramine.	0.025-0.1 mg/kg IM, IV, SQ PRN; Cattle, Horses, Dogs (hypoglycemia) for poisoning administer IV 1-5 mg per hour as IV drip following initial treatment. 0.025-0.05 mg/kg IM, IV, SQ PRN; Neonates: Calves, Foals, Puppies and miniatures. Do not exceed 1 mg per bolus dose and repeat as needed every 20 minutes. Monitor potassium, glucose.
Hydroxycobalamin Hydroxocobemine OHB ₁₂ Alpha-Cobione	<i>Hydro-Cobex®</i> 1000 mcg/ml 10-, 30 ml vial <i>Hydroxocobalamin®</i> 100 mg, 250 mg, 1 g vial	Kripps Sigma-Aldrich 117, 118, 119	Physiologic analog of Vitamin B ₁₂ (B12a) where the CN group is replaced by OH. The molecule will subsequently bind cyanide and cyanide containing compounds to form cyanocobalamin and eliminate excess bound product through the urine. Used in the treatment of cyanide poisoning; Acrylonitrile, Cyanide, Nitroprusside, Latrile, Acacia (<i>Acacia</i>), Giant	10-15 mg/kg slowly IV, 15 g in 250 ml Dextrose 5%; Cattle, Horses, Sheep, Goats 5-10 mg/kg slowly IV, 6.25 g in 125 ml Dextrose 2.5%; Dogs, Cats, Calves, Foals, Lambs, Kids 50 mg Hydroxocobalamin binds 1 mg cyanide. Slowly = 10 minute period.

			Elephant's Ear (<i>Alocasia</i>), Elderberry (<i>Sambucus</i>), Goosefoot and Wormseed (<i>Chenopodium</i>), Suckleya (<i>Suckleya</i>), Sundew (<i>Drosera</i>), Eucalyptus (<i>Eucalyptus</i>), Cassava (<i>Manihot</i>), Stillingia (<i>Stillingia</i>), Wonder Bean (<i>Canavalia</i>), Bird's-foot Trefoil and Nevada Deer Vetch (<i>Lotus</i>), Clovers (<i>Trifolium</i>), Hydrangea (<i>Hydrangea</i>), Rushes (<i>Juncus</i>), Bamboo (<i>Nandina</i>), Stargrass/Bermudagrass (<i>Cynodon</i>), Mannagrass (<i>Glyceria</i>), Switchgrass, Kleingrass, and Millet (<i>Panicum</i>), Canarygrass (<i>Phalaris</i>), Indiangrass (<i>Sorghastrum</i>), Sorghum and Sudangrass (<i>Sorghum</i>), Buttercup (<i>Ranunculus</i>), Serviceberry, Shadebush, and Juneberry (<i>Amelanchier</i>), Mountain Mahogany (<i>Cercocarpus</i>), Cotoneaster (<i>Cotoneaster</i>), Christmas Berry (California Holly) (<i>Heteromeles</i>), Apricot, Cherry and Chokecherry, Almond, Peach, and Mock Orange (<i>Prunus</i>), Firethorn (<i>Pyracantha</i>), Jetbead (<i>Rhodotypos</i>), Spirea (Bridal Wreath) (<i>Spirea</i>), Yew Taxus), Arrowgrass (<i>Triglochin</i>)	Plasma cyanogenic glycoside (CN) levels greater than 250 mcg/L is lethal. Antidotal synergy with thiosulfate.
Leucovorin Calcium Calcium folinate Calcium leucovorin Citrovorum factor Citrovorin rescue Folinic acid Wellcovorin	<i>Leucovorin</i> ® 10-, 20 mg/ml, 30-, 50 ml vial 10-, 15-, 25 mg tablets	Elkins-Sinn Roxane 107, 120, 121	Reduced form of folic acid which prevents cell damage from folic acid antagonists. Used in the treatment of Methotrexate, trimetrexate, methanol, and pyrimethamine poisonings.	0.5-1.0 mg/kg IV q4-6h PRN; Dogs, Cats Usual total antidotal dose is equivalent to total toxic dose.
Magnesium Sulfate Epsom Salts	<i>Magnesium Sulfate</i> ® 4 lb. pack	Generic 122	Soluble sulfate used as a chemical antidote immobilizing lead in the gut by precipitating it by means of formation of insoluble lead sulfate, will also act as a mild cathartic and laxative by osmotic retention and mechanical stimulation of bowel activity. Used in the treatment of Metallic lead; lead battery, lead shot, lead foil, lead weights, lead paint and sinker poisonings especially of cattle, swine.	1-2 g/kg as a 5% solution PO; Cattle, Horses, Sheep, Goats, Swine, Dogs Cats, Poultry Can be top-dressed or feed mixed as well as supplied in the drinking water of poultry. Do not use in cases of clinical gastroenteritis.
Methylene Blue	<i>Methylene Blue</i> ® USP	Sigma-Aldrich	Oxidation-reduction agent	1-3 mg/kg of 1%

Methylthionium chloride	<p>25-, 100 g vial 0.05% (0.5 mg/ml), 100 ml vial <i>Methylthionium chloride</i>® 50 mg, 5 ml vial (10 mg/ml;1%)</p> <p><i>Uroline Blue</i>® 65 mg tablet <i>Desmoidpillen</i>®</p>	<p>Generic David Bull</p> <p>Starr</p> <p>123, 124</p>	<p>which reduces ferric iron in oxidized hemoglobin to the ferrous form at low concentrations 1% or less (at high concentrations it is itself a potent oxidizer). Used in the treatment of methemoglobinemia following exposure to oxidizing agents and nitrate accumulating plants; Analine derivatives, Phenacetin (Acetanilide), Benzocaine, Chloates, Hydrazine, Dapsone, Nitrates, Nitrites, Nitrobenzenes, Cresol, Duron, Gluthetimide, Cetacaine, Mercaptan, Napthalene, Nitric Oxide, Nitroglycerin, Propylene glycol dinitrate, Nitrofurantoin, Nitrotolulenes, Promiquine, Quinine, Pigweed (<i>Amaranthus</i>), Galenia groundcover (<i>Galenia</i>), Ragweeds (<i>Ambrosia</i>), Canada thistle (<i>Cirsium</i>), Cudweeds (<i>Gnaphalium</i>), Sunflower (<i>Helianthus</i>), Milk thistle (<i>Silybum</i>), Golden eyes (<i>Viguiera</i>), Sorghum (<i>Poaceae</i>), Sage (<i>Salvia</i>), Lambsquarter and Goosefoot (<i>Chenopodium</i>)</p>	<p>solution IV PRN; Dogs, Cats</p> <p>1-10 mg/kg of 1% solution IV PRN; Cattle, Horses</p> <p>1-5 mg/kg of 1% solution IV PRN; Sheep, Goats</p> <p>Monitor blood pressure and renal function.</p>
Methionine DL-Methionine	<p><i>Methioine</i>® <i>DL-Methionine</i>® 200-, 300-, 500 mg tablets/capsules <i>Methio-Form</i>® 200-, 500 mg tablets <i>Methio PWD</i>® 3.08 g per teaspoon</p>	<p>Generic</p> <p>Vet-A-Mix</p> <p>Daniels</p> <p>125, 126, 127</p>	<p>Urinary acidifier and supplier of hepatic sulfhydryl and methyl groups for metabolic-detoxification; Phase I and weak bases. Used as an adjunct therapy for Acetaminophen, Tansy Ragwort (<i>Senecio</i>), Strychnine, Phencyclidine, Quinine, Gelsamine, Gelsemicine, Butterfly Bush (<i>Buddleja</i>), Yellow Jessamine (<i>Gelsemium</i>), poisonings.</p>	<p>10-15 mg/kg PO sid PRN; Cattle 15-25 mg/kg PO sid PRN; Horses 1.25% solution in normal saline with 2.5% Dextrose IV; Cattle, Horses 10-50 mg/kg q8h PO; Dogs, Cats</p>
Methocarbamol Robaxin Marbaxin	<p><i>Robaxin-V</i>® 100 mg/ml solution 20-, 100 ml vial <i>Robaxin</i>® 100 mg/ml solution 10 ml vial <i>Methocarbamol</i>®</p>	<p>Ft Dodge</p> <p>Wyeth-Ayerst</p> <p>Generic</p> <p>128, 129</p>	<p>Skeletal muscle antispasmodic, depressing multisynaptic pathways in the spinal chord without interfering with muscle function. Used in the treatment of Permethrin, Metaldehyde, Strychnine, Tetanus (<i>Clostridium</i>), Snakeroot (<i>Eupatorium</i>), Tremorgenic Mycotoxin (<i>Acremonium</i>), Ergot Alkaloids (<i>Claviceps</i>), and Penicillium Molds</p>	<p>110 mg/kg slowly IV PRN; Cattle 4-25 mg/kg slowly IV PRN; Horses 50-250 mg/kg slowly IV PRN; Dogs, Cats</p> <p>Monitor for CNS depression</p>

			(<i>Penicillium</i>) poisoning.	
Milk	Cow's Milk® 3% Casein; 0.5% Albumin	Generic	Natural white, amphoteric mammary secretion containing casein protein as calcium caseinate (phosphoprotein) denatures and coagulates in acids, soluble in water, non-polar solvents and especially aqueous alkali solutions. Used in the treatment of poisonings: Bleaches, Soaps, Detergents, Ammonia Compounds, General Corrosives, Organic Solvents, Essential Oils, Volatile organics, Oxalates, Dumb Cane (<i>Dieffenbachia</i>), Philodendron (<i>Monstera and Philodendron</i>), Rhubarb (<i>Rheum</i>), Goosefoot Family (<i>Chenopodiaceae</i>), Sugar Beet (<i>Beta</i>), Jack-in-the-Pulpit (<i>Araceae</i>), Skunk Cabbage (<i>Symplocarpus</i>), Elephant-ear (<i>Colocasia</i>), Halogeton (<i>Halogeton</i>), Sorrel (<i>Oxalis</i> and <i>Rumex</i>), Purslane (<i>Portulaca</i> and <i>Trianthema</i>), Tumbleweed (<i>Salsola</i>), Greasewood (<i>Sarcobatus</i>), Soda Bush (<i>Threlkeldia</i>).	6-12 ml/kg PO; Dogs, Cats, Calves, Foals, Lambs, Kids, Pigs
Naloxone HCL Narcan Nalone	Narcan® 0.4 mg/ml, 1-, 2-, 10-ml vials 1.0 mg/ml, 2-, 10-ml vials	Dupont Pharm 130, 131, 132	Opiate antagonist, pure analog, competes with and displaces narcotic at receptor sites (<i>Mu</i> , <i>Kappa</i> , and <i>Sigma</i>). Used in the treatment of narcotic and narcotic-like poisonings: Butorphanol, Alfentanil, Belladonna, Buprenorphine, Pentazocine, Captopril, Nalbuphine, Clonidine, Codine, Heroin, Dextromethorphan, Atropine, Diphenoxylate, Fentanyl Citrate, GHBA, Guanfacine, Hydrocodone, Homatropine, Hydromorphone, Ketobemidone, Levomethadyl, Acetate, Levophanol Tartrate, Lisinopril, Loperamide, Meperidine, Methadone, Morphine, Nalbuphine, Nitrous Oxide, Opium Alkaloids, Opium Tincture, Oxycodone,	0.01-0.05 mg/kg slowly IV PRN; Dogs, Cats 0.01-0.08 mg/kg slowly IV PRN; Horses Drug is of short duration, 30-60 minutes, must therefore continuously monitor for recurrent adverse effects.

			Oxymorphone, Paregoric, Propoxyphene, Sulfentanil, Tramadol, Valproic Acid, Zipeprol, Jimsonweed (<i>Datura</i>), Belladonna (<i>Atropus</i>), Jessamine (<i>Cestrum</i>), Henbane (<i>Hyoscyamus</i>), Poppy (<i>Papaver</i>).	
Neostigmine Neostigmin Prostigmin Proserine Proserinum Synstigmin Neostigmine bromide Neostigmine methylsulfate Neostigmine metilsulfate	<i>Prostigmin</i> ® 0.25, 0.5, 1.0 mg/ml, 1 ml vial 0.25, 0.5 mg/ml, 10 ml vial <i>Stiglyn</i> ® 2.0 mg/ml, 1 ml vial <i>Neostigmine</i> ® 1.0 mg/ml, 1-, 10-ml vial	ICN Malinckrodt Baxter Generic 133, 134	Synthetic quaterenary ammonium compound which acts as an incomplete competitive inhibitor of acetylcholinesterase. Used in the treatment of non-depolarizing neuromuscular blocking agents. Used in the treatment of curare, atropine, ivermectin, avermectins, , Tubocurarine, Gallamine, Atracurium, Metocurine, Pancuronium Bromide, Vecuronium, Botulism (<i>Cl. Botulinum</i>), and as a secondary agent in the treatment of Coral (<i>Micrurus</i>) and Cobra (<i>Naja</i>) snake bite and Tetrodotoxin poisoning from Porcupine Fish (<i>Diodon</i>), Deadly Nightshade <i>Atropa</i>), Jimson Weed (<i>Datura</i>), Henbane (<i>Hyoscyamus</i>), Mandrake (<i>Mandragora</i>), Jasmine (<i>Cestrum</i>), Bittersweet (<i>Solanum</i>), Ground Cherry (Chinese Lantern) (<i>Physalis</i>)	0.001-0.05 mg/kg SQ, IM; Dogs 0.01-0.04 mg/kg IM; Cats 0.02-0.4 mg/kg SQ, IV PRN; Cattle, Horses 0.03-0.06 mg/kg IM; Swine 0.01-0.03 mg/kg SQ; Sheep, Goats Corticosteroids may decrease effects. Acts within 10-30 minutes. Elimination half-life 50-90 minutes.
Norepinepherine Noradrenalin Levarterenol Adrenon Levophed	<i>Levophed</i> ® 1 mg/ml, 4 ml vial	Sanofi-Sybelabo 135, 136, 137	Direct acting sympathomimetic amine identical to the endogenously produced catecholamine norepinepherine. Alpha-Adrenergic agonist useful in reversing life-threatening hypotension by increasing systolic and diastolic blood pressure through it vasoconstrictive action. Used to restore blood pressure in toxic insults which create an acute hypotensive state by blocking alpha-adrenergic receptors: Dibenyline, Dibenamine, Phenothiazine derived tranquilizers (<i>Acepromazine</i> ®, <i>etc.</i>), Copper, Ergot alkaloids (<i>Ergotamine</i> ,	0.01-0.05 ug/kg/min administered in 500 ml 5% Dextrose solution, slowly IV PRN; Cattle, Horses 0.05-0.1 ug/kg/min administered in 500 ml 2.5% Dextrose solution, slowly IV, PRN; Dogs, Cats Not to exceed 2 ug/min. Extravasation causes severe necrosis; for occurrence administer multiple local SQ injections of phentolamine, 5-10 mg in 10-15 ml of normal saline, 0.9%

			<i>Ethchlorvynol</i>), Amanita (<i>Amanita</i>), Yew (<i>Taxus</i>), Quinine sulfate, Parazosin HCL, Lilly-of-the-valley (<i>Convallaria</i>), Periwinkle (<i>Vinca</i>), Tricyclic antidepressants, Phenoxybenzamine, Phentolamine, Terazosin	
Oxygen Hyperbaric Oxygen	<i>Oxygen</i> ® Gas under pressure	Generic Medical Gas Air Products 138, 139, 140	Diatomic medicinal gas, O ₂ , to relieve hypoxia. Displaces CO and increases elimination rate of toxicants under partial pressure. Used in the treatment of poisoning: Acrylonitrile, Carbon Monoxide, Carbon Tetrachloride, Cyanide, Hydrocarbon Products, Hydrogen Sulfide, Methylene Chloride, Chloroform, Rosaceae sub-family of plants including Stone-Fruits, Chokecherry, Elderberry, Laurel, Hawthorn, Mountain Ash, etc., Mushrooms (<i>Lepiota</i> , <i>Amanita</i> , and <i>Galerina</i>), Arachnid Bite-Systemic Manifestation (<i>Loxosceles</i> , <i>Agelenopsis</i> , <i>Phiddipus</i> , <i>Lycosa</i>).	50-250 ml/kg/min PRN; Cattle, Horses 50-200 ml/kg/min PRN; Sheep, Goats 15-150 ml/kg/min PRN; Dogs, Cats, Pigs
Pamridonate Pamridonate disodium AHP-Disphosphonate	<i>Aredia</i> ® 30-, 90 mg vial	Novartis 141, 142, 143	Synthetic bisphosphonate, a pyrophosphate analog, which inhibits bone resorption. Used in the treatment of hypercalcemia induced poisonings: Vitamin D, Cholecalciferol Rodenticides, Calcipotriene, Jessamine (<i>Cestrum</i>), Leadwort (<i>Plumbago</i>), Sacahuista-Bunchgrass (<i>Nolina</i>)	1-2 mg/kg slowly IV in 250-500 ml 0.9% sterile saline; Dogs Contraindicated in bisphosphonate drug hypersensitivity.
Penicillamine D-Penicillamine Cuprenil Cupprimine Depamine D-3-Mercaptovaline Mercaptyl	<i>Depen</i> ® 250 mg tablet <i>Cuprimine</i> ® 125-, 250 mg capsule	Wallace Merck 144, 145, 146	Stable, soluble chelator of heavy metals which promotes urinary excretion. A thiol-compound, produced by the hydrolysis of penicillin, but lacking antimicrobial activity. Forms a soluble disulfide complex with cystine dissolving and preventing formation of cystic stones. Used in the treatment of metal poisoning: Copper, Zinc, Iron, Lead, Mercury, Bismuth, Gold, Arsenic and possibly other heavy metals.	50-60 mg/kg PO daily for 6 days: Sheep, Goats 30-125 mg/kg PO daily, in divided dose, PRN: Dogs, Cats, Pigs Contraindicated in penicillin drug hypersensitivity and related blood dyscrasias.
Pentobarbital Sodium Pentobarbital Pentobarbital Sodium	<i>Sodium Pentobarbital</i> ® 65 mg/ml, 100 ml vial	Butler	Barbiturate, mid-acting anesthetic which raises seizure threshold and	20-30 mg/kg IV to effect PRN; Cattle 10-30 mg/kg IV to

<p>Pentobarbitone Mebubarbital</p>	<p><i>Pentobarbital Sodium</i>® 50 mg/ml, 2-, 20-, and 50 ml vials</p>	<p>Wyeth-Ayerst 147</p>	<p>induces liver P450 microsomal enzymes. Used in the treatment of seizures induced by poisoning and drug overdose: Caffeine, Organochlorine Pesticides, Cocaine, Monamine Oxidase Inhibitors, 4- aminopyridine, Metaldehyde, Isoniazid, Strychnine, Tetanus Toxin, Hemlock (<i>Cicuta</i> and <i>Aethusa</i>), Horse Chestnut and Buckeye (<i>Aesculus</i>), Camphor (<i>Cinnamomum</i>).</p>	<p>effect PRN; Sheep, Goats, Swine 5-20 mg/kg IV to effect PRN; Horses 25-30 mg/kg IV to effect PRN; Dogs 15-20 mg/kg IV to effect PRN; Cats</p>
<p>Pentylene-tetrazol Pentetrazol Cardizol Metrazol Cenazol Corazole Phrenazol</p>	<p><i>Pentylene-tetrazole</i>® 25 g, 50 g, 100 g powder</p>	<p>Sigma-Aldrich 147, 148, 149</p>	<p>Synthetic, barbiturate and narcotic antagonist. Used in the treatment of narcosis associated with poisoning and drug overdose: Phenobarbital, Pentobarbital, Secobarbital, Hexobarbital, Methhexital, Thiopental, Thiamylal, Thiobarbitone.</p>	<p>1-20 mg/kg IV, SQ, IM PRN; Cattle, Horses, Sheep, Swine 5-30 mg/kg IV, SQ, IM PRN; Dogs 3-9 mg/kg PO tid or PRN; Dogs 6-12.5 mg/kg IV, SQ, IM PRN; Cats</p>
<p>Phenobarbital Sodium Phenobarbital Phenobarbitone Barbiphenyl Luminal Phenobal</p>	<p><i>Phenobarbital Sodium</i>® 30-, 60-, 65-, 130 mg/ml, 1 ml vials <i>Luminal Sodium</i>®</p>	<p>Wyeth-Ayerst Sanofi-Winthrop 147</p>	<p>Barbiturate, long-acting, sedative and hypnotic effect primarily due to interference with neurotransmission in the cerebral cortex by inhibition of the reticular activating system. It limits the spread of seizure activity by increasing the threshold for motor cortex stimuli. It also is a marked inducer of microsomal enzymes. Used to control seizures associated with drug overdose and poisoning, as well as stimulating detoxification of pesticides: Organochlorines and Chlorinated hydrocarbons, Cocaine, Monamine oxidase inhibitors (MAO), 4- aminopyridine, Metaldehyde, Isoniazid.</p>	<p>5 g PO 3-4 weeks PRN; Cattle 8-15 mg/kg IV PRN; Cattle, Horses 2.5-15 mg/kg IV PRN; Swine 3-30 mg/kg IV PRN; Dogs 3-6 mg/kg IV PRN; Cats</p>
<p>Phentolamine Mesylate Methanesulfonate Regitine Rogitine</p>	<p><i>Regitin</i>® 5 mg, 1 ml vial <i>Phentolamine</i>® 5 mg, 1 ml vial</p>	<p>Novartis Bedford 150, 151</p>	<p>Synthetic, alpha- adrenergic blocking agent. Structurally related to tolazine, but more potent. Competitively blocks alpha-adrenergic receptors, in a transient way, by action on vascular smooth muscle. Produces a positive inotropic and chronotropic cardiac effect, increasing</p>	<p>0.05-1.0 mg/kg diluted in 10-15 ml of physiologic saline IV, IM PRN; Dogs</p>

			cardiac output, through action on beta-adrenergic receptors. Used to control hypertensive episodes related to poisoning and drug overdose. Used in the treatment of poisoning by direct acting alpha-adrenergic agents like Epinephrine, Phenylephrine, and Ergotamine, as well as indirect acting agents like Cocaine, Amphetamines, Tricyclic antidepressants, Monamine oxidase inhibitors and plants Acacia and Guajillo (<i>Acacia</i>), and Sassafras (<i>Sassafras</i>).	
Physostigmine Salicylate Physostigmine Sulfate	<i>Antirium®</i> <i>Isopto Eserine®</i> <i>Eserine Sulfate®</i> 1 mg/ml, 2 ml vial <i>Physostigmine®</i>	O'Neal, Jones & Feldman Generic 152, 153, 154	Natural alkaloid, tertiary amine, which acts as a reversible anticholinesterase there by increasing concentration of acetylcholine at cholinergic transmission sites. Used in the treatment of anticholinergic poisonings and drug overdose: Atropine, Baclofen, Cyclobenzaprine, Hyoscyamine, Ipratropium, Mecamylamine, Prometazine, Scopolamine, Thioridazine, Henbane (<i>Hyoscyamus</i>), Mandrake (<i>Mandragora</i>), Tomato (<i>Lycopersicon</i>), Belladonna (<i>Atropa</i>), Jimsonweed (<i>Datura</i>), Nightshade (<i>Solanum</i>), Boxthorn (<i>Lycium</i>), various Mushrooms; Amanita (<i>Amanita</i>), Boletus (<i>Boletus</i>), Clytocybe (<i>Clytocybe</i>), Inocybe (<i>Inocybe</i>), as well as reversing the effects of imipramine and other tricyclic antidepressants.	0.06-0.4 mg/kg IM, SQ PRN; Cattle 0.06-0.12 mg/kg IM, SQ PRN; Sheep, Goats, Cats 0.06-0.25 mg/kg IM, SQ PRN; Horses 0.1-0.4 mg/kg IM, SQ PRN; Swine 0.06-0.3 mg/kg IM, SQ, IV PRN; Dogs Use with caution, if administer IV, must administer slowly, can produce cholinergic crisis and profound weakness, respiratory paralysis, pulmonary edema
Phytonadione Phylloquinone Phytomenadione Vitamin K1	<i>Vitamin K1®</i> 10 mg/ml, 30 and 100 ml vials <i>Mephyton®</i> 5 mg tablets <i>Aqua-Mephyton®</i> 2 mg/ml and 10 mg/ml 0.5-, 2.5-, and 5 ml vials	Generic Phoenix Butler Neogen Vedco Merck Merck IMS	Synthetic naphthoquinone, which is identical to natural vitamin K, which promotes liver biosynthesis and regeneration of clotting factors II, VII, IX, and X. Will not reverse the anticoagulant effects of heparin. Used in the treatment of hypoprothrombinemia caused by drug overdose,	0.5-2.5 mg/kg SQ, IM daily PRN; Cattle, Horses, Sheep, Goats, Swine, Birds 2-5 mg/kg PO, SQ, IM daily in divided dose PRN; Dogs, Cats, Pocket Pets Anaphylactic reactions have been reported

	<i>Phytonadione</i> ® 2 mg/ml, 0.5 ml vials	155, 156, 157, 158	chemical, rodenticide and plant poisonings: Coumarin, Indandione, Quinidine, Quinine, Salicylates, Sulfonamides, Brodifacoum, Bromadiolone, Chlorphacinone, Hydroxycoumarin, Indanedione, Phytonadione, Pindone, Pivaldione, Dicumarol, Warfarin, Difethialone, Sweet Clover (<i>Melilotus</i>), Vernalgrass (<i>Anthoxanthum</i>).	with IV administration.
Picrotoxin <i>Anamirta</i> alkaloid (toxin)	<i>Picrotoxin</i> ® 1 gram vial	Sigma-Aldrich 159, 160, 161	Natural alkaloid which blocks GABA receptor-linked chloride channels promoting respiration. Used in the treatment of poisonings causing severe respiratory depression: Petobarbital, Phenobarbital, Secobarbital, Hexobarbital, Methexital, Thiopental, Thiomyal, Thialbarbitone.	0.05-0.13 mg/kg IV, IM PRN; Cattle, Horses 0.1-0.6 mg/kg IV, IM PRN; Dogs
Pilocarpine <i>Pilocarpus</i> alkaloid (toxin)	<i>Pilocarpine</i> ® 1 gram vial	Sigma-Aldrich 161, 162	Natural alkaloid, tertiary amine, which acts directly on cholinergic receptor sites, parasympathomimetic, mimicking acetylcholine. Induces miosis and decreases intraocular pressure. Used in the treatment of anticholinergic poisonings and drug overdose: Atropine, Hyoscyamine, Scopolamin, Henbane (<i>Hyoscyamus</i>), Mandrake (<i>Mandragora</i>), Tomato (<i>Lycopersicon</i>), Belladonna (<i>Atropa</i>), Jimsonweed (<i>Datura</i>), Nightshade (<i>Solanum</i>), Boxthorn (<i>Lycium</i>), various Mushrooms; Amanita (<i>Amanita</i>), Boletus (<i>Boletus</i>), Clytocybe (<i>Clytocybe</i>), Inocybe (<i>Inocybe</i>).	0.2-1 mg/kg SQ, IM PRN; Cattle 0.1-0.4 mg/kg SQ, IM PRN; Horses 0.1-0.6 mg/kg SQ, IM PRN; Sheep, Goats, Swine 0.5-2 mg/kg SQ, IM PRN; Dogs 0.25-0.75 mg/kg SQ, IM PRN; Cats
Pralidoxime 2-PAM Protopam Chloride 2-Pyridine Aldoxime Methylchloride	<i>Protopam Chloride</i> ® 1 gram, 20 ml vial (50 mg/ml)	Wyeth-Ayerst 163, 164, 165	Synthetic, quaternary ammonium, oxime nucleophile, cholinesterase reactivator which displaces the enzyme from its receptor sites when inactivated by phosphate esters. Free enzyme is capable of enzymatic degradation of acetylcholine. Much less effective against carbamate	25-50 mg/kg slowly IV in 5% Dextrose bid PRN; Cattle 20-35 mg/kg slowly IV in 5% Dextrose qid PRN; Horses 10-20 mg/kg slowly IV, SQ, IM bid or tid PRN; Dogs, Cats Usually, therapy is combined with

			anticholinesterases and central nervous system respiratory centers than neuromuscular sites. Used in the treatment of poisoning by organophosphate pesticides and drug overdose: Bromophos, Chlorfenvinphos, Chlopyrifos, Diazinon, Dicrotophos, Dioxathion, Disulfoton, Endrophonium, Fensulfothion, Fenthion, Malathion, Methidathion, Sarin, Soman, Tabun, Parathion, Profenfos, Tacrine, Terbufos, Tetraethyl Pyrophosphate, Echothiophate.	atropine.
Protamine Sulfate Fish sperm protein	<i>Prosul®</i> 1% solution, 5-, 25 ml vial <i>Protamine Sulfate®</i> 1% solution	Lilly Elkins-Sinn 166, 167	Purified simple basic protein, which combines with acidic glycosaminoglycans, neutralizing their action. Used in the treatment of anticoagulant poisoning and drug overdose: Heparin, Dalteparin, Enoxaparin	1-5 mg/kg slowly IV in 2.5% Dextrose PRN; Cattle, Horses, Sheep, Goats, Dogs, Cats
Prussian Blue Berlin Blue Chinese Blue Hamburg Blue Mineral Blue Paris Blue Potassium Ferric Hexacyanoferrate Iron Ferrocyanide	<i>Potassium Ferrocyanide®</i> 25 gram vial 4% solution, 250 ml vial	Sigma-Aldrich 168, 169, 170	Blue pigment that exchanges potassium for thallium in the molecular lattice while in the gastrointestinal tract. Used in the treatment of poisoning by ingestion of Thallium	62.5 mg/kg PO qid PRN; Dogs, Cats
Pyridostigmine Bromide Kalymin Mestinon Regonol Distinon	<i>Mestinon®</i> 60-, 180 mg tablets 5 mg/ml solution, 2 ml vial	Roche ICN 171,172, 173	Dimethylcarbamate, structural analog of neostigmine, indirect acting cholinergic with anticholinesterase activity. Has fewer side effects and longer duration than neostigmine. Used in the pre-emptive treatment of nerve gas poisoning and drug overdose of some non-depolarizing relaxants: Sarin, Soman, Tabun, Tubocurarine, Gallamine, Atracurium, Metocurine, Pancuronium Bromide, Vecuronium, Botulism (<i>Cl. Botulinum</i>), and as a secondary agent in the treatment of Coral (<i>Micrurus</i>) and Cobra (<i>Naja</i>) snake bite and Tetrodotoxin poisoning from Porcupine Fish (<i>Diodon</i>), Deadly Nightshade (<i>Atropa</i>), Jimson Weed (<i>Datura</i>), Henbane (<i>Hyoscyamus</i>),	0.2-2 mg/kg PO tid/qid PRN; Dogs 0.05-0.25 mg/kg PO tid/qid PRN; Cats 0.05-0.15 mg/kg IM tid/qid PRN; Dogs, Cats

			Mandrake (<i>Mandragora</i>), Jasmine (<i>Cestrum</i>), Bittersweet (<i>Solanum</i>), Ground Cherry (Chinese Lantern) (<i>Physalis</i>)	
Pyridoxine HCL Vitamin B6 Pyridoxol Pyridoxinium Chloride Adermine HCL Hexabetalin Hexabivex Pyridipea Pyridox Benadon Hexermin	<i>Beesix®</i> , <i>B-6®</i> 100 mg/ml, 10 ml vial <i>Hexa-Betalin®</i> 10-, 25-, 50 mg tablets	Generic Martindale Lilly 174, 175, 176, 177	Solution containing closely related compounds with vitamin B6 activity. All precursors of pyridoxal 5-phosphate (B6) which functions as a co-factor in the metabolism of proteins, carbohydrates and lipids, over 100 reactions, usually involving transamination and decarboxylation with generation of pyruvate, nicotinic acid (NAD), porphyrins, arachidonic acid and serotonin. Used most often in the treatment of poisonings and drug overdoses which generate seizures, coma and general neuropathy: Acrylamide, Altretamine, Chloamphenicol, Ethylene Glycol, Hydrazine, Isonazide, Crimidine, Oral Contraceptives, Cycloserine, Iron, Alcohol, False Morrel (<i>Gyrometria</i>).	2-20 mg/kg PO, IM, IV PRN; Cattle, Sheep, Goats 3-8 mg/kg PO, IM, IV PRN; Swine 2-4 mg/kg PO, IM, IV PRN; Horses 1-5 mg/kg PO, IM, IV PRN; Dogs, Cats 4-5 mg/kg PO, IM, IV PRN; Rabbits
Sodium Bicarbonate Sodium Hydrogen Carbonate Sodium Acid Carbonate Baking Soda	<i>Sodium Bicarbonate®</i> 5% (0.6 mEq/ml), 500 ml vial 8.4% (1 mEq/ml), 50-, 100-, 500 ml <i>Baking Soda®</i> 454 gram box	Generic Abbott Arm & Hammer Generic 178, 179	Short-acting, potent antacid. Systemic alkalinizer which is used to correct metabolic acidosis, QRS prolongation, rhabdomyolysis and to alkalinize urine in poisonings and drug overdose: Amitriptyline- Perphenazine, Amitriptyline, Amoxapine, Desipramine, Diethylene Glycol, Doxepin, Ethylene Glycol, Formaldehyde, Glycol Ethers, Imipramine, Maprotiline, Metformin, Methanol, Nortriptyline, Potassium Chloride, Propylene Glycol, Quinidine, Strychnine, Trimipramine Maleate, Ethanol, Salicylates, Chlorphenoxy Herbicides, Cockerell and Rubberweed (<i>Hymenoxys</i>), Jimmyweed and Goldenrod (<i>Isocoma</i>), Sugar Beet (<i>Beta</i>)	Dose is dependent on calculated anion gap and base deficit. Dose should be equivalent to ½ of calculated dose administered by slow intravenous infusion. 70-180 mg/kg PO PRN; Cattle 40-120 mg/kg PO PRN; Horses 20-100 mg/kg PO PRN; Sheep, Goats 20-80 mg/kg PO PRN; Dogs 20-150 mg/kg PO PRN; Cats

<p>Sodium Nitrite Nitrous Acid Sodium Erinitrit</p>	<p><i>OAR®</i> 1-, 3-, 30 mg/ml, 10 ml vial <i>Sodium Nitrite®</i> 100-, 500 gram vial 2-, 25 mg tablet</p>	<p>Lilly Martindale Sigma-Aldrich</p> <p>180, 181</p>	<p>Pharmaceutically used chemical which oxidizes to nitrate in air. Flammable and can be explosive. Used in conjunction with Amyl Nitrite and Sodium Thiosulfate in the treatment of Cyanide, Hydrogen Sulfide and other poisonings: Acetonitrile, Chinese Taro (<i>Alocasia</i>), Elderberry (<i>Sambucus</i>), Poison Suckle (<i>Suckleya</i>), Eucalyptus (<i>Eucalyptus</i>), Cassava (<i>Manihot</i>), Stillingia (<i>Stillingia</i>), Acacia (<i>Acacia</i>), Trefoil (<i>Lotus</i>), Clover (<i>Trifolium</i>), Rush (<i>Juncus</i>), Bamboo (<i>Nandina</i>), Cherry, Plum, Peach, etc. (<i>Prunus</i>), Mannagrass (<i>Glyceria</i>), Indiangrass (<i>Sorghastrum</i>), Sorghum and Johnsongrass (<i>Sorghum</i>), Serviceberry (<i>Amelanchier</i>), Christmas Holly (<i>Heteromeles</i>), Arrowgrass (<i>Triglochin</i>)</p>	<p>4.5-7.5 mg/kg IV, IP, PRN; Cattle, Horses 10 mg/kg IV, IP, PRN; Sheep, Goats 16-22 mg/kg IV, IP, PRN; Dogs, Cats</p> <p>Always used in combination with Sodium Thiosulfate.</p>
<p>Sodium Polystyrene Sulfonate Kayexalate Resonium A</p>	<p><i>Kayexalate®</i> 100 mg/g, 454 g jar <i>Kionex®</i> 100 mg/g, 454 g jar <i>Sodium Polystyrene Sulfonate®</i> 15 g/60 ml, 120 ml, 200 ml, 500 ml</p>	<p>Sanofi-Winthrop</p> <p>Paddock</p> <p>Roxane</p> <p>182,183</p>	<p>Sulfonated cation exchange resin which exchanges sodium ions for potassium and lithium ions in the intestinal tract. Used in the treatment of poisonings and drug overdose associated with hyperkalemia: Lithium Carbonate, Lithium Citrate, Potassium Chloride</p>	<p>2 g/kg PO with each g suspended in 3-4 ml of water, and divided into 3 doses administered tid; Dogs 0.25-0.5 g/kg PO with each g suspended in 3-4 ml of water, and divided into 3 doses administered tid; Cats Generally mixed with 70% Sorbitol to help prevent constipation.</p>
<p>Sodium Sulfate Glauber's Salt Mirabilite Thenardite Hexahydrate</p>	<p><i>Sodium Sulfate®</i> 500 g vial</p>	<p>Sigma-Aldrich</p> <p>184, 185</p>	<p>Saline cathartic used in the treatment of metal poisoning: Lead, Copper.</p>	<p>125-250 mg/kg as 6% solution PO; Cattle 60-125 mg/kg as 6% solution PO; Horses 95-280 mg/kg as 6% solution PO; Sheep, Goats, Swine 45-50 mg/kg as 6% solution PO; Dogs 75-150 mg/kg as 6% solution PO; Cats</p>
<p>Sodium Thiosulfate Sodium Hyposulfite Sodolithol Sulfothiorine Ametox Hypo Antichlor</p>	<p><i>Sodium Thiosulfate®</i> 100 mg/ml, 10 ml vial 250 mg/ml, 50 ml vial <i>Cya Dote Injection®</i> 300 mg/ml, 500 ml vial <i>Hyposulfene®</i> 100 mg/ml, 10 ml vial 250 mg/ml, 50 ml vial</p>	<p>American Reagent</p> <p>Anthony</p> <p>Generic</p> <p>179, 181, 186</p>	<p>Sodium salt which acts as an exogenous source of sulfur for increasing enzyme kinetics of rhodanase in cyanide detoxification and as a chelator of some metals. Used in the treatment of cyanide and some metal poisonings: Cisplatin, Iodine, Arsenic, Chlorates, Cyanide,</p>	<p>15-25 mg/kg IV, IP as 25% solution; Cattle, Horses 8.5-13.2 mg/kg IV, IP as 25% solution when administered with or following Sodium Nitrite; Cattle, Horses 20-60 mg/kg IV, IP as 25% solution; Sheep, Goats 10-30 mg/kg IV, IP as</p>

			<p>Acetonitrile, Acrylonitrile, Chinese Taro (<i>Allocasia</i>), Elderberry (<i>Sambucus</i>), Poison Suckle (<i>Suckleya</i>), Eucalyptus (<i>Eucalyptus</i>), Cassava (<i>Manihot</i>), Stillingia (<i>Stillingia</i>), Acacia (<i>Acacia</i>), Trefoil (<i>Lotus</i>), Clover (<i>Trifolium</i>), Rush (<i>Juncus</i>), Bamboo (<i>Nandina</i>), Cherry, Plum, Peach, etc. (<i>Prunus</i>), Mannagrass (<i>Glyceria</i>), Indiangrass (<i>Sorghastrum</i>), Sorghum and Johnsongrass (<i>Sorghum</i>), Serviceberry (<i>Amelanchier</i>), Christmas Holly (<i>Heteromeles</i>), Arrowgrass (<i>Triglochin</i>).</p> <p>Contraindicated for Hydrogen Sulfide.</p>	<p>25% solution when administered with or following Sodium Nitrite; Sheep, Goats 10-20 mg/kg as 25% solution; Swine 50-200 mg/kg as 25% solution; Dogs</p> <p>Often used with 1% Sodium Nitrite</p>
<p>Succimer DMSA Meso-dimercaptosuccinate Dimercaptosuccinate DIM-SA</p>	<p><i>Chemet</i>® 100 mg capsules</p>	<p>Sanofi-Synthelabs</p> <p>187, 188</p>	<p>Heavy metal chelator, water soluble, dimercaprol analog, which binds to toxic metals and aids in their renal elimination. Used in the treatment of various metal poisonings: Arsenic, Cobalt, Lead, Iron, Mercury, Zinc.</p>	<p>10 mg/kg PO bid/tid PRN; Dogs, Cats</p>
<p>Thiamine Thiamine HCL Vitamin B1 Aneurin Thiaminium Chloride Thiamine Monochloride</p>	<p><i>Thiamine HCL</i>® 200-, 500 mg/ml, 100 ml vial 50-, 100-, 250 mg tablets</p>	<p>Generic Vet Tech Neogen Butler Phoenix Vedco</p> <p>189, 190, 191</p>	<p>Antineuritic, water-soluble, vitamin (Vitamin B1) a precursor of the coenzyme thiamine pyrophosphate which acts in the decarboxylation of alpha keto acids and in the conversion of tryptophan to nicotinamide. Used in the treatment of various poisonings: Ametryn, Amitrole, Atrazine, Bromacil, 4-Methylimidazole, 2,4-D Phenoxy Herbicides, Glyphosate, Imazapyr, Picloram, Prometon, MCPA, Triclorpyr, Lead, Sulfur, Horsetail (<i>Equisetum</i>), Fireweed and Red Sage (<i>Kochia</i>), Bracken Fern (<i>Pteridium</i>), Lip Ferns (<i>Cheilanthes</i>), Male Fern and Wood Fern (<i>Dryopteris</i>), Sensitive Fern (<i>Onoclea</i>)</p>	<p>2.5-10 mg/kg IM, IV PRN; Cattle, Horses, Sheep, Goats, Swine, Dogs, Cats</p>
<p>Tolazoline Priscoline Phenylmethylimidazoline 2-Benzyl-2-Iminazoline</p>	<p><i>Tolazoline</i>® 100 mg/ml, 100 ml vial</p>	<p>Lloyd</p> <p>192, 193</p>	<p>Synthetic imidazoline, structurally related to phentolamine, a weak alpha adrenergic blocker, with beta adrenergic action which increases cardiac output and rate,</p>	<p>2-4 mg/kg slowly IV PRN; Cattle, Sheep, Deer, Goats 4 mg/kg slowly IV PRN; Horses</p>

			<p>additionally cholinergic effect increases GI motility and direct acting relaxant effect on vascular smooth muscle produces vasodilation. Used in the treatment of drug overdose and poisonings: Xylazine, Clonidine, Ergot (<i>Claviceps</i>), Canarygrass (<i>Phalaris</i>)</p>	
<p>Trientine Dihydrochloride Cuprid Trien Dihydrochloride TETA Triethylenetetramine</p>	<p><i>Syprine</i>® 250 mg capsules</p>	<p>Merck 194, 195</p>	<p>Water soluble chelating agent capable of chelating 2 copper atoms forming a five- membered ring for the renal elimination of copper. The molecule is dissimilar to D-penicillamine. Used in the treatment of Copper poisoning.</p>	<p>10-15 mg/kg PO bid/tid PRN; Dogs, Cats</p>
<p>Yohimbine Aphrodine Corynine Quebrachine Yomax Yohimex</p>	<p><i>Yobine</i>® 2 mg/ml, 20 ml vial <i>Antagonil</i>® 5 mg/ml, 20 ml vial</p>	<p>Lloyd Wildlife Labs 196, 197</p>	<p>Indolealkylamine alkaloid, alpha adrenergic antagonist with weak monamineoxidase (MAO) inhibition. Used in the treatment of drug overdose and poisoning: Amitraz, Xylazine, Clonidine.</p>	<p>0.125 mg/kg IV; Cattle, Sheep, Goats 0.075 mg/kg IV; Horses 0.1 mg/kg IV; Dogs 0.5 mg/kg IV; Cats 0.25 mg/kg IV; Llamas 0.2 mg/kg IV; Rabbits & Pocket Pets</p>

TABLE 2. REFERENCES FOR TABLE OF ANTIDOTES

1. Innes, IR and Nickerson, M: Drugs acting on postganglionic adrenergic nerve endings and structures innervated by them (sympathomimetic drugs). In LS Goodman and A Gilman ed; *The Pharmacologic Basis of Therapeutics*, 3rd' Ed., The Macmillan Co. New York, NY. 502-503, 1967.
2. Andrews. AR and Humphreys, IN: *Poisoning in Veterinary Practice*. 2nd ed. National Office of Animal Health Ltd., Middlesex. 76-77, 1982.
3. Ofetler, RW and Messonnier, SP: *Handbook of Sinai! Animal Toxicology and Poisonings*. Mosby Inc., Chicago, IL. 79-81, 178-180, 1997.
4. Crowe, MW. Urea Poisoning. *Mod Vet Prac* 49(3):40-41, 1968
5. McBarron, EJ and McInnes, P: Urea Toxicity *Aust Vet J* 44(3):90-96, 1968
6. Jakoby, WB: *Enzymatic Basis of Detoxification*, Vol.2, Academic Press, New York, 1980.
7. Aronson, LR, Drobatz, 1(3: Acetaminophen toxicosis in 17 cats. *J Vet Emerg Crit Care* 6(2):65-69, 1996.
8. Hjelle, J: Acetaminophen induced toxicosis in dogs and cats. *J Am Vet Med Assoc* 188(7):742-745, 1986.
9. Flanagan, RJ: The role of acetylcysteine in clinical toxicology. *Med Toxicol* 2:93-104, 1987.
10. McFarland. AF. Chyka. PA: Selection of activated charcoal products for the treatment of poisonings. *Ann Pharmacother* 27(3):358-361. 1993.
11. American Academy of Clinical Toxicology: position statement and practical guidelines on the use of multi-dose activated charcoal in the treatment of acute poisoning. *J Toxicol Clin Toxicol* 37(6):73 1-751, 1999.
12. Bailey. EM: Emergency and general treatment of poisoning. In: RW Kirk, Ed. *Current Veterinary Therapy Small Animal Practice*, WB Saunders Co., Philadelphia, PA, 116-125, 1989.
13. Oehme, FW: General principles in treatment of poisoning. In: NE Robinson, Ed. *Current Therapy in Equine Medicine*, WB Saunders Co., Philadelphia, PA, 668-670, 1987.
14. Stirt, JA: Aminophylline as a diazepam antagonist. *Anesth Analg* 60:767-768, 1981.

15. Katz, Y, Gavish, M: Aminophylline reversal of diazepam intoxication. *Lancet* 1:900-901, 1989.
16. ButLon, C, Errecalde, JO, Mulders, MSG: Loading and maintenance dosage regiments for theophylline in horses. *J Vet Pharm Ther* 8(3):328-330, 1985
17. Flanagan, RJ and Jones, AL: *Antidotes*. Taylor & Francis, London, 2001
18. Brewer, GJ: Practical recommendations and new therapies for Wilson's Disease. *Drugs* 50:240-249, 1995
19. Post, LO, Keller, WC: Current status of food animal antidotes. In: RA Smith, GD Osweiler, ED Galey Eds. *The Veterinary Clinics of North America Food Animal Practice Toxicology* 16(3):445-453, 2000.
20. Thompson JR, Buck, WB: Copper-molybdenum toxicosis. In: JL Howard Ed., *Current Veterinary Therapy 3: Food Animal Practice*. WB Saunders Co., Philadelphia, PA., 396-398, 1993.
21. Osweiler. GD. et al: *Clinical and Diagnostic Veterinary Toxicology*, 3rd Ed., Kendall/Hunt, Dubuque, IA, 87-103, 1976.
22. Brewer, GJ, Dick, RD, Johnson, V, et al. Treatment of Wilson's Disease with ammonium tetrathiomolybdate. *Arch Neurol* 51:545-554, 1994
23. Laaban. JP, Bodenau, P. Rochemaure. J: Amyl nitrite poppers and methemoglobinemia. *Ann Intern Med* 103(5):804-805, 1985.
24. Ellenhom, MJ: *Ellenhorn's Medical Toxicology*. 2nd ed. Williams & Wilkins, Baltimore, MD. 1481-1482, 1997.
25. Seiden, R: *Veterinary Drugs in Current Use*. 1st Ed., Singer Publishing Co.. New York, NY. 14, 1966.
26. Leikin, J, et al: Use of Fab fragments of digoxin specific antibodies in the therapy of massive digoxin poisoning. *Ann Emerg Med* 14(2):175-178, 1985.
27. Gieller, RW and Messonnier, SP: *Handbook of Small Animal Toxicology and Poisonings* Mosby Inc., Chicago, IL. 310, 348, 359; 1997.
28. Jackson, CA, Divers. TJ: Botulism. In: JA Orsini, Ti Divers Eds. *Manual of Equine Emergencies*. WB Saunders Co. Philadelphia. PA. 348-350; 1998.
29. Grabenstein, JD. Immunoantidotes: II . One hundred years of antitoxins. *Hosp Pharm* 27:637-646; 1992.

30. Ross, GE Jr.: Tetanus. In: RW Kirk, Ed., *Current Veterinary Therapy III Small Animal Practice*. WB Saunders Co., Philadelphia, PA, 605-607, 1968.
31. Bone. JF: Neurotoxic clostridial diseases-botulinum poisoning and tetanus. In: JL Howard, et al. Eds., *Current Veterinary Therapy Food Animal Practice*, WB Saunders Co., Philadelphia. PA, 680-684, 1981.
32. Driggers, T: Venomous snakebites in horses. *Compend Cont Ed Pract Vet* 17(2):235-241; 1995.
33. Parrish, DM, Scatterday. JE, Pollard, CS: The clinical management of snake venom poisoning in domestic animals. *JAm Vet Med assoc* 130:548; 1957.
34. Hudelson, S. Hudelson. P: Pathophysiology of snake envenomation and evaluation of treatments, part 1. *Compend Cont Ed Pratt Vet* 17(7):889-896; 1995.
35. Marks, S, Mannella, C, Schaer, M: Coral snake envenomation in the dog: Report of four cases and review of the literature. *JAAHA* 26(6):629-634, 1990.
36. Kitchens. Cs, Van Mierop, LH: Envenomation by eastern coral snake (*Micrurus fulvius*) A study of 39 victims. *J Am Vet Assoc* 258(12): 1615-1618, 1987.
37. Hudelson, S, Hudelson, P: Pathophysiology of snake envenomation and evaluation of treatments, part 2. *Compend Cont Ed Pract Vet* 17(8):1035-1040; 1995.
38. Rauber, A: Black widow spider bites. *J Toxicol Clin Toxicol* 21:473-485; 1984.
39. Clark, RF, et al: Clinical presentation and treatment of black widow spider envenomation: A review of 163 cases. *Ann Emerg Med* 21(7):782-787;1984
40. Wasserman, OS, Siegel, C: Loxoscelism (brown recluse spider bites): A review of the literature. *Vet Human Toxicol* 19:256-260; 1977.
41. Wasserman, OS, Siegel, C: Loxoscelism (brown recluse spider bites): A review of the literature. *Clin Toxicol* 14:353-358; 1979.
42. Gueron. M. et al: The management of scorpion envenomation. *Toxicon* 31:1071 -1083; 1993.
43. Bond, OR: Antivenin administration for *Centruroides* scorpion sting-risks, benefits. *Vet Human Toxicol* 32:367; 1990.
44. Bond, OR: Antivenin administration for *Centruroides* scorpion sting-risks, benefits. *Ann Emerg Med* 21:788-791; 1992.
45. Gateau, T, Bloom, M, Clark, RF: Response to specific *Centruroides sculpturatus* antivenom in 151 cases of scorpion stings. *Clin Toxicol* 32:165-

- 171: 1994.
46. Cullison, R: Acetaminophen toxicosis in small animals: clinical signs, mode of action, and treatment. *Compd Cont Ed Pract Vet* 6(4):3 15-320, 1984.
 47. Osterhoudt, KC: Methemoglobinemia. In: MD Ford, KA Delaney, U Ling, T Erickson. Eds. *Clinical Toxicology*, WB Saunders Co., Philadelphia, PA, 211-217, 2001.
 48. Korallus, U, Harzdorf, C, Lewalter, J: Experimental basis for ascorbic acid therapy of poisoning by hexavalent chromium compounds. *In: Arch Occup Environ Health* 53(3):247-256, 1984.
 49. Grossman, MR: Amitraz toxicosis associated with ingestion of an acaricide collar in a dog. *J Am Vet Med Assoc.* 203:55-57, 1993.
 50. Afzaat, S, Shakoor, A, Rabbani, MU, et al: High dose atropine in organophosphorous poisoning. *Postgrad Med J* 66(771):70-71, 1990.
 51. Miller, E: Organophosphate toxicity in domestic animals-I: acute toxicity. *Vet Med Sm Anim Clin* 78:482-488, 1983.
 52. Meerdink, GL: Organophosphorous and carbamate insecticide poisoning in large animals. In: GE Burrows, Ed. *The Veterinary Clinics of North America Food Animal Practice*, WB Saunders Co., Philadelphia, PA, 5(2):375-389, 1989.
 53. Chisolm, JJ Jr: BAL, EDTA, DMSA, and DMPS in the treatment of lead poisoning in children. *Clin Toxicol* 30:493-504, 1992.
 54. Hammond, PB, Aronson, AL: Mobilization and excretion of lead in cattle: A comparative study of various chelating agents. *Ann NY Acad Sci* 88:498-511, 1960.
 55. Hammond, PB, Aronson, AL: Lead poisoning in cattle and horses in the vicinity of a smelter. *Ann NY Acad Sci* 111:595-611, 1964.
 56. Chisolm, JJ: The use of chelating agents in the treatment of acute and chronic lead intoxication in childhood. *J Pediatr* 73:1-7, 1968.
 57. Jaeger, A, Le Tacon, S, Bosquet, C, Sauder, P: Effects of poisons on ion channels. *J Toxicol Clin Toxicol* 38:160-161, 2000.
 58. Pertoldi, F, D'Orlando, L, Mercante, WP: Electrochemical dissociation 48 hours after atenolol overdose: usefulness of calcium chloride. *Ann Emerg Med* 31:777-781, 1998.
 59. McIvor, ME: Acute fluoride toxicity. Pathophysiology and management. *Drug Saf* 5(2):79-84, 1990.

60. Pearigen, PD, Benowitz. NL: Poisoning due to calcium antagonist: Verapamil, Diltiazem, and Nifedipine. *Drug Saf* 6(6):408-430, 1991.
61. Crowell, WA, Whitloek, RH, Stout, RC, Tyler, DE: Ethylene glycol toxicosis in cattle. *Cornell Vet* 69(3):272-279, 1979.
62. James, LF: Serum electrolyte, acid-base balance and enzyme changes in acute *Halogeton glomeratus* poisoning in sheep. *Can J Comp Med* 32:539-543, 1968.
63. James, LP: Oxalate toxicosis. *Clin Toxicol* 5:23 1-243, 1972.
64. Cohn, WJ, et al.: Treatment of chiordecone (Kepone) toxicity with cholestyramine. *N Eng J Med* 298(5):243-248, 1978.
65. Pieroni, RE. Fisher. JG: Use of cholestyramine resin in digitoxin toxicity. *J Am Med Assoc* 245(19):1939-1940, 1981.
66. Jahnchen, E, et al.: Enhanced elimination of warfarin during treatment with cholestyramine. *Br J Clin Pharmacol* 5:437-440, 1978.
67. Grantham. J, Neel, W, Brown, RW: Toxicity reversed: Reversal of imipramine-monomine oxidase inhibitor induced toxicity by chlorpromazine. *J Kans Med Soc* 65:279-280, 1964.
68. Robertson, JC: Recovery after massive MAOI overdose complicated by malignant hyperpyrexia, treated with chlorpromazine. *Postgrad Med J* 48:64-65, 1972.
69. Dumonceaux, GA, Beasley, VR: Emergency treatments for police dogs used for illicit drug detection. *J Am Vet Med Assoc* 197(2):185-187, 1990.
70. Kisseberth, WC, Trammel, HL: Illicit and abused drugs. In: VR Beasley, Ed. *The Veterinary Clinics of North America Small Animal Practice*. WB Saunders Co., Philadelphia, PA, 20(2):405-418, 1990.
71. Gibly, RL, Walter, FG, Kloster, J, et al.: Cisapride Poisoning. *Vet Hum Toxicol* 39:231-233, 1997.
72. Gwaltney-Brant, SM: Newer antidotal therapies. *Vet Clin North Am Small Anim Pract* 32:335, 2002.
73. Barone, JA, Peppers, MP: Use of dantrolene in the management of amphetamine-induced hyperthermia. *Clin Pharm J* 8:324-325, 1989.
74. ten Holter, JB, Schellens, RL: Dantrolene sodium for the treatment of carbon monoxide poisoning. *B M J* 296:1772-1773, 1988.
75. Shemesh, I, Bourvin, A, Gold, D, Kutscherowsky, M: Chlorpyrifos poisoning treated with ipratropium and dantrolene: A case report. *J Toxicol Clin Toxicol* 26:495-498, 1988.

76. Rees, RS, et al: Brown recluse spider bites: a comparison of early surgical incision versus dapsone and delayed surgical incision. *Ann Surg* 202:658-663, 1985.
77. King, LE, Rees, RS: Dapsone treatment of a brown recluse bite, *J Am Med Assoc* 250:648, 1983.
78. Hansen, RC, Russell, FE: Dapsone use for *Loxosceles* envenomation treatment. *Vet Hum Toxicol* 26:260, 1984.
79. Cheney, K, et al: Survival after a severe iron poisoning treated with intermittent infusion of deferoxamine. *Clin Toxicol* 33:61-66, 1995.
80. Shannon, M: Deferoxamine in acute iron poisoning. *Lancet* 339(8809):1601, 1992.
81. Voest, EE, Vreugdenhil, G, Man, JJ: Iron-chelating agents in non-iron overload conditions. *Ann Intern Med* 120(6):490-499, 1994.
82. Yatscoff, RW, Wayne, EA, Tenenbein, M: An objective criterion for the cessation of deferoxamine therapy in the acutely poisoned patient. *J Toxicol Clin Toxicol* 29(1):1-10, 1991.
83. Browning, RW, et al.: 50% Dextrose: Antidote or toxin? *Ann Emerg Med* 19(6):683-687, 1990.
84. Bunch, SE: Anticonvulsant drug therapy. In: RW Kirk, Ed. *Current Veterinary Therapy IX Small Animal Practice* WB Saunders Co., Philadelphia, PA, 836-844, 1986.
85. Ohuna, A, Pascuat-Leone, A: Cocaine-associated status *epilepticus*. *J Epilepsy* 3:165-169, 1990.
86. Cantielena, LR Jr, Klaassen, CD: The effect of chelating agents on the excretion of endogenous metals. *Toxicol Appl Pharmacol* 63(3):344-350, 1982.
87. Hatch, RC, Clark, JD, Jam, AV: Use of thiols and thiosulfate for treatment of experimentally induced acute arsenite toxicosis in cattle. *J Vet Res* 39:1411-1414, 1978.
88. Neiger, RD: Arsenic poisoning. In: RW Kirk, Ed., *Current Veterinary Therapy X: Small Animal Practice* WB Saunders Co., Philadelphia, PA, 159, 1989.
89. Doenecke, AL, Fleurmann, RC: Treatment of haloperidol abuse with diphenhydramine. *Am J Psychiatry* 137(4):487-488, 1980.
90. Cone, KA, et al: Extended therapy for acute dystonic reactions. *Ann Emerg Med* 13(3):194-197, 1984.

91. Bousquet, P, et al.: Imidazole receptors: A new concept in central regulation of the arterial blood pressure. *Am J Hypertens* 5:475-505, 1992.
92. Bania, TC, Sauter, D, Hoffman, RS: Management of hemodynamic compromise in the poisoned patient. Contemporary management in critical care. *Crit Care Toxicol* 1(3):179-202, 1991.
93. Mather, OW, Low. DG: Thallium intoxication in dogs. *J Am Vet Med Assoc* 137:544-545. 1960.
94. Burningham, MD, et al.: Wound botulism. *Ann Emerg Med* 24:1184-1187, 1994.
95. Critchley, EMR, Hayes, PJ. Isaacs, PET: Outbreak of botulism in northwest England and Wales. *Lancet*: 2:849-89!, 1989.
96. Watt, G, Hayes, CG: Edrophonium for cobra bite. *N Engl J Med* 316:1609-1610, 1987.
97. Riou, B, et al: Treatment of severe chloroquine poisoning. *N Eng J Med* 318(1): 1-6, 1988.
98. Muller, DL, Noxon, JO: Anaphylaxis: Pathophysiology and treatment. *Compend Cont Educ Pract Vet* 12:157-167, 1990.
99. Jacobsen, D. McMartin, KE: Methanol and ethylene glycol poisoning: Mechanism of toxicity, clinical course, diagnosis and treatment. *Med Toxicol* 1(5):309-334, 1986.
100. Beasley, VR, Buck, WB: Acute ethylene glycol toxicosis: A review. *Vet Hum Toxicol* 22:255-263, 1980.
101. Beckett, SD, Shields, RP: Treatment of acute ethylene glycol (antifreeze) toxicosis in the dog. *J Am Vet Med Assoc* 158:472-476, 1971.
102. Moy, AA, Burtis, WJ: Bisphosphonates. *Conn's Current Therapy* RE Rakel Ed. WB Saunders, Philadelphia, PA, 528-529, 1995.
103. Chern, CH, et al.: Complete and partial response to flumazenil in patients with suspected benzodiazepine overdose. *Am J Emerg Med* 13:372-375, 1995.
104. Whitwam, JG, Amrein, R: Pharmacology of flumazenil. *Acta Anaesh Scand Suppl* 108:3, 1995.
105. Donovan, KL, Fisher. DJ: Reversal of chloral hydrate overdose with flumazenil. *Br Med J* 298:1253-1254, 1989.
106. Davis. RE: Clinical chemistry of folic acid. *Adv Clin Chem* 25:233-294, 1986.
107. Moore, DF, et al: Folinic acid enhances renal elimination in formic acid intoxication. *J*

Toxicol Clin Toxicol 32:199-204, 1994.

108. Brent, J: Current management of ethylene glycol poisoning. *Drugs* 61(7):979-988, 2001.
109. Connally, HE, Forney, SD, Grauer, GF, Hammar, DW, et al.: Safety and efficacy of 4-methylpyrazole treatment of suspected or confirmed ethylene glycol intoxication in dogs: 107 cases. *J Am Vet Med Assoc* 209: 1880-1883, 1996.
110. Gaddy, J: Pharm profile fomepizole. *Comp Contin Educ Pract Vet* X: 1073-1074, 2001.
111. Bahri, L: 4-Methylpyrazole: An antidote for ethyleneglycol intoxication in dogs. *Compend Cont Ed Pract Vet* 13(7): 1123-1126, 1991.
112. Dial, SM, Thrall, MA, Hamar, DW: The use of 4-methylpyrazole as treatment for ethylene glycol intoxication in the dog. *J Am Vet Med Assoc* 195:73-75, 1989.
113. Jacobsen, O. et al: Effects of 4-methylpyrazole ,methanol/ethylene glycol antidote in healthy humans. *J Emerg Med* 8(4):455-461, 1990.
114. Critchley, JAJH, Ungar, A: The management of acute poisoning due to beta-adrenoceptor antagonists. *Med Toxicol Adverse Drug Exp* 4:32-45, 1989.
115. Levey, GS, Epstein, SE: Activation of adenyl cyclase by glucagons in cat and human heart. *Circ Res* 24(2): 151-156, 1969.
116. Chernow, B, Reed, L, Geelhoed, GW, et al.: Glucagon endocrine effects and calcium involvement in cardiovascular actions in dogs. *Circ Shock* 19(4): 393-407, 1986.
117. Cottrell, JE, et al: Prevention of Nitroprusside-induced cyanide toxicity with hydroxycobalamin. *N Eng J Med* 298(1 5):809-811, 1978.
118. Holland, MA, Kozlowski, LM: Clinical features and management of cyanide poisoning. *Clin Pharm* 5(9):737-741, 1986.
119. Kayser, SR, Kurisu, S: Hydroxycobalamin in nitroprusside induced cyanide toxicity. *Drug Intell Clin Pharrm* 20:365-366, 1986.
120. Bertino, JR: Rescue techniques in cancer chemotherapy use of leucovorin and other rescue agents after methotrexate treatment. *Seminars Oncol* 4:203-216, 1977.
121. O'Keef, DA, Harris, CL: Toxicology of oncologic drugs. In: VR Beasley, Ed. *The Veterinary Clinics of North America Small Animal Practice* WB Saunders Co., Philadelphia, PA. 20(2):483-504, 1990.
122. Sexton, JW, Buck, WB: Lead. In: *Current Veterinary Therapy: Food Animal Practice* JL Howard Ed. WB Saunders Philadelphia, PA 498-499, 1981.

123. Burrows, GE: Nitrate intoxication. *J Am Vet Med Assoc* 177:82-83. 1980.
124. Buck, WB, Osweiler, GD, VanGelder, GA: Nitrates, nitrites, and related problems. In: *Clinical and Diagnostic Veterinary Toxicology*, 3rd ed., Kendall/Hunt Publishing Co., Dubuque, IA, 460-467, 1976.
125. Vale, JA, Proudfoot, AT: Paracetamol (acetaminophen) poisoning. *Lancet* 346:547-552, 1995.
126. Vale, JA, Meredith, TJ, Goulding, R: Treatment of acetaminophen poisoning: The use of oral methionine. *Arch Intern Med* 141:394-396, 1981.
127. Shull, LR, Buckmaster, GW, Cheeke, PR: Factors influencing pyrrolizidine (*Senecio*) alkaloid metabolism, species, liver sulfhydryls, and rumen fermentation. *J Anim Sci* 43:1247-1253, 1976.
128. Richardson, JA: Permethrin spot-on toxicosis in cats. *J Vet Emerg Care* 10:103-106, 2000.
129. Schell, MM: Tremorgenic mycotoxin intoxication. *Vet Med* 95: 283-286, 2000.
130. Chamberlain, JM, Klein, BL: A comprehensive review of naloxone for the emergency physician. *Am J Emerg Med* 12(6):650-660, 1994.
131. Evans, LE, et al.: Treatment of drug overdosage with naloxone, a specific narcotic antagonist. *Lancet* 1(801):452-455, 1973.
132. Beasley, VR, et al.: *A Systems Affected Approach to Veterinary Toxicology*, University of Illinois, Urbana, IL, 167, 839-840. 1994.
133. Fisher, DM, et al.: The neuromuscular pharmacology of neostigmine in infants and children. *Anesthesiology* 59(3):220-225, 1983.
134. Payne, JP, Hughes, R, AlAzawi, S: Neuromuscular blockade by neostigmine in anaesthetized man. *Br J Anaesth* 52(1):69-76, 1980.
135. Bailey, EM: Emergency and general treatment of poisonings. In: RW Kirk, Ed. *Current Vet Therapy IX Small Animal Practice*. WBSaunders Co., Philadelphia, PA, 135-144. 1986.
136. Cryer, PE: Physiology and pathophysiology of the human sympathoadrenal neuroendocrine system. *N Engl J Med* 303(8):436-444. 1980.
137. Hoffman, BB, Lefkowitz, RJ: Catecholamines, sympathomimetic drugs, and adrenergic receptor antagonists. In: JG Hardman et al., Eds. *Goodman and Gilman's The Pharmacologic Basis of Therapeutics* 9th ed. McGraw-Hill, New York, NY, 199-248, 1996.

138. Tomaszewski, CA. Thom, St Use of hyperbaric oxygen in toxicology. *Emerg Med Clin North Am* 12(2):437-459. 1994.
139. Crowe. DT: Managing respiration in the critical patient. *Vet Med* 84:55-76, 1989.
140. Fitzpatrick, RK, Crowe, DT: Nasal oxygen administration in dogs and cats: Experimental and clinical investigations..*J Am Anim Hosp Assoc* 22:293-300, 1986.
141. Bilezikian, JP: Management of acute hypercalcemia. *N Eng J Med* 326:1196-1203, 1992.
142. Rumble, WK, et al.: Use of pamidronate to reverse vitamin D3-induced toxicosis in dogs. *Am J Vet Res* 60(9):1092-1097, 1998.
143. Hare, WR, et al: Calcipotriene poisoning in dogs. *Vet Med* 95(10):770-778, 2000.
144. Lyle, WH: Penicillamine in metal poisoning. *J Rheumatol* Suppl 7:96-99, 1981.
145. Ross, FW: Teratogen update. Penicillamine. *Teratology* 33(1):127-131. 1986.
146. Twedt, DC, Whitney, EL: Management of hepatic copper toxicosis in dogs. In: RW Kirk, Ed. *Current Veterinary Therapy X Small Animal Practice* WB Saunders Co., Philadelphia, PA, 891-893, 1989.
147. Booth, NA: Drugs acting on the central nervous system. In: NH Booth, LE McDonald, Eds. *Veterinary Pharmacology and Therapeutics* 6th ed., Iowa State University Press, Ames, IA, 153-408, 1988.
148. Seiden, R: *Veterinary Drugs in Current Use* Springer Publishing Co., New York, NY, 85, 1966.
149. Clarke, EGC, Clarke, ML: *Garners Veterinary Toxicology* 3rd ed. Williams and Wilkins Co., Baltimore, MD, 194, 1967.
150. Cooper, BE: High-dose phentolamine for extravasation of pressors. *Clin Pharm* 8(10):689, 1989.
151. Hollander, JE, Carter, WA, Hoffman, RS: Use of phentolamine for cocaine-induced myocardial ischemia. *N Eng J Med* 327(5):361, 1992.
152. Caine, ED: Anticholinergic toxicity. *N Eng J Med* 300(22):1278, 1979.
153. Brier, RH: Pysostigmine dose for tricyclic drug overdose. *Ann Intern Med* 89(4):579, 1978.
154. Gfeller, RW, Messonnier, SP: *Small Animal Toxicology and Poisonings* Mosby Inc., St. Louis, MO, 102, 166, 301, 307, 308, 343, 370, 1998.

155. Mount, ME, Woody, BJ, Murphy, MJ: The anticoagulant rodenticides. In: RW Kirk, Ed., *Current Veterinary Therapy IX Small Animal Practice* WB Saunders Co., Philadelphia, PA. 156-165, 1986.
156. Bjornsson, TD, Blaschke, TF: Vitamin K1 disposition and therapy of warfarin overdose. *Lancet* 2:846-847, 1978.
157. Hirsh, J, Poller, L: Subcutaneous or intravenous phytoadione? *Arch Intern Med* 135:1337-1338, 1995.
158. Finkel, MJ: Vitamin K1 and vitamin K analogs. *Clin Pharmacol* 2:794-814, 1961.
159. Squires, RF, et al.: Convulsant properties of tetrazoles are highly correlated with actions on GABA/benzodiazepine/picrotoxin receptor complexes in brain. *Life Sci* 35:1439-1440, 1984.
160. Clarke, EGC, Clarke, ML: *Garner's Veterinary Toxicology* 3rd ed., Williams and Wilkins Co., Baltimore, MD, 193, 1967.
161. Seiden, R: *Veterinary Drugs in Current Use*. Springer Publishing Co., New York, NY, 88, 1966.
162. Kastl, RR: Inadvertant systemic injection of pilocarpine. *Arch Ophthalmol* 105:28-29, 1987.
163. De Kort, WL, Kiestra, SH, Sangster, B: The use of atropine and oximes in organophosphate poisoning: A modified approach. *J Toxicol Clin Toxicol* 26(3-4):199-208, 1988.
164. Fikes, JD: Toxicology of selected pesticides, drugs and chemicals: Organophosphorous and carbamate insecticides. In: VR Beasley, Ed. *Veterinary Clinics of North America Small Animal Practice*, WB Saunders Co., Philadelphia, PA, 20(2):353-367, 1990.
165. Hansen, SR: Management of organophosphate and carbamate insecticide toxicoses. In: JD Bonagura, RW Kirk, Eds., *Kirk's Current Veterinary Therapy XII Small Animal Practice*. WB Saunders Co., Philadelphia, PA, 245-248, 1995.
166. Lindblad, B: Protamine sulfate: A review of its effects-hypersensitivity and toxicity. *Eur J Vasc Surg* 33(3):195-201, 1989.
167. Adams, HR: Hemostatic and anticoagulant drugs. In: NH Booth, LE McDonald, Eds. *Veterinary Pharmacology and Therapeutics*, Iowa State University, Ames, IA, 481-494, 1988.
168. Lewis, ILk: *Lewis Dictionary of Toxicology*. Lewis Publishers, Boca Raton, FL, 503, 1998.

169. Heydlauf, H: Ferric-cyanoferrate (II): An effective antidote in thallium poisoning. *Eur J Pharmacol* 6: 340-344, 1969
170. Andrews, AH and Humphreys, DJ: *Poisoning in Veterinary Practice*. 2nd ed. National Office of Animal Health Ltd., Middlesex. 112, 1982.
171. Dunn, MA. Sidell, FR: Progress in medical defense against nerve agents. *J Am Med Assoc* 262(5):649-652, 1989.
172. Keeler, JR, Hurst, CG, Dunn, MA: Pyridostigmine used as a nerve agent pretreatment under wartime conditions. *J Am Med Assoc* 266(5):649-652, 1991.
173. LeCouteur, RA: Disorder of peripheral nerves. In: *Handbook of Small Animal Practice*. RV Morgan, Ed., Churchill Livingstone, New York, NY, 299-318, 1988.
174. Glenn, GM. et al.: Pyridoxine as therapy in theophylline-induced seizures. *Vet Hum Toxicol* 37:342-345. 1995.
175. Orłowski, JP, et al.: Treatment of potentially lethal dose isoniazid ingestion. *Ann Emerg Med* 17(1):73-76, 1988.
176. Harati, Y, Niakan, E: Hydrazine toxicity, pyridoxine therapy, and peripheral neuropathy. *Ann Intern Med* 104(5):728-729, 1986.
177. Morgan, RV: *Handbook of Small Animal Practice* 3rd ed., WB Saunders Co., Philadelphia, PA, 1254, 1997.
178. Narins. RG, Cohen, JJ: Bicarbonate therapy for organic acidosis: The case for its continued use. *Ann Intern Med* 106:615-618, 1987.
179. Moses, BL: Cardiac arrhythmias and cardiac arrest. In: RV Morgan, Ed., *Handbook of Small Animal Practice*. 3rd ed., WB Saunders Co., Philadelphia, PA, 71-90, 1988.
180. Hall, AH, Rumack, BH: Clinical toxicology of cyanide. *Ann Emerg Med* 15(9):1067-1074, 1986.
181. Osweiler, GD, Carson, TL, Buck, WB, VanGelder, GA: *Clinical and Diagnostic Veterinary Toxicology*, Kendall/Hunt Publishing Co., Dubuque. IA, 455-459, 1985.
182. Belanger, DR, Tierney, MG, Dickinson, G: Effect of sodium polystyrene sulfonate on lithium bioavailability. *Ann Emerg Med* 21(11): 1312-1315. 1992.
183. Gfeller, RW, Messonnier, SP: *Small Animal Toxicology and Poisonings*. Mosby Inc., St. Louis, MO, 63, 373, 1998.
184. Osweiler, GD. Carson, TL, Buck, WB, VanGelder, GA: *Clinical and Diagnostic Veterinary Toxicology*. Kendall/Hunt Publishing co., Dubuque, IA, 60, 1985.

185. Andrews, AH and Humphreys, DJ: *Poisoning in Veterinary Practice*. 2nd ed. National Office of Animal Health Ltd., Middlesex. 113. 1982.
186. Hall, Al-i, Rumack, BH: Hydroxycobalamin/sodium thiosulfate as a cyanide antidote. *J Emerg Med* 5(2): 115-121, 1987.
187. Mann. KV, Travers. JD: Succimer, an oral lead chelator. *Clin Pharm* 10(12):914-922, 1991.
188. Ramsey, DT, et al.: Use of orally administered succimer (*meso*-2,3-dimercaptosuccinic acid) for treatment of lead poisoning in dogs. *J Am Vet Med Assoc* 208(3):371-375. 1996.
189. Kim, JS, Crichlow, EC, Blakley, BR: The effects of thiamine on the neurophysiological alterations induced by lead. *Vet Hum Toxicol* 32:101-105, 1990.
190. Flora, SJS, Singh, S, Tandon, SK: Thiamine and zinc in prevention therapy of lead intoxication. *J Intern Med Res* 17:68-75, 1989.
191. Coppock, RW, et al.: Evaluation of edetate and thiamine for treatment of experimentally induced environmental lead poisoning in cattle. *Am J Vet Res* 52:860-865, 1991.
192. Olsson, JM, Pruitt, AW: Management of clonidine ingestion in children. *JPediatr* 103:646-650, 1983.
193. Plumb, DC: *Veterinary Drug Handbook*, 3rd ed., Iowa State University, Ames, IA, 625-627, 1999.
194. Twedt, DC, Whitney, EL: Management of hepatic copper toxicosis in dogs. In: RW Kirk, Ed., *Current Veterinary Therapy X Small Animal Practice*. WB Saunders Co., Philadelphia, PA, 891, 1989.
195. Morgan, RV: *Handbook of Small Animal Practice*. WB Saunders Co., Philadelphia, PA, 1373, 1997.
196. Plumb, DC: *Veterinary Drug Handbook* 3rd ed., Iowa State University, Ames, IA, 651-652, 1999.
197. Roberge, Ri, McOujre, SP, Krenzelok, EP: Yohimbine as an antidote for clonidine overdose. *J Emerg Med* 14:678-680, 1996.

TABLE 3. SOURCES OF VETERINARY ANTIDOTES

Abbott Laboratories 100 Abbott Park Road Abbott Park, IL 60064 1-800-633-9110	Antivenin Production Laboratory Arizona State University Dept. of Microbiology Tempe, AZ 85282 1-480-965-6443	Bristol-Myers Squibb Co. PO Box 4500 Princeton, NJ 08543 1-609-897-2000
Agri Laboratories Ltd. 20927 State Route K PO Box 3103 St. Joseph, MO 64505 1-800-542-8916	Arm & Hammer Division Church & Dwight Co. Inc. 469 N. Harrison St. Princeton, NJ 08543 1-609-683-5900	Butler Animal Health 5600 Blazer Pkwy Dublin, OH 43017 1-800-551-3861
AgriPharm 4869 East Raines Rd. Memphis, TN 38175 1-901-366-4442	Aspen Veterinary Resources Inc. 3155 Heartland Drive Liberty, MO 64068 1-816-415-4324	Centaur Inc. PO Box 25667 Overland Park, KS 66225 1-800-236-6180
Air Products & Chemicals Inc. 7201 Hamilton Rd. Allentown, PA 18195 1-610-481-4911	Astellas Pharma U.S., Inc. 3 Parkway North Deerfield, IL 60015 1-847-317-8800	Center for Disease Control 1600 Clifton Road NE Atlanta, GA 30333 1-770-488-7100
Aldrich Chemical Co. Sigma Aldrich Corp. 1001 West St. Paul Avenue Milwaukee, WI 53233 1-800-558-9260	Baxter Healthcare Corporation Hyland Division 550 North Brand Blvd. Glendale, CA 91203 1-800-423-2090	Cibageneva Pharmaceuticals Novartis Pharmaceuticals 59 Route 10 East Hanover, NJ 07936 1-888-669-6682
Alpharma Inc. Animal Health Division One Executive Drive Ft. Lee, NJ 07024 1-800-221-5398	Bayer Healthcare LLC. Animal Health Division PO Box 390 Shawnee Mission, KS 66201 1-800-633-3796	Ciba-Geigy Corp. Novartis Pharmaceuticals 556 Morris Ave. Summit, NJ 07901 1-908-277-5000
American Reagent Laboratories Inc. One Luitpold Dr. Shirley, NY 11967 1-631-924-4000	Bedford Laboratories Division Ben Venue Laboratories, Inc. 300 Northfield Road Bedford, OH 44146 1-800-562-4797	Colorado Serum Co. 4950 York St. PO Box 16428 Denver, CO 80216 1-800-525-2065
Anthony Products Company 10502 NW Ambassador Drive Kansas City, MO 64153 1-800-423-71 53	Biomed Inc. One Tower Lane Suite 2250 Oakbrook Terrace, IL 60181 1-630-928-0361	Crystal Chemical Inter- America 6262 Bird Rd. Suite 2E Miami, FL 33155 1-305-662-7640

Daniels Pharmaceuticals Inc.
2517 25th Avenue North
St. Petersburg, FL 33713
1-813-323-5151

David Bull Laboratories Inc.
Warwick, UK
USA Distribution Center
8777 E. Vista Drive
Scottsdale, AZ 85250
1-602-951-9500

Dey Inc.
2751 Napa Valley
Corporation Drive
Napa, CA 94558
1-800-755-5560

Dupont Pharmaceuticals
Company
Chestnut Run Plaza
Hickory Run
PD Box 80723
Wilmington, DE 19880
1-800-474-2762

Durvet Inc.
100 SE Magellan Dr.
PO Box 279
Blue Springs, MO 64014
1-800-821-5570

Eli Lilly and Company
Lilly Corporate Center
Indianapolis, IN 46285
1-800-545-5979

Elkins-Sinn, Inc.
2 Easterbrook Lane
Cherry Hill, NJ 08003
1-800-934-5556

Endo Pharmaceuticals Inc.
223 Wilmington West Chester
Pike
Chadds Ford, PA 19317
1-800-462-3636

Ft. Dodge Animal Health
Division of Wyeth-Ayerst
American Home Products
800 5th Street
PO Box 518
Ft. Dodge, IA 50501
1-800-685-5656

Geneva Pharmaceuticals Inc.
Division of Novartis
2655 West Midway Blvd.
Broomfield, CO 80038
1-800-525-8747

Glaxo Smith Kline
3021 Cornwallis Rd
Research Triangle Park, NC
27709
1-800-387-7374

Glaxo Wellcome Inc.
Five Moore Drive
Research Triangle Park, NC
27709
1-888-825-5249

Glenwood Inc.
82 North Summit Street
Tenafly, NJ 07670
1-800-542-0772

HJ Heinz Co.
600 Grant Street
Pittsburgh, PA 15219
1-412-456-5700

Hynson, Westcott & Dunning,
Inc.
Becton Dickenson and Co.
Charles and Chase Streets
Baltimore, MD 21201
1-301-837-0890

ICN Pharmaceuticals Inc. ICN
Plaza
3300 Flyland Avenue
Costa Mesa, CA 92626
1-800-548-5100 ext.353

International Medication
System Ltd.
1886 Santa Anita Ave.
South Elmonte, CA 91733
1-800-423-4136

Instituto Nacional de Salud
Avenida Huaylas Cdra 22
Chorrillos
Lima-9, Peru
51-1-467-0552

Instituto Nacional de Salud
Avenida Eldorado
Carrera 50, A.A.80080
Santa fe de Bogota,
Columbia
571-222-0577 ext. 491-418

Intervet Inc.
29160 Intervet Ln.
Millsboro, DE 19966
1-800-992-8051

IVX Animal Health Inc.
3915 S. 48th Street Terrace
St Joseph, MO 64503
1-800-759-3664

Knox Company
Nabisco Inc.
PC Box 303
Parsippany, NJ 07054-0303
1-800-566-9435

Kraft Foods, Inc.
Box JOG-BC
Rye Brook, NY 10573
1-800-431-1001

Kripps Pharmacy Ltd.
5413 West Blvd.
Vancouver, British Columbia,
CAN V6M 3W5
1-604-687-2564

Lederle Standard Products
PO Box 41502
Philadelphia, PA 19101
1-800-964-5836

Lloyd, Inc.
604 West Thomas Ave.
PD Box 130
Shenandoah, IA 51601
1-800-831-0004

Mallinckrodt Inc.
675 McDonnell Blvd.
St. Louis, MO 63134
1-800-325-8888

Martindale Pharmaceuticals
Bampton House, Bampton
Rd.
RM 38UG Romford, UK
1-800-137-6271

Mds Inc.
100 International Blvd.
Toronto, CANON, Canada
1-416-675-7661

Merck, Sharp & Dohme
Division
Merck & Co., Inc.
West Point, PA 19486
1-800-672-6372

MGI Pharma Inc.
5775 W. Old Shakopee Rd.
Suite 100
Bloomington, MN 55437
1-952-346-4700

Neogen Corporation
628 Winchester Road
Lexington, KY 40505
1-800-525-2022

Novartis Animal Health Inc.
1447 140th Street
Larchwood, IA 51241
1-800-843-3366

Novartis Pharmaceutical
Corp.
59 Route 10
East Hanover, NJ 07936
1-888-669-6682

Novo Nordisk
Pharmaceuticals Inc.
100 College Road West
Princeton, NJ 08540
1-800-727-6500

O'Neal, Jones & Feldman,
Inc.
O'Neal Inc.
1304 Ashby Road
St. Louis, MO 63132
1-314-997-6650

Orphan Medical Inc.
13911 Ridgedale drive
Minnetonka, MN 55305
1-800-359-4304

Paddock Laboratories, Inc.
3940 Quebec Avenue North
Minneapolis, MN 55427
1-612-546-4676

Parke-Davis
Division Pfizer Company
201 Tabor Road
Morris Plains, NJ 07950
1-800-533-4535

Pfizer Animal Health
Pfizer Inc.
235 East 42nd Street
New York, NY 10017
1-800-733-5500

Phoenix Pharmaceutical Inc.
1302 South 59 Street
St. Joseph, MO 64507
1-800-759-3644

Proctor & Gamble
Pharmaceuticals
Health Care Research Center
8700 Mason Montgomery Rd.
Mason, OH 45040
1-800-448-4878

Protherics
5214 Maryland Way
Suite 405
Brentwood, TN 37027
1-615-327-1027

Riker Laboratories Inc.
3M Pharmaceuticals
3M Center 275-2E-13
PC Box 33275
St. Paul, MN 55133
1-800-447-4537

Roche Pharmaceuticals
Roche Laboratories Inc.
340 Kingsland Street
Nutley, NJ 07110
1-800-526-6367

Roxane Laboratories Inc.
PO Box 16532
Columbus, OH 43216-6532
1-800-962-8364

Sigma Chemical Co.
Sigma-Aldrich Corp.
PO Box 14508
St. Louis, MO 63178
1-800-325-3010

Sanofi Synthelabo Inc.
90 Park Avenue
New York, NY 10016
1-800-223-1062

Star Pharmaceuticals Inc.
Division of Metagen
Pharmaceuticals
1990 N.W. 44th Street
Pompano Beach, FL 33064
1-800-845-7827

Vedco Inc.
5503 Corporate Dr.
St. Joseph, MO 64507
1-888-708-3326

Vet-A-Mix
Division of Lloyd Inc.
604 West Thomas Ave.
PO Box 130
Shenandoah, IA 51601
1-800-831-0004

Vet-Tech Inc.
100 S.E. Magellan Dr.
Blue Springs, MO 64014
1-800-821-5570

Vetus Animal Health
c/o Burns Veterinary Supply
1900 Diplomat Dr.
Farmers Branch, TX 75234
1-800-922-8767

Wallace Laboratories
PC Box 100!
Cranbury, NJ 08512
1-800-526-3840

Wildlife Pharmaceuticals
1401 Duff Drive
Fort Collins, CO 80524
1-877-883-9283

Wyeth-Ayerst
Pharmaceuticals
Division American Home
Products
PO Box 8299
Philadelphia, PA 19101
1-800-934-5556

TABLE 4. BIBLIOGRAPHY FOR VETERINARY ANTIDOTES

- Ellenhorn, MJ: *Ellenhorn 's Medical Toxicology 2nd*. Ed. Williams & Wilkins, Baltimore, MD, 1997.
- Dart, RC: *Medical Toxicology 3rd*. Ed. Williams & Wilkins, Baltimore, MD, 2004.
- Leikin, JB, Paloucek, FP: *Poisoning & Toxicology Handbook 2nd* Ed., Lexi-Comp Inc., Cleveland, OH, 1995.
- Leikin, JB, Paloucek, FP: *Poisoning & Toxicology Handbook 3rd* Ed., Lexi-Comp Inc., Cleveland, OH, 2002.
- Lacy, CF, Armstrong, LL, Goldman, MP, Lance, LL: *Drug Information Handbook* Lexi-Comp Inc. Hudson, OH, 2002.
- Inglis, S, Haussler, D, Reichert, V, Dow, J: *Compendium of Veterinary Products 10th* Ed. North American Compendiums, Inc., Pt. Huron, MI, 2007
- Ford, MD, Delaney, KA, Ling, LJ, Erickson, T: *Clinical Toxicology 1st* Ed. WB Saunders Co., Philadelphia, PA, 2001.
- Haddad, LM, Shannon. MW, Winchester, JF: *Clinical Management of Poisoning and Drug Overdose 3rd* Ed. WB Saunders Co.. Philadelphia, PA. 1998.
- Beasley, VR, Dorman, DC, Fikes, JD, Diana, SG: *A Systems Affected Approach to Veterinary Toxicology* University of Illinois, Urbana, IL, 1994.
- Klassen, CD: *Casarett and Doull's Toxicology the Basic Science of Poisons 6th* Ed. McGraw Hill, New York. NY, 2001.
- Klassen, CD: *Casarett and Doull's Toxicology the Basic Science of Poisons 5th* Ed. McGraw Hill, New York. NY, 1996.
- Klassen, CD, Amdur, MO, Doull, J: *Casarettl and Doull 's Toxicology the Basic Science of Poisons 3rd* Ed. Macmillan Publishing Co., New York, NY, 1986.
- Gfeller, RW, Messonnier, SP: *Handbook of Small Animal Toxicology* Mosby, St. Louis, MO, 1998.
- Powis, G, Hacker, MP: *The Toxicity of Anticancer Drugs* McGraw-Hill, New York, NY, 1991.
- Fowler, ME: *Veterinary Zootoxicology* CRC Press, Boca Raton, FL, 1993.

Oswailer, GD, Galey, FD: *The Veterinary Clinics of North America: Food Animal Practice Toxicology* WB Saunders Co., Philadelphia, PA, 2000.

Oswailer, GD: *Toxicology* Williams & Wilkins, Philadelphia, PA, 1996.

Murphy. MJ: *A Field Guide to Common Animal Poisons* Iowa State University Press, Ames, IA, 1996.

Lorgue, G, Lechenet, J, Riviere, A: *Clinical Veterinary Toxicology* Blackwell. Oxford, UK, 1996.

Clarke, EGC, Clarke, ML: *Garner's Veterinary Toxicology* 3rd Ed. Williams & Wilkins. Baltimore, MD, 1967.

Lewis, RA: *Lewis' Dictionary of Toxicology* Lewis Publishers, Boca Raton, FL, 1998.

Hodgson, E. Mailman, RB, Chambers, JE: *Dictionary of Toxicology* 2nd Ed. Macmillan, London, UK, 1998.

O'Neil, Mi: *The Merck Index* 13th Ed., Merck & Co., Whitehouse Station, NJ, 2001.

Budavari, Mi: *The Merck Index* 12th Ed., Merck & Co., Whitehouse Station, NJ, 1996.

Plumb, DC: *Veterinary Drug Handbook* 5th Ed.. Iowa State University Press, Ames, IA. 2005

Plumb, DC: *Veterinary Drug Handbook* 3rd . Ed.. Iowa State University Press, Ames, IA. 1999.

Plumb, DC: *Veterinary Drug Handbook* 2nd Ed., Iowa State University Press, Ames. IA, 1995.

Barragry, TB: *Veterinary Drug Therapy* Lea & Febiger, Philadelphia, PA, 1994.

Jones, LM: *Veterinary Pharmacology and Therapeutics* 3rd Ed., Iowa State University Press, Ames, LA, 1970.

Melmon, KL. Morrelli, HF, Hoffman, BB, Nierenberg. DW: *Clinical Pharmacology Basic Principles in Therapeutics* 3rd Ed., McGraw-Hill Inc., New York, NY. 1992.

Goodman, LS, Gilman, A: *The Pharmacologic Basis of Therapeutics* 3rd Ed., Macmillan Co., New York, NY, 1967.

Hardman, JO. et al: *Goodman and Gilman's The Pharmacologic Basis of Therapeutics* 9th Ed., McGraw-Hill, New York, NY, 1996.

Booth, NH. McDonald, LE: *Veterinary Pharmacology and Therapeutics* 8th Ed., Iowa State University Press, Ames, IA, 1988.

Oswailer, GD, Carson, TL, Buck, WB, Van Gelder, GA: *Clinical and Diagnostic Veterinary Toxicology* 3rd Ed., Kendall/Hunt Publishing, Dubuque, IA, 1985.

- Andrews, AH, Humphreys, DJ: *Poisoning in Veterinary Practice* 2nd Ed., Nat'l Office of Animal Health Ltd., Middlesex, UK. 1982.
- Burrows, GE: *The Veterinary Clinics of North America Food Animal Practice Clinical Toxicology* WB Saunders Co., Philadelphia, PA, 1989.
- Burrows, GE, Tyrl, Ri: *Toxic Plants of North America* Iowa State University Press, Ames, IA, 2001.
- Kingsbury, JM: *Poisonous Plants of the United States and Canada* Prentice-Hall Inc., Englewood Cliffs, NJ, 1964.
- Cheeke, PR: *Natural Toxicants in Feeds, Forages, and Poisonous Plants*, 2nd Ed., Interstate Publishers, Danville, IL, 1998.
- Beasley, VR: *The Veterinary Clinics of North America Small Animal Practice Pesticides* WB Saunders Co., Philadelphia, PA, 1990.
- Rakel, RE: *1995 Conn 's Current Therapy* WB Saunders, Philadelphia, PA, 1995.
- Morgan, RV: *Handbook of Small Animal Practice* 3rd' Ed., WE Saunders Co., Philadelphia. PA. 1997.
- Orsini. JA, Divers, TJ: *Manual of Equine Emergencies Treatment & Procedures* WB Saunders Co.. Philadelphia, PA, 1998.
- Howard, JL, Smith, RA: *Current Veterinary Therapy 4: Food Animal Practice*, WB Saunders, Philadelphia, PA, 1999.
- Howard, JL: *Current Veterinary Therapy Food Animal Practice* WB Saunders Co., Philadelphia, PA, 1981.
- Robinson, NE: *Current Therapy in Equine Medicine 5*, WB Saunders, Philadelphia, PA, 2003.
- Robinson, NE: *Current Therapy in Equine Medicine 3*, WB Saunders, Philadelphia, PA, 1992.
- Papich, MG: *Saunders Handbook of Veterinary Drugs* 2nd Ed. Saunders Elsevier, St. Louis, MO 2007.
- Bonagura, JD, Kirk, RW: *Current Veterinary Therapy XII: Small Animal Practice*, WB Saunders, Philadelphia, PA, 1995.
- Poppenga, RH, Volmer, PA: *The Veterinary Clinics of North America: Small Animal Practice Toxicology*, WB Saunders, Philadelphia, PA 2002
- Plumlee, KH: *Clinical Veterinary Toxicology*, Mosby, St. Louis, MO, 2004.

Flanagan, RJ, Jones, AL: *Antidotes*, Taylor & Francis, London, UK, 2001.

Pugh, DG: *Sheep & Goat Medicine*, Saunders, Philadelphia, PA, 2002.

Gupta, RC: *Veterinary Toxicology: Basic and Clinical Principles*, Academic Press, New York, NY, 2007.

Peterson, ME, Talcott, PA: *Small Animal Toxicology*, WB Saunders, Philadelphia, PA, 2001.

Peterson, ME, Talcott, PA: *Small Animal Toxicology* 2nd Ed., Elsevier Saunders, St. Louis, MO, 2006.

Dart, RC, Hurlbut, KM, Kuffner, EK, Yip, L: *The 5 Minute Toxicology Consult*, Lippincott Williams & Wilkins, Philadelphia, PA, 2000.

Brown, CM, Bertone, JJ: *The 5 Minute Veterinary Consult Equine*, Lippincott Williams & Wilkins, Baltimore, MD, 2002.