**CALCIUM CHANNEL BLOCKERS**

Calcium channel blockers (eg, diltiazem, amlodipine, nifedipine, verapamil) inhibit movement of calcium from extracellular sites through cell membrane–based calcium channels. The most common signs seen with overdoses of calcium channel blockers are hypotension, bradycardia, GI upset, noncardiogenic pulmonary edema, and heart block. Reflex tachycardia may develop in response to the drop in blood pressure.

Management of an acute overdose includes correcting hypotension and rhythm disturbances. In general, emesis is induced within 2 hr of ingestion only if the animal is showing no clinical signs. Induction of emesis in animals with signs can increase vagal tone and worsen the bradycardia. Activated charcoal binds unabsorbed drug in the GI tract and is most useful when administered within the first few hours after ingestion; if a sustained-release product was ingested, repeat doses of activated charcoal every 4–6 hr for a total of 2–4 doses can provide additional benefit. Specific therapies should be instituted based on blood pressure, heart rate, ECG, and blood chemistry profiles. IV fluids are recommended; calcium gluconate (10% solution at 0.5–1.5 mL/kg, slow IV) should be added while monitoring the ECG closely. Atropine (0.02–0.04 mg/kg) can be given for bradycardia; isoproterenol can be used if the ECG indicates atrioventricular block. For persistent hypotension not corrected by administration of IV fluids, synthetic colloids (Hetastarch), dopamine (1–20 mcg/kg/min), or dobutamine (2–20 mcg/kg/min) can be given via continuous IV infusion. A temporary cardiac pacemaker may be needed in cases of severe cardiac conduction disturbances unresponsive to medical therapy. Calcium channel blockers may interact with almost any other cardioactive medication, resulting in more profound bradycardia, hypotension, and depression of cardiac contractility. Because of the lipophilic nature of calcium channel blockers, using IV lipid emulsion solution (IntralipidTM 20% solution) may help sequester calcium channel blockers in overdose situations and prevent them from reaching their site of action. The recommended dose of 20% lipid emulsion solution in dogs is 1.5 mL/kg, IV, as an initial bolus followed by 0.25 mL/kg/min for 30–60 min. This dose can be repeated in 6 hr for a total of three treatments. Serum color and response should be monitored. If serum color is yellow, repeating the dose should be delayed until it becomes clear. If no response is seen after three doses, lipid emulsion should be discontinued. Hyperlipidemia, infection, intravascular hemolysis, lack of efficacy, and embolism are potential adverse effects associated with IV lipid emulsion therapy. The use of IV lipid emulsion for the treatment of some lipophilic drug overdoses is experimental and should be considered only if other conventional treatment options fail. Efficacy and safety of IV lipid emulsion has not been studied.

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