

+ EMERGENCY ACTION GUIDELINES

BETA-2 AGONIST POISONING

THE FACTS ABOUT BETA-2 AGONISTS^{1,2,4}

Background information:

- Widely used for treatment of asthma /chronic obstructive pulmonary disease in humans and horses.
- Typically administered to humans by inhalation via a dry-powder, soft mist or metered dose inhaler (MDI) which contains a propellant gas
- Also available in oral formulations, and in oral granules/liquid for horses (clenbuterol)
- Toxicity usually due to chewing & puncturing an inhaler leading to rapid absorption through transmucosal, inhalation +/-ingestion exposure
- 'Empty' inhalers may still contain enough product to cause clinical signs

Active ingredients in human asthma inhalers:

- May contain one or a combination of active ingredients⁸
- **β-2 agonists:** albuterol/salbutamol, formoterol, indacaterol, olodaterol, salmeterol, terbutaline
- Muscarinic antagonists: ipratropium, acclidinium, glycopyrronium, tiotropium, umeclidinium
- Corticosteroids: beclometasone, budesonide, ciclesonide, fluticasone, mometasone

Mode of Action:

- β-2 receptors are present in vascular, uterine, gastrointestinal and airway smooth muscles; β-1 receptors are found in the heart

At therapeutic concentrations:

- β-2 agonists are selective for β-2 receptors, causing bronchial dilation

At higher doses:

- Stimulate β-2 receptors in arterioles causing systemic hypotension, inducing reflex tachycardia
- β-1 receptors also activated - positive chronotropic and inotropic effects
- Drive circulating potassium into cells, causing transient hypokalaemia without reducing total body potassium

β-2 AGONIST EXPOSURE

SYMPTOMATIC

ASSESS CLINICAL SIGNS^{1,2,3}

Onset typically 1-3 hours.

- Tachycardia, tachyarrhythmias
- Tachypnoea/hyperpnoea/panting
- Lethargy/depression

- Vomiting
- Tremors/agitation/anxiety/seizures
- Hypotension
- PU/PD, weakness, collapse, pyrexia

Cold thermal injury (rare) from release of compressed gas may have delayed onset (up to 24 hours) : facial/oral inflammation, oedema of palate/pharynx/larynx

POSSIBLE LABORATORY FINDINGS

- Hypokalaemia (common)
- Hyperglycaemia (transient)
- Metabolic acidosis (2y to hypokalaemia)
- Hyperlactataemia
- Hypophosphataemia (transient)

TARGETED TREATMENT^{1, 2, 3, 4, 5, 6, 7, 9}

Treat tachycardia

- β-blocker indicated if severe (>180bpm) or prolonged tachycardia, or reduced cardiac output
- **Propranolol** (preferred as non-selective: β-1 and β-2 activity) 0.02 – 0.06mg/kg slow IV, repeat as needed

If not available:

- **Esmolol** 0.25mg/kg IV bolus twice, then 0.01-0.05 mg/kg/min CRI
- **Atenolol:** 0.2-2mg/kg po q 12 hours

If arrhythmias persist despite β-blocker consider treatment:

- **Lidocaine** 2mg/kg iv bolus then 25mcg/kg/min CRI

Treat hypokalaemia

- β-blockers impair K⁺ uptake into cells, helping normalise serum K⁺
- Supplement K⁺ with caution & monitor closely for rebound hyperkalaemia
- If serum K⁺ <2.5mEq/l add **KCl** max 0.5mEq/kg/h IV

Support circulation

- **IV fluids** (balanced crystalloid) to maintain blood pressure (hypotension risk) without exacerbating hypokalaemia
- If refractory hypotension (uncommon) consider dopamine or phenylephrine

Control tremors/anxiety/seizures

- **Ziapam**[®] (diazepam) 0.5 – 1mg/kg slow IV
- Note: Propranolol may slow the metabolism of diazepam

ASYMPTOMATIC

RECENT ORAL INGESTION?^{3,8}

INDUCE EMESIS

IN CASE OF ORAL INGESTION (WITHIN 30 MINS)
NOT INDICATED FOR INHALER EXPOSURE (RAPID ABSORPTION)

Dogs: Emedog[®] @ 0.1mg/kg SC

Cats: alpha 2 agonist⁵

ADMINISTER ACTIVATED CHARCOAL (AC) IF NO CONTRAINDICATIONS

Carbodote Prime[®] or Carbodote Liquid[®]: single oral administration.

(Refer to packaging for instructions on how much to administer).

MONITOR^{2,3,4,5}

- Blood pressure and heart rate (continuously or every 1-2 hours)
- Arrhythmias

PROGNOSIS^{1,3,5}

- Recovery over 24-48 hours
- Generally good prognosis
- Guarded prognosis if severe tachycardia (risk of persistent cardiac injury)

THIS DOCUMENT IS INTENDED FOR USE AS A GUIDELINE ONLY. DOSES ARE REFERENCED AS AT THE PUBLICATION DATE. INDIVIDUAL CASES AND TOXIC DOSES MAY VARY.

+ USEFUL CONTACTS

DÔMES PHARMA

Your partner in poisoning.

www.domespharma.co.uk | T 0800 0385868 | E help@domespharma.com

VETERINARY POISONS INFORMATION SERVICE (VPIS)

Dedicated poisoning information service.

www.vpisglobal.com | T 0207 30 55 055

TOX BOX/ELIXIR SERVICE

Immediate access to emergency poisoning products.

www.vpisglobal.com | T 0207 30 55 055

+ PRODUCTS

EMEDOG[®]

- Veterinary licensed apomorphine for dogs
- Packs of 5 or 20x 1ml vials, with a 4-year, unopened shelf life



ZIAPAM[®]

- The first veterinary licensed injectable diazepam for dogs and cats
- Packs contain 6 x 2ml vials of 5mg/ml



+ DON'T FORGET ACTIVATED CHARCOAL!

- Activated charcoal helps in the adsorption of multiple undesirable substances⁵
- Available as liquid or gel
- Repeated administrations will be required for substances that are enterohepatically recycled
- Take a look at our range of activated charcoals

THE CARBODOTE
Carbodote is a complementary feed.



THE ANTI-TOX RANGE
BE PREPARED FOR POISONING

TO FIND OUT MORE ABOUT THE ANTI-TOX RANGE FROM DÔMES PHARMA,
VISIT **WWW.DOMESPHARMA.CO.UK**

DP | DÔMES PHARMA

Carbodote is a complementary feed. **Emedog[®], 1 mg/ml, solution for injection for dogs** contains Apomorphine. Legal category **POM-V**. For the induction of emesis in dogs. **Ziapam[®] 5mg/ml solution for injection for cats and dogs** contains Diazepam. Legal category **POM-V**. In cats and dogs for the short-term management of convulsive disorders and skeletal muscle spasms of central and peripheral origin. As part of a pre-anaesthetic or sedation protocol. For further information and to view the full Summary of Product Characteristics, please contact TVM-UK Animal Health Ltd, Kirtlington Business Centre, Slade Farm, Kirtlington, Oxfordshire, UK. OX5 3JA. Tel. 0800 0385868. Email help@domespharma.co.uk. Dômes Pharma is the trading name of TVM UK Animal Health Ltd. *Registered trademark of Dômes Pharma Group Companies. **Use Medicines Responsibly. www.noah.co.uk/responsible. Prescription decisions are for the person issuing the prescription alone.** **References:** 1. Crouchley J & Bates N (2022) Retrospective evaluation of acute salbutamol (albuterol) exposure in dogs: 501 cases. J Vet Emerg Crit Care 32: 500-506. 2. Meroni E R et al (2021) Retrospective evaluation of albuterol inhalant exposure in dogs: 36 cases (2007-2017) J Vet Emerg Crit Care 31: 86-93. 3. Bates N (2023) Salbutamol toxicosis in dogs. The Vet Nurse 14 (10) 446-451. 4. Guida S J & Bazzle L (2023) Rebound hyperkalaemia in a dog with albuterol toxicosis after cessation of potassium supplementation J Emerg Crit Care 33: 715-721. 5. BSAVA/VPIS Guide to Common Canine & Feline Poisons (2012). 6. Bough M (2001) Airing the dangers of albuterol exposure in dogs. Vet Tech (June) 305-307. 7. Ochs, H R et al (1984) Propranolol interactions with diazepam, lorazepam and alprazolam. Clin Pharm & Ther 36(4) 451-455. 8. Murphy, A (2014) Respiratory Inhalers https://www.pcrs-uk.org/sites/default/files/ResphalerTable_FINAL_0.pdf [accessed Aug 2026] 9. BSAVA Formulary 12th Ed. (2026) Part A: Canine & Feline