Table 1 Drugs, food and xenobiotics, therapeutic indications, mechanism of action, toxic effects, toxic mechanism of action, treatment of intoxication and main form of exposure in cats

Medicine Name	Therapeutic Indication	Mechanism of pharmacologic al action	Toxic effects	Toxic mechanism of action	Treatment of intoxication	Main form of intoxication	Reference
Cyclophosphamide	Treatment of lymphoma, leukemia, squamous cell carcinoma and other neoplastic diseases in cats.	It is an alkylating agent that interferes with cellular DNA replication, leading to the death of rapidly proliferating cells.	Bone marrow suppression, immunosuppressio n, nausea, vomiting, diarrhea, mucositis, bladder bleeding, infertility, carcinogenicity.	Cyclophosphamide metabolism generates toxic metabolites that can damage bladder cells and cause bleeding.	Symptomatic treatment with supportive measures, nausea and vomiting control, hematological monitoring, measures to prevent bladder irritation	Accidental ingestion or excessive use in cancer treatment.	Leo et al., ³⁹ ; Limmer et al., ⁴⁰ ; Lee et al., ³⁴
Doxorubicin	Treatment of lymphomas, carcinomas, and sarcomas.	Inhibition of DNA and RNA synthesis.	Cardiotoxicity, myelosuppression	Generation of free radicals and oxidative stress.	Symptomatic support, treatment of cardiotoxicity.	Excessive administration or in animals with liver or kidney dysfunction.	Oberthaler et al., ³⁵ ; Ayla et al., ³⁶ ; Reiman; Mauldin; Neal Mauldin, ³⁷ ; Poirier et al., ³⁸ ; ³⁹
Methimazole	Treatment of feline hyperthyroidism	Inhibition of thyroid hormone production.	Anemia, thrombocytopenia, hepatopathy, nephropathy, dermatopathy.	Accumulation of toxic metabolites.	Fluid therapy, symptomatic support.	Excessive administration.	Hoffman; Yoder; Trepanier, ⁴⁰ ;

Ibuprofen	Analgesia and anti- inflammatory	Non-selective COX inhibitor	Acute kidney injury, gastrointestinal ulceration and liver damage	COX-1 and COX-2 inhibition, increased free radical production	Induction of vomiting, activated charcoal, symptomatic support and treatment of dehydration	Accidental ingestion or inappropriate administration	Parton et al., ⁴¹
Aspirin (acetylsalicylic acid))	Analgesic, anti- inflammatory and antipyretic	Inhibition of prostaglandin synthesis by irreversible inhibition of cyclooxygenase (COX-1 and COX-2)	Gastrointestinal ulcers, gastrointestinal bleeding, nephrotoxicity, hepatotoxicity, hemostatic disorders	Inhibition of COX-1 which leads to reduced production of vasodilator and antiplatelet prostaglandins, as well as increased production of vasoconstrictor and procoagulant thromboxane A2	Immediate drug discontinuatio n, monitoring and symptomatic treatment, nutritional support, blood transfusion and hemostatics, fluid and electrolyte therapy, urinary alkalinization in cases of renal failure	Accidental ingestion or excessive administration of the drug	Parton et al., ⁴¹
Acetaminophen	Analgesic and antipyretic	Inhibition of prostaglandin synthesis	Hepatic metabolism in cats resulting in toxicity	Hepatic metabolism in cats resulting in formation of toxic metabolites that damage liver cells	Detoxification with N- acetylcysteine; symptomatic treatment	Oral intake of medications or products that contain acetaminophen	Yoon et al., ⁴² ; Webb et al., ⁴³ ; "Acetaminophen", ⁴⁴

Corticosteroids	Anti- inflammatory and immunosuppress ive	Inhibits the production and release of inflammatory substances such as histamine and prostaglandins	Suppression of the immune system, polyuria, polydipsia, increased susceptibility to infections, among	Inhibition of the arachidonic acid cascade leads to reduced production of vasodilator prostaglandins and antiplatelet agents, as well as increased production of vasoconstrictor and procoagulant thromboxane A2, lipid mobilization, glucose mobilization among others	Symptomatic and supportive, in cases of acute intoxication, gastrointestina l, hepatic and	Therapeutic overdose, prolonged use, chronic administration of high doses	Behrend; Kemppainen, ⁴⁵ ; Osborne et al., ⁴⁶
Amitriptyline	Behavioral disorders	Inhibits the reuptake of serotonin and noradrenaline	Lethargy, tremors, convulsions, coma	Inhibition of neurotransmitter reuptake	Seizure control, supportive therapy	Accidental ingestion or prolonged exposure	Rusbridge et al., ⁴⁷ ; Thomas; Lee; Hovda, ⁴⁸
Clomipramine	Behavioral disorders	Inhibits serotonin reuptake	Lethargy, tremors, convulsions, coma	Inhibition of neurotransmitter reuptake	Seizure control, supportive therapy	Accidental ingestion or prolonged exposure	Lainesse et al., ⁴⁹
Imipramine	Behavioral disorders	Inhibits the reuptake of serotonin and noradrenaline	Lethargy, tremors, convulsions, coma	Inhibition of neurotransmitter reuptake	Seizure control, supportive therapy	Accidental ingestion or prolonged exposure	Boeck; Jørgensen; Fredricson Overø, ; ⁵⁰ Clineschmidt, ⁵¹ ; Kline et al., ⁵²
Amitraz	Ectoparasiticide	Alpha-2 adrenergic receptor agonist	Lethargy, hypothermia, bradycardia, coma	Alpha-2 adrenergic receptor stimulation	Atropine, glucocorticoid s, fluid therapy	Topical exposure or accidental ingestion	Andrade et al.; do Monte Barretto et al.; Filazi and Yurdakok- Dikmen, ^{53–55}

Fluoxetine	Behavioral disorders	Inhibits serotonin reuptake	Tremors, hyperactivity, seizures	Inhibition of neurotransmitter reuptake	Seizure control, supportive therapy	Accidental ingestion or prolonged exposure	Pasloske; Greenfield, ⁵⁶ ; Pugh et al., ⁵⁵
Diazepam	Anxiety, seizures, sedation	GABA-A receptor agonist, which enhances the action of the neurotransmitter GABA	Muscle weakness, respiratory depression, coma	Potentiation of GABA action and reduction of neuronal activity	Hospitalizatio n for detoxification, respiratory and cardiovascular support, administration of flumazenil	Accidental ingestion or prolonged exposure to high therapeutic doses	Nagy and Decsi, 127
Alprazolam	Anxiety, behavioral disorders	GABA-A receptor agonist, which enhances the action of the neurotransmitter GABA	Ataxia, sedation, bradycardia, hypothermia	Potentiation of GABA action and reduction of neuronal activity	Hospitalizatio n for detoxification, respiratory and cardiovascular support, administration of flumazenil	Accidental ingestion or prolonged exposure to high therapeutic doses	Campbell; Chapman, ⁵⁷
Lorazepam	Anxiety, sedation, seizures	GABA-A receptor agonist, which enhances the action of the neurotransmitter GABA	Sedation, ataxia, hypothermia, hypotension	Potentiation of GABA action and reduction of neuronal activity	Hospitalizatio n for detoxification, respiratory and cardiovascular support, administration of flumazenil	Accidental ingestion or prolonged exposure to high therapeutic doses	Volkow et al., ¹²⁸
Paracetamol	Analgesic and antipyretic	Inhibition of cyclooxygenase enzyme	Difficulty breathing, facial oedema, vomiting, diarrhea, jaundice, central nervous system depression	Accumulation of toxic metabolites in the liver	Supportive treatment, administration of N- acetylcysteine	Accidental ingestion or administered in high doses	Court; Greenblatt, ⁵⁹ ; Dorigon; Almeida; Costa, ⁵⁸ ; Serious; Boag, ⁶⁰

5-fluorouracil (5-FU)	Chemotherapy for cancer	Inhibition of thymidylate synthase, which leads to inhibition of DNA synthesis	Myocarditis, liver failure, spinal cord depression, seizures	Inhibition of DNA synthesis in normal and cancerous cells	Symptomatic support, intensive care, antidote administration	Incorrect administration, accidental ingestion, or prolonged exposure to high therapeutic doses	Okeda et al., ⁶¹
Propofol	Induction and maintenance of general anesthesia	GABA-A receptor agonist, resulting in central nervous system inhibition	Respiratory depression, hypotension, cardiac arrhythmias, pain and inflammation at the site of administration	Potentiates the central inhibitory action of gammaaminobutyr ic acid on its type A receptor, blocks the ion channel in cerebral cortical tissue and central nicotinic receptors, and exerts an inhibitory effect on lysophosphatidate signaling at lipid	Supportive treatment, assisted ventilation, control of hypotension and arrhythmias	Accidental overdose or error in administration	Taylor et al., ¹²⁹
Ketamine	Induction and maintenance of general anesthesia	Non- competitive NMDA receptor blocker, resulting in analgesia, sedation, and	Agitation, hallucinations, excessive salivation, tachycardia, hypertension, seizures, and	Mon-competitive antagonist of the glutamatergic receptor of the NMDA type (N-methyl-D-aspartate - NMDAR),	Supportive treatment, control of arousal, seizures, and respiratory depression	Accidental overdose or error in administration	Fukushima et al., ⁶²
		anesthesia	respiratory depression	characteristic responsible for its primary therapeutic effects, thus, ketamine	depression		

prevents the actions of glutamate on NMDAR.

Isoflurane	Induction and maintenance of general anesthesia	GABA-A receptor agonist, resulting in central nervous system inhibition	Respiratory depression, hypotension, cardiac arrhythmias, increased intracranial pressure, cardiac sensitization to catecholamines	Toxic effects caused by the hepatic metabolism product of CYP450 by alphacarbon oxidase and isoenzymes 2E1 and 3A.	Supportive treatment, assisted ventilation, control of hypotension and arrhythmias	Accidental overdose or error in administration	Hikasa et al.; Mader et al.; Pypendop and Ilkiw, ^{63,64,66}
Sevoflurane	Induction and maintenance of general anesthesia	GABA-A receptor agonist, resulting in central nervous system inhibition	Respiratory depression, hypotension, cardiac arrhythmias, increased intracranial pressure, cardiac sensitization to catecholamines	Toxic effects caused by the hepatic metabolism product of CYP450 by alphacarbon oxidase and isoenzymes 2E1 and 3A.	Supportive treatment, assisted ventilation, control of hypotension and arrhythmias	Accidental overdose or error in administration	Hikasa et al., ⁶⁶ ; Körner et al., ⁶⁵
Midazolam	Sedation, anxiolysis, anticonvulsant and preanesthetic	GABA-A receptor agonist, resulting in central nervous system inhibition	Respiratory depression, hypotension, ataxia, paradoxical arousal	Potentiation of GABA action and reduction of neuronal activity	Supportive treatment, control of paradoxical arousal and respiratory depression	Accidental overdose or error in administration	Dholakia et al.; Nishiyama et al.; Yaksh and Allen, ^{67,133,68}

Acepromazine	Sedation, reassurance, pre- anesthesia	D2 dopamine receptor agonist	Hypotension, hypothermia, respiratory depression	Blockade of dopamine nerve receptors in the CNS	Supportive and symptomatic treatment	Overdosage, accidental ingestion	Boland and Angles; Peres-Gomes and Ribeiro, ^{69,70}
Butorphanol	Analgesia, sedation, pre- anesthesia	Partial μ-opioid receptor agonist and κ-opioid receptor antagonist	Hypotension, bradycardia, respiratory depression, nausea, vomiting	Its molecule has phenanthrenic structure, which acts as an agonist of kappa opioid receptors, partial agonist of sigma receptors and partial agonist with low activity and high affinity for MU opioid receptors (MU antagonist), the latter effect explains its slight potential to produce respiratory depression.	Supportive and symptomatic treatment	Overdosage, accidental ingestion	Hannah, ⁷¹ ; Robertson; Taylor, ⁷²
Dexmedetomidine	Anaesthesia	Selective α2 receptor agonist	Bradycardia, hypotension	Hyperpolarization of noradrenergic neurons in the cerulean locus of the brainstem (a small bilateral nucleus that contains many adrenergic receptors), which is the main site in modulating wakefulness. When the α-2	Symptomatic treatment	Overdose	Benito et al., ⁷³ ; Thawley; Drobatz, ⁷⁴

receptor is activated, it inhibits adenylate cyclase.

				cyclase.			
Norepinephrine	Hypovolemic shock	Selective α1 receptor agonist	Bradycardia, hypertension	Norepinephrine has a very potent action on alpha receptors and a more moderate effect on beta-1 receptors.	Symptomatic treatment	Overdose	Whitby; Axelrod; Weil-Malherbe, 1961. ⁷⁵
Adrenaline	Cardiopulmonar y resuscitation	α and β receptor agonist	Tachycardia, hypertension	Sympathomimetic effect with direct action on β-adrenergic receptors and less marked effect on α-adrenergic receptors.	Symptomatic treatment	Overdose	Mukherjee, ⁷⁶
Dopamine	Cardiogenic shock	α and β receptor agonist	Tachycardia, hypertension	Sympathomimetic effect with direct action on β-adrenergic receptors and less marked effect on α-adrenergic receptors.	Symptomatic treatment	Overdose	Wanke et al., ⁷⁷ ; Wiebe; Howard, ⁷⁸
Toceranib phosphate	Treatment of oral squamous cell carcinoma in cats	Tyrosine kinase inhibitor for the treatment of oral squamous cell carcinoma in cats	Toxicity in cats with oral squamous cell carcinoma	Inhibitor of tyrosine kinase receptors belonging to the split-kinase family, which include VEGFR, PDGFR\$\beta\$ and KIT receptor	Symptomatic treatment	Overdose	Merrick et al.; Wiles et al., ^{79,134}

Iodized Contrast	Diagnostic auxiliary medicine	Diagnostic aid	Cardiorespiratory arrest suspected of anaphylactic reaction	Anaphylactic hypersensitivity	Symptomatic treatment	Sensitivity to the asset	Rodrigo-Mocholí et al., ⁸⁰
Meloxicam	Analgesia, inflammation	Selective COX-2 inhibitor	Acute renal failure	Inhibition of prostaglandin E2	Fluid therapy, renal support	Oral ingestion, overdose	Lascelles et al., 135
Carprofen	Analgesia, inflammation	Non-selective COX-1/COX-2 inhibitor	Acute renal failure	Inhibition of prostaglandin E2	Fluid therapy, renal support	Oral ingestion, overdose	Balmer et al.; Steagall et al., ^{81,82}
Ketoprofen	Analgesia, inflammation	Non-selective COX-1/COX-2 inhibitor	Acute renal failure	Inhibition of prostaglandin E2	Fluid therapy, renal support	Oral ingestion, overdose	Robertson and Taylor, ⁸³
Firocoxib	Analgesia, inflammation	Selective COX-2 inhibitor	Acute renal failure	Inhibition of prostaglandin E2	Fluid therapy, renal support	Oral ingestion, overdose	Phuwapattanachart and Thengchaisri, 84
Deracoxib	Analgesia, inflammation	Selective COX-2 inhibitor	Acute renal failure	Inhibition of prostaglandin E2	Fluid therapy, renal support	Oral ingestion, overdose	

Medicinal products with tolerable toxicity in cats	Therapeutic indication	Mechanism of pharmacological action	Toxic effects	Mechanism of toxic action	Treatment of intoxication	Main form of intoxication	Reference
GS-441524	FIP (Feline Infectious Peritonitis)	Inhibition of viral replication	Not reported	Not reported	Not reported	Not reported	Plumb, 2018; Pedersen et al., 2019
MOMP (meclor- ethamine, vincristine, melphalan and prednisolone)	Lymphoma in cats	Inhibition of cell division	Myelosuppression, nephrotoxicity, neurotoxicity	Cytotoxicity by alkylation in DNA, or inhibition of mitotic spindle formation.	Symptomatic support, discontinuation of the drug, specific treatment for each toxic effect	Overdose or prolonged use	Martin and Price, ⁸⁷

Accelerated protocol for hypofractionated radiotherapy	Tumors in cats	Damage to tumor DNA	Myelosuppression, gastrointestinal toxicity	Burns, radiation-induced cytotoxicity	Symptomatic support, discontinuation of treatment, specific treatment for each toxic effect	Excessive dosage, prolonged treatment	Poirier et al., ⁸⁸
Photodynamic therapy (PDT)	Squamous cell carcinomas in cats	Photoactivation of photosensitizers	Pain, edema, necrosis, phototoxicity	Formation of toxic oxygen species, known as singlet oxygen and free radicals. These are highly reactive chemical specimens that damage proteins, lipids, nucleic acids, and other cellular components	Symptomatic support, discontinuation of treatment, specific treatment for each toxic effect	Phototoxicity	Buchholz et al., ⁸⁹

Common Name of the Plant	Scientific Name	Type of Toxicity	Symptoms of intoxication	Mechanism of action	Treatment of Intoxication in Cats	Main form of intoxication in Cats	Reference
Lily	Lilium spp.	Renal and Gastrointestinal	Vomiting, anorexia, lethargy, increased thirst and urination	Deposition of calcium oxalate in the renal tubules and gastrointestinal tissues	Fluid therapy, symptomatic treatment, and renal support	Ingestion of the plant or parts of the plant	Fitzgerald, 90
Azalea and Rhododendron	Rhododendron spp.	Cardiovascular and Gastrointestinal	Vomiting, diarrhea, salivation, weakness, tremors, seizures, and coma	Andromedotoxin glycosides that affect the cardiovascular system	Fluid therapy, activated charcoal and symptomatic treatment	Ingestion of the plant or parts of the plant	Milewski and Khan, ⁹¹
St. George's Sword	Sansevieria spp.	Gastrointestinal	Vomiting, diarrhea, salivation, and abdominal pain	Saponins that irritate the gastrointestinal tract	Symptomatic treatment and hydroelectrolytic support	Ingestion of the plant or parts of the plant	Filmer and Dodge, ⁹²

Me-no-one-can	Dieffenbachia	Gastrointestinal	•	Calcium oxalate crysta	• 1	ic	Ingestion of the	•
	spp.		salivation, and	that irritate that	ne treatment	and	plant or parts of	Hanedan;
			abdominal pain	gastrointestinal tract	hydroelectro	olytic	the plant	Uysal, ⁹⁴ ;
					support			Dantas et al., ⁹³
Aloe vera	Aloe vera	Gastrointestinal	Vomiting, diarrhea,	Aloin an	nd Symptomat	c	Ingestion of the	95
			anorexia,	anthraquinones th	at treatment	and	plant or parts of	
			depression, and	irritate	ne hydroelectro	olytic	the plant	
			color changes in	gastrointestinal tract	support			
			urine					

Food Name	Toxic agent	Mechanism of pharmacological action in cats	Toxic effects for cats	Mechanism of toxic action in cats	Treatment of intoxication in cats	Main form of intoxication in cats	Reference
Chocolate	Theobromine and caffeine	Inhibition of phosphodiesterase enzyme and antagonism of adenosine receptors	Hyperactivity, muscle tremors, cardiac arrhythmias, seizures, coma and death	Accumulation of theobromine and caffeine in tissues	Induction of vomiting, activated charcoal, fluid therapy, symptomatic treatment and cardiac monitoring	Ingestion of food containing chocolate	Cortinovis; Caloni, ⁹⁶ ; Gwaltney- Brant, ⁹⁵
Onion and garlic	Thiosulfate	Hemoglobin oxidation and formation of Heinz corpuscles	Anemia, lethargy, muscle weakness, vomiting, and diarrhea	Accumulation of thiosulfate in the blood	Nutritional support, blood transfusion and symptomatic treatment	Ingestion of food containing onions and garlic	Botha; Penrith, 97; COPE, 98; Cortinovis; Caloni, 96; Kovalkovičová et al., 99
Grapes and raisins	Unknown	Unknown	Vomiting, diarrhea, anorexia, abdominal pain, lethargy, muscle weakness, acute renal failure	Unknown	Induction of vomiting, gastric lavage, fluid therapy and symptomatic treatment	Ingestion of food containing grapes and raisins	Botha; Penrith, 97; Cortinovis; Caloni, 96

Milk and dairy products	Lactose	Lactose intolerance	Diarrhoea, flatulence and abdominal pain	Accumulation of lactose in the intestine	Symptomatic treatment and lactose-free diet	Excessive intake of milk and dairy products	Hau et al.; Sun et al., ^{100,137}
Caffeine and Energy Drinks	Caffeine	Inhibition of phosphodiesterase enzyme and antagonism of adenosine receptors	Hyperactivity, muscle tremors, cardiac arrhythmias, seizures, coma and death	Accumulation of caffeine in tissues	Induction of vomiting, activated charcoal, fluid therapy, symptomatic treatment and cardiac monitoring	Ingestion of caffeine- containing food and energy drinks	Haag; Woodley, ¹⁰¹
Cereal	Aflatoxin B1	Inhibition of protein synthesis and DNA damage	Anorexia, lethargy, vomiting, diarrhea, bleeding, jaundice, seizures, and death	Interaction with liver cells and production of toxic metabolites	Symptomatic treatment and nutritional support	Ingestion of food contaminated by aflatoxins	Jaynes et al., 138

Common Product Name	Toxic agent present	Mechanism of pharmacological action in cats	Toxic effects for cats	Mechanism of toxic action in cats	Treatment of intoxication in cats	Main form of intoxication in cats	Reference
Pyrethroids	Pyrethroids	Blockade of sodium channels in peripheral nerves	Tremors, convulsions, salivation, vomiting, and hyperthermia	Alteration of nerve and muscle function	Symptomatic treatment and respiratory and cardiovascular support	Ingestion or contact with products containing pyrethroids	Melo; Olive Tree; Lake, ¹⁰²
Cleaning products	Cleaning products	Irritation and corrosion of mucous membranes and skin	Irritation and lesions of the skin, eyes and mucous membranes	Direct contact with the skin and mucous membranes	Symptomatic treatment and washing with plenty of water	Direct contact with cleaning products	Addie et al., ¹⁰³ ; Campbell; Chapman, ⁵⁷ ; Malik et al., ¹⁰⁴
Bleach	Bleach	Oxidation of tissues and irritation of mucous membranes	Irritation and lesions of the skin, eyes and mucous membranes	Direct contact with the skin and mucous membranes	Symptomatic treatment and washing with plenty of water	Ingestion or direct contact with bleach	RR and Obire, ¹³⁹

Insecticides	Insecticides	Inhibition of cholinesterase, a neurotransmitter responsible for carrying the message between nerve cells	Tremors, convulsions, weakness, salivation, vomiting, and diarrhea	Alteration of nerve and muscle function	Symptomatic treatment and administration of atropine and oximes	Ingestion or contact with insecticides	Mileson et al., 105
Gardening products	Gardening products	Variable toxicity according to the product, which can cause irritation, corrosion, gastrointestinal disorders, among others	Miscellaneous, depending on the product	Miscellaneous, depending on the product	Symptomatic treatment, specific to each product	Ingestion or contact with gardening products	Lee, ¹⁰⁶
Antifreeze	Antifreeze	Damage to the kidneys, liver and central nervous system	Lethargy, weakness, lack of coordination, seizures and coma	Depression of the central nervous system and damage to internal organs	Symptomatic treatment, administration of ethanol or fomepizole to inhibit toxic metabolism	Ingestion of antifreeze with ethylene glycol	Ebrahim et al., ¹⁴⁰
White Hand	Sodium monofluoroacetate	Not used for treatments	Vomiting, tachycardia, dyspnea, and muscle weakness.	Respiratory chain decoupler	Symptomatic treatment and respiratory and cardiovascular support	Sodium Monofluoroacetate Intake	Eason and Frampton, 107