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The 2023 World Small Animal Veterinary Association (WSAVA)

list of essential medicines for cats and dogs

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BACKGROUND

The second version of the list of essential medicines is presented by members of the WSAVA Therapeutic Guidelines Group (TGG) following extensive internal and external peer-review. Internal peer-review was provided by TGG members in 2023, whereas external peer-review was performed by board-certified individuals and other WSAVA working groups. Additionally, there was a 3-month audit (January to March 2023) allowing any individual including WSAVA member affiliates to provide comments, suggestions and overall feedback. Any comment received was carefully considered by the TGG taking into consideration the definitions of core and complementary medicine. The updated (version 2) list is a product of several rounds of revision and based on expert consensus.

This list of essential medicines should allow veterinarians to provide proper preventive care and treatment of the most frequent and important diseases in dogs and cats while maintaining appropriate animal welfare standards. The purpose of the list is to improve and facilitate regulatory oversight for ensuring appropriate medicines availability, drug quality, use and pharmacovigilance, while mitigating the growing black/counterfeit market of pharmaceutical products. The list of essential medicines is not intended to define what medicines should be always available within the clinic/hospital nor a drug compendium; rather that veterinarians should have ready access to these (medicines) if required for the prevention and treatment of specific diseases and conditions. Additionally, the committee understands that there is no "one-size fits all" and that there may be specific medicines used for endemic/epidemic diseases in some countries that the list does not cover. For example, the essential antimicrobials were defined as those medicines that are recommended as first line agents for treatment of at least one common disease condition but also taking into consideration the issue of antimicrobial resistance.

DEFINITION

Essential medicines are those that satisfy the primary health care and welfare needs of cats and dogs.

USING THE LIST OF ESSENTIAL MEDICINES

The definitions of essential medicines are based on a similar list of essential medicines in human medicine by the World Health Organization (https://www.who.int/medicines/publications/essentialmedicines/en/). However, our current approach does not involve, *e.g.* extensive systematic reviews and meta-analysis to demonstrate evidence-based information for each medicine as this may not be always achievable in veterinary medicine. Medicines presented in the list may or may not be approved and/or licensed for use in veterinary medicine, which may vary from country to country. From a regulatory standpoint, the list should be adapted in accordance with specific regional or national needs and conditions. The presence of a medicine in the essential medicines list carries no assurance as to the pharmaceutical quality of products containing that medicine. It is the responsibility of the relevant national or regional drug regulatory authority to ensure that each product is of appropriate pharmaceutical quality (including stability) and that, when relevant, bioequivalent products can be interchangeable. Individuals should be also aware of potential different concentrations and formulations of each compound/medicine, and possible drug combinations present in a commercial product. Additionally, this list is not meant to be used as a reference for dosage regimens, drug interactions, indications or contraindications, adverse effects or description of pharmacologic effects. It does not describe what medicines require monitoring, specific means of disposal/elimination/record keeping or follow-up consultations as the list should not be used as guidance for therapy.

Essential medicines are presented in alphabetical order and divided by either drug category (anaesthetic, analgesics, immunomodulators, oncology drugs, sedatives, vaccines, antiparasitics and antimicrobials, including antibacterial, antifungal, antiprotozoal and antiviral drugs) or organ system/specialty (cardiorespiratory and renal, endocrinology, gastrointestinal, neurology, ophthalmology or reproduction). The essential list of medicines for dermatology is presented in other sections of the document (*e.g.* immunomodulators, antimicrobials, antiparasitics, etc.). Cross-reference between a drug category and an organ system is acknowledged where appropriate. Some veterinary specialties may not be listed as their lists of essential medicines have been merged into another drug category or organ system.

CRITERIA FOR SELECTION OF ESSENTIAL MEDICINES

Essential medicines are selected with due regard to disease prevalence and public/animal health relevance, evidence of clinical efficacy and safety, and comparative costs and cost-effectiveness. These medicines can be rarely replaced by other medicines and their absence could compromise public/animal health and welfare.

The core list presents a list of minimum medicine needs for a basic health care system, listing the most efficacious, safe and cost-effective medicines for priority conditions. Priority conditions are selected based on current and estimated future public/animal health relevance, and potential for safe and cost-effective treatment.

The complementary list presents essential medicines for priority diseases, for which advanced diagnostic or monitoring facilities, and/or advanced medical care, and/or advanced training are needed. In case of doubt, medicines may also be listed as complementary based on consistently higher cost or less attractive cost-effectiveness in a variety of settings and wide availability in the profession.

ANAESTHETIC, ANALGESIC, SEDATIVE AND EMERGENCY DRUGS

(The WSAVA Global Pain Council has published the 2022 WSAVA guidelines for appropriate recognition, assessment and treatment of pain including protocols with different drug availability – https://onlinelibrary.wiley.com/doi/10.1111/jsap.13566. The WSAVA Global Pain Council has published information on the minimum analgesic availability – https://www.wsava.org/WSAVA/media/Documents/Committee%20Resources/WSAVA-GPC-Position-minimum-analgesic-availability.pdf.)

Core list

1) α2-Adrenoceptor agonists (xylazine, medetomidine or dexmedetomidine)

Sedatives, muscle relaxants and analgesics that are used for premedication and chemical restraint with the benefit of reversibility (if an antagonist such as yohimbine, tolazoline or atipamezole is available). They are used as part of injectable protocols for spay-neuter programmes and may counteract the muscle rigidity produced by ketamine.

2) Adrenaline (epinephrine)

Inotrope and vasoactive drug used in the emergency setting during cardiac arrest and/or the management of severe systemic anaphylaxis.

3) Antagonists of α2-adrenoceptors (yohimbine, tolazoline or atipamezole)

Reversal of the effects produced by α2-adrenoceptor agonists. Reversal is often required to quicken anaesthetic recovery and manage adverse effects.

4) Anticholinergics (atropine or glycopyrrolate)

Anticholinergic drug used for the prevention or treatment of bradycardia in the perioperative period and in the emergency setting during cardiac resuscitation. Topical atropine is used in the treatment of uveitis (see ophthalmology).

5) Benzodiazepines (midazolam or diazepam)

Depressants of the central nervous system used for muscle relaxation and anti-seizure therapy. Often administered in combination with ketamine for anaesthetic induction. Midazolam can be administered intramuscularly (IM) as part of spay-neuter anaesthetic protocols.

6) Calcium gluconate or chloride

This is used for the intravenous (iv) treatment of hypocalcaemia in dogs and cats, including periparturient hypocalcaemia or as part of treatment of hyperkalaemia. Cardiovascular parameters should be monitored during administration to prevent toxicity. Calcium gluconate is preferred over calcium chloride to avoid irritation associated with perivascular administration.

7) Corticosteroids

These drugs are used for hypoadrenocorticism, inflammatory, immune-mediated and neoplastic conditions.

8) Crystalloid solutions

These are a mixture of water and electrolytes and may be hypo-, iso- or hypertonic. Isotonic fluids are commonly used to replace metabolic, procedural and ongoing losses (*i.e.* prevention and treatment of dehydration and hypovolaemia) and to provide maintenance fluid requirements and a source of electrolytes (*e.g.* dextrose 5%, sodium chloride 0.9%, balanced electrolyte solutions such as lactated Ringer's or Hartmann's solution). Hypertonic solutions (*e.g.* hypertonic saline 7.5%) can be used for the treatment of increased intracranial pressure and in cases of severe hypotension.

9) Dextrose

For emergency treatment of hypoglycaemia and fluid supplementation.

10) Dissociative anaesthetics (ketamine or tiletamine-zolazepam)

Dissociative anaesthetic with anti-hyperalgesic (*i.e.* analgesic) properties administered for induction of anaesthesia, chemical restraint and often as part of injectable protocols for spay-neuter programmes or disaster medicine. Ketamine must not be administered alone as an anaesthetic (see benzodiazepines) because it causes hypertonia and cataleptic effects (The WSAVA Global Pain Council has published information on the minimum analgesic availability https://www.wsava.org/WSAVA/media/Documents/Committee%20Resources/WSAVA-GPC-Position-minimum-analgesic-availability.pdf).

11) Inhalant anaesthetics (isoflurane, sevoflurane)

Inhalant anaesthetics have favourable pharmacokinetic profiles in terms of drug metabolism and elimination and should be preferred for long-term procedures where drug accumulation with injectable anaesthetic can compromise safety and animal welfare, or when injectable anaesthetics are not available.

12) Lidocaine

Local anaesthetic drug with antiarrhythmic (*i.e.* treatment of ventricular arrhythmias), prokinetic and analgesic properties. Widely used in several local-regional anaesthetic techniques as the first line of analgesia in acute pain management. Other local anaesthetics may be used topically (see ophthalmology).

13) Non-dissociative anaesthetic agents (propofol or alfaxalone)

General anaesthetics for iv administration. They can be used for procedural sedation, anaesthetic induction and maintenance, especially if ketamine is not available.

14) Non-steroidal antiinflammatory drugs (NSAID)

These drugs produce anti-inflammatory, antipyretic and analgesic effects that can be administered for the treatment of fever, acute and chronic pain. If one drug is to be chosen, preference should be given to a NSAID with a good safety profile that can be administered by enteral and parenteral routes of administration to both dogs and cats for short or long term. Topical NSAIDs can be used in specific conditions (see ophthalmology).

15) Opioids

First line analgesics for the treatment of acute pain in the perioperative period. These drugs are required in cases of moderate to severe pain, especially if other analgesics are contra-indicated. Otherwise, pain management is suboptimal. If one drug is to be chosen, preference should be given to opioids with good efficacy and safety profile that can be administered to both dogs and cats. Some of these drugs have regulatory approval in various national veterinary markets (*e.g.* methadone or buprenorphine).

16) Osmotic diuretic (mannitol)

Mannitol is indicated to reduce brain oedema and intracranial pressure. It is preferred to hypertonic saline because it does not require monitoring of electrolyte levels. It is also used in ophthalmology to decrease intraocular pressure associated with glaucoma.

17) Oxygen

This is used for supplemental oxygenation to prevent or treat hypoxemia and in patients with respiratory distress. It is also used as a carrier gas in volatile anaesthesia. Oxygen can be administered *via* "flow-by", facemasks, oxygen hoods or cages, nasal cannula or endotracheal intubation.

18) Potassium chloride

This is used to prevent or treat hypokalaemia. It is also used for humane euthanasia once the animal is unconscious (*e.g.* during general anaesthesia).

19) Vitamin K1

Oral (PO) and injectable formulations are used in the treatment of rodenticide (*e.g.* warfarin, pindone, bromadiolone, etc.) toxicosis, and severe liver disease or biliary obstruction (parenteral formulation).

Complementary list

1) Anti-thrombotic agents (clopidogrel, aspirin)

These medicines are used for management of diseases associated with hypercoagulability. Conditions commonly associated with a hypercoagulable state include immune-mediated haemolytic anaemia, protein losing nephropathies and enteropathies, dirofilariasis, and cardiac disease.

2) Antihistamines (hydroxyzine, chlorphenamine or diphenhydramine)

These are antagonists of histamine H1 receptors. They can be used in histamine-mediated allergic pruritus including urticaria, angioedema and hypersensitivity reactions including systemic anaphylaxis. Different formulations are available depending on the antihistamine drug. For example, diphenhydramine can be administered orally and iv. The final consensus for this group of medicines is that there is minimal evidence for the use of antihistamines; however, they have been reported to be used in clinical practice with few adverse effects.

3) Colloid solutions

These solutions can be used in selected patients to increase oncotic pressure and expand circulating plasma volume. The type of colloid, volumes and speed of administration and risk of adverse effects vary among colloid solutions. The efficacy and safety profiles should be carefully considered before administration.

4) Fresh blood

Giving the complexities of component processing and storage of blood products, veterinarians should be able to perform at least fresh whole blood transfusion for the treatment of severe hypovolaemia, anaemia and/or thrombocytopenia and factor replacement in coagulopathies within 4 to 6 hours of blood collection in dogs and cats. In some countries, veterinary blood banks are available. Quality control and transfusion practices of fresh blood should be optimal.

5) Lipid emulsions

Fat emulsion solutions are used as a source of calories and essential fatty acids in parenteral nutrition. They are also used for the treatment of poisoning by fat soluble compounds including local anaesthetic and ivermectin toxicity.

6) Monoclonal antibodies anti-nerve growth factor

These medicines are used for the treatment of osteoarthritis in dogs (bedinvetmab) and cats (frunevetmab). They may be beneficial when NSAIDs are contra-indicated or if pain is refractory to the administration of NSAIDs.

ANTIMICROBIAL DRUGS

Antibacterial and antiprotozoal drugs

Systemic administration

Core List

1) Amoxicillin

This aminopenicillin is recommended as the first choice for treatment of bacterial cystitis and a variety of infections, including those caused by anaerobic bacteria.

2) Amoxicillin/clavulanic acid or a first-generation cephalosporin (cephalexin or cefadroxil)

These β-lactams are widely used for management of superficial or deep pyoderma and other common skin and soft tissue infections associated with *Staphylococci* and other Gram-positive bacteria.

3) Ampicillin or benzylpenicillin

Injectable preparations of these penicillins are recommended for treatment of life-threatening infections such as sepsis and acute pneumonia in combination with fluoroquinolones as well as acute treatment for the zoonotic infection, leptospirosis.

4) Cefazolin

This injectable first-generation cephalosporin is recommended as the first choice when surgical prophylaxis is indicated.

5) Clindamycin

This lincosamide is recommended in some countries as the first choice for management of canine superficial or deep pyoderma and elsewhere is considered an important alternative to amoxicillin/clavulanic acid and first generation cephalosporins for these indications. It is also recommended for treatment of infections involving anaerobic bacteria. Injectable preparations are important for combination therapy of life-threatening infections such as sepsis and acute pneumonia in association with fluoroquinolones or other antimicrobials providing Gram-negative coverage. Clindamycin has been shown to reach therapeutic levels in the central nervous system and it is also used for the treatment of infections with *Mycoplasma*, *Neospora* and *Toxoplasma*.

6) Doxycycline or minocycline

This tetracycline is an essential antimicrobial for treatment of upper and lower respiratory tract infections, Lyme borreliosis and a variety of infections caused by obligate intracellular bacteria (*Ehrlichia canis*, *Rickettsia rickettsii*, *Mycoplasma* and *Anaplasma* spp.).

7) Enrofloxacin, marbofloxacin, orbifloxacin or pradofloxacin [The "OIE List of Antimicrobial Agents of Veterinary Importance" state that Fluoroquinolones (together with third and fourth generation cephalosporins and colistin) should: (1) not be used as preventive treatment, (2) not to be used as a first-line treatment unless justified, when used as a second-line treatment, it should ideally be based on the results of bacteriological tests and (3) extra-label/off label use should be limited and reserved for instances where no alternatives are available. Such use should be in agreement with the national legislation in force. https://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/A_OIE_List_antimicrobials_July2019.pdf]

These fluoroquinolones are the first choices for treatment of prostatitis and meningitis due to their ability to penetrate the blood/prostate and blood/brain barriers, respectively. Injectable preparations are needed for treatment of life-threatening infections such as pyelonephritis, or sepsis and acute pneumonia when used in combination with clindamycin or a penicillin. They are also useful for treatment of infections caused by bacteria that are resistant to first line agents.

8) Metronidazole

This nitroimidazole is recommended for management of selected bacterial and protozoal enteric infections.

9) A sulfonamide potentiated with a dihydrofolate reductase inhibitor (*e.g.* sulfadiazine/trimethoprim)

Potentiated sulfonamides are recommended as a first line agent for treatment of bacterial cystitis and are useful antimicrobials for treating skin and other infections, including central nervous system infections caused by susceptible bacteria and protozoa.

Complementary List

1) Chloramphenicol

This bacteriostatic antimicrobial has a broad-spectrum activity against Gram-positive, Gram-negative and obligate anaerobic bacteria. It is suitable for treatment of intraocular and CNS infections. Due to concerns of resistance development, its use should be restricted to animals with infections resistant to other antimicrobials [available in injectable, oral and topical (ophthalmic) formulations].

Topical administration

Core List

1) Chlorhexidine gluconate

This biguanide antiseptic is available in different forms (*e.g.* shampoos, sprays and ointments) for a variety of indications, including but not limited to otitis externa, gingivitis, periodontal disease, superficial skin infections, topical disinfection of wounds and perioperative skin antisepsis.

2) Enrofloxacin or marbofloxacin

These fluoroquinolones are the first choices for treatment of otitis media and a valid alternative to aminoglycosides for management of otitis externa caused by Gram-negative bacteria.

3) Fusidic acid

This fusidane is the first choice for management of otitis, eye and localised skin and wound infections associated with *Staphylococci*.

4) Florfenicol

An increasingly used antibacterial agent for the management of staphylococcal otitis, usually as part of a combination product that includes antifungal and corticosteroid drugs.

5) Gentamicin or neomycin

These aminoglycosides are the first choices for management of otitis externa caused by *Pseudomonas aeruginosa* and other Gram-negative bacteria.

6) Polymyxin B

This polypeptide is a useful alternative to aminoglycosides and fluoroquinolones for management of otitis externa caused by Gram-negative bacteria. It is often used in combination with miconazole, an antifungal agent with antibacterial activity.

7) Povidone-iodine

This iodophor antiseptic is widely used as an alternative of chlorhexidine gluconate for perioperative skin antisepsis, post-operative application to surgical incisions and emergency antisepsis in patients with minor lacerations, abrasions and burns.

Antifungal drugs

Core list

1) Agents for the treatment of dermatophyte infections.

Azole antifungal drugs lead to depletion of lanosterol, the primary sterol of the fungal cell wall, by inhibiting cytochrome P450-dependent lanosterol C14-demethylase. Drugs include miconazole, fluconazole, econazole, itraconazole, clotrimazole and enilconazole.

2) Terbinafine an allylamine fungicidal agent that inhibits fungal squalene epoxidase to interrupt synthesis of ergosterol.

Complementary list

1) Amphotericin B

This drug binds to fungal cell membrane ergosterol leading to increased permeability and intracellular cation loss. Amphotericin B has poor oral availability and is administered iv. Antifungal activity is highly dependent on the formulation administered.

Antiparasitic drugs

Core list

(It is acknowledged that the spectrum of these medicines may overlap and not every medicine might be available for the treatment of ecto and endoparasites.)

1) Amitraz
Amitraz belongs to the formamidine class and acts as a monoamine oxidase inhibitor and octopamine agonist. It has activity as an acaricide and insect repellent, with major use in the treatment of demodicosis and myiases (Flystrike).
2) Arsenicals (melarsomine)
The trivalent arsenical melarsomine is a *Dirofilaria immitis* adulticide.
3) Benzimidazoles and probenzimidazoles (febantel, fenbendazole, flubendazole, mebendazole and oxibendazole)
These drugs bind to β-tubulin and prevent the formation of microtubules. They are particularly effective against nematodes, but selected agents can be used to treat other helminth and protozoal diseases.
4) Isoquinoline (praziquantel, epsiprantel)
This class of drug causes severe contraction/muscle spasm and paralysis of sensitive parasites, resulting in death. These drugs are effective against cestodes (tapeworms) and many trematode species.
5) Isoxazolines (afoxolaner, fluralaner, lotilaner and sarolaner)
These drugs inhibit GABA (gamma-aminobutyric acid)-gated and glutamate-gated chloride channels. Depending on the formulation, they are effective against fleas, ticks and mites. Monthly and long-acting treatment formulations are available.
6) Macrocyclic lactones (avermectins: ivermectin, selamectin; milbemycins: milbemycin oxime, moxidectin)
These drugs interact with and activate invertebrate glutamate-gated chloride channels conveying antinematodal activity and, for some agents, ectoparasite control with activity against fleas, mites and certain tick species (*e.g.* selamectin against fleas and mites).
7) Neonicotinoids (imidacloprid, nitenpyram, dinotefuran)
These drugs inhibit insect post-synaptic nicotinic acetylcholine receptors, thus having selective activity against ectoparasites.
8) Phenylpyrazole (fipronil, pyripole)
Fipronil and pyripole inhibit arthropod GABA-gated and glutamate-gated chloride channels and are active against fleas and ticks.
9) Pyrethrins and synthetic pyrethroids (pyrethrins, permethrin, deltamethrin, flumethrin)
These drugs disrupt sodium channels affecting cell polarisation. They are effective against fleas and ticks depending on the drug and formulation. They may also have insect repellent properties and in some cases prevent the transmission of vector-borne pathogens.
10) Tetrahydropyrimidines (oxantel, pyrantel)
These drugs are agonists of nematode acetylcholine nicotinic receptors with drug specific spectrum of activity against gastrointestinal nematodes.

Complementary list

1) Emodepside
A cyclo-octadepsipeptide acting as an agonist of latrophilin receptors providing a novel mechanism of nematocidal activity.
2) Insect development inhibitors or insect growth regulators (S-methoprene, pyriproxyfen)
These drugs interfere with normal moulting and the development of arthropods.
3) Miltefosine or meglumine antimoniate
The oral formulation of these drugs is commonly used in combination with allopurinol for the treatment of canine and feline leishmaniosis.
4) Oxadiazine (indoxacarb)
This class of drugs is bioactivated by insect esterases and amidases and acts by blocking sodium channel receptors. It is effective against fleas.
5) Spinosyns (spinosad)
These drugs bind to nicotinic acetylcholine receptors in the insect's nervous system leading to disruption of acetylcholine transmission. They are effective against fleas.
6) Xanthine oxidase inhibitors (allopurinol)
The oral formulation is used for the treatment of canine and feline leishmaniosis as the disease is allowed to be treated in many countries of the world.

Antiviral drugs

Core list

1) Nucleoside analogues
Idoxuridine and trifluridine are used for the treatment of viral infections affecting the ocular surface. Remdesivir and/or GS-441524 are used for the treatment of feline infectious peritonitis.

Complementary list

1) Famciclovir
   This can be used systemically for treatment of acute ocular disease caused by feline herpesvirus type 1.

BEHAVIOUR MODIFYING THERAPIES

Core List

1) Clomipramine
   Used for the treatment of behavioural disorders including, but not limited to, separation anxiety, obsessive-compulsive changes and noise phobia.
2) Fluoxetine
   Used for the treatment of behavioural disorders including, but not limited to, separation anxiety, obsessive-compulsive changes, fear-based aggression and noise phobia.
3) Trazodone
   Used for the treatment of behavioural disorders related to anxiety and/or phobia.

CARDIORESPIRATORY AND RENAL SYSTEMS

Core List

1) Aldosterone antagonist (spironolactone)
   Spironolactone alleviates cardiac remodelling in chronic cardiac disease and can be combined with antihypertensive drugs for treatment of refractory systemic hypertension. It can be used judiciously alongside loop diuretics for its anti-aldosterone effect and potassium-sparing activity.
2) Angiotensin converting enzyme (ACE) inhibitors (enalapril, benazepril, captopril, lisinopril and ramipril) or angiotensin receptor blockers (ARB) (telmisartan)
   ACE inhibitors and ARBs are mild vasodilators and reduce systemic vascular resistance, hypertrophy and aldosterone release, especially in the treatment of dogs with dilated cardiomyopathy or myxomatous mitral valve degeneration, and as second line for the management of systemic hypertension. These drugs are also utilised for the treatment of proteinuric kidney disease.
3) Inodilator (pimobendan)
   It combines the effect of a vasodilator and an inotrope in dogs with heart failure. It improves long-term outcomes in preclinical stages of dilated cardiomyopathy and mitral valve disease as well as during cardiac failure.
4) Loop diuretics (furosemide or torsemide)
   These agents block the reabsorption of sodium (and water) in the ascending loop of Henle. They are available for iv or oral administration and are indicated for the management of acute pulmonary oedema and heart failure. They may induce electrolyte imbalances and their effect is limited by the activation of the renin-angiotensin system.
5) Vessel selective calcium channel blocker (amlodipine)
   Amlodipine is used for feline and canine hypertension and is titrated orally to effect.

Complementary List

1) Antagonists of β-adrenergic receptors (propranolol, atenolol or esmolol)
   These are negative inotropes and chronotropic drugs. They can be used for treatment of tachyarrhythmias or conditions with left and right ventricular outflow obstruction.
2) Cardiac glycosides (digoxin)
   This drug inhibits the sodium-potassium pump and facilitates increased concentrations of calcium influx. It produces weak positive inotropism while reducing sympathetic input and improving renal blood flow. Digoxin blocks the atrioventricular node and can be used in the treatment of atrial fibrillation. The drug is used in combination with other therapies in the treatment of heart failure in some specific cases. The drug can be administered orally or iv.
3) Cardiac-selective calcium channel blockers (verapamil or diltiazem)
   These are used in the management of supraventricular arrhythmias (oral and injectable forms).

4) Fluticasone

This is an inhaled synthetic corticosteroid with profound anti-inflammatory effects that is used in several upper respiratory tract and pulmonary disorders in dogs and cats including rhinitis, bronchitis, asthma and eosinophilic pneumonia. Metered dose inhalers combined with a spacer and appropriate mask should be used for administration.

5) Salbutamol

This is a selective agonist of β2- receptors that may produce bronchodilation after aerosol or oral administration with the assumption that bronchoconstriction exists, particularly in cats.

6) Sodium channel blockers (lidocaine or procainamide)

They are indicated for the management of significant ventricular arrhythmias that are associated with important haemodynamic changes.

ENDOCRINOLOGY

Core List

1) Antithyroid agent (methimazole/thiamazole)

Thyroid hormone synthesis inhibitors act by interfering with the incorporation of iodine into the tyrosyl moiety of thyroglobulin. These agents are important in the treatment of feline hyperthyroidism. These medications are for oral administration but can be compounded as transdermal preparations.

2) Glucocorticoids

A class of corticosteroids that bind to the glucocorticoid receptor. Can be used for the diagnosis of hyperadrenocorticism, including the differentiation of pituitary and adrenal dependent hyperadrenocorticism. Necessary for the treatment of hypoadrenocorticism. Prednisolone is also beneficial in the medical management of insulinoma. See gastrointestinal drugs and neurology for cross-reference.

3) Insulin (short, intermediate and long acting)

Insulin is required for emergency treatment of diabetic ketoacidosis (short acting insulin), resulting from poorly controlled or undiagnosed diabetes mellitus. Porcine zinc insulins or human recombinant insulins (intermediate acting) are required for the long-term stabilisation and control of diabetes mellitus. Long acting insulin might be required when intermediate formulations fail to regulate.

4) Mineralocorticoid/Corticosteroid with mineralocorticoid effect (deoxycorticosterone pivalate, fludrocortisone)

Mineralocorticoids or corticosteroids that act as mineralocorticoids that influence salt and water balance are needed in the long-term treatment of hypoadrenocorticism. Deoxycorticosterone pivalate is in injectable and fludrocortisone in (oral) form.

5) Steroid hormone synthesis inhibitor (trilostane, mitotane)

These medications inhibit the production of pregnenolone from cholesterol and reduce the synthesis of steroid hormones. These medications can be used for treatment of hyperadrenocorticism and are for oral administration.

6) Synthetic thyroxine (levothyroxine)

This medication is used to treat thyroid hormone deficiency in canine hypothyroidism.

Complementary List

1) Hydroxylated metabolite of oestradiol, oestrone or similar class

Functions as an agonist of oestrogen receptors to increase urethral sphincter tone in medical management of urethral sphincter mechanism incompetence.

2) Sympathomimetic agent (phenylpropanolamine)

Functions as an agonist of α- and β-adrenergic receptors and stimulates the release of noradrenaline (norepinephrine). Phenylpropanolamine is used in cases of urinary incontinence.

3) Vasopressin analogue (desmopressin acetate; DDAVP)

It is available for oral or conjunctival administration and is used in the treatment of central diabetes insipidus in dogs and cats. This can also be administered iv or subcutaneously to dogs with von Willebrand's disease.

EUTHANASIA DRUGS

Core List

1) Barbiturates

Barbiturates (thiopental or pentobarbital) may not be essential as anaesthetics, but they are crucial euthanasia agents especially in the absence of other anaesthetics (ketamine, propofol and alfaxalone) to induce unconsciousness before humane euthanasia. These drugs are often combined with other medicines as part of euthanasia solutions.

2) Potassium chloride

This is also used for humane euthanasia once the animal is under general anaesthesia. See also anaesthetic, analgesic, sedative and emergency drugs.

GASTROINTESTINAL SYSTEM

Core List

1) Activated charcoal

For the treatment of gastrointestinal toxicosis, since this is not absorbed from the gastrointestinal tract.

2) Antiemetic drugs: antagonists of D2-dopaminergic receptor and antagonists of 5-HT3 serotoninergic receptors (metoclopramide and ondansetron) or antagonists of neurokinin-1 receptor (maropitant)

Indicated for the control of vomiting associated with drug administration or disease, and the prevention of motion sickness (*i.e.* maropitant only). These drugs are used for symptomatic therapy and do not treat the underlying disease. Metoclopramide lowers the risk of gastroesophageal reflux but does not prevent it.

3) Antiulcer drugs: antagonists of histamine-receptor (ranitidine or famotidine), sucralfate or proton pump inhibitors (omeprazole)

Histamine-receptor antagonists decrease proton secretion and decrease gastric acid secretion that is stimulated by histaminergic pathways. Sucralfate adheres to ulcerated tissues creating a physical barrier and protecting against hydrogen ions, pepsin and bile, promoting ulcer healing. Proton pump inhibitors bind and irreversibly block H^+/K^+ATPase, blocking gastric secretion stimulated by all pathways. These agents are indicated for gastroduodenal ulceration, oesophagitis and gastritis.

4) Emetic agent (apomorphine or xylazine)

Apomorphine stimulates dopamine receptors in the chemoreceptor trigger zone, inducing emesis after oral or parenteral administration. The drug is used in cases of inadvertent/accidental toxin/drug ingestion if given promptly. Xylazine is an agonist of α2-adrenergic receptors (see anaesthesia). It can be used in cats as an emetic agent; however, it may cause sedation.

5) Immunomodulatory therapy with glucocorticoids (prednisolone)

This is used as an immunosuppressant agent for the treatment of different immune-mediated diseases.

6) Lactulose

Lactulose acidifies the colonic contents. Ammonia is then trapped as ammonium and, in this form, the intestinal wall cannot absorb it. Lactulose is used to reduce ammonia concentrations in the treatment of hepatic encephalopathy, but also as an osmotic laxative in constipation. See neurology.

Complementary List

1) Mirtazapine

Tricyclic antidepressant used as an appetite stimulant mostly in cats.

IMMUNOMODULATORY DRUGS

Core List

1) Glucocorticoids (see endocrinology, neurology and gastrointestinal systems)

The recommended molecules for dogs and cats using the oral route of administration is prednisolone. Dexamethasone can be used iv when the oral route is compromised.

2) Immunosuppressive drugs (azathioprine, cyclosporine/ciclosporin, mycophenolate)

Immunosuppressive drugs can produce different levels of immune suppression or immune regulation to treat different immune-mediated disease or some inflammatory disorders (*i.e.* myasthenia gravis, immune-mediated haemolytic anaemia or thrombocytopenia, skin diseases, inflammatory bowel disease, polyarthritis, systemic lupus erythematosus, etc.). They should not be used

interchangeably. These therapies are generally used in combination with corticosteroids or used more in one species *versus* the other (*i.e.* azathioprine is only used in dogs and not recommended for cats, where chlorambucil is an alternative). Cyclosporine is licensed for the management of canine and feline atopic dermatitis and for topical use in ophthalmology for the treatment of keratoconjunctivitis sicca in dogs. Other than cyclosporine, these agents are not licensed veterinary medicines.

Complementary list

1) Oclacitinib
   This drug is used for the treatment of canine atopic dermatitis and allergic skin disease.
2) Tacrolimus
   This drug is used in specific conditions for immunosuppression. In ophthalmology, the drug is used for keratoconjunctivitis sicca refractory to treatment with other immunosuppressants/immunomodulators.

NEUROLOGY

Core List

1) Antiepileptic drugs (phenobarbital/phenobarbitone, iv, PO; pentobarbital iv; diazepam iv)
   Phenobarbital and diazepam are recommended as first-line anti-seizure treatment in dogs and cats. Pentobarbital is a barbiturate that can be used as an antiepileptic, but also as an agent for euthanasia (see anaesthetic, analgesics, sedative and emergency drugs).
2) Dextrose
   For emergency treatment of hypoglycaemia and fluid supplementation in case of acid–base disturbance associated encephalopathy (see anaesthetic, analgesic, sedative and emergency drugs).
3) Glucocorticoids (dexamethasone iv; prednisolone PO)
   Glucocorticoids have anti-inflammatory and immunosuppressive properties depending on the dose. Injectable and oral formulations of dexamethasone are available; oral prednisolone is associated with lower prevalence of adverse effects in long-term therapy. Prednisolone is the preferred steroid in cats (see anaesthetic, analgesics, sedative and emergency drugs, gastrointestinal, endocrinology and immunomodulatory therapy).
4) Osmotic diuretic (mannitol)
   Mannitol is indicated to reduce brain oedema and intracranial pressure. It has an advantage over hypertonic saline because it does not require monitoring of electrolyte levels (see anaesthetic, analgesics, sedative and emergency drugs).
5) Thiamine
   Supplementation of thiamine or vitamin B1 is required in cases of deficiency in dogs and cats (in anorexic cats; inadequate diet; exposure to meat containing excessive sulphites).

Complementary List

1) Antiepileptic drugs (imepitoin, potassium bromide, levetiracetam, gabapentin and pregabalin)
   Multi-antiepileptic drug therapy is often required as refractory cases of epilepsy are not uncommon. Potassium bromide is inexpensive and can be used in dogs with hepatic dysfunction. Loading doses of potassium bromide are required to reach a steady state faster. Loading doses are associated with a higher prevalence of adverse effects. This drug should not be administered to cats. Imepitoin is approved in the veterinary market for use in dogs. Levetiracetam should be administered as an adjunct to other antiepileptic drugs. Gabapentin and pregabalin are poor anti-epileptic drugs but used for the treatment of painful conditions including neuropathic pain and to decrease stress during patient transportation.

ONCOLOGY

(The relapsed disease using rescue protocols or cases of toxicity with a specific drug cannot always be treated with this essential list of drugs).

Core List

1) Alkylating agents (cyclophosphamide and chlorambucil)
   Cyclophosphamide is available in oral and iv forms and it is used commonly to treat canine and feline lymphoma in conjunction with other medications as part of a multi-drug protocol. Chlorambucil is orally administered and it is used to treat chronic lymphocytic leukaemias, mast cell tumours and transitional cell carcinomas.

2) Anti-tumour antibiotics (doxorubicin)
Used alone or in combined protocols to treat lymphoma, hemangiosarcoma, osteosarcoma, mammary carcinomas, feline injection site sarcomas and most epithelial and mesenchymal tumours in dogs and cats.
3) Corticosteroids (prednisolone)
Prednisolone is the most routinely used corticosteroid for the treatment of almost all round cell tumours.
4) Platinum agents (carboplatin)
Carboplatin is widely used to treat a variety of sarcomas and carcinomas, including osteosarcoma, transitional cell carcinomas, prostatic carcinomas, head and neck carcinomas, pulmonary carcinomas and others.
5) Vinca alkaloids (vincristine, vinblastine)
Vincristine is a first-line chemotherapeutic agent used in many lymphoma and leukaemia protocols and for the treatment of transmissible venereal tumour (TVT). It is used in a multiagent protocol for treatment of hemangiosarcoma. Vinblastine is commonly used for the treatment of mast cell tumours and transitional cell carcinomas.

Complementary List

1) Antimetabolite (hydroxyurea)
Mostly used to treat polycythaemia vera and can be considered for certain forms of leukaemia.
2) Nitrosureas (lomustine and melphalan)
Lomustine is a drug for oral use in the treatment of canine cutaneous lymphoma, mastocytoma and lymphoma, histiocytic sarcoma or relapsing lymphomas. Lomustine crosses the blood-brain barrier, and it is widely used for tumours of the central nervous system. Melphalan is orally administered and used to treat multiple myeloma.
3) Tyrosine kinase inhibitors (toceranib, masitinib and imatinib)
These drugs are targeted therapies that can block specific receptors that are frequently aberrantly expressed in certain tumours, especially mast cell tumours. The use of toceranib has been expanded to treat apocrine gland adenocarcinomas of the anal sac, GIST, pulmonary neoplasia, oral squamous cell carcinomas and most endocrine neoplasia such as insulinomas, thyroid carcinomas, pancreatic and adrenal carcinomas (anecdotal evidence).

OPHTHALMOLOGY

Core list

1) Carbonic anhydrase inhibitors (dorzolamide)
Topical carbonic anhydrase inhibitors should be considered to decrease intraocular pressure by decreasing aqueous humour production in cases of glaucoma.
2) Glucocorticoids
Topical steroids that are potent (dexamethasone phosphate) and/or have good penetration through the cornea (prednisolone acetate) are often required to treat ocular surface disorders and intraocular disorders.
3) Hyperosmotic agents (mannitol)
Drugs that increase osmolality of the blood can be used iv to help decrease intraocular pressure during glaucoma crisis (see anaesthetic, analgesics, sedative and emergency drugs).
4) Immunosuppressive/immunomodulatory drugs
Cyclosporine and tacrolimus are immunosuppressive/immunomodulatory drugs that are routinely used in immune-mediated disorders (*e.g.* keratoconjunctivitis sicca). These drugs are used topically (*e.g.* cyclosporine, tacrolimus) (see immunosuppressive drugs).
5) Local anaesthetics
Local anaesthesia can be administered topically (*e.g.* proparacaine, tetracaine) or during loco-regional anaesthesia for enucleation, for example (see anaesthetics, analgesics, sedative and emergency drugs).
6) Mydriatics and cycloplegics
Topical administration of antagonists of cholinergic receptors (tropicamide and atropine) is commonly used to allow visualisation of the lens, vitreous and retina and as an adjunctive treatment for uveitis. Mydriatics and cycloplegics can be used topically.
7) Non-steroidal anti-inflammatory drugs (NSAID)
Topical NSAIDs (*e.g.* flurbiprofen, diclofenac, ketorolac) are routinely used to treat ocular surface or intraocular disorders. They can also be used to prevent intraocular inflammation when there is an increased risk for that to occur (*e.g.* lens-induced uveitis).
8) Prostaglandin analogues (latanoprost)
This drug is used in some types of glaucoma (*e.g.* primary glaucoma) and contraindicated in other types of glaucoma (*e.g.* anterior lens luxation, uveitic glaucoma).

Complementary List

1) Agonist of cholinergic receptors/direct-acting parasympathomimetic (pilocarpine)
   This drug can be considered to treat neurogenic keratoconjunctivitis sicca by topical or oral administration.
2) Proteinase inhibitors
   Proteinase inhibitors (EDTA, *N*-acetylcysteine and tetracycline antibiotics) are to be considered when the activity of matrix metalloproteinases is excessive, resulting in corneal melting, which can be common in geriatric dogs.

REPRODUCTION

Core List

1) Antiprogestogens (aglepristone)
   These drugs are used for medical interruption of pregnancy (up to 45 days after mating), induction of parturition or medical management of pyometra, feline mammary fibroadenomatosis, acromegaly during dioestrus and induction of parturition in small breeds up to 15kg.
2) Calcium gluconate or chloride
   This is used for the iv treatment of periparturient hypocalcaemia (see anaesthetic, analgesics, sedative and emergency drugs).
3) Dopamine agonists (cabergoline, metergoline)
   These are used for the cessation of lactation (pseudopregnancy or at weaning). They can cause vomiting, pregnancy interruption if used in pregnant females and should not be used with dopamine antagonists.
4) Gonadotropin-releasing hormone (GnRH) (deslorelin)
   This is administered as subcutaneous implants. Deslorelin achieves reversible chemical sterilisation post-implant in male dogs and cats and in prepubertal female dogs.
5) Oxytocin
   This drug is used for metritis or during problems associated with delivery in dogs and cats.

Complementary List

1) Antiandrogens (osaterone acetate, delmadinone acetate, finasteride and flutamide)
   These drugs are predominantly used for the treatment of prostatic disease in dogs, including canine benign hyperplasia.
2) Glucocorticoids (dexamethasone)
   These drugs enhance foetal maturation just before caesarean section.

VACCINES (HTTPS://WWW.WSAVA.ORG/GUIDELINES/VACCINATION-GUIDELINES)

Core List

Core vaccines are those that all dogs and cats should receive, after considering the geographical areas in which they live or to which they travel.

Recommended vaccination schedules for puppies and kittens, and for adult dogs and cats, as well as for animals living in shelters and other group-housing situations, can be found in the WSAVA Vaccination Guidelines (The WSAVA Vaccination Guidelines relate to the use of companion animal vaccines of validated high quality that are produced by major global manufacturers. The Guidelines do not apply to regionally produced products of less certain quality. An issue facing veterinarians in many parts of the world is a limited range of available vaccines. In many countries, there is only access to multicomponent products including up to 12 different antigens (mixed core, non-core and not recommended vaccine components). This limits the ability of veterinarians to provide optimised, individualised patient care). All veterinary practices should develop a core vaccination programme for the dogs and cats under their care. Guidance on how to do this can be found in the WSAVA Vaccination Guidelines and, for some countries, in various evidence-based national and regional guidelines.

Dogs: Core vaccines for dogs, in all parts of the world, are those that protect against canine distemper virus (CDV), canine adenovirus (CAV) and canine parvovirus-2 (CPV). Wherever canine rabies is endemic, rabies vaccines should also be considered core for dogs. In many parts of the world, canine leptospirosis is endemic. In these places, if suitable vaccines are available to protect dogs against leptospirosis, these should also be considered core.

Cats: Core vaccines for cats, in all parts of the world, are those that protect against feline parvovirus (FPV) (feline panleukopenia virus), feline herpesvirus-1 (FHV) and feline calicivirus (FCV). Wherever feline rabies is endemic, rabies vaccines should also be considered core for cats. In many parts of the world, feline leukaemia virus (FeLV)-related diseases are endemic. In these places, FeLV vaccines should be considered core for young cats (<1 year of age) and for adult cats with outdoor access or that live with other cats that have outdoor access.

Complementary List: Complementary essential medicines are defined in this Essential Medicines List as those that require a measure of specialist input related to their use. None of the prophylactic vaccines described here require specialist input. So, strictly speaking, the complementary list should be empty. However, thoughtful, well informed selection of which non-core vaccines to recommend is required and this relies on specialised local knowledge. Therefore, the "non-core" vaccines are listed here as "complementary." Selection of which non-core vaccines to recommend for a particular dog or cat should be based on knowledge of the local prevalence of relevant infectious diseases and on knowledge of the lifestyle and consequent exposure risks of that individual animal. Non-core vaccines can be as important as core vaccines, depending on local risk factors. Non-core vaccines should ideally be available as monovalent or limited component products that can be selected for appropriate use in individual animals. In many countries, such optimised products are unavailable.

Dogs: Vaccines not already mentioned that might be recommended to protect dogs with particular lifestyles and in particular regions of the world include:

- *Bordetella bronchiseptica* vaccines (for parenteral, intranasal or oral application; availability differs between regions)
- Canine parainfluenza virus vaccines (for parenteral, intranasal or oral application; sometimes in combination with *Bordetella bronchiseptica*; availability differs between regions)
- *Borrelia* vaccines (mostly North America and Europe)
- *Leishmania* vaccines (Europe and Latin America)
- *Babesia* vaccine (Africa and Europe)
- Canine influenza virus vaccines (North America)

The WSAVA Vaccination Guidelines do not recommend the use of canine enteric coronavirus vaccine or Giardia vaccine.

Cats: Vaccines not already mentioned that might be recommended to protect cats with particular lifestyles and in particular regions of the world include:

- Feline immunodeficiency virus vaccine (Japan, Australia and New Zealand)
- *Chlamydia felis* vaccines
- *Bordetella bronchiseptica* vaccine

The WSAVA Vaccination Guidelines do not recommend the use of feline infectious peritonitis vaccine or vaccines against dermatophytosis.

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