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"Pearls" of Veterinary Medicine

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AT A GLANCE

Dosing guidelines for levothyroxine

For more than half a century, the recommended thyroid hormone replacement dosing regimen was 0.10 mg/10 lb (20 µg/kg) of levothyroxine, given twice a day. This dosage does not appear to be based on any particular scientific research. It just miraculously appeared in the first edition of *Current Veterinary Therapy.* Finally, years later, Duncan Ferguson, VMD, PhD, DACVIM, designed a study that would determine whether this was, in fact, the best dose. He confirmed that 0.10 mg/10 lb was the proper dose. However, the study also determined that the drug should be ***administered only once a day***, rather than twice a day. The half-life of levothyroxine in dogs is 10-16 hours. If this is the half-life, then why would this be a once-a-day drug? When you give the drug orally, it's absorbed, it binds to the protein in the blood and it's converted to free thyroxine (fT4). Then fT4 enters the cell and becomes free triiodothyronine (fT3), and then that goes into the nucleus and does its thing. That's a 24-hour process. The serum half-life does not equate to the biologic half-life of the tablet. Biologically, it's a once-a-day drug. If you encounter a client who is upset by and resists the change, it does not harm the dog to continue administering two tablets a day. The dog will defecate the evening dose.

David Bruyette, DVM, DACVIM
Vetted, Nov 2017

Spironolactone is CHF

The current accepted standard treatment for congestive heart failure (CHF) in dogs is "triple therapy" (furosemide, an ACEi, and pimobendan). However, in both people and dogs, there is evidence of ***improved outcomes when spironolactone is added*** to standard therapy of CHF, even in patients whose CHF is well controlled (as opposed to refractory). The human RALES trial demonstrated a 30% reduced risk of cardiac death and 25% reduced risk of re-hospitalization in patients receiving spironolactone. "Quadruple therapy" (furosemide, ACEi, pimobendan, and spironolactone) is the author's standard of care for chronic treatment of CHF in dogs. Spironolactone is generally begun at the first recheck visit after initial onset of CHF (usually ~1 week following CHF episode), so that the author is able to recheck renal values and electrolytes after initiating furosemide (prior to starting spironolactone). Assuming that patients are nonazotemic and either normokalemic or hypokalemic at that recheck, spironolactone is started at 2 mg/kg, PO, q24h. Spironolactone is generally withheld, at least initially, in azotemic or hyperkalemic patients. Spironolactone is never indicated as a monotherapy (except for primary hyperaldosteronism. The author is more hesitant about the use of spironolactone in cats due to reports of ulcerative facial dermatitis in a relevant proportion (~30%) of Maine Coons receiving spironolactone in one study, and thus the author tends to reserve spironolactone for cats with refractory CHF.

Jessica Ward, DVM, DACVIM
ACVIM Conf, 06:17

Gabapentin for reducing stress in cats

Owners' perception of stress in their cats is a primary reason for failure to seek veterinary care. In a randomized clinical trial involving 20 healthy cats with a history of fractious behavior or signs of stress during veterinary examination, gabapentin was found to be safe and effective in helping to reduce stress and aggression and increase compliance. Owners were instructed to administer gabapentin (100 mg) or a placebo, PO, 90 minutes prior to placing the cat in a carrier and transporting it to the veterinary hospital. Owner-assessed cat stress scores during transport and veterinary examination and veterinarian-assessed compliance scores were significantly lower when cats received gabapentin than when they received the placebo. Thus, in summary this study supported the

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use of gabapentin administered orally at 20 mg/kg for ***short-term anxiolysis in cats***. Administration 2-3 hours prior to onset of a stressful event such as placing a cat in a carrier may provide best results, and efforts to minimize stress during veterinary visits may improve the cat's experience and compliance on subsequent visits.

Karen A. van Haaften, DVM et al.
JAVMA, Nov 15, 2017

Feeding the geriatric cat

The dogma that all older cats should be fed reduced energy "senior" diets must be questioned based on what is now known about the increasing energy requirements and nutritional needs of older cats. In most geriatric cats, logic dictates the use of highly digestible, energy-dense food to mitigate the decline in body weight and lean body tissue and to avoid protein:calorie malnutrition. ***Reducing protein intake*** in geriatric cats, at a time when lean tissue has been lost, ***is contraindicated***. Geriatric cats seem to have nutritional requirements closer to kittens than to mature adult cats. Remember that when deprived of protein, carnivores will continue to break down muscle tissue to create the energy they need. By feeding only high-quality protein diets, we will help restore the cat's muscle mass and improve strength and agility.

Mark E. Peterson, DVM, DACVIM
N Amer Vet Conf, 02:17

Using cobalamin orally

Cobalamin supplementation has traditionally been with a repeated, parentally administered, Vitamin B12 injection protocol (500-1500 mg/dog depending on the size; 250 mg/cat). This protocol was based on the pathophysiologic justification that oral Vitamin B12 would be poorly absorbed and would not normalize hypocobalaminemia. Several studies in humans suggested oral cobalamin might be as effective as parenteral administration in various conditions, including gastrointestinal disorders. A retrospective study in dogs with chronic enteropathies and hypocobalaminemia (cobalamin concentration of <270 ng/L) demonstrated oral cobalamin supplementation can restore normocobalaminemia. Cyanocobalamin 1 mg tablets (dogs with a body weight of 1-10 kg, 1/4 tablet, 10-20 kg, 1/2 tablet, and >20 kg, 1 tablet, PO q24h) were shown to be effective. Daily, oral cobalamin supplementation has been suggested to be likely cheaper, simpler, and pain-free alternative to parental cobalamin injections. Cobalamin supplementation can be started while pending Vitamin B12 levels; therapy can be considered even with low normal measurements. Despite therapy with parental vitamin B12 supplementation for 6 weeks, a prior study suggested hypocobalaminemia remains a negative prognostic indictor and associated with an increased risk of euthanasia.

Marnin A. Forman, DACVIM
ACVIM Forum, 06:16

Canine oral papillomatosis

Canine oral papillomatosis produces multiple lesions in the oral cavity and on the head of dogs. The lesions begin as smooth white plaques or papules which progress to whitish gray, pedunculated or cauliflower-like hyperkeratotic lesions that can cover the face and mouth in severe cases. Clinical management of papillomas may include surgical excision, cryosurgery, electrosurgery, and observation without treatment. Surgical debridement or cryosurgery may be required if masses interfere with eating or hygiene. ***Anecdotal reports*** indicate that IFN-alpha-, 1.5 to 2 million units/m2 BSA given subcutaneously 3 times a week, is effective for the treatment of severe cases of oral or cutaneous viral papillomatosis, or both.

Jenis C. Daigle, DVM, DACVD
SW Vet Symp, 10:16

Treatment of FIP

At the present time, both forms of FIP are considered incurable. Some supportive treatments may extend longevity and improve quality of life temporarily. Oral prednisolone (1-2 mg/kg, PO, q12h) may be used to decrease the adverse inflammatory response and the detrimental humoral immune response; however, the drug may dampen any beneficial cell-mediated response and predispose to opportunistic infections. Corticosteroid treatment seems to improve quality of life, but not increase longevity. Pentoxifylline (100 mg, PO, q12h) has been used anecdotally (in combination with prednisolone) because of its beneficial effects in improving circulation and reducing inflammation in vascular diseases. It is not licensed for use in cats. One report described significant lengthening of life span of three cats with non-effusive FIP using Polyprenyl Immunostimulant (VetImmune). Treatment of experimentally infected cats with ***viral protease inhibitors*** recently has been reported to be very promising in ***reducing or eliminating clinical signs***.

Dr. John R. August
SW Vet Symp, 10:16

Questions aggressive fluids in kidney patients

Use of aggressive fluid therapy to induce diuresis in kidney patients is not evidence based. ***Diuresis does not necessarily improve glomerular filtration rate***. Fluids should maintain renal perfusion, which may increase urine output through decreased activation of the renin-angiotensin-aldosterone system. The renal capsule prevents interstitial expansion during hypervolemia, increasing venous congestion and thus decreasing venous, lymphatic, and arterial blood flow. The resulting worsening renal failure might prompt clinicians to increase the fluid rate and volume, whereas the more appropriate response would be to correct the hypervolemia through discontinuation of fluids or, perhaps, cautious use of diuretics.

J.D. Foster
NAVC Clin Brf, Nov 2017

Diabetic ketoacidosis

At presentation, fluid therapy is a ***higher priority than insulin*** in dogs and cats with DKA. Patients that present with hypovolemia should be adequately fluid resuscitated with a balanced isotonic crystalloid such as Plasmalyte 148 (or A), Normosol-R, or lactated Ringer's solution. Plasmalyte or Normosol-R may be superior choices because they contain slightly more potassium and some magnesium (than lactated Ringer's solution), both of which are often depleted in patients with DKA. After resuscitation, fluid therapy should continue to replace any remaining deficits and maintenance requirements, as well as to account for expected abnormal ongoing losses in the polyuric diabetic.

Jamie M. Burkitt, DVM, DACVEC
Atl Coast Vet Conf, Oct, 2017

Canine cognitive disorder

Nicergoline (Sermion) and Propentophylline have been approved for canine cognitive dysfunction in the European Union. These act primarily as vasodilators with the ability to cross the blood-brain barrier and show activity to increase cerebral blood flow. Anecdotal reports and information provided by drug manufacturers have been positive but controlled studies are lacking. Propentophylline is not currently available in the USA. Another class of drugs that selectively block NMDA/AMPA receptors are also in common use. Amantadine, and its derivative memantine, have shown the efficacy in humans with dementia syndromes. ***Amantadine*** is currently used in dogs for osteoarthritis however it remains an ***attractive option for CCD***. Further study is warranted.

J.P. McCue, DVM, DACVIM
New Eng Vet Conf, Sep 2017

A new diuretic for CHF

Pimobendan is a standard therapy for late-stage myxomatous mitral valve disease (MVD) in dogs. Now, a recent study has demonstrated its efficacy in treating dogs with advanced preclinical disease in delaying the onset of congestive heart failure (CHF). In addition, results from QUEST and VETSCOPE studies show robust evidence that this drug not only improves survival time, but also quality of life. Another recent drug study has demonstrated the efficacy of the diuretic torasemide (Demadex) for treating CHF in dogs. The randomized, single-blinded study of dogs determined that a daily dose of torasemide was equivalent in efficacy with a twice-daily dose of furosemide, which is currently the only diuretic recommended in the American College of Veterinary Internal Medicine consensus guidelines. This is significant because torasemide is more bioavailable and has a longer half-life than furosemide.

Michele Borgarelli, DVM and Lance Visser, DVM
Vet Pract News, Dec 2017

Surgical removal of mast cells

Surgical removal of all MCT is considered standard of care. Traditionally, surgical removal of the lesion should include at least 2 cms of healthy tissue around the entire lesion and one fascial plane below. In clinical situations where 2 cm lateral margins cannot be obtained, the author prefers to take minimal margins over not pursuing surgery. Numerous recent studies have found that true low grade MCT ***do not require the same historical surgical margins of 2 cm***. Additionally, repeated studies have found that low grade MCT have minimal regrowth rates as long as the microscopic surgical margins are free of disease. This includes margins in the 1-5 mm range that have been historically treated as "dirty." It is important to understand that the vast majority of canine MCT are low grade in behavior and that tumor grade is rarely known prior to surgery. Consequently, when determining surgical plans, the likelihood is that the MCT in question is low grade. However, if the tumor is actively inflamed or rapidly growing, a more aggressive phenotype should be assumed. Many tumors are too large or in a difficult location at presentation for a reasonable expectation of complete removal. In these situations, a short trial (10-14 days) of antiinflammatory prednisone (1 mg/kg/day) can often result in significant tumor reduction. This allows for an easier surgical plan and increased likelihood for success. For low grade MCT with no evidence of tumor spread, complete surgical removal is considered curative and no adjuvant therapy is indicated.

Zachary M. Wright, DVM, DACVIM
125th SD VMA Conf, 08:16

Treating mycobacteria in the cat.

Those in the *M. chelonae/M. abscessus* group tend to be resistant to most oral options except for clarithromycin. Those in the *M. smegmatis* group are often sensitive to a number of agents except for clarithromycin. Empirical therapy could therefore be started with a fluoroquinolone combined with clarithromycin. The author's first choice now is pradofloxacin (Veraflox: 7.5 mg/kg, PO, q24h; used at 5 mg/kg in Europe). It is most like the human drug moxifloxacin used in the sensitivity testing, and it attacks bacteria at two different points, making the development of resistance less likely. Pradofloxacin in the USA is labeled for 7 days, but it can be used off-label for long periods of time safely in adult cats, based on the European literature and experiences. Doxycycline could be added in as well for triple antibiotic therapy until the sensitivity results are back. The empirical choice of antibiotics will be determined by where in the world one practices, but the combination of a fluoroquinolone, clarithromycin, and doxycycline should cover most of these species. For many species of rapidly growing mycobacteria, amikacin can be very effective. Although an aminoglycoside, it is less likely to cause renal problems than gentamicin, and with monitoring, it can be used for several months, if needed.

Valerie A. Fadok, DVM, PhD, DACVD
21st ABVP Conf, 10:16

Giardia treatment guidelines

It is controversial whether to treat healthy dogs and cats that test positive for *Giardia* because *Giardia* is generally not considered a significant human health risk. This author recommends treating the asymptomatic, positive dog and if on recheck evaluation the patient is still positive but subclinical, therapy is repeated using a different agent. If the animal remains positive after two therapies, the author simply rechecks the patient again at the next yearly health evaluation. Some animals are chronic asymptomatic carriers and are very difficult to clear. The author has observed some animals spontaneously clear when they reach maturity. It is a more significant concern when infected dogs live with immunocompromised individuals or young children.

David C. Twedt, DVM, DACVIM
125th SD VMA Conf

Determining which topical to use

To help improve your chances of using a topical product that contains what it says it does, the practitioner should follow these rules. First, if possible, use products from companies that produce their topical products in a facility that also produces FDA-approved drugs. They will have to use the same good manufacturing practices for all the topical products manufactured in the same facility. This means they will have to verify the ingredients and their concentrations both pre-and post-production. They will also have to determine the shelf life of the product and keep product available for postproduction testing by the FDA if required. Therefore, practitioners should ***only use products that have an expiration date***. This should mean that the product has undergone post-production testing that proves the active ingredients are still active and in the appropriate concentrations and that they are stable for a specific length of time. Second, if possible, use products that have published, blinded, in vivo studies showing their effectiveness for a specific problem. If in vivo studies are not available, then the next best thing is an in vitro study that has been performed by an independent laboratory.

Dawn Logas, DVM, DACVD
N Amer Vet Conf, 01:16

Sleep aids poisoning

Sleep aids are often benzodiazepines or non-benzodiazepine hypnotics, and include drugs such as zolpidem (Ambien) and eszopiclone (Lunesta). These drugs work similarly to benzodiazepines (e.g., diazepam) as they potentiate GABA transmission, increasing frequency of chloride channel opening and resulting in inhibition of neuronal excitation. While these drugs result in sedation in humans, up to 40%-50% of dogs ingesting toxic doses of sleep aids ***develop paradoxical CNS stimulation*** rather than expected depression. Clinical signs include CNS depression (e.g., depression, ataxia, weakness, paresis), CNS stimulation (e.g., hyperactivity, anxiety, agitation, panting, tremors), or other signs like nausea, vomiting, diarrhea, and hyperthermia. Treatment includes decontamination, activated charcoal, and for those patients demonstrating signs of CNS stimulation, the use of sedatives or anxiolytics (e.g., acepromazine at 0.05 mg/kg, IV, IM PRN). In patients exhibiting CNS stimulation, benzodiazepines (e.g., diazepam IV) should *not* be used, as they may worsen the symptoms. Rather, the use of phenothiazines (e.g., acepromazine, chlorpromazine) or barbiturates (e.g., phenobarbital IV) should be used instead. In severe cases of respiratory or cardiac depression, the use of flumazenil, the reversal agent for benzodiazepines, can be considered.

Justine A. Lee, DVM, DACVECC, DABT
3rd Gulf Atl Conf

Wipes as topical therapy

Topical therapy is this author's preferred treatment of choice for fold pyoderma. In particular, wipes are great for folds! These can be as simple as baby wipes. We have a number of commercial wipes that are very useful too. These include acetic acid/boric acid wipes with or without hydrocortisone (MalAcetic Wet Wipes, MalAcetic HC Wipes:Dechra), 2% chlorhexidine, 1% ketoconazole, 2% acetic acid (Mal-A-Ket wipes:Dechra, or even better Miconahex-Tris with ceramide complex wipes by Dechra), 4% chlorhexidine in Tris EDTA (Triz Chlor 4:Dechra), and 3% chlorhexidine with climbazole and phytosphingosine (DOUXO by Ceva). Regular use of wipes can prevent the buildup of sloughed keratinocytes and skin oils that accumulate in folds and serve as medium for bacterial and yeast overgrowth. If surface infection persists long enough, some dogs will develop erosions and ulcers. Cytologies can be very helpful in guiding topical therapy. If cocci alone are found, then 2% mupirocin ointment is a great choice. If mixed bacteria and/or yeast are found, then 1% silver sulfadiazine cream is indicated. For staphylococcal pododermatitis, we have found that mixing mupirocin with Burrow's solution with hydrocortisone (specifically Hydro-Plus brand, Phoenix Laboratories, 1/2 of 22 gm tube in 2 oz. squeeze bottle, then fill to 2 oz. with Hydro-Plus and shake) is useful as an antibacterial lotion.

Brian A. Scott, DVM, DACVD
SE Vet Conf, 06:16

Lead in pets

Pets may have an ***under-recognized risk of lead toxicosis***. Toxicosis probably is rare, but testing is uncommon. In addition, lead exposure is associated with nonspecific neurologic and gastrointestinal clinical signs, and lead toxicosis can be mistaken for other diseases. The author is not suggesting that veterinarians test for lead first when dogs have gastrointestinal disease or consider it first in response to neurologic signs. But it is recommended to consider lead exposure when no other explanation is available.

Dr. Daniel K. Langlois
JAVMA, Oct 15, 2017

Special Report

Intravenous lipid therapy for treating toxicoses

Currently, lipid therapy is only considered a first line, standard of care with LAST (local anesthetic systemic therapy). For all other toxicoses, lipid therapy should be considered an adjunct tool and NOT replace standard supportive therapies or antidotes. If a patient's clinical syndrome is mild and/or controlled with standard therapies, lipid therapy should not be used. However, lipid therapy should be considered if: a) The patient's clinical signs are life threatening. b) The patient has failed to respond to standard antidotes or supportive therapies. c) Cost prohibits standard or prolonged supportive therapies. Theoretically, lipid therapy can be considered for any xenobiotic that is lipophilic or directly effects the cardiovascular system. In order of decreasing evidence, lipid therapy may be beneficial for the following xenobiotics or xenobiotic classes: a) Pyrethrins (cats); b) Moxidectin (dogs), Ivermectin (dogs and cats), lidocaine (cats), naproxen (dogs), baclofen (dogs), diltiazem (dogs), and marijuana (dogs). c) Human case reports (listed by drug class with possible veterinary applications that are not already mentioned above listed in brackets): local anesthetics [cocaine], anti-depressants [amitriptyline, doxepin], anti-psychotics [acepromazine, trazadone], blood pressure/cardiovascular [diltiazem, propranolol, atenolol, amlodipine], muscle relaxants, and miscellaneous [diphenhydramine, pentobarbital, phenobarbital, aminta (mushrooms), and amphetamines]. Anecdotal: Phenobarbital, bromethalin, and CCNU. Do not forget the value of poison control centers when deciding the ideal approach to a poisoned patient. They are likely to have the most up-to-date information on this rapidly evolving therapy. In summary, if you are new to using lipid therapy, the following xenobiotics are the most supported in the veterinary literature: pyrethrins (cats only), macrocyclic lactones (e.g. ivermectin and moxidectin), and local anesthetics. A**dministration and dosing:** Administering lipid therapy is technically easy and safe through a peripheral catheter because intralipid 20% is both isotonic and neutral. The unopened bag has a shelf life of 2 years. Once opened, unused product can be refrigerated and used again within 24 hours. Strict aseptic technique should be used when removing product from the bag to minimize the risk for sepsis and so the rest of the contents can be saved for later. For large infusion volumes, the bag can be spiked with a standard extension set and delivered via an infusion pump or free dripped. For smaller infusion volumes, the author prefers 35-60 mL syringes delivered manually or via a syringe pump. Finally, hematocrit tubes and a centrifuge are needed to evaluate the patient for gross lipemia post-administration. Similar to other drugs, veterinary dosing guidelines are extrapolated from human medicine. All doses are listed in ml/kg which makes use of a 20% product imperative. Based on all available evidence, the author recommends the following dosing guidelines: **Administer 1.5 ml/kg bolus over one minute (for cardiovascularly unstable pets), then/or administer a constant rate infusion of 0.25 ml/kg/min for 30-60 minutes.** The above protocol delivers 9 ml/kg for the 30 minute CRI and 16.5 ml/kg for the 60 minute CRI. (includes one initial 1.5 mL bolus). To date, no maximum daily dose has been established for lipid therapy. **What if the patient isn't improving?!?** The aforementioned standard protocol can be altered if a patient is not responding. If a patient remains in cardiopulmonary arrest, the initial 1.5 ml/kg bolus may be repeated two more times (3 boluses total) before the 30 minute CRI is started. If a patient is stable but no initial improvement is seen, three options may be considered: **Wait it out.** The author has observed numerous situations with a delayed response to lipid therapy (e.g. pyrethrin toxicosis taking 4-6 hours to dramatically improve). If the serum is grossly lipemic, lipid therapy should be working. **Repeat the initial protocol if serum lipemia has cleared.** The entire protocol can be repeated once the serum is no longer lipemic. However, caution is advised because it is very easy to administer excessive cumulative daily doses if the protocol is repeated more than once. The author recommends staying below a total cumulative daily dose of 20-30 ml/kg. **Stop the initial 0.25 ml/kg/min CRI after 30 minutes and then decrease to a maintenance CRI of 0.5 ml/kg/hr for 24 hours.** The idea behind the low dose maintenance CRI is to prolong lipemia without accumulating large daily doses. No matter what, be mindful of your total daily dose. Lipids are not the time to practice the adage "if some is good, more is better." Based on all available evidence, the author tries to stay below a maximum daily dose of 20 ml/kg while occasionally administering up to 30ml/kg in select patients. Unfortunately, some patients do not appear to respond to lipid therapy even when they "should."

Marc Seitz, DVM, DABVP
New Eng Vet Conf, 02:17

Care to share your own favorite treatment? Send it to capsed1@gmail.com, subject treatment. We will publish them as space allows.

Treating mastitis in the dog

Warm compresses can be applied 2-3 times a day and nursing may speed resolution of the disease. However, offspring should not be allowed to nurse from the affected gland when the milk is frankly purulent. Also, bitches with mastitis may be reluctant to nurse or unable to provide adequate nutrition to the young and it may be prudent to raise the offspring as orphans. If the offspring are allowed to continue to nurse, ***natural yogurt*** or another source of *Lactobacillus acidophilus* can be given orally to the neonates to prevent intestinal flora from being upset. Drying up milk secretions using anti-prolactinic drugs (e.g. cabergoline: 5 µg/kg, SID, PO, for 5 days) may be beneficial in promoting healing.

Michelle A. Kutzler, DVM, PhD, DACT
AVMA Conf, 07:15