NEW TRICKS FOR OLD KIDNEYS: UPDATE ON MANAGING CHRONIC KIDNEY DISEASE

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General Key Points:

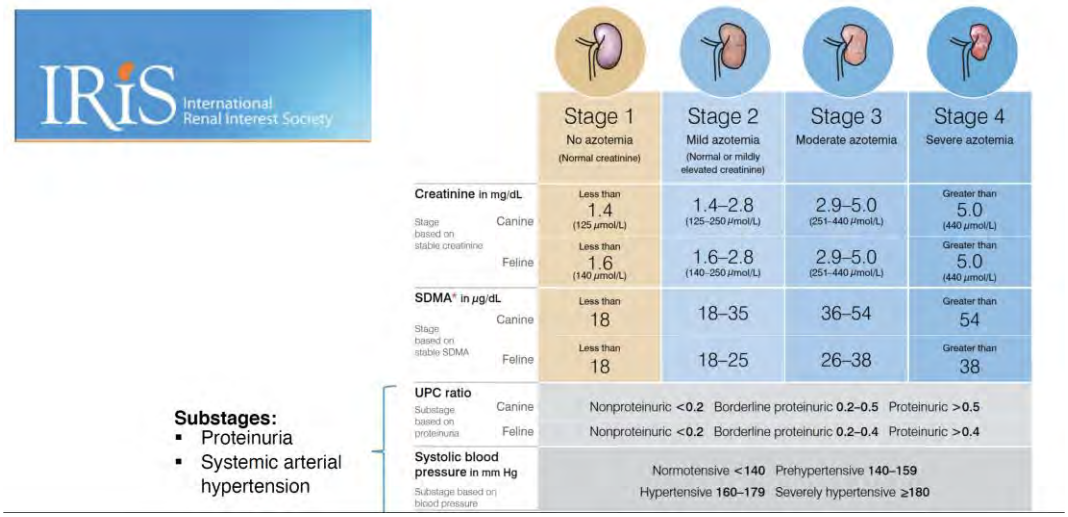
- CKD implies **irreversible** renal failure that remains **stable** for a period of time, but ultimately **progresses**
- Incidence increases with increasing age in dogs and cats

* Although many things can cause chronic kidney disease, by the time chronic kidney disease is diagnosed the cause(s) is/are not present and not treatable. It can occur as a result of:
    * Congenital renal disease
    * Acquired diseases – hypotension, drugs, toxins, hypotension, infections, cancer
    * Periodontal disease has been linked to renal histologic changes in dogs
    * Feline immunodeficiency virus infection has been linked to renal disease in cats
* Kidneys are involved with whole body homeostasis; therefore, CKD affects general well-being
* Clinical signs involve primarily
    * Change in **water balance**: polyuria / polydipsia (PU / PD)
    * **Gastrointestinal signs** (vomiting, hyporexia / anorexia, halitosis)
    * Signs of **chronic disease** (weight loss, loss of body condition, unkempt appearance)
* Diagnosis
    * Laboratory evaluation reveals
        * Azotemia
        * Inappropriately dilute urine
        * Hyperphosphatemia
        * Metabolic acidosis
        * ± Hypokalemia
        * ± Non-regenerative anemia
        * ± Bacterial UTI
    * Kidneys are often small and irregular on palpation, abdominal radiography and abdominal ultrasonography; however, some causes of chronic kidney disease are associated with renomegaly (ie neoplasia)
    * ± Systemic arterial hypertension occurs in 65-80% of patients
    * ± Proteinuria (microalbuminuria, microalbuminuria)
* Progression of CKD
    * The cause(s) of progression of CKD is not completely known
    * It is likely that in typical situation, CKD results from repeated insults over time that result in sequential loss of nephrons
    * The compensatory response is an increase in single nephron GFR in the surviving nephrons
    * This results in maintenance of total GFR despite loss of functional renal tissue (renal reserve)
    * There is dilation of the afferent arteriole
    * Increase in intraglomerular pressure
    * The result is increase in GFR and renal blood flow
    * There are **trade-offs**, however:
    * Increase in GFR due to increase in renal blood flow and intraglomerular pressure increases likelihood of increased protein loss
    * Increased intraglomerular pressure is transmitted distally
    * There is activation and release of growth factors that promote tubulointerstitial fibrosis and glomerulosclerosis
    * Eventually, these **adaptations** result in loss of further nephrons and the cycle continues
    * Over time, renal reserve is lost as the threshold of nephron mass loss is surpassed resulting in progression of CKD to end stage

INTERNATIONAL RENAL INSUFFICIENCY SOCIETY (IRIS) STAGING

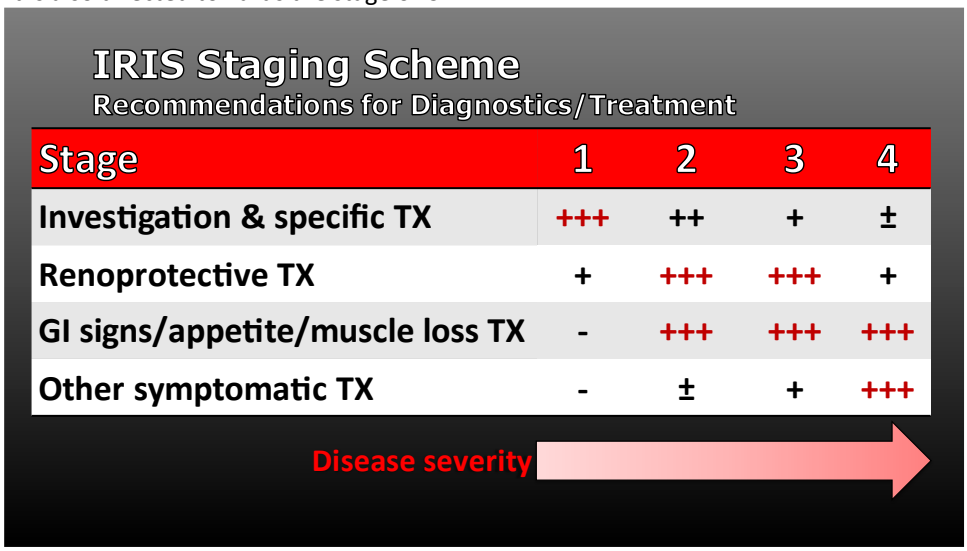
* The International Renal Insufficiency Society (http://www.IRIS-kidney.com) has developed staging system for animals with CKD and treatment based on staging.

- The staging system is designed for use with dogs and cats with CKD. A diagnosis of CKD is made first and staging is accomplished by evaluating
  - (1) 2 serum **creatinine** values when patient is well hydrated,
  - (2) 2 to 3 urine **UPC** and
  - (3) 2 to 3 **indirect arterial blood pressure** determinations.
    - Indirect arterial blood pressure is determined by 1 of 2 methods
      - **Doppler**: this utilizes ultrasonographic waves that are transmitted by a piezoelectric crystal and is reflected back to the crystal and then converted to audible sound
        - It utilizes the Doppler shift effect – you know the sound an ambulance or race car makes as it approaches and then drives by you (?)
        - Blood in an artery is moving while surrounding tissue is not
        - It is very good for systolic blood pressure, but is not very accurate for measuring diastolic and mean arterial pressure
        - A cuff is placed over the artery proximal to placement of the piezoelectric crystal
        - The crystal is placed on a shaved area over the artery
        - The cuff is inflated above systolic blood pressure so no flow of blood occurs in the artery
        - The cuff is slowly released until blood flow is re-established, which is the systolic blood pressure
        - A sphygmomanometer (gauge) is used to give a numeric value to the systolic pressure
      - **Oscillometric**: this utilizes the principle of movement (oscillations) and the intensity of vascular wall vibration (movement) from the pressure
        - It can determine systolic, diastolic, and mean arterial pressure
        - Although useful, it is less accurate then Doppler
        - A cuff attached to the oscillometric blood pressure instrument is placed over an artery. No clipping is necessary
        - Pressure in the cuff is increased until it exceeds systolic blood pressure and no flow of blood occurs in the artery
        - The instrument slowly releases pressure from the cuff and detects vascular wall vibrations as blood flow is re-established.
          - The first vibration = systolic
          - The most intense vibration = mean
          - The point where vibrations level off = diastolic
      - Indirect arterial blood pressure is determined over the palmar metacarpal, cranial tibial, or coccygeal arteries
      - It is important to perform when patient is not stressed; therefore, having the owner hold, use minimal restraint, perform away from people and other patients, and perform prior to sample collection and physical examination
      - Systemic arterial hypertension may occur in 65-75% of dogs and cats with CKD
  - CKD is staged by magnitude of renal dysfunction and further modified (sub-staged) by presence or absence of proteinuria and/or hypertension. Proteinuria ONLY refers to renal proteinuria and not pre-renal (e.g. hyperglobulinemia) or post-renal (e.g. urinary tract infection, hematuria, etc), and is based on UPC. Blood pressure determination should be performed several times in order to account for a “white coat” effect using a standard protocol.
  - Most dogs present in stages 3 and 4 while cats are more often to present in stages 1 and 2



MANAGEMENT OF CKD

* Goal of management is to minimize excesses and deficits induced by CKD in order to improve quality and quantity of patient's life
* Treatment is also directed towards the stage of CKD



* Summarized using the acronym NEPHRONS

N	Nephrons
E	Electrolytes
P	pH of blood (acid-base status), proteinuria
H	Hydration status
R	Retention of wastes
O	Other renal insults – avoid
N	Neuroendocrine changes
S	Serial monitoring

* **NUTRITION**
  * Maintain adequate to optimum body condition and adequate muscle condition (lean body mass)
  * Body condition scoring (you will learn in nutrition)
  * Want a body condition score of 3/5 or 5/9
  * There are formulae to estimate daily caloric requirements (you will learn in nutrition)
  * **Anorexia and nausea** occur commonly with chronic kidney disease. Treatment includes:

* Minimizing excesses and deficiencies
    * Feeding a highly palatable diet or increasing palatability of diet – add water to dog food, use flavoring agents, warm food to near body temperature
    * Modifying feeding patterns – feed frequent small meals, offer rewards, prevent food aversion
    * Treat **uremic gastroenteritis**
        * Dietary protein induces gastric HCl secretion; therefore, dietary protein restriction is associated with decreasing gastric acid
        * Gastrin levels are increased with CKD
        * Gastrin stimulates HCl production and secretion by gastric parietal cells
        * Results in gastric hyperacidity
        * **H2 blockers**: decrease HCl secretion by blocking the histamine-2 receptor on parietal cells of stomach. It is reasonable to put all patients with CKD on these (e.g. Ranitidine, Famotidine)
        * **Sucralfate**: a mucosal protectant that forms a "physiologic Band-Aid" on active ulcers by binding to exposed submucosal collagen in an acidic environment. May also have cytoprotectant effects via PGE2. Additionally, it is a weak antacid and phosphate binder as it contains aluminum hydroxide.
        * **Antacid**: are not typically used with CKD although many are available. Usually these are used as phosphate binders.
        * **Mirtazapine** (Remeron): a noradrenergic and serotonergic antidepressant. It stimulates appetite and is an anti-emetic
        * **Capromerelin** (Entyce for dogs, Elura for cats)): a ghrelin receptor agonist
        * **Maropitant** (Cerenia): a neurokinin-1 (NK-1) antagonist that is used for motion sickness and is an anti-emetic.
        * **Misoprostol** (Cytotec): a prostaglandin E2 analog that increases blood flow to gastric mucosa and increases stir layer on mucosal surface. Not used routinely, but good for prevention of NSAID-induced gastric ulcers
    * **Gastrostomy feeding tubes** may be used to facilitate nutritional management as well as used for medication administration and fluid support. **Esophagostomy feeding tubes** work as well and are easier to place with less morbidity and complications

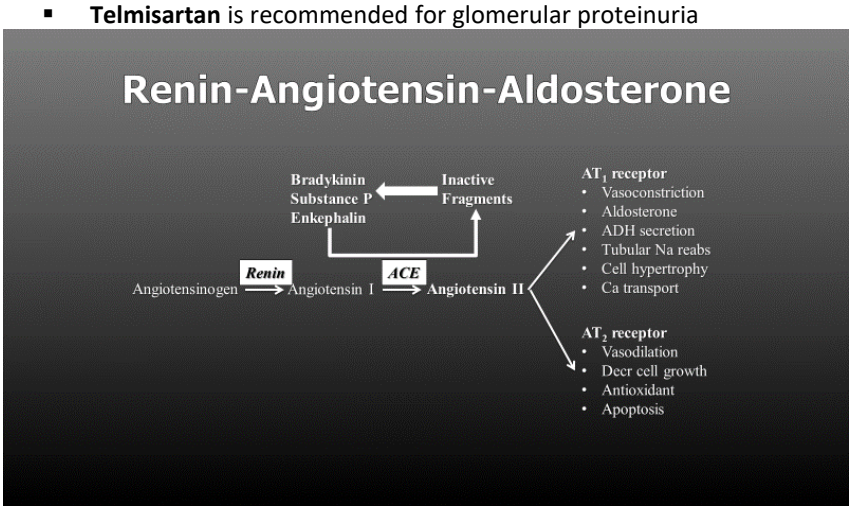
* One theory of progression of CKD involves intraglomerular hypertension in the remaining nephrons. This is beneficial in that it keeps GFR up; however, the intraglomerular hypertension may ultimately result in loss of surviving nephrons and progression.
    * Feeding diets containing **omega-3 fatty acids** may be beneficial in dogs
    * Omega-3 fatty acids decrease intraglomerular hypertension, maintain GFR, and prolong survival
    * An omega-6 to omega-3 fatty acid ratio of 3:1 to 5:1 appears to be a reasonable intake and is present in many renal failure diets
* **Rubenal**
    * An extract of medicinal rhubarb (*Rheum officinale*)
    * Proposed to decrease renal fibrosis
    * In one study of cats of CKD, no benefit was found
* **RenAvast**
    * Proprietary mixture of amino acids and peptides
    * Unproven in a controlled, published study
* **Gut-kidney axis**
    * A bidirectional gut-kidney axis exists
    * Alteration in gut microbiota may affect kidneys and alteration in kidney function may affect gut microbiota
    * **Probiotics** may be of benefit
        * **Azodyl** is a proprietary mixture of probiotic organisms called Klibow formula
            * One study in cats did not show benefit
        * **Visbiome** is a mix of 8 strains of bacteria
            * Veterinary and human product are identical

- Veterinary product comes in 112.5 billion and 225 billion organism capsules
- Additional human product comes as 450 billion organisms in a packet
- One 2 month study showed a slight increase in GFR in dogs with CKD stage 1 and 2 when compared with dogs receiving placebo
- Dosed at 10 billion organisms per kilogram
- Cost is < 1 cent per billion and is most cost effective on market currently

- **ELECTROLYTES**
  - **Potassium**
    - **Hypokalemia** may occur especially in cats due to
      - Anorexia
      - Excessive renal and fecal losses
      - Chronic metabolic acidosis (transcellular shift)
      - Activation of renin-angiotensin-aldosterone system (RAAS)
    - Clinical signs of hypokalemia include
      - **Polymyopathy** – classic sign is an animal that cannot lift its head while sitting sternally; however, generalized weakness may occur more commonly
      - **Worsening renal failure**
      - **Anorexia**
    - Treatment
      - Potassium (as potassium chloride) may be added to IV or SQ fluids
      - Potassium is often present in renal failure diets as potassium citrate
      - Potassium may be supplemented orally using potassium gluconate or potassium citrate
      - Potassium citrate provides alkalinization as well as potassium
      - May cause GI upset – related to formulation not to drug
      - E.G. If problems with liquid – try powder, granules, or tablets
      - Serum potassium concentrations should be maintained in middle to upper half of normal range
  - **Sodium**
    - Changes in serum sodium concentration occur rarely
    - Sodium retention occurs with chronic kidney disease resulting in expansion of extracellular fluid volume and hypertension
    - Moderate sodium restriction beneficial
    - Decrease fluid retention
    - Synergistic with anti-hypertensive medications
    - Excessive restriction may activate RAAS promoting urinary potassium excretion
    - In one study, high salt intake (1.2%) was associated with increasing azotemia in cats with CKD
- **PH OF BLOOD (ACID-BASE STATUS)**
  - **Metabolic acidosis** occurs commonly
    - Occurs because of retention of organic acids, decreased renal ability to regenerate and reclaim bicarbonate, decreased ammoniagenesis (ammonia is a buffer and is renally excreted with acid), generation of acids from catabolism,
    - **High anion gap metabolic acidosis**
      - There is actually no anion gap
      - "the body is not a battery" – negative charged ions (anions) must equal the positive charged ions (cations)
      - Anion gap = $(Na^+ + K^+) – (HCO_3^- + Cl^-)$
      - $0 = (\text{unmeasured cations (UC)} + Na^+ + K^+) – (\text{unmeasured anions (UA)} + HCO_3^- + Cl^-)$
      - $UA – UC = (Na^+ + K^+) – (HCO_3^- + Cl^-)$
      - UA are acids; body cannot tolerate much of a change in UC
      - With an increase in unmeasured anions -> decrease in bicarbonate with a subsequent increase in anion gap (**high anion gap acidosis**)
      - With loss of bicarbonate (base) from body -> decrease in bicarbonate but an increase in chloride to compensate with subsequent normal anion gap (**hyperchloremic normal anion gap acidosis**)

* Metabolic acidosis may cause anorexia, hypokalemia, muscle weakness; however, it does not appear to directly influence progression
* Serum bicarbonate or total carbon dioxide concentration can be used to estimate blood bicarbonate levels
* Try to maintain a normal concentration
* Treatment
* Many renal failure diets contain potassium citrate, an alkalinizing agent
* Because metabolism of dietary protein results in production of organic acids, dietary protein restriction decreases amount of organic acid that must be excreted by kidneys
* Alkalinizing agents (potassium citrate or sodium bicarbonate):
* **Potassium citrate** may be preferred because it provides potassium in addition to its alkalinizing properties
- Sodium bicarbonate administration results in a large sodium load that may worsen hypertension and fluid retention, but has been used

- **Proteinuria**
  - Proteinuria is not just a marker of glomerular disease
  - Proteinuria appears to be nephrotoxic
    - Stimulates renal fibrosis and activates inflammation
  - Indicated when:
    - CKD IRIS stage 1: UPC > 2.0
      - I will treat if UPC > 1.0 and have ruled out other causes of proteinuria
    - CKD IRIS stage 2-4: UPC > 0.4 (cats), > 0.5 (dogs)
  - Treatment
    - **Low protein diet** (renal failure diet)
    - **Angiotensin converting enzyme inhibitor (ACEI)**: decreases intraglomerular pressure
      - ACE-I escape may occur due to non ACE pathways for production of AT2 (e.g. chymase, cathepsin-G)
      - Therefore, effect may diminish over time
    - **Angiotensin receptor blocker works similar to ACE-I**
      - These block the $AT2_1$ receptor that is associated with vasoconstriction, aldosterone secretion, tubular sodium reabsorption, thirst, ADH secretion, cellular hypertrophy, and calcium transport
      - They may be more effective with proteinuria and in decreasing systemic blood pressure
      - **Telmisartan** is recommended for glomerular proteinuria



    - **Omega-3 fatty acids**
      - Insertion of EPA (eicosapentaenoic acid, the 20 carbon long chain fatty acid equivalent of arachidonic acid) into the cell membrane is associated with production of odd-

numbered cytokines (prostaglandins, leukotrienes, thromboxanes) that tend to be less inflammatory or anti-inflammatory, vasodilatory, and less platelet aggregatory.

- Omega-3 fatty acids are dosed by the amount of EPA and DHA (docosahexaenoic acid, 22-carbon long chain n3 fatty acid) at 300 mg of the sum of EPA + DHA per 10 pounds body weight per day
  - When beginning fish oil supplementation, give ½ of this dose for the first 2 weeks as it may cause diarrhea, then increase
  - The dose can be increased but usually GI signs (especially diarrhea, flatulence) becomes an issue

* **HYDRATION**
  * Polyuria due to chronic kidney disease is offset by a compensatory polydipsia
  * Dehydration occurs if water intake does not equal water loss
  * Treatment
    * **Oral**
      * Clean fresh water should be available at all times
      * Water may be added to food or a canned diet may be fed
      * Flavoring agents, such as broth, may be added to food
    * **Intravenous**
      * In a dehydrated animal, address 3 parts of fluid therapy
      * Amount needed for rehydration: %dehydrated x BW_{kg} = liters needed for rehydration
      * Maintenance: for healthy animals: 50-70 ml/kg/day
      * Amount necessary to replace fluid lost as vomitus, diarrhea, or third-spaced fluid
    * **Subcutaneous**
      * Animals with chronic kidney disease, especially cats, may require subcutaneously administered fluids to maintain hydration and prevent dehydration
      * Usually 75-150 ml are administered q12-72hr; this is highly variable and is specific to the individual patient
      * Use a non-glucose containing electrolyte solution such as lactated Ringer's solution, Ringer's solution, etc
      * An implantable device is available for long term subcutaneous fluid administration (GIF-Tube); however, many complications
* **RETENTION OF WASTES**
  * Elimination of wastes particularly nitrogen-containing compounds is an important function of the kidneys
  * **Reduction of dietary protein** seems logical
    * Studies are contradictory whether protein reduction slows progression
    * Dietary protein restriction may be associated with
      * Decreased degree of azotemia
      * Decreased serum phosphorous concentration (meat-based protein is also high in phosphorous)
      * Decreased metabolic acids
      * Decreased gastric acidity (protein digestion occurs in stomach and gastric acid secretion is stimulated, in part, by dietary protein)
      * Studies of dogs and cats with spontaneously occurring renal failure demonstrated a beneficial effect from feeding a renal failure diet when compared with feeding a maintenance diet
        * Animals lived longer
        * Episodes of uremia were less frequent and time to onset of first episode was longer
        * Owners perceived quality of life was better
        * Renal failure diets differ from maintenance in other ways
    * But, level of dietary protein found in renal failure diets is adequate for maintenance of adult animals is not likely to be associated with protein malnutrition due to amino acid composition
      * Providing dietary protein at levels above those recommended as minimal for adult dogs and cats by the National Research Council seems to be a reasonable place to start:
        * adult dogs, 2.62 g/$BW_{kg}^{0.67}$
        * adult cats, 3.97 g/$BW_{kg}^{0.67}$

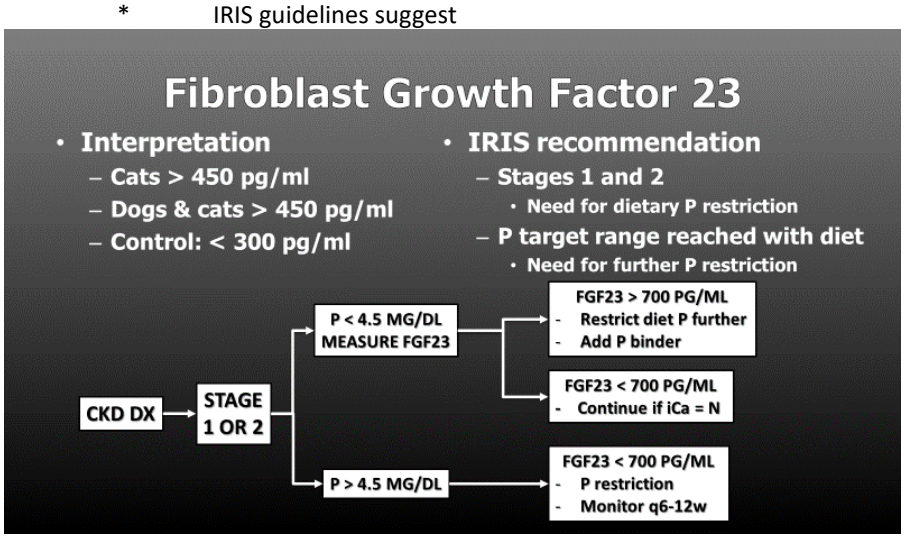
        * This recommendation for cats has come into question due to their carnivorous nature
            * Nutrient digestibility decreases in cats > 10-14 years of age with 1/3 of cats > 12 years of age showing decreased fat digestibility and 1/5 cats showing decreased protein digestibility
            * In one study young cats (1 year old) had 80-85% protein digestibility on dry food that was 75-80% in cats > 14 years eating same diet
            * In another study, healthy young adult cats required 5.2 g / kg (7.8 g/kg$^{0.75}$) of dietary protein to maintain lean body mass compared with 1.5 g / kg (2.1 g/kg$^{0.75}$) of dietary protein to maintain nitrogen balance
            * Results of these studies are difficult to apply to cats with CKD particularly as protein digestibility is dependent on protein source, heat in processing, interaction with other ingredients such as fiber and fat, and metabolic differences between healthy cats and cats with CKD
        * Diets formulated for managing dogs with renal failure typically contain 13 to 18% protein (dry matter basis) and diets formulated for managing cats with renal failure typically contain 25 to 32% protein (dry matter basis).
* **Prebiotics**: Feeding diets that contain soluble fiber may redistribute a small amount of nitrogen into the gut for elimination thus decreasing the amount required by the kidneys to eliminate ("nitrogen trapping")
    * Soluble fiber promotes bacterial proliferation in the colon
    * This proliferation requires nitrogen
    * The major source of nitrogen is blood urea nitrogen
    * Thus, promoting colonic bacterial proliferation may decrease blood urea nitrogen concentration
    * The effect is small and studies are lacking to demonstrate an effect on survival or quality of life
* **Probiotics**: involve administering live bacteria. One formulation, Azodyl, is marketed as "enteric dialysis". In one study of cats with CKD, there was no benefit and administration of Azodyl was not associated with decreasing the degree of azotemia.

*** OTHER RENAL INSULTS – AVOID**

* Dehydration may precipitate an acute renal failure episode making the chronic kidney disease worse
* Certain drugs may be directly nephrotoxic or may worsen renal failure
    * Gentamicin
    * Amphotericin
    * Urinary acidifiers
    * Catabolic drugs – glucocorticoids, immunosuppressive drugs
    * Non-steroidal anti-inflammatory drugs
        * May be nephrotoxic if given in high enough dose
        * Are not nephrotoxic when given at recommended dosages, but are a risk factor for renal failure
        * By decreasing production of prostaglandins, vasodilatory prostaglandins may also be decreased
        * If hypotension or hypovolemia occurs, blood flow to renal medulla is compromised due to decreased activity of vasodilatory prostaglandins resulting in ischemia and renal tubular necrosis
    * Nonsteroidal anti-inflammatory drugs
        * Often these are avoided with CKD; however, there are 3 studies in cats with CKD that demonstrate their safety
        * Additionally, there may be an indication with CKD at low doses in order to not only decrease risk of thrombosis but also to decrease intrarenal inflammation that may occur and be associated with progression
* Risk of bacterial urinary tract infection is increased
    * **However,** asymptomatic bacteruria should not be treated
        * Bacteruria is NOT associated with progression of CKD
    * Prophylactic antibiotics should be avoided
        * May select for resistant organism
        * Some antibiotics are nephrotoxic
        * Most antibiotics are renally excreted and so their kinetics are altered by chronic kidney disease
        * Administration may have side effects – anorexia, vomiting, diarrhea

* Only use antibiotics if a bacterial infection is documented
* Because of dilute urine, bacteriuria, pyuria, and hematuria may not be obvious
* Urine culture of a sample obtained by cystocentesis is best
* If asymptomatic (no clinical signs, no pyuria/hematuria, no change in renal parameters), then NOT treating is an option
* Consider use of prophylactic measures (i.e. probiotics, D-mannose, etc) and monitor

* **NEUROENDOCRINE FUNCTION**
* **Bone and Mineral Disorder of CKD (renal secondary hyperparathyroidism)**
* Occurs, in part, because of phosphorous retention and decreased calcitriol (vitamin D3) metabolism by the failing kidneys
* **Fibroblast growth factor 23 (FGF 23)** is a phosphaturic hormone
* It inhibits renal 25-hydroxyvitamin D-1α-hydroxylase enzymatic synthesis of calcitriol and it increases phosphaturia by down-regulating Na-P type II cotransporters in the proximal renal tubule
* It decreases PTH production and secretion by the parathyroid gland
* It increases with increasing stage of CKD and changes earlier than plasma PTH or phosphorous
* It is available commercial for measurement
* IRIS guidelines suggest



* Hyperphosphatemia may result in renal mineralization and loss of nephrons
* Fibrous osteodystrophy (rubber jaw)
* Hyperphosphatemia is associated with progression of chronic kidney disease and of shortened survival
* **Treatment**
* Goal is to decrease serum phosphorous concentration to
* < 4.5 mg/dl with stage 2
* < 5.0 mg/dl with stage 3
* < 6.0 mg/dl with stage 3
* Lower is better.
* Serum phosphorous concentration may be decreased by:
* Feeding a **low phosphorous diet (**renal failure diets)
* Administering **phosphate binders**
* Administer with food – the idea is to bind phosphorous within the gastrointestinal tract. Side-effects are anorexia and constipation
* **Aluminum hydroxide**
* Phosphorous binder as well as antacid
* Conventional drug of choice

        * Aluminum toxicity extremely rare and occurs with very high dosing
      * **Calcium acetate (PhosLo)**
        * Phosphate binder and antacid
        * May induce hypercalcemia
        * No studies in dogs and cats
      * **Sevelamer hydrochloride (Renalgel)**
        * Non-calcium containing phosphate binder
        * Minimal side effects in dogs and cats
        * Dose is extrapolated but based on toxicity studies
    - **Lanthanum carbonate (Fosrenol)**
      - Non-calcium containing phosphate binder
      - Appears to be well tolerated
      - Dose is extrapolated
    - **Chitosan + calcium carbonate (Ipakitine)**
      - Veterinary specific phosphate binder
      - May induce hypercalcemia
      - One study in cats showed decreased phosphorous
  - **Vitamin D**
    - Hypovitaminosis D has a role in renal hyperparathyroidism
    - Kidneys metabolize 25-hydroxyvitamin D to the active form 1,25-dihydroxyvitamin D (calcitriol) by enzyme, 1-alpha-hydroxylase
    - Calcitriol decreases parathyroid hormone concentration
    - Although recent study in dogs documented decreased vitamin D3 receptors in parathyroid glands
    - Parathyroid hormone may have a role in clinical signs and of progression of chronic kidney disease, but it is controversial
    - Dietary phosphorous restriction decreases parathyroid hormone levels
    - Oral administration of low doses of calcitriol may decrease parathyroid hormone
    - Serum phosphorous should be normalized before administering calcitriol because of risk of hypercalcemia and increasing calcium x phosphorous solubility product
    - To date, only dogs in stage III or IV IRIS benefit from calcitriol therapy
    - Not been shown to be beneficial in cats at any stage
    - **IRIS no longer recommends treating with vitamin D**
- **Hypoproliferative anemia**
  - **Normocytic, normochromic non-regenerative anemia** occurs in many animals with chronic kidney disease. May induce progression of disease due to decreased blood flow, stagnation of blood, oxidative stress, decreased oxygen diffusion, and induction of fibrosis
  - Causes of the anemia include
    - Decreased production of erythropoietin
    - Nutritional imbalances because of anorexia
    - Blood loss due to uremic gastroenteritis
  - Treatment includes
    - Maintaining good nutritional status
    - Minimizing gastrointestinal blood loss
    - Stimulating red blood cell production by bone marrow
      - Anabolic steroids have a minimal effect in promoting red blood cell production
        - They may also stimulate appetite
        - They may be associated with hepatopathy
      - **Erythropoietin** and **Darbepoetin**
        - Recombinant human erythropoietin (rHuEPO) and its synthetic analog Darbepoetin have been used successfully in dogs and cats with chronic kidney disease that are severely anemic

- Many animals receiving rHuEPO feel better even if their anemia does not improve
    - Darbepoetin may be associated with fewer incidence of antibody production and is administered weekly and is the hormone replacement of choice
- It is indicated when:
    - Packed cell volume is less than 15-20%
    - With Darbepoetin can start at higher PCV due to low risk of antibodies
- Give iron (usually **iron dextran** IM) when using hormone replacement therapy for anemia
- Because antibody production does not appear to occur with Darbepoetin, consider use when anemia begins to develop
- Animal does not feel well because of the anemia
    - Because uremic gastroenteritis is common, **iron** should be supplemented to offset the iron deficiency associated with blood loss
        - Infections should also be treated to minimize iron sequestration
    - Target of treatment is to achieve a **PCV of 35-45%**
        - Once target is reached, the frequency and amount of dosage can be slowly decreased to find lowest amount necessary to control anemia
    - Complications include
        - Irritation at injection site
        - Systemic arterial hypertension
        - Polycythemia
        - Worsening of anemia after initial response
            - Usually associated with antibody production against rHuEPO
                - Occurs in 20-40% of dogs and cats
                - Anti-rHuEPO antibodies may cross-react with native erythropoietin resulting in more severe anemia than initial
                - Discontinuing rHuEPO usually results in improvement of packed cell volume to value at start of rHuEPO treatment
                - This has not been documented with Darbepoetin
    - If an animal initially responds to rHuEPO or Darbepoetin, but the packed cell volume begins to decline
        - Cross-reacting antibodies may have developed
        - Iron deficiency may be occurring
            - Treat for uremic gastroenteritis
            - Treat any infections
            - Give iron supplementation if not already receiving
- **Systemic arterial hypertension**
    - Occurs in 65-75% of dogs and cats with chronic kidney disease
    - Pathogenesis includes activation of RAAS, activation of sympathetic nervous system, increased ADH due to hypovolemia
    - Risks
        - AP0 (sBP < 140 mmHg): minimal risk
        - AP1 (sBP = 140-159 mmHg): low risk
        - AP2 (sBP = 160-179 mmHg): moderate risk
        - AP3 (sBP > 180 mmHg): high risk
    - Results in diseases associated with organs with small vessels
        - **Eyes** – retinal vessel tortuosity, hemorrhage, hyphema, blindness
        - **Kidneys** – proteinuria, progression of renal failure
        - **Heart** – left ventricular hypertrophy, possible congestive heart failure (left sided)
        - **Brain** – ischemic encephalopathy, seizures, death
    - Diagnosis is made by measuring arterial blood pressure
    - Treatment includes

- Goal is **sBP < 150 mmHg**
- **Restricting dietary sodium** – renal failure diets contain less sodium than maintenance diets
- Anti-hypertensive drugs
  - **Calcium channel blockers**
    - Decreases blood pressure by arteriolar vasodilation
    - More effective first line treatment for systemic arterial hypertension in dogs and cats without proteinuria
    - Decreases systolic blood pressure by @ 50 mmHg
    - Dilates glomerular afferent arteriole
    - Appears to have fewer complications than with ACE inhibitors
      - Hypotension
      - GI signs
  - **Angiotensin converting enzyme (ACE) inhibitors**
    - Decreases metabolism of angiotensin I to angiotensin II resulting in vasodilation and decreased aldosterone production
    - Systemic arteriolar dilation (via decrease in angiotensin II) and preferentially dilates glomerular efferent arteriole
    - Complications
      - May worsen azotemia – monitor
      - Hyperkalemia
    - Benazepril has been reported to slow progression of chronic kidney disease in cats
      - 1 study of induced chronic kidney disease has been reported
        - GFR values were not different between benazepril and placebo groups
        - The study lasted only 6 months
      - A long term clinical trial failed to show benefit over placebo except in cats with overt proteinuria
    - Decreases systolic blood pressure by @ 10 mmHg
  - **Angiotensin receptor blockers (ARBs)**
    - Inhibit interaction of angiotensin II with receptor
    - Recommended to treat hypertension in patients with proteinuria
    - Decreases systolic blood pressure by @ 30 mmHg
    - Similar effects as ACE-I
      - Decreases systolic blood pressure by @ 30 mmHg
      - Preferential dilation of glomerular efferent arteriole
      - Complications include
      - Worsening of azotemia
      - Hyperkalemia
  - **Aldosterone receptor antagonists**
    - Spironolactone
    - Promotes sodium excretion and very mild diuresis
    - Decreases vascular volume
    - Decreases blood pressure – minimal effect
    - Complications
    - Dehydration
    - Hyperkalemia
    - May work synergistically with ACE-I and ARBs to decrease RAAS activation
- **Other drugs** are not as effective and are only used if multiple drugs are required to lower systemic arterial blood pressure
    - Beta-blockers (propranolol, atenolol)
    - Alpha-blockers (prazosin)
    - Direct arteriolar vasodilators (hydralazine)
    - Diuretics (furosemide, thiazides, spironolactone)

- **OTHER TREATMENT OPTIONS**
  - **Renal transplantation**
    - Renal transplantation can be done
    - More effective and higher success in cats vs dogs
    - Less than 20% one-year survival in one study; however, in another study, a 50% survival at over 500 days
    - Cost is > $10,000 and must adopt donor patient
  - **Intermittent hemodialysis**
  - **Stem cell therapy**
    - Mesenchymal stem cells (MSCs) have been proposed as a novel treatment option for the management of CKD.

SOME ASSOCIATED COMORBIDITIES

- Asymptomatic bacteruria – addressed above
- **Hyperthyroidism in cats**
  - Management hyperthyroidism and treat concurrent CKD
  - Do NOT treat with methimazole to leave the cat "slightly hyperthyroid"
  - Can do treatment trial with diet or methimazole before considering I131 therapy
- **Nephroliths and renal mineralization**
  - Neither have been shown to be associated with progression of CKD
- **Associated (not causative) risks for CKD**
  - Cats
    - Hyperthyroidism
    - Systemic arterial hypertension
    - Periodontal disease
    - Vaccination (?)
    - Not age, gender, reproductive status, diet, previous diseases (e.g. arthritis, diabetes mellitus, upper respiratory infection), body condition, body weight
  - Dogs
    - Periodontal disease

SERIAL MONITORING

- Chronic kidney disease is progressive and thus a dynamic disease
- Serial monitoring of body condition, body weight, thoracic auscultation, blood pressure, CBC and serum biochemical profile, urinalysis, and urine culture are necessary to adjust treatment
- How often an animal should be examined depends on
- How rapidly the chronic kidney disease is progressing
- Any non-renal influences that affect renal function
- Owner satisfaction and finances

OBSERVATIONS

- At some point, the disease progresses
- Early modification of rate of progression has marked implication
- Early diagnosis of CKD has profound implications
- Educate owners early
  - Changes in water intake, urine volume, food intake, body weight, activity, behavior
  - Decreased body weight and body condition, small or dissymmetrical kidneys, large urinary bladder (polyuria?), hypertension
  - Urinalysis – an extremely important tool

WHEN SHOULD DIET BE CHANGED IN AN ANIMAL WITH CHRONIC KIDNEY DISEASE?

- Dietary modification can offset many deficiencies and excesses that occur with chronic kidney disease
- Dietary modification includes more than just dietary protein restriction as renal failure diets are more calorically dense, may contain omega-3 fatty acids, may contain soluble fiber, low phosphorous, low sodium, potassium replete, alkalinizing, and water soluble vitamin replete
- I believe diet should be changed when an animal is diagnosed with chronic kidney disease

- Renal failure diets are usually indicated at some point in management of dogs and cats with chronic kidney disease
- Renal failure diets are not associated with deficiencies
- Renal failure diets may be tolerated better if introduced while the animal feels good and is willing to accept a dietary change
- Renal failure diets may decease uremic episodes and prolong survival

DRUGS AND DOSAGES MENTIONED IN THESE PROCEEDINGS

Class	Drug	Dosage for dogs (D) or cats (C)
H2 blocker	Famotidine	D, C: 1-2 mg/kg PO q12h
	Ranitidine	D, C: 1-2 mg/kg PO q12h
Gastroprotectant	Sucralfate	D: 0.5-1 gm PO q8-12h; C: 0.25-0.5 gm PO q8-12h
Proton pump inhibitor	Omeprazole	D, C: 0.7-2 mg/kg PO q12-24hr
	Esomeprazole	D, C: 0.7 mg/kg PO q12-24hr
Serotonin antagonist	Mirtazapine	D: 15-30 mg PO q24h; C: 1.875-3.75 mg PO q72h- can give q48h with CKD
	Ondansetron	D, C: 1) 0.5 mg/kg IV; then 0.5 mg/kg/hr constant rate infusion 2) 0.1-0.2 mg/kg IV slowly q6-12h prn 3) 0.5-1 mg/kg PO q12-24h
	Dolasetron	D, C: 0.6-1 mg/ kg PO, IV q12-24h
NK-1 inhibitor	Maropitant	D, C: 2-4 mg/kg PO q24h
PGE2 analogue	Misoprostol	D: 2-7.5 mcg/kg PO q8-12hr; C: 5 mcg/kg PO q8hr
Medicine rhubarb	Rubenal	D: < 3kg: 37.5 mg; 3-6kg: 150 mg: 6-12kg: 150 mg; 13-25kg: 300mg; 26-45kg: 600mg; >45kg: 900 mg PO q12h C: <2kg: 37.5mg; >3kg: 75mg PO q12h
Amino acids / peptides	RenAvast	C: 1 capsule with food
Potassium	Potassium citrate	D, C: initial: 75 mg/kg PO q12h
Probiotics	Azodyl	D, C: < 2.5kg: 1 capsule PO q24h; 2.5-4.5 kg: 1 capsule PO q12h; > 4.5kg: 2 capsules PO in AM and 1 capsule PO in PM with food
	Visbiome	10 billion organisms per kg body weight per day
Phosphate binder	Aluminum hydroxide	D, C: 15-45 mg/kg PO q12h with food
	Calcium acetate	D, C: 60-90 mg/kg PO q12h with food
	Sevelamer hydrochloride	D, C: 400-1600 mg PO q12h with food
	Lanthanum carbonate	D: 5-20 mg/kg PO q12h C: 1 ml (1 pump) PO q12h (Renalzin)
	Chitosan + calcium carbonate	D, C: 1 g/kg PO q12h 3-5kg: 1 scoop; 10kg: 2 scoops; 15kg: 3 scoops; 20kg: 4 scoops PO q12h (Ipakitine)
Vitamin D		D, C: initial:2-2.5 ng/kg PO q24h; maximum: 5 ng/kg PO q24h D, C: alternative: 8.75 – 12.25 ng/kg every 3.5 days PO
Erythropoietin	Erythropoietin	D, C: 100 ug/kg SQ 3X/week initially
	Darbepoetin	D, C: 1.5-1.0 ug/kg SQ 1X/week initially
Calcium channel blocker	Amlodipine	D: 0.1-0.4 mg/kg PO q24h; C: 0.625-1.25 mg PO q24h
ACE-I	Enalapril	D, C: 0.25 mg/kg PO q12h initially
	Benazepril	D, C: 0.25 mg/kg PO q12h initially
Angiotensin receptor blocker	Losartan Azilsartan Irbesartan Telmisartan Valsartan	D, C: 1 mg/kg PO q12h D: 0.1-1.0 mg/kg PO q12h D: 5 mg/kg q12-24h D, C: 1 mg/kg PO q12-24h D: 80-160 mg PO q24h
Aldosterone receptor blocker	Spironolactone	D, C: 1-4 mg/kg PO q12h-24h

Cushing's Syndrome
Diagnosis & Controversies in Cortisol Monitoring

Andrew Bugbee, DVM, DACVIM

Clinical Signs of Cushing's Syndrome (CS)

Common signs: Pu.Pd, panting (dogs), polyphagia, pot-bellied appearance, dermatopathy/alopecia (bilateral, truncal, non-pruritic), muscle weakness/wasting

Less common signs: comedones (black-heads), calcinosis cutis, thin skin, ligamentous injury, myotonia (hindlimb rigidity), facial nerve paralysis, CNS signs (pituitary macroadenoma?)

-Other systemic issues: hypertension, gall bladder mucocele, calcium-containing uroliths, thromboembolism (PTE, splenic vein thrombosis), concurrent diabetes mellitus (<10% of dogs, commonly present in cats at the time of CS diagnosis)

Diagnostic Workup

-Only pursue if ≥ 2 signs or exam abnormalities are present = **HIGH clinical suspicion**

-If atypical signs are present (vomiting, diarrhea, anorexia, coughing, bleeding, etc)… it is **NOT** the time to test for Cushing's!

-Minimum database (CBC, chemistry, u/a) to screen for characteristic CS abnormalities and/or concurrent disease(s).

-Biochemical changes ***in the absence of clinical signs*** should LOWER suspicion of CS.

-Common biochemical abnormalities: USG <1.020, elevated ALP, stress leukogram (lymphopenia, mature neutrophilia)

-Other diagnostic considerations: blood pressure, urine protein:creatinine ratio, abdominal ultrasound, urine culture

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Cushing's Syndrome Testing

-If concurrent disease(s) are present, try to first manage or regulate those conditions ***prior to CS testing***. Non-adrenal illness is ***likely to cause false positive results on most Cushing's tests!***

- **Urine Cortisol : Creatinine Ratio (UCCR**)

-Highly sensitive (= ***low # of false negatives*** = can believe a negative result).

-Used to **RULE OUT Cushing's** in patient with a LOW clinical suspicion of disease.

-Poorly specific (= ***high # of false positives***), if positive must perform LDDST or ACTH stim.

-Ideal for non-clinical dogs with persistent ALP elevation or low USG to exclude Cushing's.

-If high clinical suspicion for CS (ex. Pu.pd, panting, pot-bellied, high ALP, proteinuria, calcinosis cutis)… ***skip the UCCR*** and go straight to a LDDST or ACTH stim.

UCCR performance:

-Collect urine in a non-stressed environment. This typically means at home, at least 48 hours after any veterinary visits or known stressors.

-The client should collect at least one midstream urine sample. They can collect several samples from different voiding events, pooling them together, & storing in the refrigerator.

-Pull several mL & centrifuge. Submit at least 1mL of the supernatant for analysis to the lab.

- **Low-Dose Dexamethasone Suppression Test (LDDST)**

-Highly sensitive (= can believe a negative), but moderately specific (more false positives can occur with the LDDST compared to the ACTH stim when concurrent illness is present).
-Can be used to differentiate PDH from ADH in ~60% of cases.

LDDST performance:
-Patient should be acclimatized to the environment (hospitalize overnight, test done next day)
-Patient housed in a low-traffic, quiet area within practice. Handle minimally during the test.
-No other procedures (vaccines, ultrasound, etc.) should occur during a LDDST – risks causing ***false positive result***.

Performing the LDDST
-Pull a baseline cortisol sample (serum = red top tube)
-Inject 0.01-0.015 mg/kg dexamethasone IV
    -If using DexSP, use 3mg/mL to calculate dose instead of 4mg/mL as listed on vial
-Pull a serum cortisol sample 4-hours & 8-hours post-dex injection

LDDST interpretation:
-Diagnostic time point = 8-hour cortisol concentration
    -**8-hr cortisol concentration >/= 1.4 ug/dL = consistent with Cushing's**

- **ACTH Stimulation test**

-Slightly less sensitive than the LDDST (= slightly more false negative results than LDDST)
    -Due to low sensitivity in adrenal-dependent disease (PDH = ~80-85%; ADH = 55-65%)
    -But 85% of patients get PDH, so ok for the vast majority of cases
-Cannot be done in patients on steroids (topical/skin/ears/eyes), ketoconazole, or progestogens

ACTH stim performance:
-Pull a baseline cortisol concentration (serum = red top tube)
-Inject 5 mcg/kg synthetic ACTH (cosyntropin) IV (maximum dose = 250 mcg or 1 vial)
-Pull a post-stimulation serum cortisol sample 1-hour following the sACTH injection

ACTH stim interpretation:
-Diagnostic time point = 1-hr post-stimulated cortisol concentration
    -Normal: 6-17 ug/dL
    -Grey zone: 17-22 ug/dL
    -Cushing's likely: >22 ug/dL

Differentiation Testing (PDH vs. ADH)

- **LDDST or HDDST** (only able to diagnose PDH, cannot diagnose ADH!!!)
    -The HDDST is performed the same as the LDDST, but the dose of dexamethasone is increased by a factor of 10x to **0.1-0.15mg/kg IV** for dogs.
    -If you did not see suppression on a LDDST, you can then perform a HDDST to see if the higher dose induces suppression.
    -If **ANY** of the 3 suppression criteria are met – the patient likely has **PDH**

*** LDDST & HDDST Suppression criteria ***

- 4-hr cortisol is < 1.4 ug/dL
- 4-hr cortisol concentration is <50% of the baseline cortisol concentration
- 8-hr cortisol concentration is <50% of the baseline cortisol concentration
-Example: baseline = 6 ug/dL & 4-hour = 2.1 ug/dL
-2.1 is less than 3.0, therefore this is suppression = PDH diagnosed!

- **Abdominal ultrasound**
  -Normal adrenal size is <0.74cm measured in the dorsoventral, sagittal plane
  -PDH = bilaterally normal to enlarged ("plump") adrenal glands
  -ADH = Typically unilateral adrenal nodule or mass, atrophy of the contralateral gland
  -Malignant neoplasia more likely if maximal gland/nodule/mass width is >4cm

- **Endogenous ACTH concentration (eACTH)**
  -Historically not commonly utilized due to being very labile & having strict handling requirements to prevent getting inaccurate results.
  -Recently, the **TruForma benchtop endocrine analyzer** (made by Zomedica) can run eACTH samples now allowing an eACTH to be performed in-house within 15 minutes.

  Interpretation of eACTH
  -PDH = HIGH eACTH concentrations (>20 pg/mL)
  -ADH = LOW eACTH (<5pg/mL)

Cushing's Treatment

PDH = medical (**trilostane**, mitotane)
-Surgical = hypophysectomy (i.e. removal of pituitary)… options limited in U.S.
-Radiation therapy for pituitary tumors causing neurologic signs, doesn't treat CS!

ADH = surgery (adrenalectomy) > medical

Trilostane (Vetoryl®)

-FDA-approved for veterinary use (5mg, 10mg, 30mg, 60mg, and 120mg capsules)
-Inhibits 3-beta-hydroxysteroiddehydrogenase (3-beta-HSD), blocking cortisol production
-Avoid compounded formulations, large variability in concentration between batches and can impact bioavailability causing inconsistent control (i.e. intermittent clinical signs).

Protocol: Start **Vetoryl at 1-3 mg/kg PO every 12 hours.** Twice daily administration has been shown to be best and provide more reliable, consistent control of signs.

Initial monitoring & trilostane dose determination

- Assess clinical signs and ACTH stimulation test after 10-14 days
  -This visit is looking for over-controlled cortisol, **DO NOT increase dose now**
  -Full drug response can take up to at least 1 month
  -For monitoring, you can save costs by using a **1 mcg/kg** dose of sACTH (cosyntropin)
  -ACTH stim started ~3-5 hours after trilostane dosed
  -Test completed within **4-6 hours post-pill**

- Re-assess clinical signs and ACTH stimulation test after at least 30 days on trilostane

-This visit is looking for CS control, so it is ok to increase the dose as needed.
-A recheck is needed every 10-14 days following dose changes until control achieved.

- Treatment goals:
-**Most important = controlled clinical signs**
-1-hour post-ACTH stimulated cortisol concentration **around 5 ug/dL** (~3-8 ug/dL)

Long-Term Trilostane Monitoring

-**Once controlled, mostly monitoring the patient's clinical signs.**
-If doing well clinically, you can maintain the current trilostane dose.

-Most endocrinologists agree some form of intermittent cortisol testing is ideal every 6-12 months in well-controlled dogs. This could be a pre-pill cortisol or an ACTH stim.

-If clinical signs develop or you're concerned the Cushing's is uncontrolled = an ACTH stimulation test should be performed.

Pre-Pill cortisol monitoring

-This is an alternative to using the ACTH stim & best used in **well-controlled, non-clinical dogs**.

-A pre-pill cortisol **> 1.45 ug/dL and < 5.0 ug/dL** mostly excludes cortisol deficiency
-However, this test is NOT perfect…
-Odd results or conflicting info based on clinical signs? **Perform an ACTH stim**.

-Remember some signs of Addison's can mimic those of Cushing's, and an ACTH stim is the definitive test for diagnosing cortisol deficiency (i.e. iatrogenic hypocortisolism)

UPDATES ON DIAGNOSIS AND MANAGEMENT OF PITUITARY PARS INTERMEDIA DYSFUCTION

Michelle C. Coleman, DVM, PhD, DACVIM

Pars Pituitary Intermedia Dysfunction

Pituitary *pars intermedia* dysfunction (PPID) is a neurodegenerative condition of horses that has been associated with aging.[1] Historically referred to as Equine Cushing's Disease, PPID actually affects the pituitary *pars intermedia* rather than the *pars distalis*, it is typically not a neoplastic condition, and the adrenocortical contribution to the clinical syndrome is of less importance as compared to Cushing's disease that is described in other species. To avoid confusion, the term PPID is preferred over Cushing's disease.

Recent evidence suggests that over 20% of horses aged 15 and older are affected with PPID[2], however, younger horses may also be affected. Common clinical signs include hypertrichosis, lethargy, weight loss/muscle wasting, abnormal fat deposition, polyuria/polydipsia, recurrent infections (ie, skin, feet, sins, etc.), laminitis, and hyper- or anhydrosis. Other less common signs include seizures, blindness, ataxia, and reproductive problems such as persistent udder development and chronic pyometra.

While our understanding of the pathophysiology of the disease remains somewhat limited, significant progress has been made recently in our ability to diagnose and manage the condition

Diagnosis of PPID

PPID is a slowly progressive condition that represents a range of change to the pituitary. It is, therefore, challenging to make a 'definitive diagnosis', but can be even more challenging to identify those horses which are susceptible to developing clinical signs of disease, particularly laminitis. Diagnostic tests available include the dexamethasone suppression test (DST), resting adrenocorticotropic hormone (ACTH) concentration, and the thyrotropin-releasing hormone (TRH) stimulation test.

ACTH Concentration

Resting ACTH concentration is the most commonly used test in the diagnosis of PPID. Sensitivity and specificity are approximately 70% and 97%, respectively. [3] Historically, veterinarians were cautioned against testing during the autumn months due to a seasonal increase, however, recent evidence noted that this increase is to our advantage, as horses with PPID have a more marked increase than unaffected horses. Consequently, seasonal reference ranges have been established. However, despite the very high sensitivity, there are limitations to the use of this diagnostic test.

Stressors, such as systemic illness, high-intensity exercise, general anesthesia, and severe pain may all increase plasma ACTH. Sampling surrounding these stressful stimuli should be avoided. Additionally, due to variation in resting ACTH concentrations in affected and unaffected horses, the reliability of a single measurement of ACTH has been historically questioned, however, a recent study revealed that paired measurements offered no advantage over single measurements.[4] Another study revealed that plasma ACTH concentrations were lower following a 12-hour fast, compared with post-feeding samples.[5] For this reason, standardized methods of sample collection by veterinarian is advised. Finally, there have been historic concerns about sample handling. It is now thought that little degradation of the ACTH occurs if samples are chilled or frozen within a few hours of collection.[6]

TRH Stimulation Test

Administration of TRH results in increased plasma concentrations of ACTH and cortisol in horses with PPID and in unaffected horses, however, the magnitude of the effect is greater in affected horses.[3] The specificity of the test is nearly 100% [3], and the sensitivity is better than that of the resting ACTH alone, making this a more desirable diagnostic test for horses with early PPID. While both cortisol and ACTH can be measured following TRH administration, the test is more reliable if ACTH is measured. Plasma ACTH peaks within 2-10 minutes of TRH administration, then begins to decline. It is recommended that ACTH concentration be measured 0, 10 and 30 minutes, though for financial considerations, the 30 minute sample is frequently not collected. Owners should be warned of several side-effects may occur including muscle trembling, yawning, flehmen, coughing, and lip-smacking. Seasonal reference intervals have not been published.

Dexamethasone Suppression Test

Historically considered the 'gold standard' diagnostic test, there are several limitations to the DST. Seasonal pituitary activity during the autumn months result in a high number of false positives during this time of the year. More importantly, there are concerns for administration of glucocorticoids to horses that are predisposed or have a history of laminitis. This test is now performed with less frequency compared to the plasma ACTH and TRH stimulation test.

Treatment of PPID

The only licensed treatment for PPID in horses is pergolide (Prascend, Boehringer Ingelheim), at a dose of 2µg/kg by mouth once daily. There is some variability in response to treatment between patients, such that the the dose frequently warrants adjusting based on clinical signs and repeat endocrinologic evaluation. In a study of 2000 horses treated with pergolide, ACTH concentration returned to within normal limits or improved by more than 75% in over half of the cases at the first follow-up test following initiation of treatment. [7]

Pergolide is considered safe, with transient anorexia following initiation of treatment or increasing in dose as the most common side effect of treatment. Other clinical signs may include lethargy, behavioral changes, weight loss, and mild gastrointestinal signs. There is no evidence to support hepatic or cardiovascular compromise as a side effect of treatment.

Finally, proper nutrition and general health care are important mainstays of management of horses with PPID. Clipping, regular farrier care, proper anthelmintic therapy, routine dentistry, and early treatment of infectious disease are advised. There is poor evidence to support the use of other therapeutic agents, such as cyproheptadine, trilostane, and herbal extracts that have been implicated for the treatment of PPID.

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RATIONAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING IN VETERINARY PRACTICE

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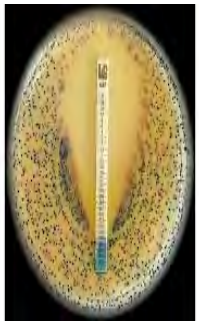
OVERVIEW

Introduction

Terminology and breakpoint development

Clinical use

- **When to test**
- **Individual animal**
- **Cumulative testing**



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INTRODUCTION

Antimicrobial Susceptibility Testing

- **One of the most frequently used diagnostic tests in veterinary medicine**
  - Confusing and misunderstood
  - Used inappropriately
- **Component of antimicrobial stewardship programs**
  - Disease treatment and control
  - Monitoring for changes in susceptibility over time

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INTRODUCTION

Antimicrobial Susceptibility Testing

- **Resistance threats seen more and more commonly in all areas of veterinary practice**
  - Cattle – *Mannheimia haemolytica* and *Moraxella* spp
  - Horses – *R. equi* and *Klebsiella spp*
  - Small animals – *Campylobacter jejuni*, *Enterobacteriales*, *Staphylococcus* spp
- ***AST can be a useful part of antimicrobial selection when used correctly***
  - *Clinical decision making*
  - *Prudent antimicrobial use*

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INTRODUCTION

Goals for This Hour

- **Introduction to terminology and methods associated with AST**
- **Provide an understanding of the breakpoint development process**
  - Breakpoints specific to common infectious disease syndromes
  - Expectations for clinical outcome when validated interpretive criteria are used
- **Describe "best practices" for the use of individual animal and cumulative AST testing in clinical practice**

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Definitions

- ***Broth dilution susceptibility test:*** **Method of AST that exposes the bacterial pathogen grown to a density of $5x10^5$ cfu/ml to a 2-fold dilution series of an antimicrobial agent in a liquid culture media. The measured result of this test is the MIC**

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Definitions

- ***Minimum inhibitory concentration (MIC):*** Lowest concentration of an antimicrobial agent that prevents visible growth of a microorganism in a broth dilution susceptibility test
  - Used to generate values to which other parameters can be compared
    - PK/PD indices
    - Clinical breakpoints
  - ***Distinct from a clinical breakpoint***

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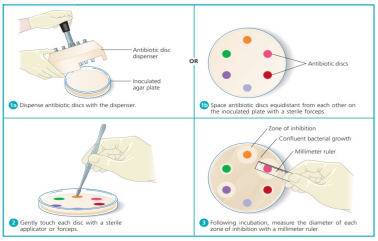
TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Definitions

- ***Disc diffusion susceptibility test*: *Method of AST that uses antimicrobial impregnated discs on solid culture medium. The measured result of this test is a zone of inhibition***



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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Definitions

- ***Clinical breakpoint/Interpretive criteria*: Specific *MIC or zone diameter used to declare isolates as being susceptible (S), intermediate (I), or resistant (R). Based on 3 criteria:***

  1. Wild-type cutoff

  2. PK/PD cutoff

  3. Clinical cutoff

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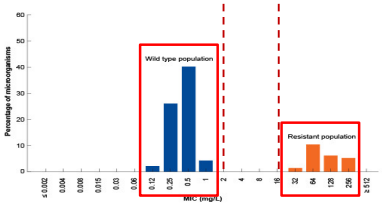
TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Breakpoint development is based on the MIC and requires 3 types of data

1. ***Wild-type cutoff (Co_{wt}): Histogram of a population of bacterial isolates categorized by MIC***



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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Breakpoint development is based on the MIC and requires 3 types of data

2. ***Pharmacokinetic/Pharmacodynamic cutoff ($Co_{PK/PD}$): Evaluation of pharmacokinetic properties of a specific antimicrobial to determine whether or not the appropriate target index can be achieved using accepted dosing regimens***
   - *T>MIC vs C_{max}/MIC vs AUC:MIC*
   - *% Protein binding*
     - *Only free drug is available for biological activity*

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Breakpoint development is based on the MIC and requires 3 types of data

3. ***Clinical cutoff (CO_{CL}): Correlation of in vivo treatment outcomes with bacterial pathogen causing disease***
   - *Validation of CO_{WT} and $CO_{PK/PD}$*
     - *Clinical trials or Monte Carlo simulations*
     - *Incorporation of complicating factors related to treatment outcomes*
       - *Host immune function*
       - *Disease severity*

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Definitions of Susceptible, Intermediate, and Resistant

Interpretive Criteria		Definition
S	Susceptible	An infection may be treated appropriately with the dosage regimen of an antimicrobial agent recommended for that type of infection and infecting bacterial species
I	Intermediate	An infection may be appropriately treated in body sites where drugs are physiologically concentrated, or when a high dosage of a drug can be used
R	Resistant	Strains are not inhibited by the usually achievable concentrations of the agent with normal dosage schedules and/or fall in the of MICs where specific resistance mechanisms are likely and clinical outcome has not been predictable in efficacy studies

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Breakpoint development is based on the MIC

- **Kirby-Bauer Disk Diffusion and AST**
  - Correlated to MIC based on zone diameter vs MIC regression, population distributions, PK, and efficacy studies
    - Error rate bounding performed
      - Very major errors
        - Falsely susceptible
      - Major errors
        - Falsely resistant
      - Minor errors
        - Intermediate in one category when the other is S or R

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Canine Breakpoints

Antimicrobial	Dosage regimen used for breakpoint analysis	Tissue or body site			
		Bone	Resp	SST	Gen
Amikacin	15 mg/kg SC IM or IV q 24		X	X	X
Amoxicillin or Ampicillin	*11 mg/kg PO q 12 (amoxicillin*	X	X	X	X
Amoxicillin-clavulanate	*11 mg/kg PO q 12*	X	X	X	X
Cefpodoxime	*5-10 mg/kg PO q 24*	X	X	X	X
Cefovecin	*8 mg/kg SQ once*	X	X	X	X
Clindamycin	*5.6 mg/kg PO q 12 (maximum of 33 mg/kg PO q 12)*	X	X	X	X
Doxycycline	*5 mg/kg PO q 12*		X	X	X
Enrofloxacin	*5 mg/kg PO q 12 or 2.5 mg/kg q 12*	X	X	X	X
Cefazolin	*25 mg/kg IV q 6*	X	X	X	X
Gentamicin	*10 mg/kg IM q 24*		X	X	X
Marbofloxacin	*2.75 mg/kg q 24*	X	X	X	X
Pradofloxacin	*3 mg/kg PO q 24*	X	X	X	X
Minocycline	*5 mg/kg PO q 12 to fasted dogs*		X	X	X

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Canine Breakpoints

Bacteria with Canine Specific Breakpoints	May Extrapolate to Other Bacteria	May Not Extrapolate Breakpoints to Other Bacteria
E. coli	*Other Enterobacteriacaea*	
Enterobacteriaceae and P. aeruginosa		*One fluoroquinolone may not be predictive of other fluoroquinolones*
P. aeruginosa	*Other Pseudomonas spp*	*Nonfermenting gram (-) species*
P. multocida	*Other Pasteurellaceae*	
Gram (+) cocci	*Other Gram (+) cocci*	*Not applicable to Enterococcus*
S. pseudointermedius	*Other staphylococci and doxycycline for other staphylococci*	*Breakpoints for cefovecin are applicable only to S. pseudointermedius*
Streptococcus canis	*B-hemolytic streptococci*	

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Feline Breakpoints

Antimicrobial	Dosage regimen used for breakpoint analysis	Tissue or body site			
		Bone	Resp	SST	Gen
Amoxicillin or Ampicillin	*12.5 mg/kg PO q 12 (amoxicillin)*	X	X	X	X
Amoxicillin-clavulanate	*12.5 mg/kg PO q 12*	X	X	X	X
Cefovecin	*8 mg/kg SQ once*			X	X
Enrofloxacin	*5 mg/kg PO q 12 or 2.5 mg/kg q 12*	X	X	X	X
Marbofloxacin	*2.75 mg/kg q 24*	X	X	X	X
Pradofloxacin	*5 mg/kg PO q 24*	X	X	X	X
Orbifloxacin	*2.5 mg/kg (tablet) PO or 7.5 mg/kg (suspension) PO q 24*	X	X	X	X

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Feline Breakpoints

Bacteria with Feline Specific Breakpoints	May Extrapolate to Other Bacteria	May Not Extrapolate Breakpoints to Other Bacteria
E. coli	*Other Enterobacteriacaea*	
Enterobacteriaceae and P. aeruginosa		*One fluoroquinolone may not be predictive of other fluoroquinolones*
P. aeruginosa	*Other Pseudomonas spp*	*Nonfermenting gram (-) species*
P. multocida	*Other Pasteurellaceae*	
Staphylococcus felis	*Other staphylococci*	
Streptococcus spp	*B-hemolytic streptococci*	

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Bovine Breakpoints

Antimicrobial	Dosage regimen used for breakpoint analysis	Tissue or body site			
		Joint	*Resp*	SST	Mast
Ampicillin	11 mg/kg IM q 24	X	X	X	
Ceftiofur	*2.2 mg/kg IM; 6.6 mg/kg SQ at ear base*		X	X	
Danofloxacin	*6 mg/kg SQ twice q 48 hr; 8 mg/kg SQ once*		X		
Enrofloxacin	*7.5 mg/kg SQ once*		X		
Gamithromycin	*6 mg/kg SQ once*		X		
Tulathromycin	*2.5 mg/kg SQ once*		X		
Tilmicosin	*10 mg/kg SQ once*		X		
Tildipirosin	*4 mg/kg SQ once*		X		
Penicillin	*22,000 IU/kg IM q 24*	X	X	X	
Tetracycline	*20 mg/kg IM once*	X	X	X	
Florfenicol	*20 mg/kg IM twice q 48 hr*	X	X	X	

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Bovine Breakpoints

Bacteria with Bovine Specific Breakpoints	May Extrapolate to Other Bacteria	May Not Extrapolate Breakpoints to Other Bacteria
E. coli	*Other Enterobacteriacaea*	*Enteric infections or infections outside of the mammary gland*
M. haemolytica	*Other Pasteurellaceae*	
Gram (+) cocci	*Other Gram (+) cocci*	*Not applicable to Enterococcus or infections outside of the mammary gland*

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Equine Breakpoints

Antimicrobial	Dosage regimen used for breakpoint analysis	Tissue or body site				
		Bone	Joint	Resp	SST	Gen
Amikacin	Adult: 10 mg/kg IV q 24	X	X	X	X	X
	Foal: 20 mg/kg IV q 24			X	X	
Ceftiofur	*2.2 mg/kg – 4.4 mg/kg IM q 24; 6.6 mg/kg IM twice 4 days apart*			X	X	X
Gentamicin	*Adults: 6.6 mg/kg IM q 24*	X	X	X	X	X
Enrofloxacin	*7.5 mg/kg PO q 24*	X	X	X	X	X
Ampicillin	*22 mg/kg IM or IV q 12 (sodium salt)*	X	X	X	X	X
Doxycycline	*20 mg/kg PO q 12*		X	X	X	X
Minocycline	*5 mg/kg PO q 12*		X	X	X	X
Penicillin	*22,000 IU/kg IM q 24*	X	X	X	X	X
Cefazolin	*25 mg/kg IV q 6*	X	X	X	X	X

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Dosage Regimens and Tissue Sites Applicable to Equine Breakpoints

Bacteria with Equine Specific Breakpoints	May Extrapolate to Other Bacteria	May Not Extrapolate Breakpoints to Other Bacteria
E. coli	*Other Enterobacteriacaea*	
Enterobacteriaceae and P. aeruginosa		*One fluoroquinolone may not be predictive of other fluoroquinolones*
P. aeruginosa	*Other Pseudomonas spp*	*Nonfermenting gram (-) species*
Gram (+) cocci	*Other gram (+) cocci*	*Not applicable to Enterococcus spp*
Staphylococcus aureus	*Other staphylococci*	
Streptococcus equi subsp equi and subsp zooepidemicus	*B-hemolytic streptococci*	

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Realistic Expectations for Susceptibility Testing

- **"90/60" rule**
  - > 90% of infections respond to appropriate antimicrobial therapy if pathogen classified as S
  - < 60% of infections respond to antimicrobial therapy if pathogen classified as R
    - Immunocompetent
    - Monoinfections
    - Accumulation of antimicrobial at infection site

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Realistic Expectations for Susceptibility Testing

- **Reasons for treatment failure or inadequate response**
  - ***Delayed diagnosis/Advanced disease state***
  - ***Inappropriate choice of antimicrobials relative to PK properties and infection site (i.e. ceftiofur)***
  - ***Inappropriate clinical diagnosis***
  - Use of AST results that lack validated breakpoints
  - Incorrect identification of causative agent
    - Polymicrobial infections
  - Immune competence/incompetence

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Take Home Points

- **AST reporting accounts for multiple factors related to disease outcome**
  - PK/PD
  - Host response
- **Translates data into clinically relevant interpretation**
  - S, I, or R
- ***Specific to a disease process, infecting organism, animal species, antimicrobial agent, and dosing regimen***

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Take Home Points

- **Dose, route, frequency, and duration of therapy all integral components of breakpoint interpretation**
  - Determine concentrations of drug in the animal
  - Based on oral or injectable administration following systemic administration
- **Inappropriate to apply breakpoint for a drug to any other dose, route, frequency, or duration**
  - Topical or local use

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TERMINOLOGY AND BREAKPOINT DEVELOPMENT

Take Home Points

- **Correlation between AST and clinical outcome not perfect**
  - Multiple different factors interact to affect outcome
    - Some S will fail to respond to treatment
    - Some R will respond to treatment
  - Clinical tool that allows for clinicians to choose an antimicrobial with a greater chance of a positive outcome
    - ***Most applicable to patient populations rather than the individual animal***
    - ***Only useful when validated interpretive criteria are used***

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Selection of an antimicrobial dependent on more than results of AST**
  - Withdrawal times
    - Food and performance animals
  - Dosing route/frequency
  - Product price
- **AST part of a complex decision-making process**
  - Expectation of efficacy (or lack thereof)

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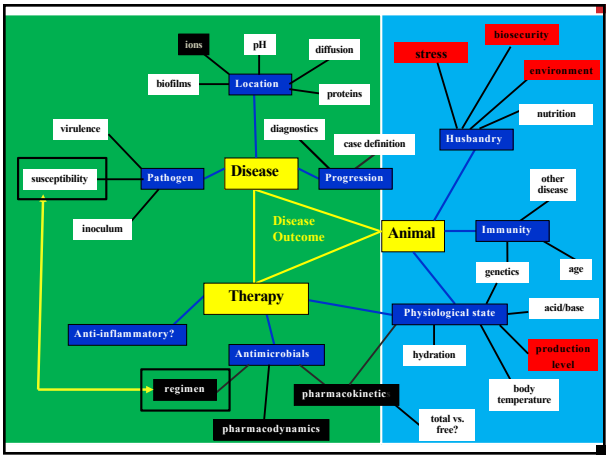

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Is AST actually necessary for successful treatment?**
  - Often not
    - Most infections often respond adequately to empiric therapy
      - Uncomplicated
      - Caused by wild-type bacteria
      - Known history of antimicrobial exposure

HOW WILL THE USE OF THIS TEST CHANGE HOW I MANAGE THIS PATIENT?

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Is AST actually necessary for successful treatment?**
  - ***It's time to culture when:***
    - ***Suspicion that an infection caused by organisms resistant to empirically selected drugs***
      - Unsuccessful empiric treatment
        - Recurrent UTI
      - History of previous antimicrobial exposure
        - Metaphylaxis in high-risk beef calves
      - Suspicion of pathogen with high likelihood of resistance
        - *Enterobacteriales*
        - *MRSA/MRSP*

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Two ways AST data can be used**
  - Individual animal
    - Applied to clinical decision making at the level of the individual animal/group of animals from which an isolate was obtained
      - "Rule-out what wouldn't work"
  - Cumulative antibiograms
    - Monitoring of emerging resistance patterns
    - ***Support choice of empiric therapy for future cases***

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Individual animal**
  - Prior to testing
    - Define clinical question
      - Susceptibility of primary pathogens vs group/pen susceptibility profiling
    - ***Determine what samples are most representative of disease at site of interest***
  - After testing
    - Integrate results with clinical decision-making process

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Individual animal**

Two pens of highly commingled, lightweight feeder calves were mass medicated (metaphylaxis) on arrival to a feedyard and are now experiencing an outbreak of BRD. First treatment response risk is low (50%) and the veterinarian is concerned that resistance might be playing a role in the poor response to therapy. Necropsies are performed, and lung tissue is submitted for culture and susceptibility. The samples yield a pure culture of M. haemolytica

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Individual animal**

Antimicrobial	Interpretation	MIC	Test Range
Ampicillin	S	≤0.25	0.25-16
Ceftiofur	S	≤0.25	0.25-8
Chlortetracycline	NI	>4	0.5-8
Clindamycin	NI	>16	0.25-16
Danofloxacin	R	>1	0.12-1
Enrofloxacin	R	>2	0.12-1
Florfenicol	S	1	0.25-8
Gentamicin	R	>16	1-16
Neomycin	NI	8	4-32
Oxytetracycline	R	>8	0.5-8
Penicillin	I	0.5	0.12-8
Spectinomycin	R	>64	8-64
Sulfadimethoxine	NI	≤256	256
Tiamulin	NI	8	0.5-32
Tilmicosin	I	16	4-64
Trimeth/sulfa	NI	≤2	2/38
Tulathromycin	R	>64	1-64
Tylosin tartrate	NI	32	0.5-32

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Cumulative antibiograms**
  - Listing of percentage of isolates susceptible to commonly used antimicrobials
    - Development of empirical prescribing guidelines for management of patients that do not currently have microbiologic test data
      - Local resistance patterns
    - Evaluation of changes in susceptibility that have occurred over time

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Cumulative antibiograms**
  - Guidelines for presentation
    - Present only % susceptible
    - Analyze and present data at least annually
      - Monitoring for changes over time
    - Present data from populations with 30 or more isolates represented
    - Include only drugs commonly used or legal for use in a specific species

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Cumulative antibiograms**
  - Rules of thumb
    - Changes in empiric therapy needed when 75% of isolates classified as R
      - *Always interpret in light of previous response to antimicrobial therapy*
  - Significant utility in management in individual animal or outbreak situations when diagnostics are pending or not available

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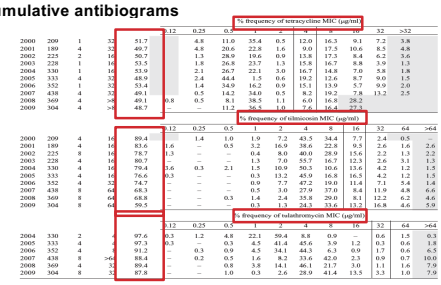
CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Cumulative antibiograms**



10-year study of susceptibility of *M. haemolytica* from cattle with BRD

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CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Cumulative antibiograms**

A veterinarian is reevaluating health protocols on a stocker operation. This practitioner will be evaluating cumulative AST data on calves at the time of 1st treatment for BRD to determine which antimicrobials would be appropriate for empiric use given historical trends

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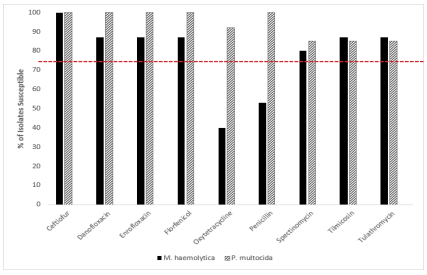
CLINICAL USE OF ANTIMICROBIAL SUSCEPTIBILITY TESTING

Best Practices for the Use of AST

- **Cumulative antibiograms**



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CONCLUSIONS

- **Large amount of data go into development of veterinary-specific interpretive criteria**
  - Microbiologic and pharmacologic
  - Clinical
- **Outcome = *in vitro* test correlated with clinical outcome**
  - ***Imperfect because it is affected by multiple different factors***
  - ***Tool that helps set reasonable expectations of success or failure***
  - ***Eliminates antimicrobial agents that are unreasonable***

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CONCLUSIONS

- **Maximum benefit of AST can be seen by:**
  - Understanding whether or not veterinary-specific breakpoints are being used or if they are derived from another source
  - Preferentially using veterinary-specific breakpoints when available
  - Understanding which extrapolations can and can not be made when specific breakpoints do not exist
- ***Interpret results in conjunction with clinical experience and other logistical factors***
  - ***Broth dilution more informative than disc diffusion***

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QUESTIONS

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SMALL RUMINANT MEDICINE FOR THE SMALL ANIMAL PRACTITIONER

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OVERVIEW

Introduction

Intestinal Parasitism

- **Use of dewormers in parasite management programs**

Neurologic Disorders

- ***Listeria monocytogenes* and *P. tenuis***

Nutritional Management of the Goat Herd

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JUDICIOUS USE OF DEWORMERS

3

JUDICIOUS USE OF DEWORMERS

Resistance to dewormers a severe and worsening problem

Resistance = natural process impossible to prevent

Dewormers essential to parasite control on an individual operation

- **Measures required to reduce development of resistance**
- **Preserve efficacy of drugs currently available**

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JUDICIOUS USE OF DEWORMERS

Kaplan, 2019

- **Fecal samples from 34 goat farms in eastern United States**
  - 100% of farms had *H. contortus* resistant to Valbazen
  - 44% of farms had *H. contortus* resistant to Prohibit
  - 94% of farms had *H. contortus* resistant to Ivomec
  - 56% of farms had *H. contortus* resistant to Cydectin

Complete dewormer failure found on 30% of farms

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JUDICIOUS USE OF DEWORMERS

Step 1

- **Understand the resistance level and what dewormers are effective within a given population**
  - Fecal egg count reduction test
    - Evaluation of egg count before and 2 weeks after dewormer administration
- **Step 2**
  - Keep resistant worms off the farm by quarantining all new additions in a dry lot and treating them with 3 dewormers from 3 different classes (Panacur, Cydectin, Prohibit)

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JUDICIOUS USE OF DEWORMERS

Step 3

- **Only treat animals if they absolutely need to be treated**
  - Goal is not to keep animals free of parasites
    - Want to manage parasite burden
  - Maintenance of "refugia"
    - Population of parasites not exposed to dewormers
    - Dilution of resistant worms on pasture
  - Targeted selected treatment (TST)
    - Treatment of individual sheep or goats based on specific indicators of health or production status

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JUDICIOUS USE OF DEWORMERS

Step 3

- **Only treat animals if they absolutely need to be treated**
  - FAMACHA scoring

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JUDICIOUS USE OF DEWORMERS

Step 3

- **Only treat animals if they absolutely need to be treated**
  - FAMACHA scoring
    - Animals with FAMACHA 1 or 2
      - Don't deworm unless diarrhea or other evidence of parasites
    - Animals with FAMACHA 4 or 5
      - Always deworm
    - Animals with FAMACHA 3
      - Deworm if > 10% of herd is 4 or 5
      - At risk due to production stage
        - Near parturition
      - Poor body condition or questions about health

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JUDICIOUS USE OF DEWORMERS

Step 3

- **Only treat animals if they absolutely need to be treated**
  - FAMACHA scoring
    - If < 10% of herd/flock is FAMACHA 4 or 5 check every 2 weeks during peak transmission season
      - Check every 4 weeks outside of peak transmission season
      - Focus on high-risk animals
        - Lambing or kidding ewes/does
    - If > 10% of herd/flock is FAMACHA 4 or 5 check every 1 week during peak transmission season

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JUDICIOUS USE OF DEWORMERS

Step 3

- **Only treat animals if they absolutely need to be treated**
  - FAMACHA scoring
    - 40-97% reduction in use of dewormers
    - 72% of people using FAMACHA report fewer problems with worms on farms
    - 90% of people continue using FAMACHA once implemented on farm

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JUDICIOUS USE OF DEWORMERS

Step 4

- **Use only combinations of drugs and give the proper dose**
  - Choose dewormers from 3 different classes
    - Benzimidazole (Panacur, Valbazen, Safeguard)
    - Imidithiazole (Prohibit, Strongid)
    - Macrocyclic lactone (Cydectin, Ivomec)
  - Use full dose of each drug
  - Administer separately, never mix in same syringe or dosing gun

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JUDICIOUS USE OF DEWORMERS

Step 4

- **Use only combinations of drugs and give the proper dose**
  - Enhanced efficacy relative to to use of one drug alone

Impact of using anthelmintics in combination on the efficacy of treatments

Drug 1 (%)	Drug 2 (%)	Drug 3 (%)	Combination (%)
80	80	–	96
80	80	80	99.2
90	90	–	99
90	90	90	99.9
60	95	–	98
60	60	95	99.2
99	99	–	99.99
60	60	60	93.6
50	50	50	87.5

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JUDICIOUS USE OF DEWORMERS

Step 5

- **Consider non-drug approaches**
  - Copper oxide wire particles
  - Secondary plant compounds
    - *Sericea lespedeza*
  - Nematode-trapping fungi
    - Bioworma

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JUDICIOUS USE OF DEWORMERS

Step 5

- **Consider non-drug approaches**
  - Copper oxide wire particles
    - Copasure
      - 2-4 gram/head in adults; 0.5-1 gram/head in lambs/kids
      - No more than 2 treatments in one grazing season
      - 6 weeks between treatments
    - Use name brand Copasure and avoid copper sulfate products

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JUDICIOUS USE OF DEWORMERS

Step 5

- **Consider non-drug approaches**
  - Nutrition
    - "You can feed your way out of a worm problem, but you can't worm your way out of a feed problem"
    - Ensuring adequate protein and energy intake in diet
      - Understand nutrient requirements of animals at various stages of production
    - Supplementation of at-risk or nutritionally challenged animals with proper feedstuffs

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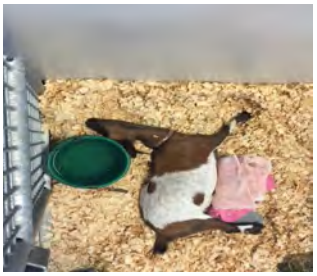
NEUROLOGIC DISORDERS



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LISTERIOSIS

- **Most common condition associated with CN deficits AND brainstem disease**
- **Associated with winter housing and poorly preserve silage**
  - More common to see cases in individual small ruminants than as herd outbreaks
- **Multiple, unilateral CN deficits *WITH ALTERED MENTATION***

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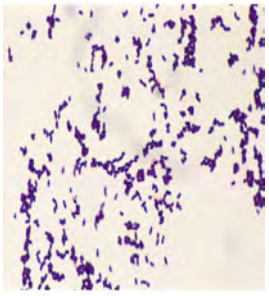
LISTERIOSIS

Etiology

- ***L. monocytogenes***
  - Gram (+) rod
    - Intracellular pathogen
  - Shed in feces and milk
    - Raw milk consumption
  - Psychrophilic
    - Survives in refrigeration



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LISTERIOSIS

Clinical Signs

- **Multiple, unilateral, cranial nerve deficits**
  - CN V, VII, VIII, IX
- **Depression**
  - Involvement of ARAS
- **Vomiting and Ptyalism**
  - Nuclei of vagus and glossopharyngeal

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LISTERIOSIS

Clinical Signs

- **CN V**
  - Loss of facial sensation
  - Poor jaw tone
- **CN VII**
  - Ear droop
  - Ptosis
- **CN VIII**
  - Circling and head tilt

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LISTERIOSIS

Listerial myelitis

- **Sheep, goats, cattle, humans**
  - Normal mental status
  - Normal cranial nerves
  - Flaccid paraparesis or tetraplegia
    - Recumbency

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LISTERIOSIS

Diagnosis

- **History and Clinical Signs**
- **Laboratory Tests**
  - CSF collection – Mononuclear pleocytosis
- **Necropsy**
  - Multifocal micro-abscesses
    - Medulla and Pons
  - Demonstration of organism – IHC

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LISTERIOSIS

Treatment

- **Procaine Penicillin G**
  - 25,000 IU/kg IM q 24 hrs
- **Ampicillin trihydrate**
  - 11 mg/kg IM q 24 hrs
- **Oxytetracyline (LA 200)**
  - 20 mg/kg IV daily
- **Florfenicol (NuFlor)**
  - 20 mg/kg IM q 48 hrs

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LISTERIOSIS

Differential Diagnoses

- **Brainstem abscessation (other causes)**
- ***P. tenuis***
- **Otitis media/interna with meningitis**
- **Honey mesquite toxicosis**

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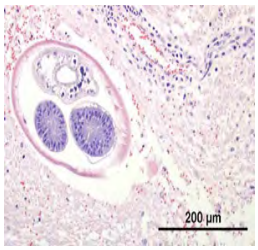
PARALEPHASTRONGLYUS TENUIS

Reported in:

- Sheep
- Goats
- Llamas
- Alpacas
- Cattle
- Deer
- Horses



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PARALEPHASTRONGLYUS TENUIS

Clinical Signs

- Asymmetric Spinal Cord Disease
  - Ascending UMN lesions
    - Hypermetria, ataxia, truncal sway
- Cerebral/brainstem signs reported (Worse prognosis)
  - Seizures
  - Depression

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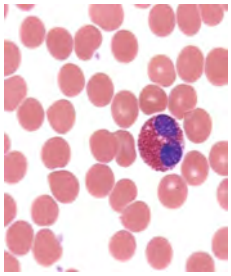
PARALEPHASTRONGLYUS TENUIS

Diagnosis

- **Clinical Signs**
  - Asymmetric, ascending UMN lesions
- **CSF Collection**
  - Lumbosacral space
    - Eosinophilia



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PARALEPHASTRONGLYUS TENUIS

Treatment

- Anthelmintics
  - Fenbendazole – 50 mg/kg q 24 hrs for 5 days
  - Avermectins
    - Ineffective for parasites within CNS
      - Do not cross BBB
    - May have some benefit for parasites in tissues outside CNS
- Anti-inflammatories
  - Meloxicam

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PARALEPHASTRONGLYUS TENUIS

Prevention

- Minimize contact with WTD and snail/slug
  - Eliminate brush and moist areas
- Monthly administration of anthelmintics
  - Ivermectin or Doramectin
    - Begin 1 month after last frost
    - Stop after first frost

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PARALEPHASTRONGLYUS TENUIS

Differential Diagnoses

- **Cervical spinal cord disease**
  - Trauma
  - DJD
  - Fracture
  - Abscessation; Diskospondylitis

Neoplasia

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QUESTIONS

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Fluid, Electrolyte, and Antimicrobial Therapy in Neonatal Calf Diarrhea

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Neonatal calf diarrhea (NCD) remains a common disease throughout both the beef and dairy cattle industries. NCD is responsible for approximately 60% of all mortality in preweaned dairy heifers, 14% of all mortality in beef calves less than 21 days of age, and 23% of all mortality in beef calves older than 21 days of age. Dehydration, acidosis, and translocation of enteric organisms to the bloodstream play an important role in the disease process. As a result, fluids, anti-inflammatories, and antimicrobials are sometimes necessary to achieve a favorable clinical outcome. Of the aforementioned therapeutic choices, fluids have the greatest potential to reduce morbidity and mortality. The use of antimicrobials in calves with diarrhea is controversial with strong opinions on both sides of the argument. Nevertheless, evidence does exist to suggest that antimicrobials do have a place in treating calves with diarrhea and, when used appropriately, can improve outcome. The purpose of these proceedings is to review the clinical rationale for therapeutics in calves with diarrhea and provide recommendations to help assist the practitioner with decision-making when faced with a critically ill calf.

The primary goals in treating calves with diarrhea are the following:

1) Correct free water and electrolyte abnormalities

2) Correct acid-base deficits

3) Provide nutritional support

4) Treat and/or prevent bacteremia

Three of the 4 aforementioned goals can be addressed with appropriate fluid therapy and much of this fact sheet will be focused on this particular aspect of treatment. If abnormalities are noticed early in the disease process, clinical outcome will be much better than if they are recognized later.

FLUID THERAPY

Oral Fluid Therapy

Diarrhea increases the loss of both fluid and electrolytes in the feces of calves. In addition, calves with diarrhea often have decreased milk intake. These processes result in dehydration/hypovolemia, strong ion acidosis, electrolyte abnormalities, D-lactic acidosis, and negative energy balance. Fluids can be administered by either the oral or parenteral routes. Oral fluids have the advantage of being easier to administer on farm, less expensive and more physiologic. Oral fluids should be considered when calves have diarrhea and show evidence of a functional gastrointestinal tract (suckle reflex, chewing action). Parenteral fluids should be considered when severe dehydration and hypovolemia are present or a calf has shown evidence

of a dysfunctional gastrointestinal tract. Oral electrolyte solutions must satisfy the following requirements:

1) Supply sufficient sodium to normalize ECF volume (90-130 mmol/L)
2) Provide agents that facilitate the absorption of sodium and water (glucose, glycine, citrate, acetate, propionate)

3) Provide an alkalinizing agent to correct acidosis (acetate, propionate, bicarbonate)

4) Provide energy in the form of glucose and amino acids

In general, oral electrolyte solutions should be fed as an extra meal to calves with diarrhea and should be fed for 5-7 days. For example, if calves are fed twice daily the electrolyte solution could be given mid-day between the two regular feedings. These solutions may be fed from a bottle or bucket, depending on farm resources. Mixing of electrolyte solutions in milk or milk replacer is not recommended since plasma volume will not be adequately expanded. Along those same lines it is important to continue feeding milk to calves with diarrhea as this will support intestinal healing and growth

Table 1 below lists oral electrolyte solutions available in North America that meet the 4 requirements listed above. These products should be chosen over other available products when designing treatment protocols for calves with diarrhea.

Table 1. Electrolyte products suitable for diarrheic calves

Product
Diaque (Boehringer Ingelheim Vetmedica)
Hydrafeed (A&L Laboratories)
Hydralyte (Vet-A-Mix and Agrilabs)
Land O Lakes Base plus Add pack (Land O Lakes)
Land O Lakes Complete (Land O Lakes)
Revitilyte (Vet Plus Inc)

Intravenous Fluid Therapy

Oral fluids are generally more convenient for on farm use. Nevertheless there are times when intravenous fluid therapy is necessary. Intravenous fluids are indicated when calves are weak, unable to stand, or have a weak to absent suck reflex. Despite the issues associated with administration of large volume of intravenous fluids on farm, practical protocols do exist. The following protocol has worked well in the hands of the author in on-farm situations:

1) 8.4% $NaHCO_3$ – 5 ml/kg IV over 5-10 minutes

2) 2 liters of an appropriate oral electrolyte solution (see list above)

The aforementioned protocol is most appropriate for calves > 7 days of age with moderate signs of dehydration (< 8%). This protocol will also work well in calves with severe depression and coma. In calves less < 7 days of age and/or more significant fluid deficits, larger volumes of fluid are likely required. A simple method of estimating fluid deficits is as follows:

Amount of eyeball recession in mm X 2 = % dehydration

For example, if a calf's eyes are recessed 5 mm in the orbits then it is estimated to be 10% dehydrated (5 mm X 2 = 10%)

With that knowledge, fluid deficits can now be calculated using the following formula:

% dehydration X BW in kg = Fluid deficit in Liters

For example, a calf weighing 50 kg with 10% dehydration would need 5 liters of fluid to correct existing deficits (0.10 X 50 = 5 liters)

The next step is to determine what type of fluid is necessary for the calf. While numerous fluids are available, many are inappropriate for use in acidotic calves. The following protocol can be used to address severe dehydration (> 10%) and acidosis in calves with diarrhea:

Infuse 250 ml of 8.4% $NaHCO_3$ in 5 L of 0.9% saline and administer over the course of 2-3 hours. If an adequate response is obtained, maintain calf on oral electrolyte solutions until diarrhea resolves. If there is no response or if the calf relapses, administration can be repeated.

ANTIMICROBIAL THERAPY

The goal of choosing antimicrobials for use in calves with diarrhea is to protect animal health while reducing the unnecessary use of ineffective or inappropriate medications. Also, practitioners should be focused on two important factors when treating calves with diarrhea. First, antimicrobials must decrease the number of coliform bacteria in the intestinal lumen. Second, bacterial translocation from the GIT to the bloodstream must be addressed. In addition, due to concerns regarding the development of antimicrobial resistance in pathogens of human importance, potential impacts of unnecessary or inappropriate antimicrobial use on animal and human health should be considered. Therefore, the following considerations are of utmost importance when using antimicrobials in calves with diarrhea:

1) Administering medications per label recommendations or with the input of a veterinarian if medications are to be used in a legal extra-label manner

2) Selecting an antimicrobial agent with an appropriate spectrum of activity

3) Selecting a dose that maintains therapeutic concentrations at the site of infection (blood and intestinal tract)

4) Treating for an appropriate duration

5) Avoid side effects and violative tissue residues

6) Minimizing the transfer of resistant bacteria from animal to animal or animal to humans

Calves with diarrhea experience an overgrowth of coliform bacteria, primarily *E. coli*, in the intestinal tract. In addition, approximately 30% of calves with diarrhea will be bacteremic and most of the pathogens (75%) isolated from these calves are Gram negative enteric bacteria with *E. coli* again being the predominant isolate (50%) in most cases. Therefore, antimicrobials

chosen for use in calves with diarrhea should achieve concentrations effective against Gram negative enteric pathogens in both plasma and the intestinal lumen. Furthermore, antimicrobials should be targeted to calves that are most likely to benefit from their use and not given to every affected calf. ***Calves that are bright, alert, and otherwise systemically healthy DO NOT require antimicrobials and therapy should be focused on maintaining hydration and addressing electrolyte abnormalities***. Calves that meet the following criteria are most likely to benefit from systemic antimicrobial therapy:

1) Calves that are systemically ill (weak suckle, > 6% dehydrated or hypovolemic, recumbent, comatose

2) Calves with blood in the feces

3) Calves with failure of passive transfer (regardless of other systemic signs)

Most of the products labeled specifically for use in calves with diarrhea are ineffective or unavailable. Therefore, the antimicrobial currently recommended for use in systemically ill calves with diarrhea is ceftiofur. Products such as ceftiofur sodium (Naxcel) or ceftiofur HCl (Excenel) are recommended over ceftiofur crystalline free acid (Excede). The dosing regimens for these products are as follows:

1) Naxcel – 2.2 mg/kg SQ or IM q 24 hrs for 5 days

2) Excenel – 2.2 mg/kg SQ or IM q 24 hrs for 5 days

3) Excede – 6.6 mg/kg SQ at the base of the ear q 72 hrs for 2 doses

It is important to note that the extra-label use of cephalosporins is restricted by the FDA and any deviation from the aforementioned dosing regimens is considered illegal. In addition, the use of Excede and Excenel ARE NOT to be used in calves to be processed for veal.

ANTI-INFLAMMATORIES

The use of anti-inflammatories in calves with diarrhea is controversial. Nevertheless, recent work has shown meloxicam to improve attitude, appetite, and weight gain in calves with undifferentiated diarrhea. ***Therefore, it is reasonable to recommend the use of a single dose of meloxicam at a dose of 1-2 mg/kg of body weight. Meloxicam should be given orally and may be given concurrent with the first feeding of electrolytes. Slaughter withdrawal for this drug is 21 days from the last dose.***

Antimicrobial Therapy for Bovine Respiratory Disease

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Bovine respiratory disease (BRD) is the most common and costly disease of beef cattle in North America. In feedlots, BRD is responsible for 75% of all morbidity and 50-75% overall mortality. Approximately 16.2% of all cattle entering feedlots will be diagnosed with BRD and 2% will die. In stocker cattle, BRD morbidity occurs far more frequently than what is commonly seen in feedlot cattle and is estimated to be responsible for 90% of all morbidity and mortality in these operations. As a result, it is not unusual to see morbidity risk exceed 75% in certain cohorts of animals. Economically, BRD costs the beef industry $2-4 billion annually with 20% of total losses due to medication costs and 80% of total losses due to reduced carcass weight and quality. While multiple factors play a role in the development of BRD, bacteria, particularly *Mannheimia haemolytica,* are ultimately responsible for the clinical signs seen in affected cattle. As a result, antimicrobials are a mainstay of therapy and surveys of feedlots across the United States have shown that 100% of cattle diagnosed with BRD are given antimicrobials (oral and/or parenteral) as part of the initial therapeutic regimen. Unfortunately, the stocker and feedlot segments have been encountering issues with antimicrobial resistance in *Mannheimia haemolytica* and, based on recently published data, the isolation of strains of *Mannheima haemolytica* that are resistant to multiple antimicrobials is becoming a more frequent occurrence. The purpose of these proceedings is to review the antimicrobials currently available for use in cattle with BRD and provide data that might help with decision-making in clinical settings.

ANTIMICROBIAL EFFICACY

There are currently 16 antimicrobials registered for use in cattle with BRD and, unfortunately, they are not all created the same. Generally, antimicrobial selection is based on several factors, with cost, efficacy, availability, and our own personal biases influencing the drug we choose for a specific patient. In the ideal world, clinical decisions are made based on data derived from blinded, randomized, controlled clinical trials that compare one antimicrobial to another or an antimicrobial to a non-active control (saline). Unfortunately, such information is often unavailable or difficult to access, a factor that can be frustrating at times. In addition, busy practitioners in field settings often do not have the time to keep up with the massive amounts of literature currently available. Recently, however, several meta-analyses and systematic reviews have been published that summarize available data in an attempt to provide practitioners with reasonable estimations of antimicrobial efficacy using well-designed studies.

Number Needed to Treat

The number needed to treat (NNT) is a statistic that is designed to evaluate the effect of a therapeutic in a population. The NNT is essentially the number of animals that a clinician needs to treat to make a difference in one animal and gives some idea as to the number of treated animals that spontaneously cure. In other words, the NNT gives us some sense of how often a given treatment actually makes a difference in a population of clinically ill animals. The NNT is calculated using the following formula:

1/(Cure in Treatment Group – Cure in Control Group)

For example, a trial evaluating the efficacy of ceftiofur crystalline free acid (CCFA, Excede) in dairy cattle with acute puerperal metritis (APM) compared to normal saline found that clinical cure risk in the treated and control groups was 74.3% and 55.3%, respectively. The NNT from this trial is 5.3 [1/(74.3 – 55.3)]. In other words, 5 cows with APM will need to be treated with CCFA to make a difference in the outcome of one case.

The NNT for numerous antimicrobials evaluated for use in the prevention, control, and treatment of BRD has been calculated. When evaluating control of BRD in cattle at high risk of developing disease, the average NNT is 2. In other words, 5 animals must be mass medicated with approved antimicrobials to prevent BRD in one animal. It is important to note that antimicrobials vary in efficacy, with some being more effective than others. When evaluating treatment of BRD and risk of retreatment. In these trials the average NNT is 2. Again, 2 animals must be treated to prevent retreatment in one. Lastly, the NNT for prevention of mortality is 6, indicating 6 animals must be treated to prevent the death of one. All data are summarized in tables 1, 2, and 3.

Mixed Treatment Meta-Analyses

A mixed treatment meta-analysis was recently published that combined efficacy evidence from published trials for 12 antimicrobials registered for use in cattle with BRD. The antimicrobials were ranked in order of efficacy and, from the results, it is clear that available data suggests that tulathromycin and enrofloxacin rank higher than other available drugs. It is also clear that ceftiofur (Naxcel, Excenel, Excede), oxytetracyline, and trimethoprim are not much more effective than saline. The results of the meta-analysis are summarized in Table 4 below.

Expectations of Antimicrobials in Field Settings

There are few, if any, published trials specifically evaluating first treatment success risk. As a general rule of thumb, > 80% of cattle given any antimicrobial for treatment of BRD should respond and not require a second treatment. If more than 20% of cattle are requiring retreatment, something may be amiss and farm treatment protocols should be reevaluated. Reasons for treatment failure are numerous but include antimicrobial resistance, inappropriate antimicrobial choice, and prolonged disease duration to name a few. It is the author's experience that prolonged disease duration plays a large role in many of the treatment failures encountered in practice.

DURATION OF THERAPY AND POST-TREATMENT INTERVALS

Data on the optimal duration of therapy in cattle with BRD are scarce. In human medicine, the emerging paradigm is short durations of therapy with higher doses of antimicrobials. This is being done to minimize antimicrobial exposure time in an effort to reduce selection pressure for resistant bacterial strains. With the emergence of multi-drug resistant strains of *Mannheimia haemolytica* being isolated with increasing frequency from cattle with BRD, a similar approach may be prudent in cattle. Unfortunately, as stated previously, there are no data from randomized, controlled, blinded clinical trials to help us decide how long is long enough. Nevertheless, recent studies evaluating post-treatment intervals (PTI) may help guide us in deciding when it is time treat again. A PTI is essentially a treatment moratorium. It is the

period of time after a treatment is administered that we wait before declaring an animal a treatment failure and administering a second treatment. While not perfectly interchangeable for duration of therapy, observing a set PTI before declaring an animal a treatment failure can reduce over antimicrobial use and reduce selection pressure. PTIs for the drugs most commonly used in cattle with BRD are listed in Table 5 below.

Table 1. NNT for Metaphylaxis

Treatment	NNT
CCFA	7.5
Tulathromycin	2
Florfenicol	7.5
Oxytetracycline	10
Gamithromycin	3
Tilmicosin	3.5
Tildipirosin	3

Table 2. NNT for Treatment

Treatment	NNT
Ceftiofur Na	7.5
dFlorfenicol (20 mg/kg IM)	2
Florfenincol (40 mg/kg SQ)	1.8
CCFA	7.5
Enrofloxacin (2.5 mg/kg SQ)	2
Enrofloxacin (5 mg/kg SQ)	2
Enrofloxacin (12.5 mg/kg SQ)	1.7
Danofloxacin	2
Tulathromycin	2
Gamithromycin	2
Tilmicosin	2

Table 3. NNT for Mortality

Treatment	NNT
Florfenicol (20 mg/kg IM)	2.5
Florfenicol (40 mg/kg SQ)	7.5
Enrofloxacin (2.5 mg/kg SQ)	5
Enrofloxacin (5.0 mg/kg SQ)	5
Enrofloxacin (7.5 mg/kg SQ)	3.5
Enrofloxacin (12.5 mg/kg SQ)	7.5
Danofloxacin	10
Tulathromycin	6
Tilmicosin	2

Table 4. Ranking of Antimicrobials for Treatment of BRD (Mean and 95% credibility interval)

Treatment	Mean	95% Credibility Interval
Tulathromycin	1.68	1.00-4.00
Enrofloxacin	2.36	1.00-4.00
Danofloxacin	3.19	1.00-7.00
Florfenicol	4.68	3.00-7.00
Tildipirosin	5.60	1.00-11.00
Gamithromycin	6.04	3.00-8.00
Tilmicosin	6.15	4.00-8.00
Ceftiofur HCl	8.36	3.00-12.00
Ceftiofur Na	9.08	7.00-11.00
Trimethoprim	9.82	4.00-13.00
Ceftiofur pinna	10.23	4.00-13.00
Oxytetracycline	11.24	9.00-13.00
Saline	12.55	11.00-13.00

Table 5. Post-Treatment Intervals for Antimicrobials Commonly Used for Treatment of BRD

Treatment	PTI
CCFA	7 days
Tulathromycin	10-14 days
Tilmicosin	7 days
Enrofloxacin (12.5 mg/kg SQ)	7 days
Oxytetracycline (200 mg/ml)	3-4 days
Florfenicol	4 days

DENTAL EXTRACTIONS: THE BASICS& ADVANCED

UGA Spring Conference 2023

HEATHER L. DUNCAN, DVM, DIPL. AVDC
Board Certified Veterinary Dentist ™

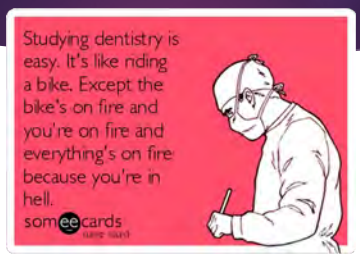
1

Introductions:

- Heather L. Duncan, DVM, Dipl. AVDC
  - Board certified veterinary dentist ™
  - Greenville, SC
  - Upstate Vet Emergency & Specialty
  - carolinavetdentist@gmail.com

UPSTATE VET
EMERGENCY + SPECIALTY CARE

2



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Objectives:

- Anatomy review
- Brief review of indications for dental extractions
- Dental nerve blocks
- Dental equipment needed for extractions
- Dental instruments needed for extractions
- Dental equipment to help with ergonomics
- How to perform dental extractions
- Complications that can occur with dental extractions

4

Part I: Anatomy

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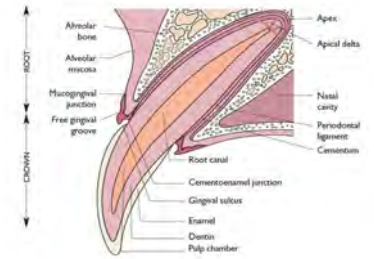
Dental Anatomy



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Dental Anatomy

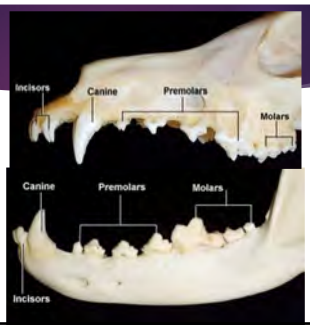
- Upper teeth--Maxillary
- Lower teeth--Mandibular
- Dogs 42 teeth; 28 deciduous
- Cats 30 teeth; 26 deciduous

Virbac

7

Dental Anatomy

- Incisors (12)
- Canines (4)
- Premolars (16)
- Molars (10)



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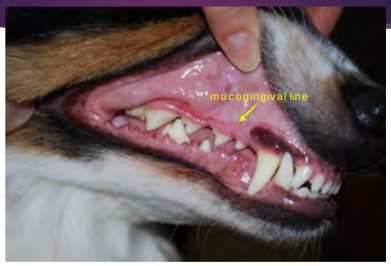
Dental Anatomy

- 60% of the tooth structure exists below the gumline

9

Normal Gingiva



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Gingiva vs. Mucosa

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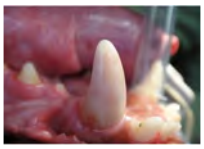
Oral Pathology: Indications for Treatment

- Tooth Resorption (TR)
- Non-vital tooth (discolored)
- Fractured teeth
  - Uncomplicated vs complicated
  - Restoration
  - Root canal therapy
- Periodontal disease
  - Root planing (closed vs open)
  - Bone grafting or GTR (guided tissue regeneration)



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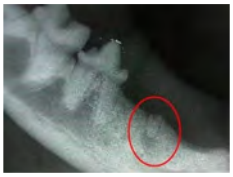
Oral Pathology: Indications for Treatment

- Retained roots
  - Stomatitis
  - Apical disease
  - Complication of extractions
- Oronasal fistula
- Dehiscence



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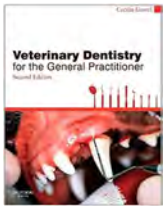
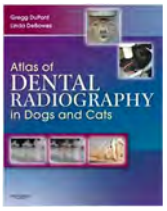
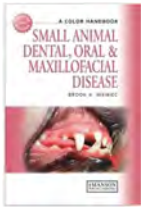
Oral Pathology- Resources







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When to Consider Referral:

- For dental extractions with:
  - Extensive bone loss – especially MN ventral cortex
  - Root dilacerations
  - Root resorption
  - Severely diseased or recessed soft tissue
- For advanced periodontal procedures like GTR
  - Bone grafting, periodontal flap procedures
  - Major teeth or 'particular' owners

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When to Refer:

- For endodontic or prosthodontic procedures
  - Vital Pulp Therapy
  - Root Canal therapy
  - Metal Crowns – Abrasion
- For higher risk anesthesia patients
  - Depends on your comfort level

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Part II: Regional Nerve Blocks:

-Infraorbital
-Middle Mental
-Caudal Maxillary
-Caudal Mandibular

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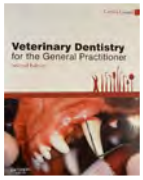
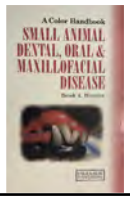
Some Dental Nerve Block Resources:

- Multiple Journal Articles

- Text Books





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Nerve Block: Benefits

- Prevent, rather than modulate pain nociception
- Block sodium channels in nerves, prevent depolarization & propagation of the action potential = no progression of nociception
- Reduces inhalant MAC
- Reduces need for rescue drugs, i.e., opioids
  - Less opioid mediated side effects (nausea)
  - Less paperwork
- Reduces risk of chronic pain

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Nerve Blocks: Motor vs. Sensory

- Nerves are in A, B, and C groups based on size and myelination with subgroups
- Largest are group A – most resistant to blocks
- Motor function is last to be blocked, may not be blocked at all
- Bupivacaine blocks more sensory than motor nerves,
- Ropivacaine and liposome-encapsulated bupivacaine cause less motor blockade than regular bupivacaine.
- Higher doses or concentrations – more likely to block motor function

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	Onset	Duration	Recommended Dose	Toxic Dose
Lidocaine HCl	Rapid < 5 min	60-120 min	4-6 mg/kg dog 2-4 mg/kg cat	20 mg/kg IV dog 11.5 mg/kg IV cat
Bupivacaine HCl	2-5 min 10 min full block	4-6 hr diffusion Up to 24 hr	1-2 mg/kg dog 1 mg/kg cat	4.3 mg/kg IV dog 3.8 mg/kg cat
Ropivacaine HCl	5-10 min	4-8 hours	1-3 mg/kg dog 1-2 mg/kg cat	4.8 mg/kg IV dog ? 3mg/kg IV cat
Mepivacaine HCl	2-5 min	2-3 hr soft tissue 05-1 hr pulp	5-6 mg/kg dog 2-3 mg/kg cat	80mg/kg IV dog (CV death)
Articaine HCl	Widely used in human dentistry. Anecdotal in Vet Med. No animal studies.			

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Nerve Blocks: Bupivacaine Volume

0.5% BUPIVACAINE INFUSION VOLUME PER SITE BASED ON PATIENT WEIGHT

Patient Weight (kg)	Volume Range (mL)
≤5	0.1–0.3
5–25	0.3–0.6
25–40	0.7–1
>40	1.1–1.4

https://www.cliniciansbrief.com/article/nerve-blocks-oral-surgery-dogs

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Nerve Blocks: Ropivacaine

- ROPIVACAINE
  - Has been used since 1996
  - Use as you would use bupivacaine- (good substitute if needed)
  - Structurally similar to bupivacaine
  - Less cardiotoxic then bupivacaine, more than lidocaine
  - Slightly less potent – max dose of 3mg/kg vs 2mg/ kg for bupivacaine
  - May cause slight vasoconstriction, comparable to bupivacaine + epi
  - Acute systemic toxicity can cause convulsions, apnea and cardiac arrest
  - Starts to work within a few minutes and lasts for ~3-6 hours
  - Studies used either 0.5% or 0.75% solution, few dental studies

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Nerve Block: Equipment

- 3cc and 1cc *luer lock* syringes vs human-style injector
- 25, 27 or 30g needles
- Short needles

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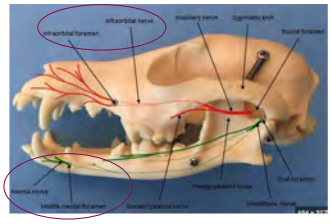
Pain Management: Nerve Blocks



http://alfaxan.co.uk/news/pain-what-a-pain-part-2

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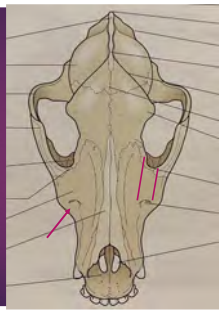
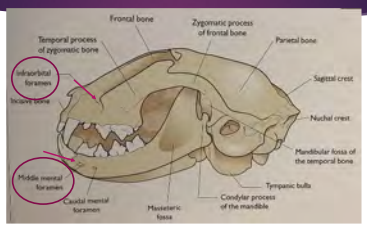
Nerve Blocks: Dog Infraorbital



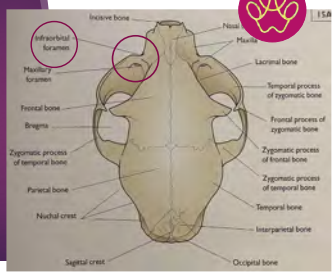
27

Nerve Blocks: Cat Infraorbital & MM



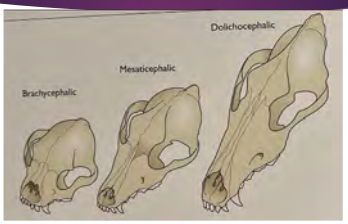
28

Nerve Blocks: Cat Infraorbital

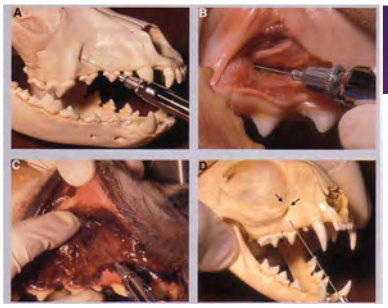


29

Nerve Blocks: Skull Shape Significance



30



Pain Management: Nerve Blocks – Infraorbital (IO)

- Dr. Gary Lantz, JVD 2003

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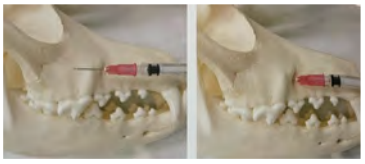
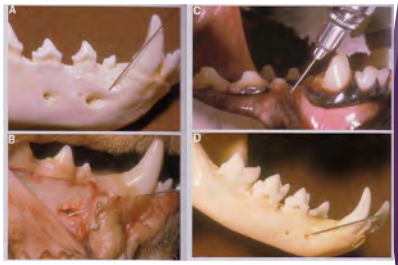
Maxillary Nerve Block: Caudal Infraorbital – needle placement



- Neurovascular damage possible
- Aspiration is essential
- Skull type must be taken into consideration

32



Mid Mental Foramen (MM) Block

DR. GARY LANTZ, JVD 2003

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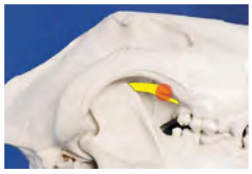
Maxillary Nerve block

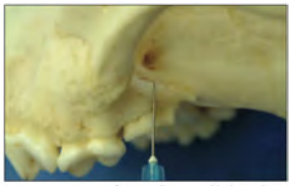
- *Caudal maxillary blocks:*
- bone
- Teeth
- intraoral soft tissue
- ipsilateral soft and hard palatal mucosa and bone



34

- 1. Palpate the caudal aspect of the hard palate behind MX M2
- 2. Advance the needle approx. 3-5mm vertically with the bevel facing rostrally
- 3. Aspirate!!
- 4. Slowly inject agent
- 5. Withdraw and apply pressure with finger or cotton tip applicator

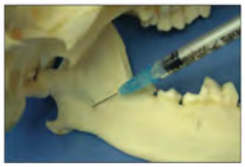
Caudal Maxillary Nerve Block: Intraoral



35

Caudal Mandibular (Inferior Alveolar) Nerve Block Technique- Intraoral

Intraoral



Dr. Loic Legendre & Dr. Brett Beckman Compendium 2002

https://www.aaha.org/aaha-guidelines/2020-aaha-anesthesia-and-monitoring-guidelines-for-dogs-and-cats/local-anesthetic-techniques/for-dental-extractions/

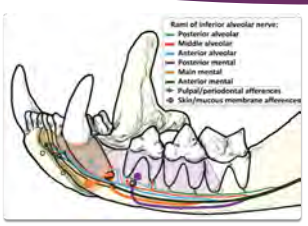
36

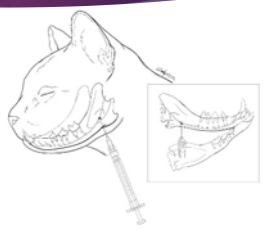
Caudal Mandibular (Inferior Alveolar) Nerve Block Technique- Intraoral

Figure 2—Injection site for an inferior alveolar nerve block (extraoral technique) in a dog.

37

Mandibular Nerve Block - Extraoral





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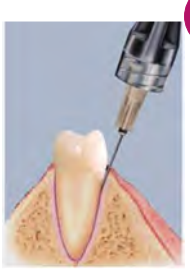
Pain Management: Nerve Blocks – PDL (Periodontal ligament)



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Complete Pain Management: Use a Multimodal Approach

- Local nerve blocks
- NSAIDs
  - Carprofen - advantage of injectable
  - Onsior vs. Metacam
- Opioid (preop / intraop +/- TGH)
  - Fentanyl Patches
  - Simbadol, Zorbium
- Gabapentin, Tramadol
- Cerenia

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Part III: Essential Dental Instruments - Motor Units- Dental delivery systems

41

Instruments: Dental Motor Units

-compressor
-water bottles
-suction (less common)
-3-way syringe
-high speed handpiece
-low speed handpiece
-piezoelectric ultrasonic scaler

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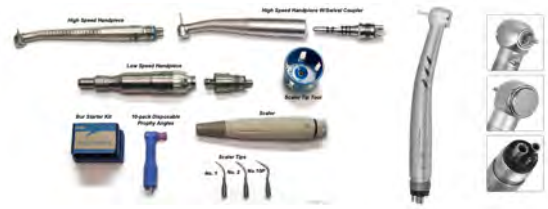
Instruments: Handpieces



43

Instruments: High Speed Heads

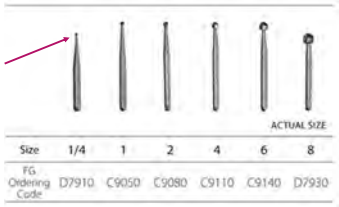
44

Instruments: High speed Handpiece

im3 iPush tool for Friction Grip (FG) burs

45

Instruments: Burs



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A Quick Guide to IM3 Dental Burs

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Instruments: Burs

Buccal Bone Removal: #2 for most; #4 big dogs; #1/2 for cats & root outlines

Sectioning Multi-rooted teeth: 699 cats, 701-701L most dogs

48

NOT A DENTAL INSTRUMENT

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Instruments: Burs

Working bur handpiece compatibility = FG
describes the type and size of bur (701)
Extra long working area = #L (701L)
Extra long shank = SL Surgical Length (FG 701L SL)

50

Part IV: Essential Dental Instruments – Hand Instruments

51

Instruments: Scalpel Blades & Handles

52

Instruments: Molt 2/4 Periosteal Elevator

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Instruments: Periosteal Elevators

54

Instruments: Winged Elevators & Handles

www.im3vet.com

55

Instruments: Winged Elevators

https://cislak.com/pages/downloadable-catalog-pdf

(Section 2.2)

56

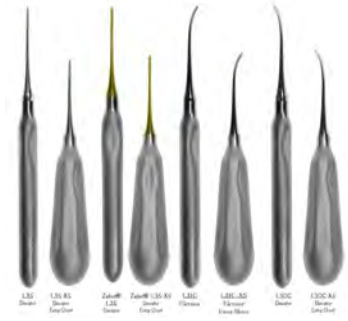
Instruments: Luxators

57

Instruments: Non-winged Elevators

https://serona.vet/blogs/seronas-blog/the-difference-between-elevators-luxating-type-elevators

58



Instruments: Root Elevators

- 1.3, 1.35, 1.8
- VARIOUS CURVES
- *NOT* ROOT TIP PICKS

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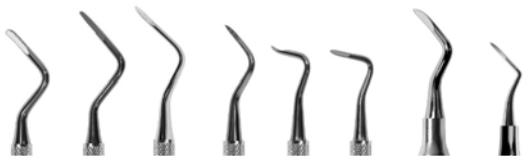
Instruments: Root Tip Picks



60

Instruments: Extraction Forceps

61

Instruments: NOT Extraction Forceps

62

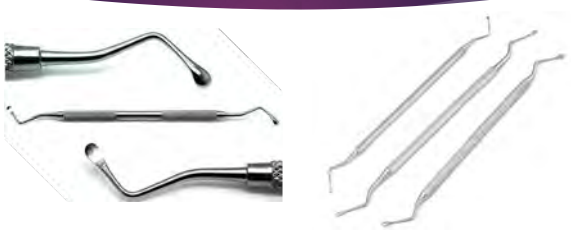
Instruments: Small and Root Extraction Forceps

63

Instruments: Root Tip Picks & Forceps

64

Instruments: Spoon curette



65

Instruments: Find a Zombie

66

Instruments: Thumb / Tissue Forceps

Adson-Brown

Bishop Harmon

Rat Tooth 1 x 2

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Instruments: Scissors

-LaGrange Scissors

-Iris Scissors (curved and / or straight)

-Suture Scissors

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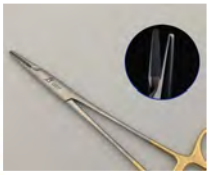
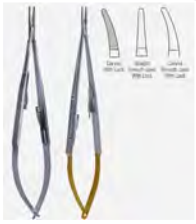
Instruments: Needle Holders



69

Instruments: Needle Holders



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Instruments: Suture

Dogs (unless ~ <7#)

Cats & Small Dogs

Puppies and Kittens

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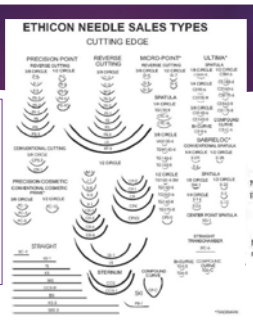
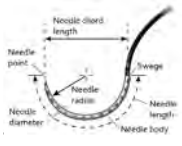
Instruments: Suture

- Dyed or undyed
- Taper or reverse cutting needle
- Suture length
- Needle size
  - P3 for 5-0
  - FS2 for 4-0





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Loupes & Ergonomics

73

Instruments: Investment

74

Instruments: Loupes

- Considerations:
- - single person or dept. use
- - 2 to 2.5X is the highest you need in the beginning
- - TTL = Through the Loupe lenses – lighter
- - light or no light
- - what more expensive frames provide

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Instruments: Loupes Resources

https://www.rosemicrosolutions.com/
Used by GPs, vet dentists and VTS dental techs – positive reviews & more economical than others.

https://www.surgitel.com/
The most expensive, great high-tech options, very popular with vet dentists.

https://hoges.com/
Used to be very popular, may be sold in US under different name now.

https://www.denmat.com/loupe-configurator
Denmat sells Perioptix – another popular brand (Dr. Scott has used since 2013)

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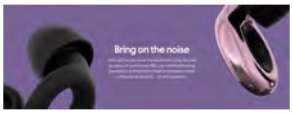
Consider Ear Protection: Earplugs



Loop Earplugs
https://us.loopearplugs.com/

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Additional Helpful Products

https://www.surgiden.com/media/SurgiDEN-Product-Catalog.pdf

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Instruments: Shopping Resources

- IM3.com
- Shippsdental.com
- Ultimatedental.com / Safco.com
- Dentralree.com (burs)
- Cislak.com
- Net32.com
- Germedusa.com
- Surgiden.com
- Amazon.com & Ebay.com (cheaper instruments)
- Covetrus / Patterson / MWI

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Instruments: Sharpening Resources

- Cislak: https://cislak.com/pages/service-center
- Precision Instrument Sharpening: https://www.pisharpening.com/?utm_campaign=457530b2-419b-457c-b33e-917b1f56119e&utm_source=so&utm_medium=mail&cid=aecafdcc-9758-4819-ab46-81f96a07b32d
- You Tube Sharpening Videos: https://www.youtube.com/watch?v=0bMrxJpzyks (an example)

81

Questions?

82

Part V: Extraction Techniques

83

Extraction: Flap Design – Know your tissues

84

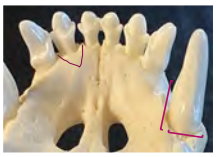
Single Root Extraction Instruments & Steps

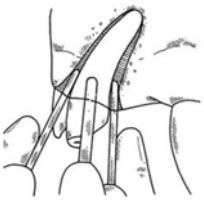
- *Pre-extraction: *Clean (or at least de-chunk) the tooth & take your dental x-rays*
- 1. PLAN YOUR FLAP DESIGN BASED ON YOUR X-RAYS / ANATOMY
- 2. 15, 15C OR 11 blade to make a sulcular incision
- 3. Periosteal elevator to reflect back and mobilize the gingiva
- 4. Luxators or winged elevators to mobilize the tooth
- 5. Extraction forceps
- 6. Spoon curettes for debridement
- 7. Instruments and suture for closure

85

Extractions: Anatomy – Root Shape

- Know your root anatomy
  - Choose the right instrument





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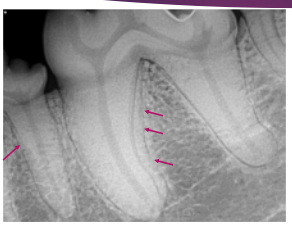
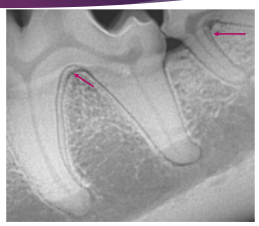
Extractions: Anatomy - Interradicular Grooves





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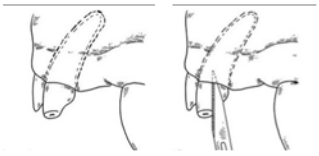
Extractions: Flap Design – 1 Root, Envelope Flap

- Visualize the root – palpate the juga, check your x-rays
- 15, 15C or 11 blade to deeply incise the sulcus
- Use a small periosteal elevator to mobilize the gingiva +/- mucosa.
- Careful - flap may tear at Mucogingival Line (MGL)!



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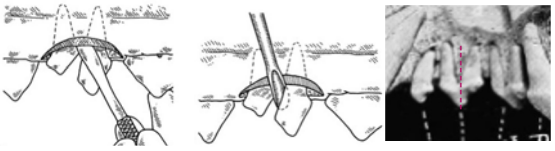
Extractions: 2 Roots, Envelope Flap



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Extractions: Flap Design - beyond the envelope…

- Why make a larger flap?
  - Better visualization
  - Resorbing root(s)
  - Supernumerary roots – (MX PM3)
  - Difficult root anatomy
  - Gingival recession
  - Closure - root shape of MX 3rd incisor, PM4 and molars

90

Extractions: Flap Design - beyond the envelope…

- Terminology:
  - Mesial and Distal releasing incisions
    - Vertical releasing incisions
  - Line angles
  - Divergent incisions
  - Triangular flap

Credit:
Holmstrom, Frost & Eisner

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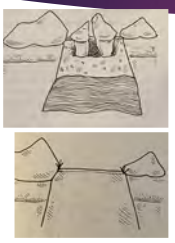
Extractions: Flap Design - beyond the envelope…



Credit:
Holmstrom, Frost & Eisner

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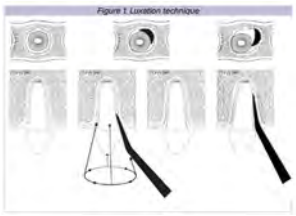
Extractions: Straight Line Access & Luxation



Credit: Dr. David Crossley
https://www.vin.com/apputil/content/defaultadv1.aspx?pId=11223&meta=generic&catId=31453&id=3858985&ind=76&objTypeID=17

93

Extractions: Elevators and Luxators

- Use palm grip and a short finger stop (finger guard)
- Avoid excessive force on adjacent teeth or bone
- Use opposite hand as support and guard
- Do not damage the surrounding vital structures
- Follow root anatomy
- Avoid excessive apical force
- Instrument should conform to the tooth surface

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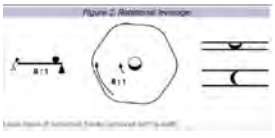
Extractions: Elevators and Luxators

- Luxators and periotomes cut the periodontal ligament
- Elevators stretch the PDL
- Luxators should only be used in short apically directed twists
- Elevators can more readily handle use as levers
- Apical force must be applied with a short finger stop



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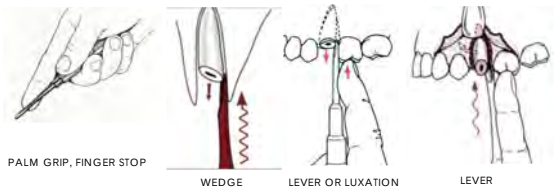
Extractions: Use of Luxators & Elevators

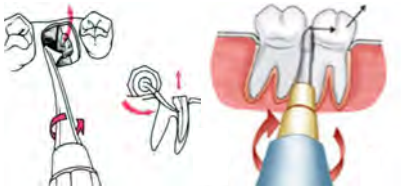


PALM GRIP, FINGER STOP | WEDGE | LEVER OR LUXATION | LEVER

96

Extractions: Use of Elevators

- Wheel & Axel
  - Cryer elevator
  - Straight elevator

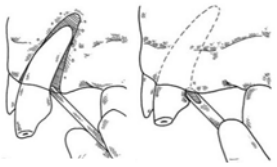


97

Extractions: Mobilization & Exodontia

- NEVER use a luxator like this
  - Fractured lux tip or wing of an elevator can get trapped in bone
- Use extraction forceps

Credit: https://veteriankey.com/exodontics/



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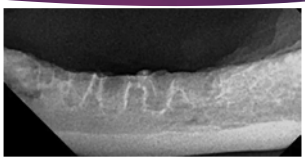
Extractions: Post-Extraction Dental X-rays



****Always** take post-extraction radiographs before you suture!**
ALWAYS – ALWAYS – ALWAYS – ALWAYS

99

Extractions: Finishing Steps

1. Take dental x-rays (to confirm complete root extraction)
2. Alveoloplasty with diamond bur
3. Debride with spoon curette (or periosteal elevator)
4. Release flap with scissors
5. Suture closed (with 4-0 PGCL on reverse cutting needle in Simple Interrupted and/ or cruciate patterns)

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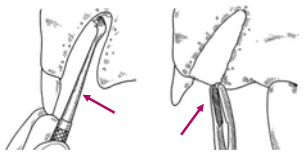
Extractions: Prepare for Closure

- What instruments are being used?



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Extractions: Alveoloplasty

Diamond burs or white stones of varying grit

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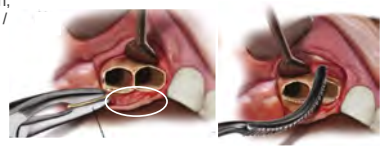
Extractions: Prepare for Closure

- Note that the soft tissue has been loosened all the way around the tooth, including the palatal / lingual aspect.



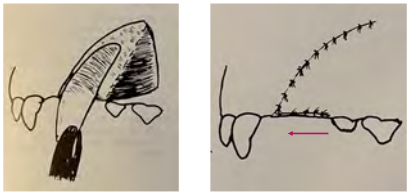
103

Extractions: Closure

- CLOSURE MUST BE TENSION FREE!!
- Suture patterns:
  - *Simple interrupted
  - Cruciate
  - Mattress

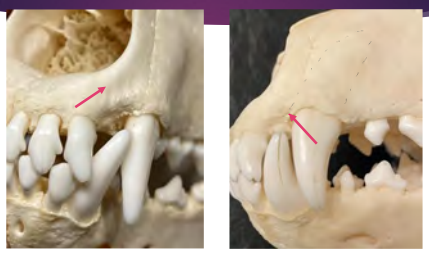
104

Extractions: Flap Design – Single Releasing Incision



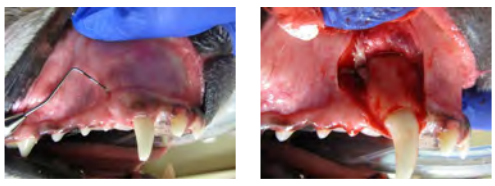
105

Extractions: Flap Design – Single Releasing Incision Variation



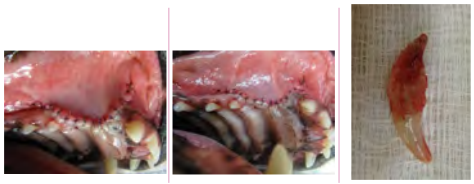
106

Extractions: Flap Design – Double Vertical Releasing Incisions



107

Maxillary Canine Extraction Closure



108

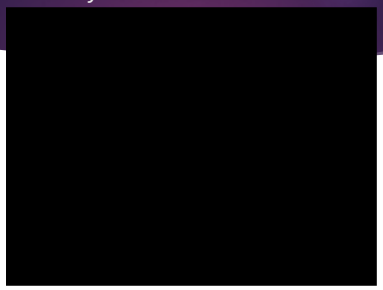
Let's Watch Some Videos:

109

Maxillary Canine Extraction in the dog

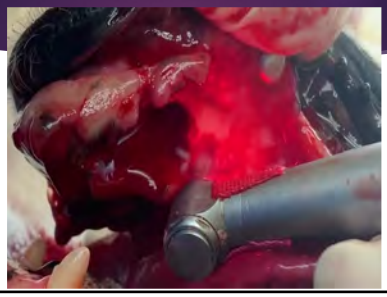
110

Maxillary 3rd Premolar Extraction



111

Removal of Fractured Roots:



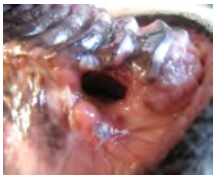
112

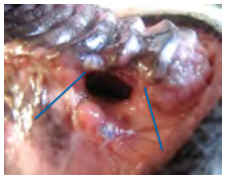
Part VI: Advanced Surgical Extraction/Oral SurgeryTechniques

113

Advanced Surgical Techniques: Oronasal Fistula (ONF) Repair

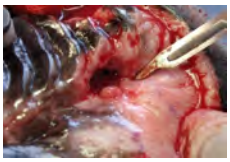
This is essentially the same mucogingival flap you would make for a maxillary canine extraction, Just extended toward the lip margin further – make sure there is NO tension present.

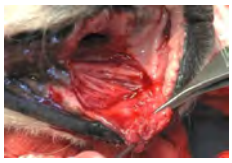




114

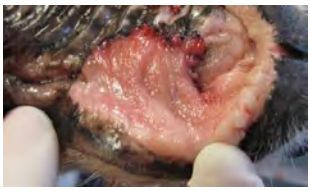
Advanced Surgical Techniques: Oronasal Fistula (ONF) Repair





115

Advanced Surgical Techniques: Oronasal Fistula (ONF) Repair



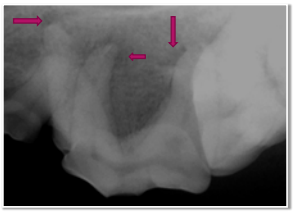
116

Extractions of Premolars & Molars

- Multiple roots – remove each individually
- Create flap to aid exposure
- Section teeth - crosscut fissure bur/round bur
- Remove buccal bone – round bur
- Incise gingival attachment from around tooth
- Elevate and luxate each root
- Osteoplasty & hemostatic agent if needed
- +/- **Bone graft material** (not stomatitis/CCUS- as this could act as a foreign body)
- Suture with 4-0 or 5-0 absorbable monofilament (**poliglecaprone 25**): **Monocryl**

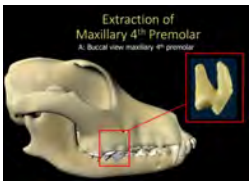
117

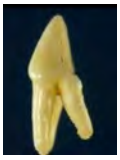
Surgical Extraction of the Maxillary 4th Premolar: Periapical lucencies (granuloma vs. abscess)



118

Extractions: MX PM4 furcations

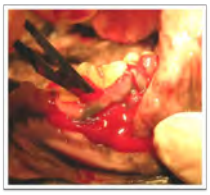


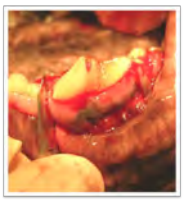


- https://www.slideshare.net/JimWentworth/extraction-canineupm4a

119

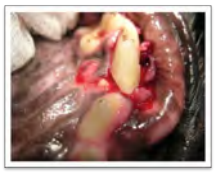
Surgical Extraction of the Maxillary 4th Premolar: Mucogingival flap release





120

Surgical Extraction of the Maxillary 4th Premolar: Sectioning the tooth



Section between the mesial & distal crown-root segments and the mesial & palatal crown-root segments

121

Surgical Extraction of the Maxillary 4th Premolar Video:

122

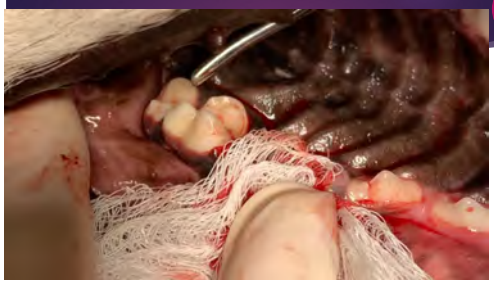
Surgical Extraction of the Mandibular 1st Molar: Keep in mind the anatomy of the Mandibular Canal

123

Surgical Extraction of the Mandibular Canine Tooth:

124

Surgical Extraction of the Maxillary 2nd Molar:



125

Feline Extractions

126

Feline Extraction Techniques: Principles

- Same principles as in the dog, but much smaller teeth & thinner gingiva and mucosa
- Section multi-rooted teeth
- Osteoplasty (removal of alveolar bone) to aid in tooth removal
- Place Bone Graft (optional) & suture gingiva with 5-0 Monocryl with a reverse cutting P3 needle

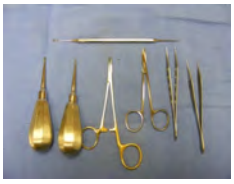
Extract whenever possible!

Crown amputation must meet several conditions.

127

Feline Extraction Techniques: Instruments

Feline Instrument Pack: Finer Instruments



- Periosteal Elevator (to elevate flap)
- Elevators/Luxators (sharp and appropriate size – I prefer winged)
- Scissors (small and sharp)
- Forceps (Brown-Adson preferred)
- Small needle holders

128

Feline Extraction Techniques: Luxators

Cislak (www.cislak.com) ; Shipps Laboratory; Serona Animal Health

Luxators: 1.3S, 1.8S, 2S IC (inner curve), 2S OC (outer curve), 3S

Pro Tip: Luxating type elevators work nicely!

129

Feline Extraction Techniques: Cotton Tipped Applicators (CTAs)

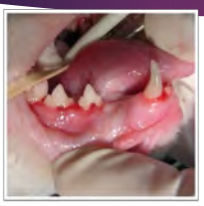
- Atraumatic handling of friable tissues
- Stabilizes tissues for suturing
- Blood absorption increases visibility

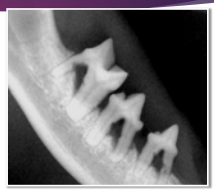
130

Feline Extraction Techniques: CTAs

131

Feline Extractions: Radiographs

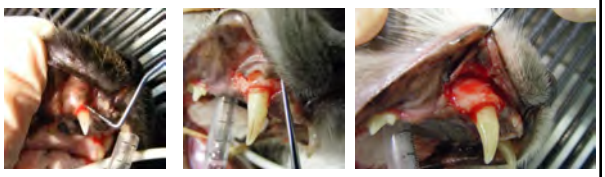




Always know what your dental x-ray looks like ~ know what is going on below the gumline!

132

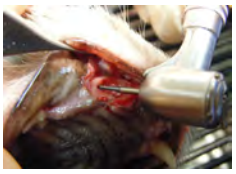
Feline Extractions: Maxillary Canine Tooth



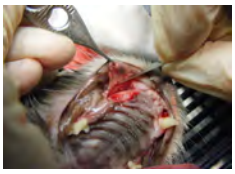
Feline gingiva & mucosa is much thinner compared to the canine patient.

133

Feline Extractions: Maxillary Canine Tooth



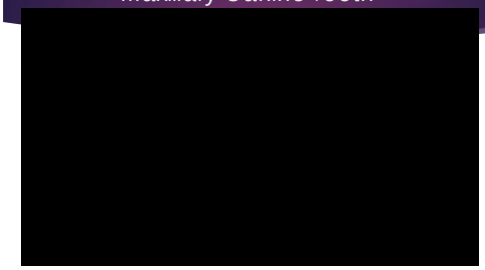
Alveoplasty



Releasing incision

134

Feline Extraction Video: Maxillary Canine Tooth

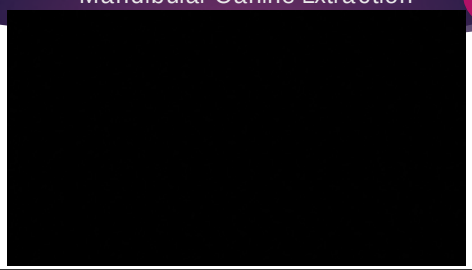


135

Feline Extractions: Mandibular Canine Extraction

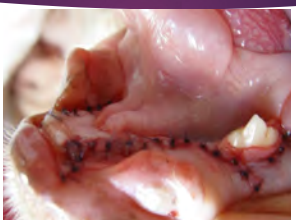
136

Feline Extractions: Mandibular Canine Extraction



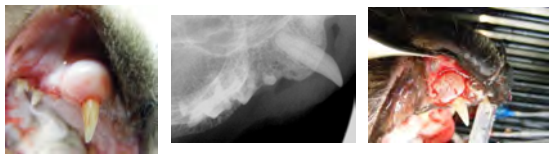
137

Feline Extractions: Mandibular Canine Extraction Postoperative Appearance



138

Feline Extractions: Oral Pathology



Buccal Alveolar Expansion vs. Osteomyelitis vs. Oral Mass…..

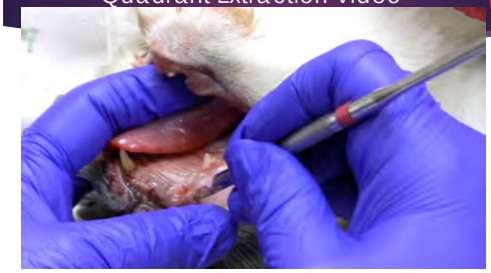
Biopsy……Biopsy…..Biopsy

139

Feline Extractions: Quadrant Extractions

140

Feline Extractions: Quadrant Extraction Video



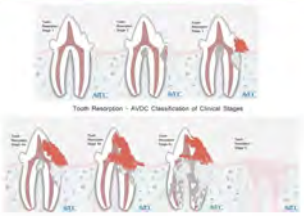
141

Crown Amputation: Intentional Root Retention

- Do no harm!
- Document root fragment location
  - Radiographically and on dental chart
- Inform owner
- Recommend referral
  - If declined, recheck regularly and/or attempt removal
  - This is not a "free pass" to leave roots behind!!

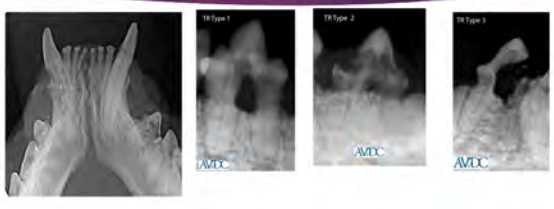
142

Feline Extractions: Tooth Resorption & Crown Amputations



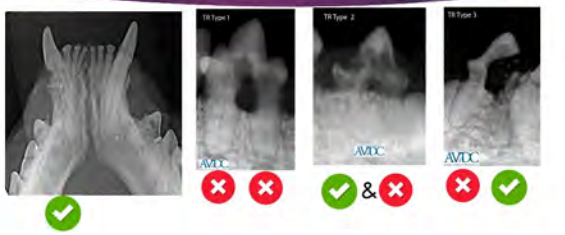
143

Feline Extractions: Tooth Resorption & Crown Amputations



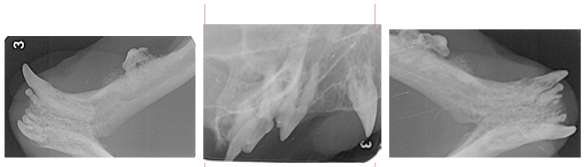
144

Feline Extractions: Tooth Resorption & Crown Amputations



145

Crown Amputation: "Kitty Mia" Preoperative X-rays



TR4c Lesions of 304 & 307 | TR4c Lesion of 104 | TR4c Lesions of 404 & 407

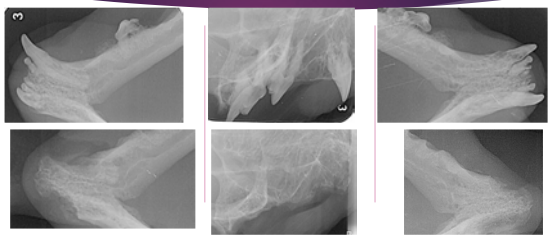
146

Extractions of teeth with TR4c lesions

[redacted]

147

Crown Amputation: "Kitty Mia" Postoperative X-rays



148

Feline Extractions: Summary

- Gingival Flaps
- **Always** section Multi-Rooted Teeth
- Remove Buccal Bone with High-speed Handpiece
- Luxation and Elevation Techniques
- Alveoplasty and curette / debridement of alveolus
- Flush extraction site with sterile saline
- +/-Fill Defects with Bone Graft Material
- Releasing Incision for gingival flap (no tension)
- Suture the Extraction Sites
  - (monofilament suture, simple interrupted pattern)

149

Part VII: Complications & Challenges of Dental Extractions

150

Complications: Communication

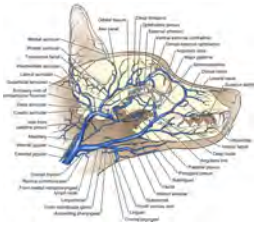
Communication with the owner is key!!!

- ✓Discuss possible risks pre-op
- ✓Discuss possible risks intra-op
- ✓Discuss possible risks post-op

151

Complications: Hemorrhage

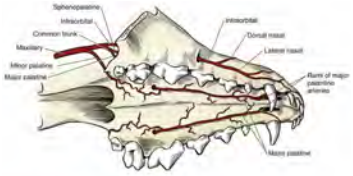
- Maxillary a./v.
- Infraorbital a./v.
- Palatine a./v.
- Mandibular a./v.
- Mental a./v.
- Sublingual vessels
- Epistaxis



152

Complications: Hemorrhage

Incisions that cross the interdental space between the lateral incisors and canines bleed significantly.



DeLahunta, Miller's Guide, 2013; https://veteriankey.com/palate/

153

Complications: Nerve Damage

- Nerves run with vessels
- Motor nerves
- Cranial nerves
- Sensory nerves
  - Chronic pain?
  - Neuroma
  - Parasthesia

154

Complications: Ocular Trauma

- Periodontal probe
- Elevators/luxators
- Nerve block
- Retrobulbar hemorrhage
- Retrobulbar abscess

Avoided with careful apical pressure during extraction and knowledge of anatomy

155

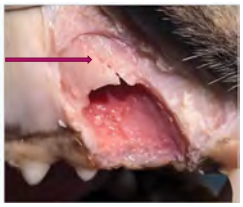
Speaking of Eyes….Corneal Ulcers

Keep the eyes well lubricated!

- Reapply eye lubrication every hour while under anesthesia & before waking up
- Consider reapplying in recovery- especially in brachycephalic breeds
- Underlying herpes virus in cats & the stress of being at the vet/anesthesia can cause a flare up, including corneal ulcers

156

Complications: Alveolar bone fracture



Tips to Avoid This:

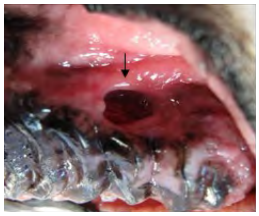
- Remove adequate buccal alveolar bone before elevating
- Do not place much pressure/strength when elevating a tooth
- Clean removal of buccal alveolar bone from the tooth root

157

Complications: Oronasal Fistula

Causes:

- Inadvertent penetration into nasal/sinus cavity
- Failed primary closure
  - Tension
  - Inappropriate suture pattern or size
  - Friable tissue or poor tissue handling
- Excessive sneezing post operatively



158

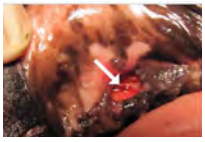
Complications: Oronasal Fistula

Tips to Avoid ONF

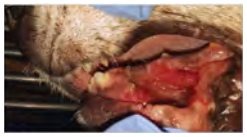
- Remove adequate buccal alveolar bone before elevating
- Do not elevate along the palatal aspect of the MX canine
- Do not place much pressure/strength when elevating a tooth
- Suture a tension free mucogingival flap!!!
  - Elevate more palatal mucosa for a bigger "bite" of mucosa to suture with
- Send home with e-collar and clear discharge instructions
  - 2 weeks of restrictions (soft food, no toys) & E-collar that goes past the front of the mouth

159

Complications: Dehiscence



Dehiscence of Right Maxillary Canine Extraction Site



Dehiscence of Left Mandibular Canine Extraction Site

160

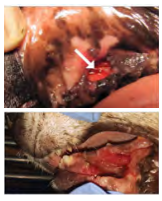
Complications: Incision Dehiscence

Tips to Avoid Dehiscence

- Tension free mucogingival flaps!!!
- Close over smooth bone (Alveoplasty)
- Simple interrupted sutures with 4-5 knots/throws
- Large enough 'bites' into normal tissue
- Appropriate post-operative care instructions:
  - E-collar until recheck visit (~2 weeks)
  - Soft food for 2 weeks
  - No toys for 2 weeks
  - Don't allow to roam outside unsupervised
  - Owner compliance is key

161

Complications: Dehiscence

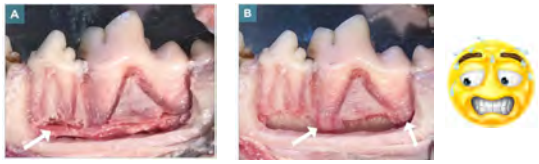


How to Handle Dehiscence

- Evaluate for alveolar bone exposure
- Have owner use MaxiGuard Gel
  - With Vit C granules
  - Use at least 3 times per day
  - Use for 7 days & recheck
- Antibiotics for 7-14 days
- Recheck closely in 1 week & 2 weeks
- Surgical repair ~ rarely in some cases

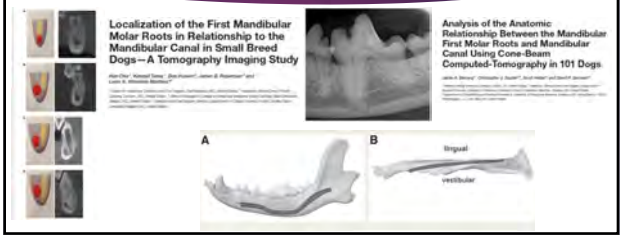
162

Complications: Mandibular Canal Anatomy



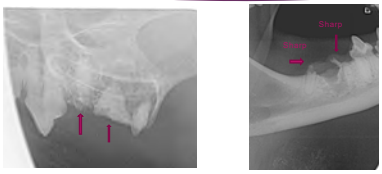
163

Complications: Location of Mandibular Canal is Variable



164

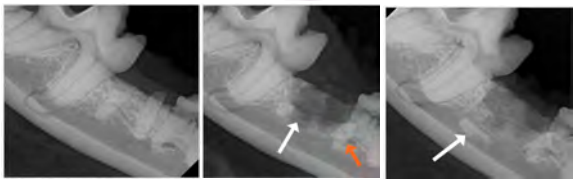
Complications: Retained Tooth Roots



Do not leave these retained tooth roots behind. Surgically extract or refer to a specialist.

165

Complications: Translocation of Tooth Roots



166

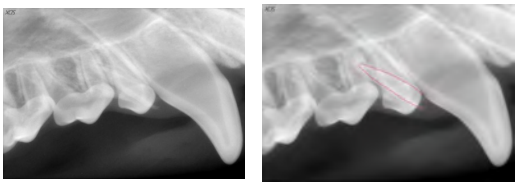
Complications: Translocation of Tooth Roots

- Into the nasal/sinus cavity

- Into the mandibular canal

167

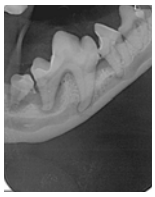
Complications: Retained Deciduous Roots



168

Complications: Iatrogenic Jaw Fractures

- Symphyseal separation
- Mandibular canines
  - Inappropriate bone removal
  - Excessive force
- Mandibular first molars
  - Advanced periodontal disease
  - Abnormal root structure
- Post-op due to weakened/thin alveolar bone and pet causing trauma

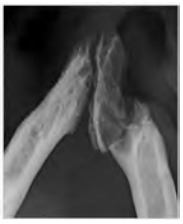


169

Complications: Iatrogenic Jaw Fractures

Tips to Avoid Jaw Fractures

- Know how much bone to remove – especially MN canines
- Remove enough to be able to outline the root and lavage to prevent debris build up
- Do not use excessive pressure/strength when elevating
- MN canine extraction ~ use rolled gauze and hold with your non-dominant hand to counter-act and absorb the pressure you use while elevating the tooth
- Use sharp instruments
- **Gentle, controlled movements!! Patience.**

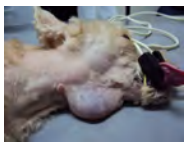


170

Complications: Salivary Duct Damage

- Laceration
- Scar formation
- Sialocele

A Ranula may resolve over a few weeks with time and an NSAID
(Make sure pet can eat well)



More severe cases need surgical intervention

171

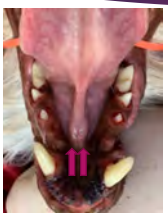
Complications: Anatomy of Salivary Papillae & Sublingual Caruncles

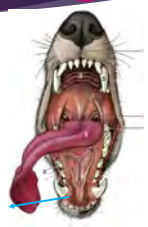
Salivary glands

- Parotid
- Mandibular
- Sublingual
- Zygomatic

172

Complications: Anatomy of Salivary Papillae & Sublingual Caruncles

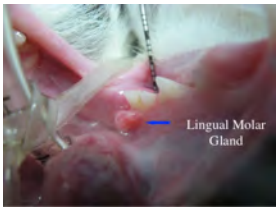




173

Complications: High-Speed Drill

- Soft tissue damage
  - Molar gland in cats
  - Tight spaces in small mouths
  - Brachycephalics with mucosal folds
  - Sublingual chewing lesions
- SQ emphysema
- Air embolus



174

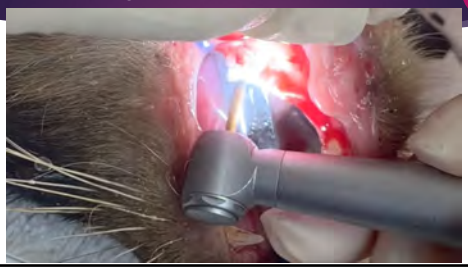
Complications: High-Speed Drill

Avoid Iatrogenic Drill Trauma

- Protect the soft tissue
  - Tongue depressor
  - Della retractor
  - Senn retractor
  - MN Cheek retractor
  - Zombie

175

Complications: Video of catching sublingual tissues in high-speed drill



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Complications: Trismus & Blindness

- Open too wide
- Open too long
- Passive vs. active mouth gags
- Don't be fooled, using longer syringe cases can do this too

177

Complications: Trismus & Blindness

Better Options for Mouth Gags

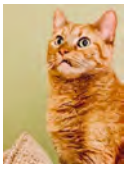
Rubber Posterior Mouth Gag (IM3)

Plastic Mouth Gag Set (IM3)

Take these out to relax the TMJs every 5-10 minutes

178

Complications: Cosmesis

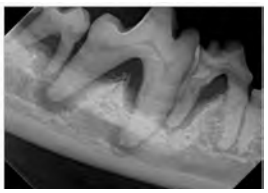


- Lip catching
  - Especially when extracting the maxillary canine teeth in cat
- Tongue protrusion
  - When extracting the mandibular canines in dogs

179

Challenges: Read the Preop Dental Radiographs

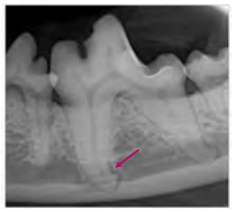
- In cases with Advanced Periodontal Disease, you are not going to take away as much alveolar bone as you would in other cases…
- STILL SECTION THESE TEETH ~ trying to remove them without sectioning will lead to fracturing the tooth roots & possibly the jaw
- Plan your flaps accordingly, there may be significant gingival recession.
- Plan on debriding the granulomatous tissue from the alveoli.



180

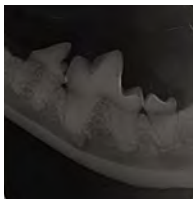
Challenges: Dilacerated Tooth Roots

- Helpful hints for Dilacerated Roots:
  - Remove adequate buccal alveolar bone before elevating
  - You may need to take away more buccal alveolar bone in these cases
  - Do not place much pressure/strength when elevating a tooth – this may cause a fulcrum (and fracture) at the dilaceration



181

Challenges: Difficult Extractions



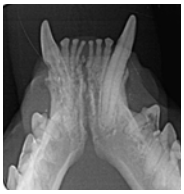
- Specialized instruments
  - Stieglitz root forceps
  - Root tip picks
  - Small, sharp luxators
  - Small diameter burs
- Patience!
- Pre-op radiographs
- Intra-op radiographs
- Post-op radiographs

182

Challenges: When to Perform Crown Amputations (CRA)

Only when ALL these conditions are met

- No periodontal ligament
- No root canal
- No evidence of infection
  - Endodontic
  - Periodontal
- No grossly or radiographically visible root structure (replaced by bone)
- NOT in STOMATITIS cases



183

Challenges: Intentional Root Retention

- Do no harm!
- Document location
  - Radiographically and on dental chart
- Inform owner
- Recommend referral
  - If declined, recheck regularly and/or attempt removal
  - Consult with a veterinary dentist
  - This is not a "free pass" to leave roots behind!!

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Veterinary Dental Forum (Annually, every Fall)

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Questions?

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Contact Information

- Heather L. Duncan, DVM, Dipl. AVDC
  - Board certified veterinary dentist ™
  - Greenville, SC
  - Upstate Vet Specialists
  - carolinavetdentist@gmail.com

UPSTATE VET
EMERGENCY + SPECIALTY CARE

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AFAST/TFAST

Extension of the physical exam
A radiologist's perspective

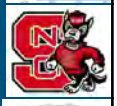
Kahlina Frey, DVM
Diagnostic Imaging Resident

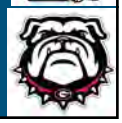
UNIVERSITY OF GEORGIA

1

A little about me…

- Born and raised on Long Island
- Graduated from North Carolina State University-College of Veterinary Medicine in 2013
- Small Animal Rotating Internship at a private practice in Knoxville, TN (2013-2014)
- Returned to Raleigh, NC and worked as a lead emergency clinician (2014-2021)
- Diagnostic imaging fellowship with Blue Pearl Radiology Department (2020-2021)
- Started diagnostic imaging residency at UGA in 2021!





2

Outline

Ultrasound Basics

What is a FAST exam, key points and limitations

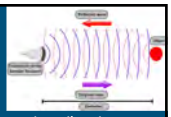
AFAST, TFAST, Focused Echo Views, VetBLUE with examples of common pathologies

Ultrasound artifacts

Pearls

3

How Does Ultrasound Work?



-The probe has little crystals inside (piezoelectric crystals) that emit a vibration when an electrical current is applied to them (the machine is turned on).

-These crystals then deform and emit vibrations→initial sound pulse

-The ultrasound beams are transmitted through the tissues and generate several echoes (returning waves) that return to the probe

-These received vibrations cause the crystals to vibrate again which create a new electrical signal which goes to the computer to create an image

4

How Does Ultrasound Work?

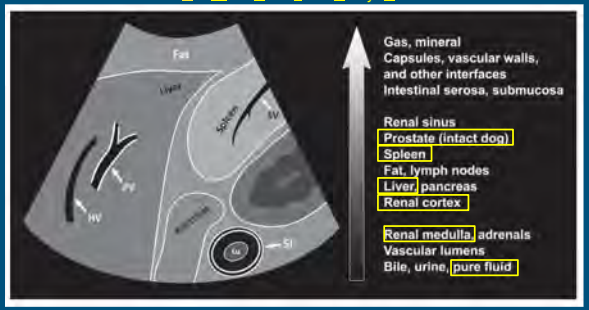
-Sound wave interactions with different tissues vary→leading to different echogenicities

+scatter, absorption, reflection, refraction

-The depth that the echoes traveled is calculated by the machine/probe and thus helps with creating an image of the organs in relation to one another

5

"For Most Cats Love Sunny Places"



Atlas of Small Animal Ultrasonography Fig 1.2

6

Ultrasound Equipment/Scan Basics

-Curvilinear/convex probe

-5-10 MHz

-Abdominal settings for both AFAST and TFAST

-Depth at 4-6cm

-Gain (2D) is generally set at 70% to create an image that can be viewed in room with high ambient lighting

-B-mode ("brightness mode",2D grayscale mode) is used

7

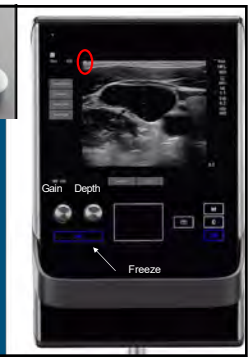
Knobology

-Gain=Brightness

-Depth=Length of the long axis

-C=Color (Doppler)

Blue Dot top left=corresponds to "notch" on probe



8

What is a FAST exam?

Focused Assessment with Sonography for Trauma

-Originated in 1990s as a 4-point scanning technique used for injury surveillance in people with blunt and penetrating trauma (triage and tracking)

-More sensitive and specific for detecting abdominal fluid than radiographs

-Exam findings are used to direct immediate patient stabilization efforts and serial studies can be used to monitor hospitalized patients

-In emergency setting, focused ultrasound examinations are increasingly being used as extensions of the physical examination

9

Key Points

- NOT an extensive exam of all of the abdominal/thoracic organs
- Objective=detect presence of free fluid within 5 minutes
- Not all trauma produces free fluid
- Positive FAST scan typically suggests hemorrhage, however, urine, bile, ascites and other forms of fluid cannot be excluded without sampling
- TFAST used to detect pleural or pericardial effusions or pneumothorax

*Pneumothorax can only be detected if pleural air is directly below the ultrasound probe.

*Glide sign/lack of glide sign may be difficult to detect in panting patients!

10

Limitations

- Operator's skill level/experience
- Quality of equipment
- Often performed in suboptimal settings (bright ambient light, stressed/critical patient, loud room)

*Routine is important! If you adhere to a protocol, **you will succeed.**

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AFAST

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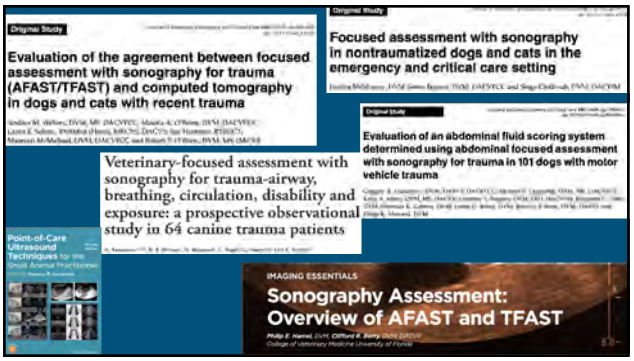

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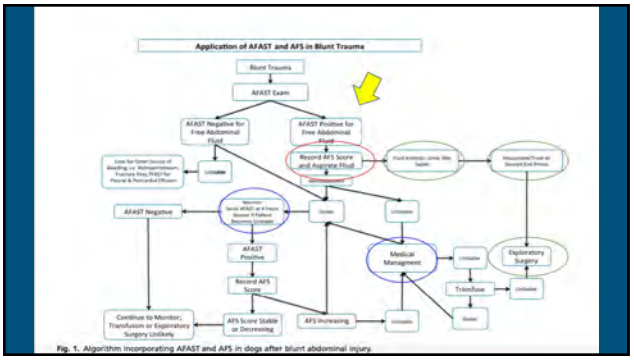

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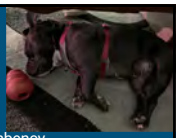
Patient Positioning-AFAST



-Lateral Recumbency
+ No difference in detecting fluid in left/right lateral recumbency
+ Right kidney more difficult to visualize when located in dependent flank (right lateral recumbency)

**Right lateral recumbency preferred for: echocardiographic evaluation, left retroperitoneal space, limit risk for inadvertent iatrogenic puncture of spleen
-Standing
-Sternal Recumbency
-NOT DORSAL RECUMBENCY
-Generally don't need to be shaved (unless long haired, sampling)
-Apply alcohol and/or ultrasound gel (don't use alcohol if defibrillation anticipated)

15

Assessment of the Validity of a Standing Abdominal Point-Of-Care Ultrasound Exam for the Evaluation of Peritoneal Effusion in Dogs

Presenting Author: Mara Sirio, DVM, DACVR - Department of Clinical Sciences, College of Veterinary Medicine, Mississippi State University
Co-Author: Cindy Rudisky, DVM - Veterinary Imaging Center of San Diego
Co-Author: Nikon Lee, DVM, MS, DACVR - Department of Clinical Sciences, College of Veterinary Medicine, Mississippi State University
Co-Author: Robert Wills, DVM, MS, PhD, DACVPM (Epidemiology) - Department of Basic Sciences, College of Veterinary Medicine, Mississippi State University

The purpose of this study was to assess the validity of a standing approach when assessing for free abdominal fluid with a point of care ultrasound examination (POCUS). Patients underwent a right lateral approach and standing approach in a randomized and sequential order followed by a full abdominal ultrasound (AUS). The described novel approach to the abdominal POCUS is similar to the previously described lateral approach and includes the following locations: subxiphoid, umbilicus, urinary bladder, left flank, and the right flank. Five-second cine loops were taken for our POCUS examinations and reviewed in the order they were obtained. These were then scored for free abdominal fluid based on a previously published system by a board-certified radiologist, radiology resident, and radiology intern and compared to a subjective full abdominal ultrasound score given by a board-certified radiologist. Excellent agreement (Interclass Correlation Coefficient) was found between the standing and right lateral positions (0.95, 0.92, 0.94), good agreement between standing position and AUS (0.80, 0.77, 0.82), and good agreement between right lateral position and AUS (0.80, 0.82, 0.84). The interobserver agreement for the standing position was good (0.87) and excellent for the right lateral position (0.91). Mean observer agreement score was excellent (0.94) when evaluating right lateral to standing position, good (0.86) when evaluating standing position to AUS, and good (0.87) when evaluating right lateral position to AUS. A standing approach to a point of care ultrasound examination may be a valid option for situations where a traditional right lateral approach cannot be performed.

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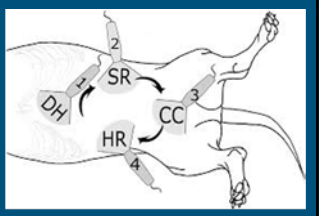
AFAST Technique



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AFAST Technique

-On average, should take 3-6 minutes

-Order of evaluation not important--JUST BE CONSISTENT/SYSTEMATIC EVERY TIME

+Improves efficiency

+detect more subtle changes due to familiarity

*RECOMMEND: clockwise rotation, start subxiphoid region→to non-gravity dependent flank→to bladder→to gravity-dependent flank

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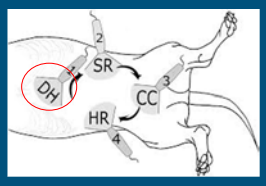
Site 1: DH (Diaphragmatic-Hepatic)

Subxiphoid view: evaluation of liver-diaphragm interface, gallbladder region, pericardial sac and pleural space



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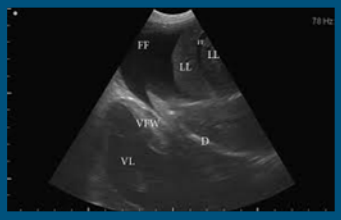
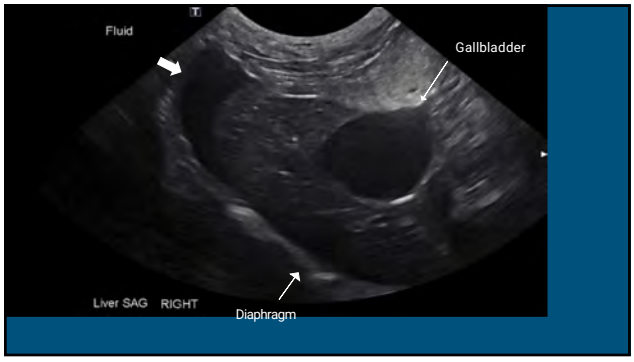
Site 1: DH (Diaphragmatic-Hepatic)

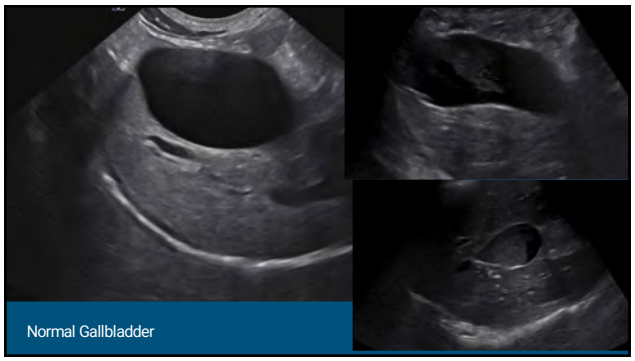


FF-Free fluid
LL-Liver lobe
VFW-Vetricular Free wall
VL-Venticular lumen
D-Diaphragm

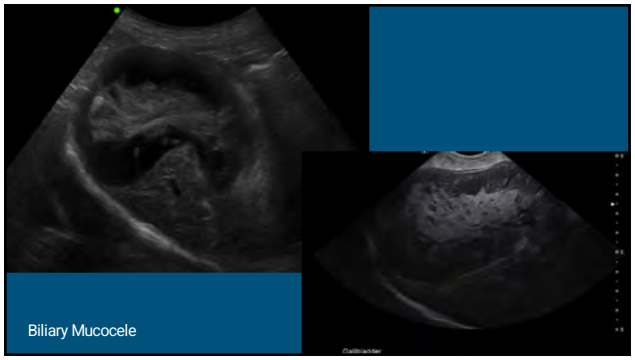
20



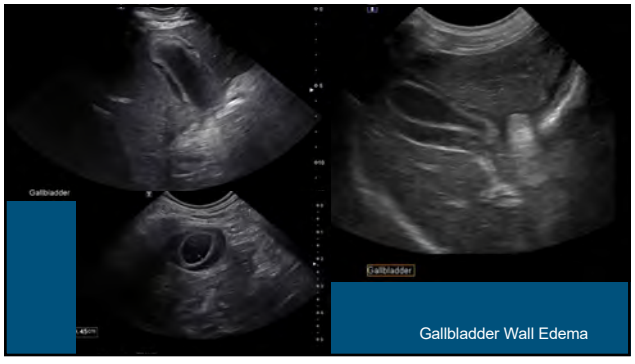
21


Normal Gallbladder

22


Biliary Mucocele

23


Gallbladder
Gallbladder
Gallbladder Wall Edema

24

Causes of Gallbladder Wall Edema

- Anaphylaxis
- Right-sided CHF/pericardial effusion/right-sided volume overload (IVF)
- Cholecystitis
- Pancreatitis
- Hypoalbuminemia
- IMHA
- Post blood transfusion

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Sonographic Evaluation of Gallbladder Wall Edema in Dogs

Presenting Author: Rebecca Woodworth, DVM · University of California, Davis
Co-Author: Eric Johnson, DVM, DACVR · University of California, Davis
Co-Author: Stanley Marks, BVSc, PhD, DACVIM · University of California, Davis

Gallbladder wall edema (GBWE) is a relatively rare finding on abdominal ultrasound indicating the presence of underlying disorder(s). This imaging finding has not been previously investigated in a large cohort of dogs. The objectives of this retrospective case series were to identify and further evaluate concurrent disorders in dogs diagnosed with GBWE based on abdominal ultrasound. Medical records from 2008 to 2020 were searched for dogs with GBWE identified on abdominal ultrasound. All images were reviewed and clinical data was recorded. Three-hundred and eighty five dogs with a sonographic diagnosis of GBWE were identified. Five dogs were excluded due to insufficient data. A variety of breeds, sexes, and ages were represented. GBWE was mild in 194 dogs (51%), moderate in 133 (35%), and severe in 53 (14%). Ninety-four dogs with GBWE (25%) had a single concurrent disease process diagnosed with the remaining 286 dogs (75%) having multiple identified comorbidities, accounting for overlap in the following diagnoses. The most common disorders associated with GBWE included hepatopathy (106/380), neoplasia (100/380), recent transfusion (96/380), immune-mediated disease (79/380), acute pancreatitis (54/380), acute kidney injury (37/380), hypoalbuminemia (36/380), hypovolemic shock (33/380), right-sided congestive heart failure (31/380), systemic inflammatory response syndrome (31/380), sepsis (21/380), and disseminated intravascular coagulation (12/380). The most common neoplastic disease was round cell neoplasia (53/100), specifically lymphoma (44/100). Immune-mediated hemolytic anemia was the most common immune-mediated disease (51/79). GBWE is an important imaging finding, and dogs with GBWE commonly have multiple coexisting disorders or a history of blood transfusion administration.

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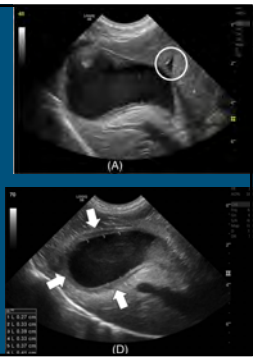
Sedation with dexmedetomidine is associated with transient gallbladder wall thickening and peritoneal effusion in some dogs undergoing abdominal ultrasonography

JVIM 2021

Marc A. Seitz[2] | Alison M. Lee[3] | Kimberly A. Woodruff[1] | Alexis C. Thompson[2]

- 79 client owned dogs, 10 healthy research dogs
- 24% of patients had gallbladder wall thickening (>2.0mm)
- Median dose of dexmedetomidine=5.0 ug/kg (range 2-12.5ug/kg)
- Developed within 20-40 minutes
- Few patients developed scant peritoneal effusion
- Duration of sedation significantly associated with thickening



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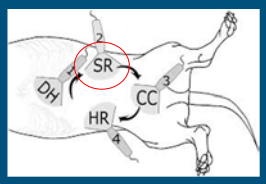
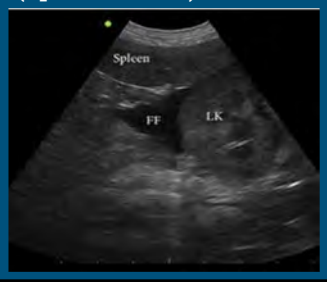
Site 2: SR (Spleno-Renal)

Left Flank View: splenorenal interface and areas between spleen and body wall



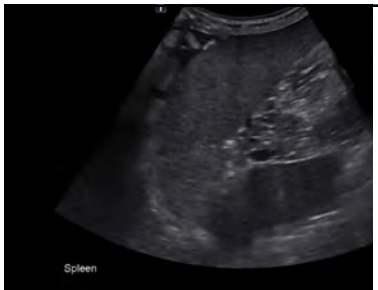
28

Site 2: SR (Spleno-Renal)

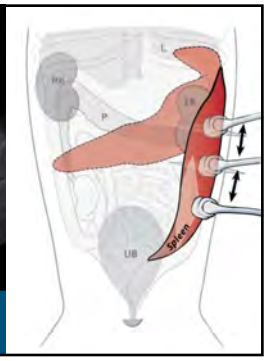


FF-Free fluid
LK-Left Kidney

29



Normal Spleen



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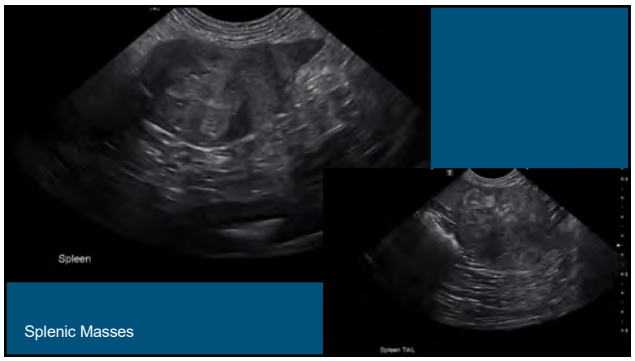

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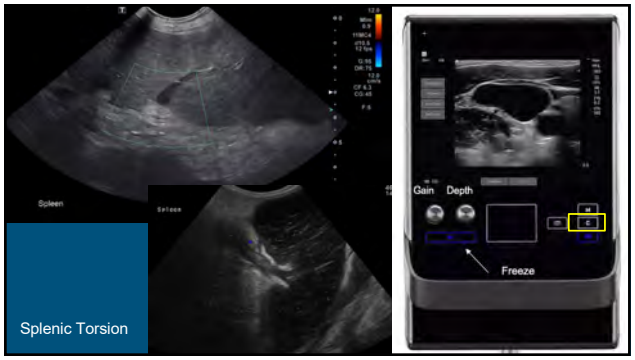
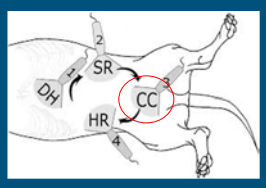


32

Site 3: CC (Cysto-Colic)

Midline Bladder View: apex of the bladder



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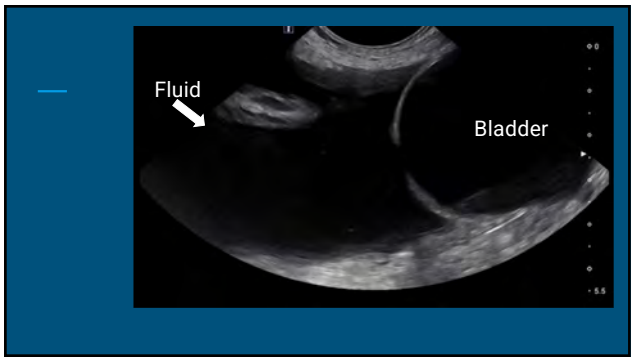

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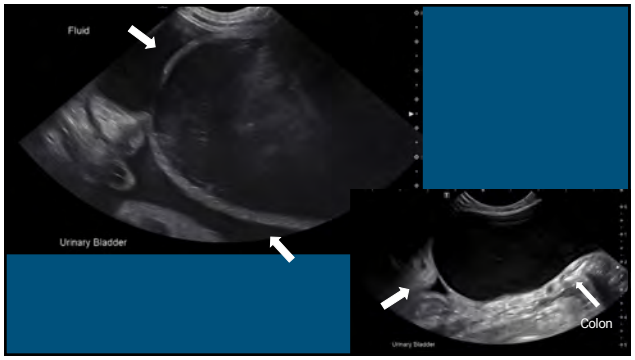
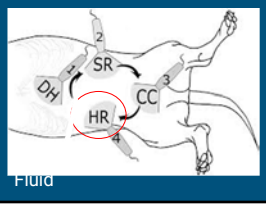


35

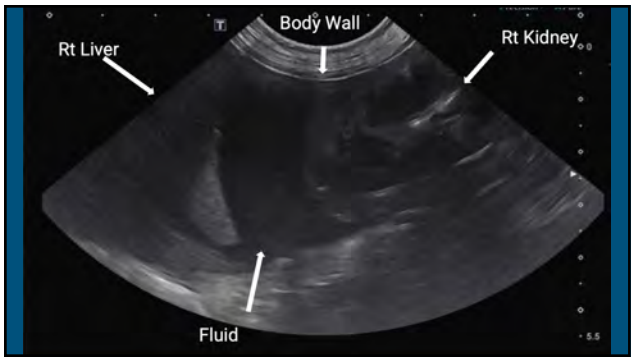
Site 4: HR (Hepato-Renal)

Right Flank View: hepatorenal interface and areas between intestinal loops, right kidney, and the body wall

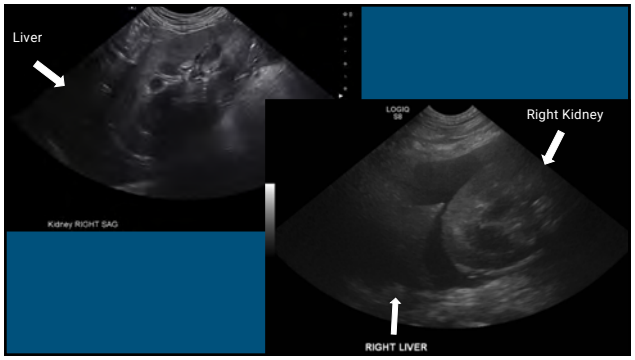


Fluid

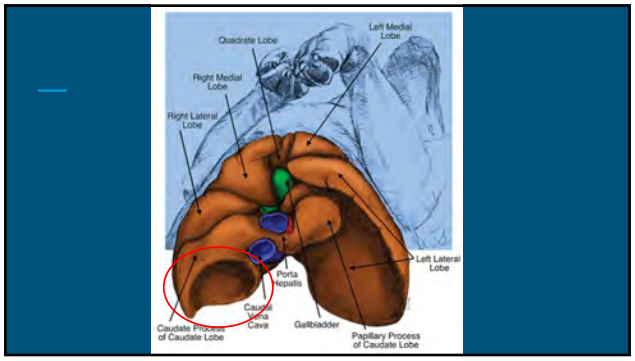
36


Body Wall
Rt Liver
Rt Kidney
Fluid

37


Liver
Kidney RIGHT SAG
Right Kidney
RIGHT LIVER

38

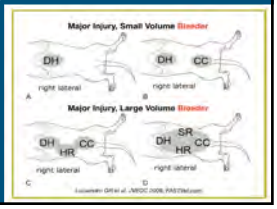

Quadrate Lobe
Left Medial Lobe
Right Medial Lobe
Right Lateral Lobe
Left Lateral Lobe
Porta Hepatis
Caudate Process of Caudate Lobe
Caudate Vena Cava
Gallbladder
Papillary Process of Caudate Lobe

39

Abdominal Fluid Score (AFS)

Count number of sites out of the four standard views in which free fluid is detected with the animal in lateral recumbency

- AFS 0, negative all sites
- AFS 1, positive in one site
- AFS 2, positive in any two sites
- AFS 3, positive in any three sites
- AFS 4, positive in all four sites



40

Evaluation of an abdominal fluid scoring system determined using abdominal focused assessment with sonography for trauma in 101 dogs with motor vehicle trauma

JVECC 2009

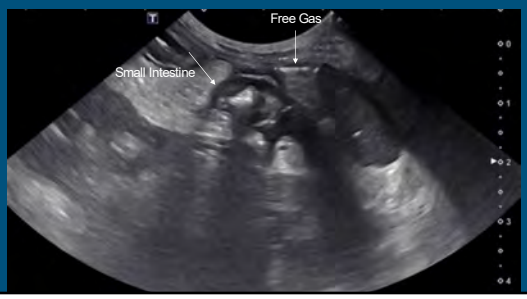
Gregory R. Lisciandro DVM, DABVP, DACVECC, Michael S. Lagutchik DVM, MS, DACVECC, Kelly A. Mann DVM, MS, DACVR, Geoffrey T. Fosgate DVM, PhD, DACVPM, Elizabeth G. Tiller DVM, Nicholas R. Cabano DVM, Leslie D. Bauer DVM, Bradley P. Book DVM, DABVP, Philip R. Howard DVM

Abstract

Objective – Evaluate an abdominal fluid scoring (AFS) system using an abdominal focused assessment with sonography for trauma (AFAST) protocol.
Design – Prospective study.
Setting – Private veterinary emergency center.
Animals – One hundred and one client-owned dogs with motor vehicle trauma.
Interventions – AFAST performed on admission and 4 hours post-admission.
Measurements and Main Results – An AFS was assigned to each dog based on the number of AFAST fluid-positive quadrants identified using a 4-point scale: AFS 0 (negative for fluid in all quadrants) to AFS 4 (positive for fluid in all quadrants). Free abdominal fluid was identified in 27 of 101 dogs (27%). Dogs with AFS scores of 3 or 4 (14/27 [52%] AFS-positive dogs) experienced more marked decreases in packed cell volume and total plasma protein, increases in alanine aminotransferase, and needed more blood transfusions than dogs with lower AFS scores and AFS-negative dogs. Serial AFAST was performed in 71% of dogs (71/101); 17% (12/71) of these cases changed AFS score, and 75% (9/12) of the changes were higher (worsened) AFS, correlating with increasing amounts of free abdominal fluid. Ninety-eight percent of the study population was a primary presentation. Overall, median time from trauma to initial AFAST was 60 minutes and median AFAST examination time was 3 minutes.
Conclusions – Initial and serial AFAST with applied AFS allowed rapid, semiquantitative measure of free abdominal fluid in traumatized patients, was clinically associated with severity of injury, and reliably guided clinical management. Where possible, AFAST and AFS should be applied to the management of blunt trauma cases.

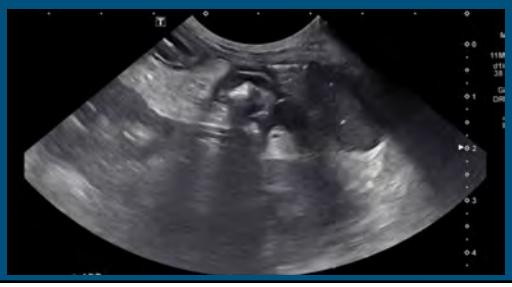
41

Free Peritoneal Gas



42

Free Peritoneal Gas



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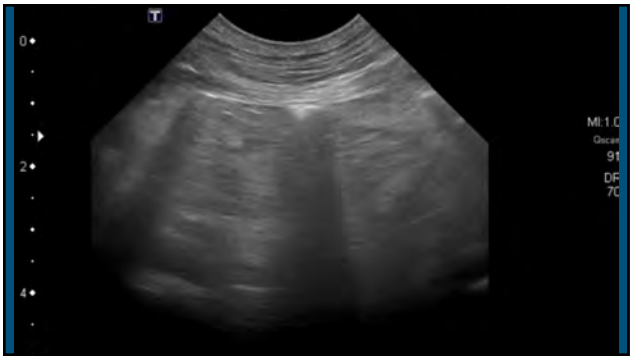


44

TFAST

45

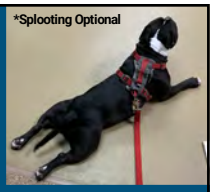
46

Patient Positioning-TFAST

-Alternating Left AND Right recumbencies

OR

-Sternal Recumbency



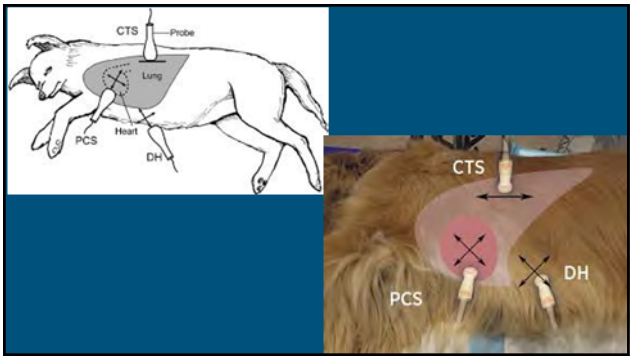
***Sternal Recumbency may be preferred if significant respiratory distress

47

5-Point Scan

- Chest tube site view (CTS)-left and right side
- Left and right pericardial (PCS) views
- Diaphragmatic-hepatic (DH) view (part of both AFAST and TFAST)

48



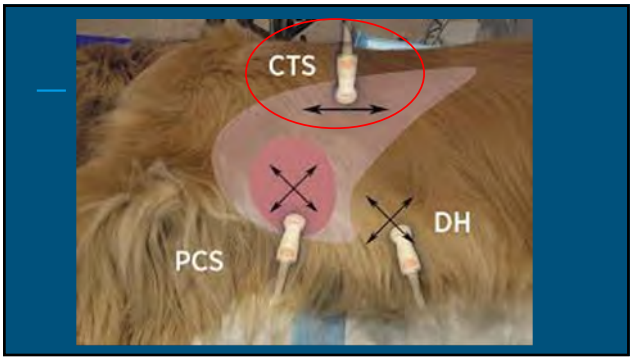
49

Sites 1 and 2: CTS (Chest Tube Site)

Left and Right Sides

-The CTS is best used to look for pneumothorax and survey for lung pathology

50



51

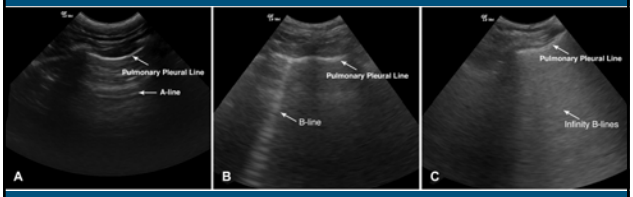
Evaluation of Pneumothorax

Glide sign: Normal smooth movement of the lung along the thoracic wall (pulmonary pleural interface, aka. P-P line)

- A-lines: air reverberation artifact. Parallel to P-P line.
- B-lines (previously called lung rockets): Hyperechoic lines perpendicular to the P-P line).
- Air rises = Image the highest point on the thorax.
- The presence of a glide sign or B-lines exclude a a pneumothorax.
- B-line in trauma patient- think contusions

52

Evaluation of Pneumothorax



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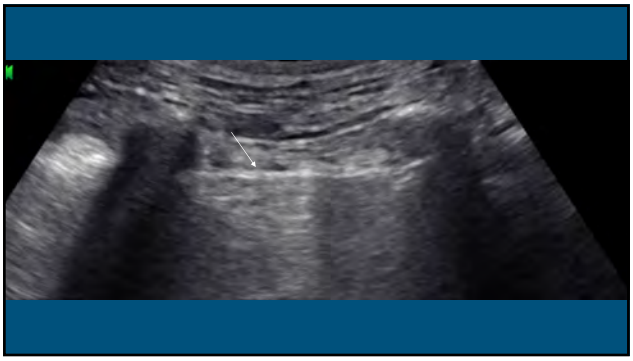

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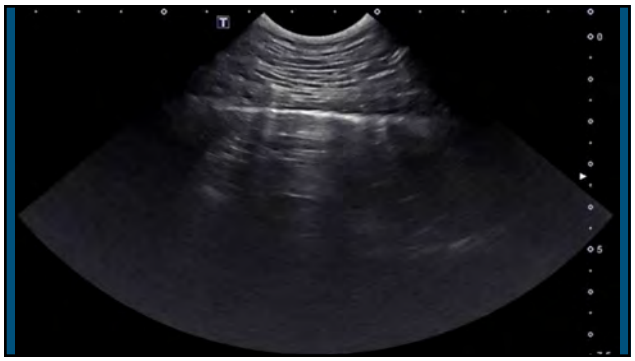

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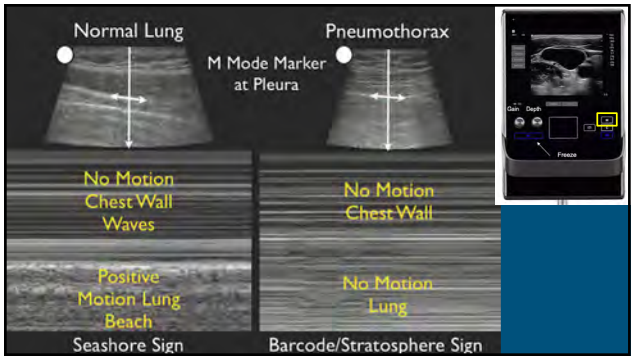
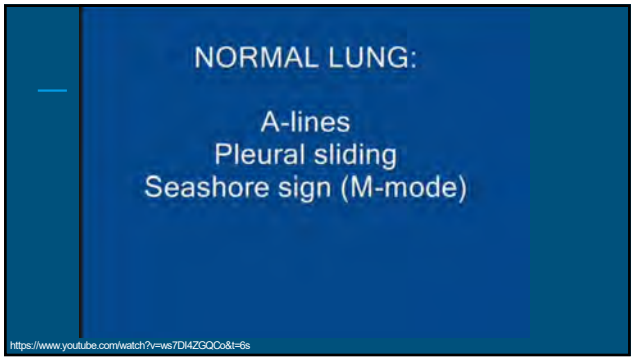

Normal Lung
Pneumothorax
M Mode Marker at Pleura
No Motion Chest Wall Waves
Positive Motion Lung Beach
Seashore Sign
No Motion Chest Wall
No Motion Lung
Barcode/Stratosphere Sign

56


NORMAL LUNG:
A-lines
Pleural sliding
Seashore sign (M-mode)
https://www.youtube.com/watch?v=ws7DI4ZGQCo&t=6s

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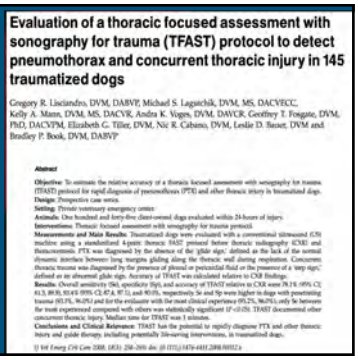
TFAST

Greater than 95% accuracy of detecting pneumothorax



Evaluation of a thoracic focused assessment with sonography for trauma (TFAST) protocol to detect pneumothorax and concurrent thoracic injury in 145 traumatized dogs

Gregory R. Lisciandro, DVM, DABVP, Michael S. Lagutchik, DVM, MS, DACVECC, Kelly A. Mann, DVM, MS, DACVR, Andra K. Voges, DVM, DAVCR, Geoffrey T. Fosgate, DVM, PhD, DACVPM, Elizabeth G. Tiller, DVM, Nic R. Cabano, DVM, Leslie D. Bauer, DVM and Bradley P. Book, DVM, DABVP

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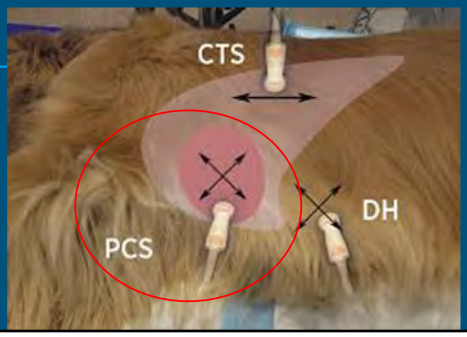
Sites 3 and 4: PCS (Pericardial Site)

Left and Right Sides

- PCS view is used to detect the presence of pleural and pericardial fluid.
- The PCS view may be used for volume status assessment
- Evaluate the LA:Ao ratio (which is important in patients suspected to have left-sided heart failure or cardiac disease)
- Right side best to look for right auricular mass if pericardial effusion present

59



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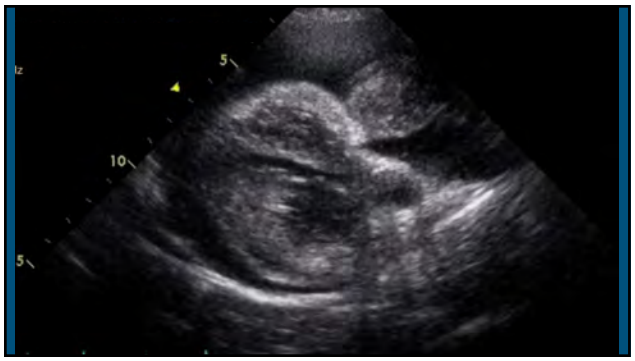


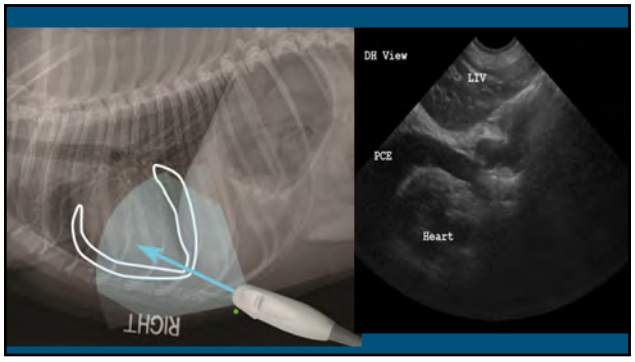
61

Site 5: DH (Diaphragmatic-Hepatic)

-The DH view is advantageous over the PCS views because of the acoustic window into the pleural and pericardial spaces through the liver and gallbladder.

-To differentiate between pleural and pericardial fluid, multiple views (eg, right and left PCS and the DH views) prevent potentially catastrophic mistakes of misidentifying an enlarged right ventricle for pleural effusion or pericardial effusion, and for the presence or absence of cardiac tamponade

63



64

J Vet Emerg Crit Care (San Antonio). 2016 Jan-Feb;26(1):125-31. doi: 10.1111/vec.12374. Epub 2015 Oct 1.

The use of the diaphragmatico-hepatic (DH) views of the abdominal and thoracic focused assessment with sonography for triage (AFAST/TFAST) examinations for the detection of pericardial effusion in 24 dogs (2011-2012).

Liaciandro GR[1].

Author Information

Abstract

OBJECTIVE: To evaluate the clinical usefulness of the diaphragmatico-hepatic (DH) view of the abdominal and thoracic focused assessment with sonography for triage (AFAST/TFAST) in detecting pericardial effusion (PE) in dogs.

DESIGN: Retrospective case series from 2011 to 2012.

SETTING: Private practice emergency and critical care hospital.

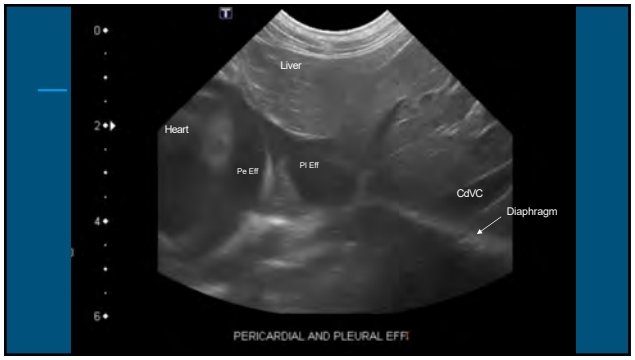
ANIMALS: Twenty-four dogs with PE diagnosed by FAST.

INTERVENTIONS: None.

MEASUREMENT AND MAIN RESULTS: Fifty-two medical records from October 1, 2011 through September 30, 2012 had the terms "PE" within the medical record. Twenty-four dogs were diagnosed with PE by FAST with entries for the DH view. Of the 24 dogs, 7 had abdominal FAST, 6 had thoracic FAST (TFAST), and 11 had both exams performed. PE was noted on the DH view in 20 of 24 (83%) cases. Subjective PE volume assessment ranged from trivial (<5 mm) to severe. Of the 4 cases in which PE was absent via the DH view, PE was seen during the same exam at the TFAST pericardial views (n = 2) or detected on serial exam at the DH view (n = 2). The PE volume that was missed via the DH view was characterized as trivial (<5 mm; n = 1), mild (n = 1), and moderate (n = 2).

CONCLUSIONS: The DH view of FAST was found to be clinically helpful for the detection of PE. Veterinarians should make it routine practice and part of FAST training to look into the thorax via the DH view during both abdominal FAST and TFAST exams.

65



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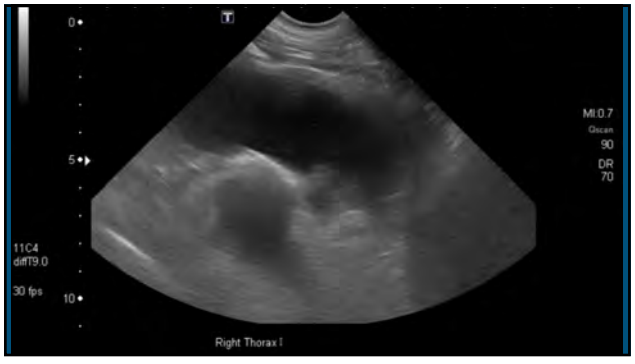

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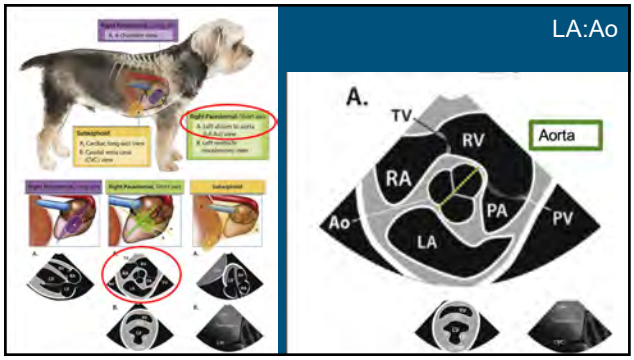
Focused Echo Views

68



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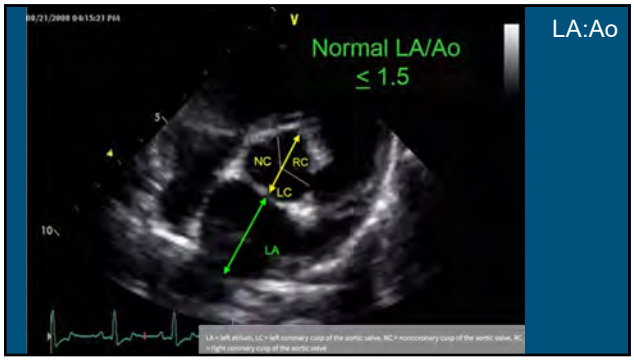

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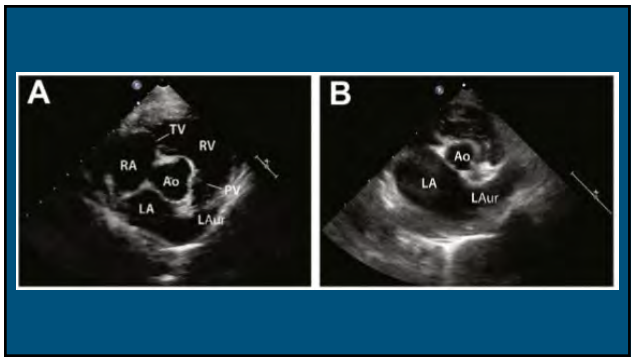
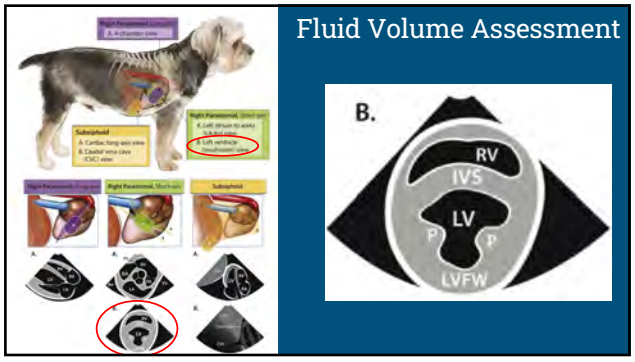

A
TV
RV
RA
Ao
PV
LA
LAur
B
Ao
LA
LAur

71

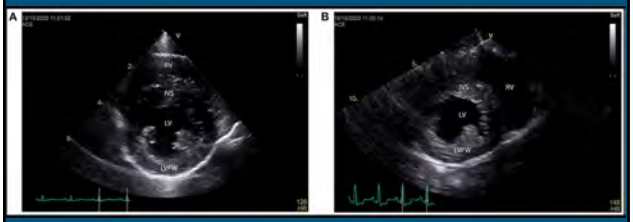

Fluid Volume Assessment
Ao
LA

72


Fluid Volume Assessment
B.
RV
IVS
LV
LVFW

73

Fluid Volume Assessment



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Vet BLUE

75

Vet BLUE

Blue-cyanosis

BLUE-Bedside Lung Ultrasound Examination/Emergency

<90 seconds, complements TFAST

Abdomen or cardio presets

4-7cm depth

No need to shave--part fur and apply alcohol/gel

76

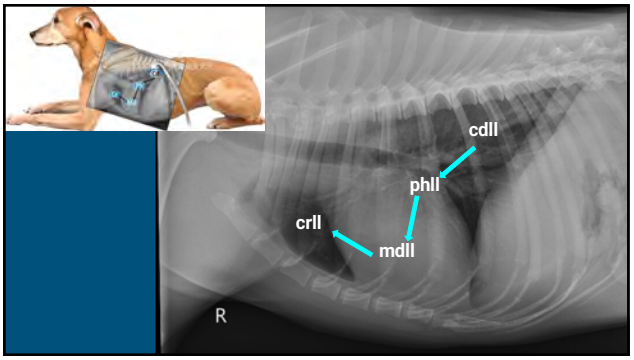
Vet BLUE

*ULRs (ultrasound lung rockets), aka B-lines

-Caudodorsal lung lobe region (cdll)--same as TFAST CTS view
+8-9th rib intercostal space, upper third
-Perihilar lung lobe region (phll)
+6-7th intercostal space, middle third
-Middle lung lobe region (mdll)
+4-5th intercostal space, lower third
-Cranial lung lobe region (crll)
+2nd-3rd intercostal space, lower third

Maximum number of ULRs over single intercostal space at each view recorded (1, 2, 3, >3) and infinity when ULRs blend into one another ("white lung")

77



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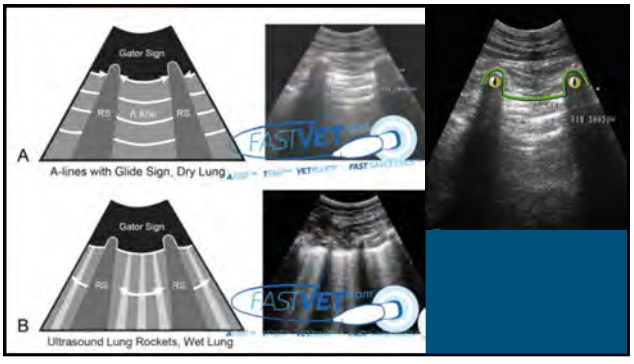
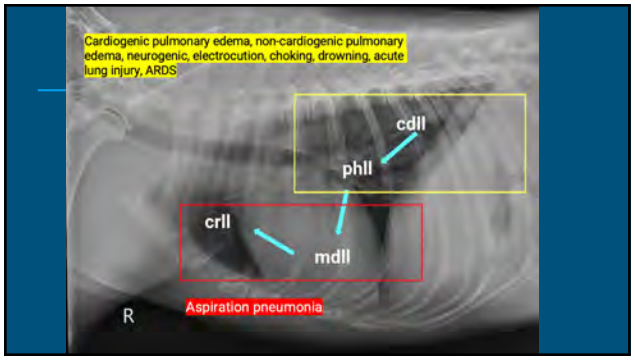


79

Assessing Lung Pathology

**LIMITATION: can only assess for superficial pulmonary disease. Could miss lesions deep within the pulmonary parenchyma so thoracic radiographs are important once stabilize to obtain big picture of what is going on

80



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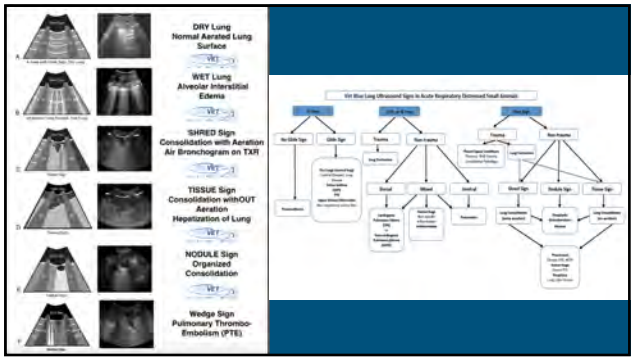


82

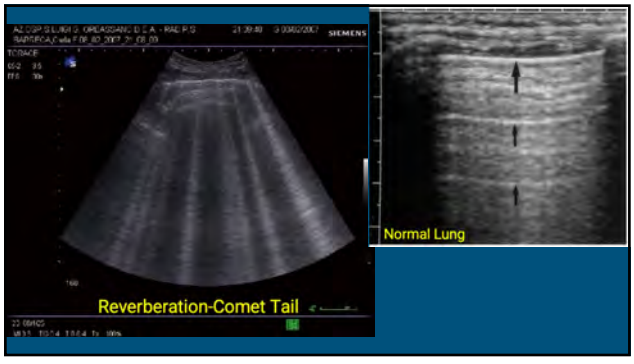
Artifacts

83

But, what are B-lines?

Reverberation.

84



85

FREQUENCY AND NUMBER OF ULTRASOUND LUNG ROCKETS (B-LINES) USING A REGIONALLY BASED LUNG ULTRASOUND EXAMINATION NAMED VET BLUE (VETERINARY BEDSIDE LUNG ULTRASOUND EXAM) IN DOGS WITH RADIOGRAPHICALLY NORMAL LUNG FINDINGS

GREGORY R. LISCIANDRO, GEOFFREY T. FOSGATE, ROBERT M. FULTON

Lung ultrasound is superior to lung auscultation and supine chest radiography for many respiratory conditions in human patients. Ultrasound diagnoses are based on easily learned patterns of sonographic findings and artifacts in standardized images. By applying the wet lung (ultrasound lung rockets or B-lines, representing interstitial edema) versus dry lung (A-lines with a glide sign) concept many respiratory conditions can be diagnosed or excluded. The ultrasound probe can be used as a visual stethoscope for the evaluation of human lungs because dry artifacts (A-lines with a glide sign) predominate over wet artifacts (ultrasound lung rockets or B-lines). However, the frequency and number of wet lung ultrasound artifacts in dogs with radiographically normal lungs is unknown. Thus, the primary objective was to determine the baseline frequency and number of ultrasound lung rockets in dogs without clinical signs of respiratory disease and with radiographically normal lung findings using an 8-view novel regionally based lung ultrasound examination called Vet BLUE. Frequency of ultrasound lung rockets were statistically compared based on signalment, body condition score, investigator, and reasons for radiography. Ten left-sided heart failure dogs were similarly enrolled. Overall frequency of ultrasound lung rockets was 11% (95% confidence interval, 6–19%) in dogs without respiratory disease versus 100% (95% confidence interval, 74–100%) in those with left-sided heart failure. The low frequency and number of ultrasound lung rockets observed in dogs without respiratory disease and with radiographically normal lungs suggests that Vet BLUE will be clinically useful for the identification of canine respiratory conditions.

86

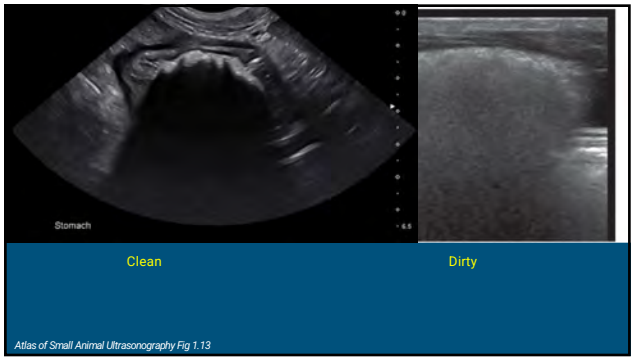
Embrace the Artifacts!

Acoustic Shadowing

Clean Shadowing
- -deep to strongly attenuating structure with no reverberation artifact
- -examples: formed stool in colon, bone, calculus, foreign body

Dirty Shadowing
- -due to reflection from gas with reverberation artifacts superimposed with shadow
- -examples: gas in small intestine or colon

87



Clean Dirty

Atlas of Small Animal Ultrasonography Fig 1.13

88

Don't get tripped up by these!

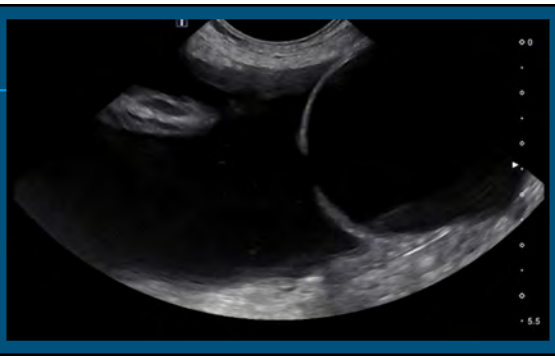
-Edge Shadowing (a type of refraction)

+commonly seen at curved surfaces (i.e. urinary bladder)

+causes a hypoechoic region at the site of refraction

+know this exists and evaluate structure from different angles

89



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Don't get tripped up by these!

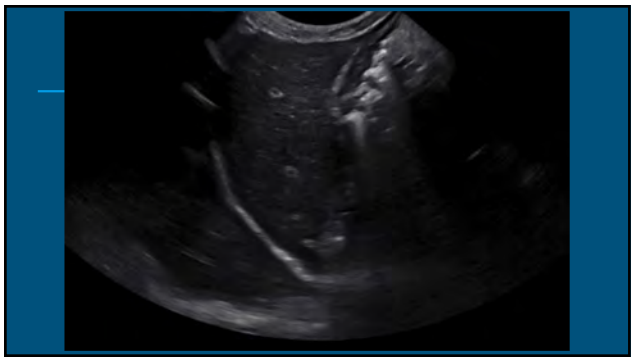
-Mirror Image (type of reverberation artifact)

+sound aimed toward a large specular reflector (e.g. diaphragm) that acts like a mirror and directs some of sound in a direction other than back to transducer

+duplicate object on other side of the strong reflector

+know this exists; don't mistake for hernia or pulmonary mass

91



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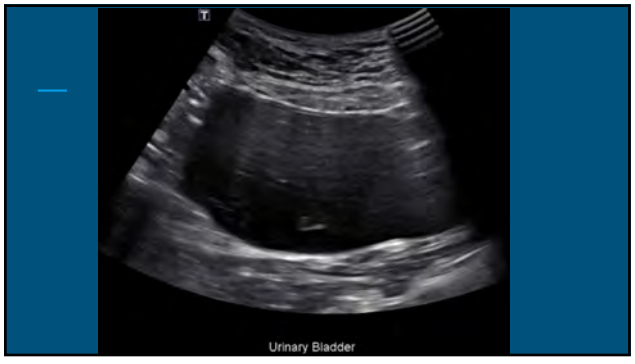
Don't get tripped up by these!

-Volume Averaging
+US beam has 3 dimensions: length of transducer, width of the beam and depth of the beam
+When returning echoes are mapped on the display, length and depth are preserved but width is compressed, or averaged to form a 2 dimensional image
+may appear as false echogenic debris/sludge within a fluid-filled structure→most commonly seen in urinary bladder

93



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Pearls

- When sampling, decrease your depth! It will make it much easier to sample smaller quantities of fluid (and with cystos!)
- Stick to a routine
- Remember—air rises, fluid sinks!
- Image non-traumatic/stable animals to get a feel for normal and to feel comfortable with the machine and the views
- When in doubt, convert to diagnostic ultrasound if available once patient is stabilized

95

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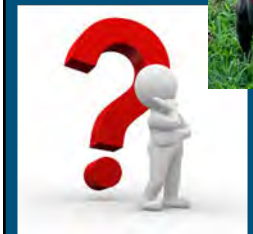
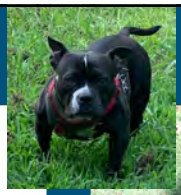
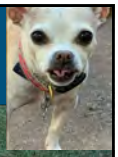
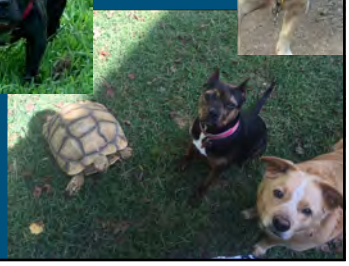
Questions?









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-Google Images/YouTube

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Top 5 Anesthetic Complications
Are You Ready?

Tim Loonam DVM

Grace Animal Hospital

Encore Vet Group

Special Thanks to…

Bhavani Kodali MD
Professor of Anesthesia
Harvard Medical School
Boston, MA
www.capnography.com

NORTH AMERICAN VETERINARY INSTITUTE - *EMERGENCY and CRITICAL CARE COURSE*

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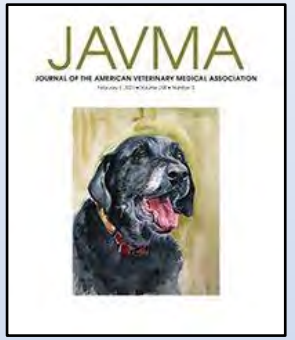
What's the evidence?

"There are no safe anesthetic agents, there are no safe anesthetic procedures. There are only safe anesthetists." -R. Smith MD

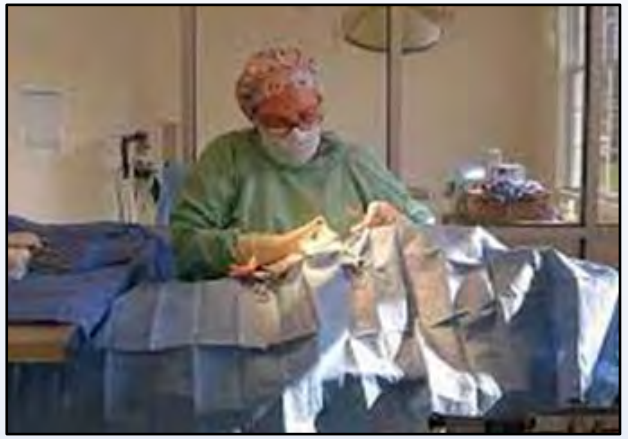
The Sad News: **Adverse anesthetic events occur with no explanation based on current knowledge, yet there's no negligence, error, or fault**

Risk of Death: **In human studies, risk is 1 in 100,000-250,000 cases. In dogs, 1 in 2,000 anesthesia episodes; in cats 1 in 900 (0.5-2.0%)**



The Good News: **We can all improve! Let's move from defining success as 'surviving' the event (mortality) to focusing on limiting follow-on disease and complications (morbidity)**

The Evidence and the Future



- ***Main Risk Factors*: Physical status (ASA), age, lack of monitoring, breeds and endotracheal intubation (cats)**
- ***Human and DVM studies*: The majority of deaths occur during maintenance and recovery of anesthesia; 60% occurred during post-op**
- **Study of >150k cases: *'Greater patient care in the postoperative period could reduce fatalities.'*** *(Broadbelt et. al.)*

ERAS® Society

'Doorknob to Doorknob Care' - Dr. Tamara Grubb

Anesthesia is a continuum of care…from pet at home through pre-anesthesia, induction, maintenance and recovery ending with the patient at home pain-free and with no complications

What are the Top 5 Anesthetic Complications in Small Animal Medicine?

There's plenty of other 'complications' in veterinary practice…

The Big 5…

1. ***Hypothermia***
2. ***Hypotension***
3. ***Arrythmias***
4. ***Hypoventilation***
5. ***Difficult Recovery***

HYPOTHERMIA

Hypothermia: **Lower-than-normal body temperature; 100.5°F to 102.5°F**

Secondary**: Alterations in heat production because of anesthesia drugs & illness.**

ORGAN	EFFECTS OF HYPOTHERMIA
BRAIN	Altered consciousness, apnea, coma
HEART	Arrythmias, electrical activity w/no pulse, vasoconstriction
LUNGS	Poor tidal volume, aspiration pneumonia, left shift Hg-O_2 curve
KIDNEY	Poor perfusion, acute renal failure
INTESTINES	GI bleeding, decrease immune function
BLOOD	↓ platelet function, ↑ fibrinolysis, DIC

OTHERS: **Stimulation of SNS…delayed wound healing…altered pharmokinetic function, etc.**

HYPOTHERMIA

Body heat loss occurs through 4 mechanisms

- ***Convection*** Heat transfer from the body to air or water *around* the animal
- ***Conduction*** From the body to cold objects *in contact* with the skin
- ***Radiation*** Heat exchange between the body and objects NOT in contact with the skin, independent of surrounding air temp; *most common*
- ***Evaporation*** Moisture in contact with skin & respiratory tract dissipates into the air

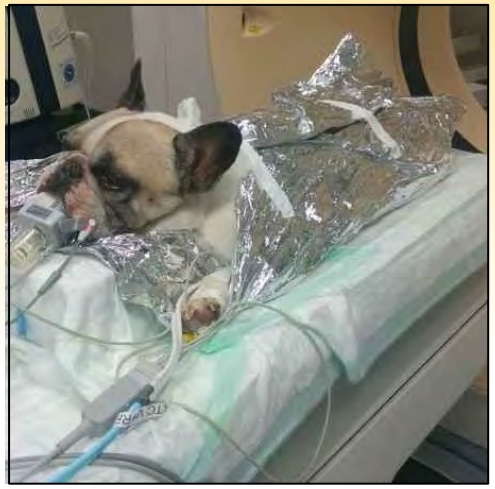
Hypothermia treatment begins with <u>prevention !</u>

WAYS TO COMBAT HYPOTHERMIA

PASSIVE	**Prevents Heat Loss**	***Warm blankets, space blankets, bubble wrap, plastic blanket, rice socks***
ACTIVE EXTERNAL	**Heat to Body Surface**	***Forced warm air or circulating warm water blanket, conductive fabric, inline IV fluid warmer***
ACTIVE INTERNAL	**Heat to Body Core**	***Sterile warm lavage fluids, warm IV fluids***

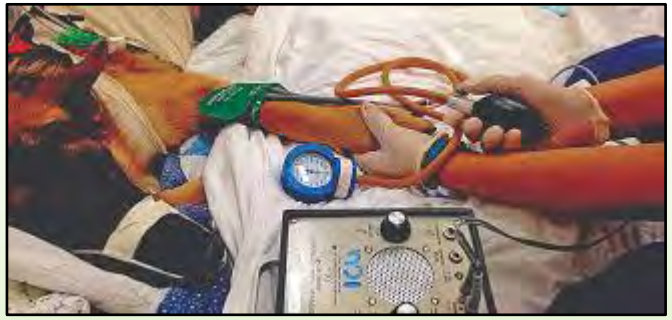
ACTIVE EXTERNAL

PASSIVE



ACTIVE INTERNAL

HYPOTENSION



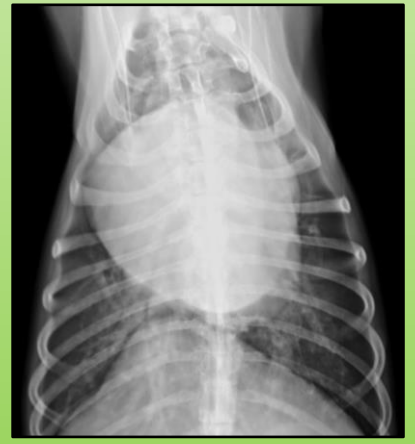
Hypotension: **Mean arterial pressure (MAP) < 60mmHg, a systolic arterial pressure (SAP) < 80mmHg, and diastolic (DBP) < 40mmHg.**

Hypotension **results in decreased perfusion to vital organs due to hypovolemia, decreased cardiac output and vasodilation**

Most effects are 2^0 to anesthetic agents

- ***Propofol, Acepromazine*****: ↑ Vasodilation**
- ***NOTE:*** **Hypercapnia (↑ CO_2) Most potent vasodilator…**
- ***Iso-, Sevoflurane*****: ↓ Cardiac contractility and systemic vascular resistance**

OTHER CAUSES: Shock, CHF, cardiomyopathies, hypoxemia, hypothyroidism, Addisonian crisis, etc.



HYPOTENSION

Some evidence… **Colorado State Small Animal Anesthesia Retrospective Studies on the Incidence of Hypotension During Anesthesia:**

- **Population: ASA Class I and II patients w/typical protocols and procedures**
- **27% had a hypotensive event (1-in-4 dogs; 1-in-3 cats)**
- **>50% were treated by ↓ vaporizer and ↑ IV fluids**
- **The others were treated with positive inotropes (dobutamine, ephedrine)**
- **KEY POINT: *Although easily treated, these cases would've gone undetected in typical small animal practices if BP was NOT monitored***

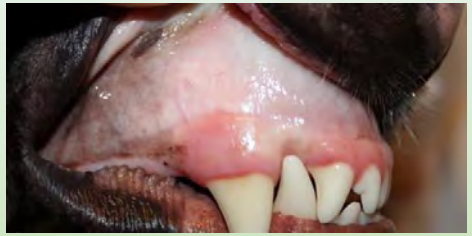
More Evidence… **Survey of 20 practitioners: Only one DVM considered hypotension to be a problem during anesthesia. Also the *only* DVM who regularly measured BP in all her patients. *Coincidence…?***

- **Recent human study: *A hypotensive event was a significant predictor of increased mortality and morbidity during the year following anesthesia***

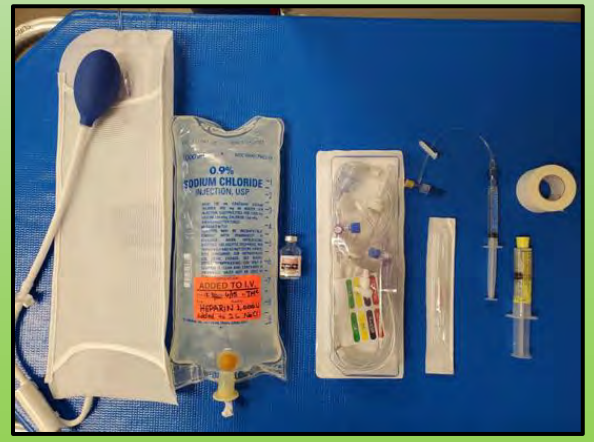
HYPOTENSION

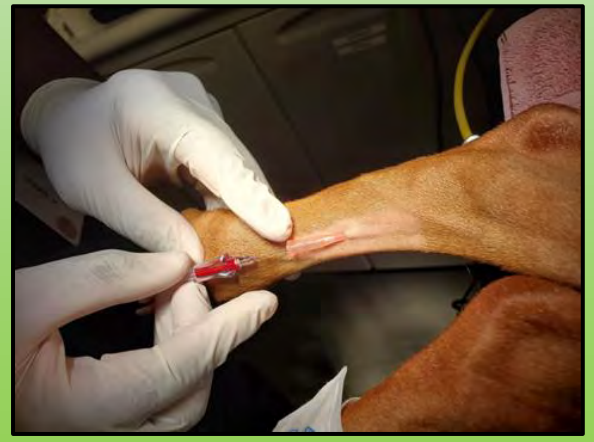
Signs and Monitoring

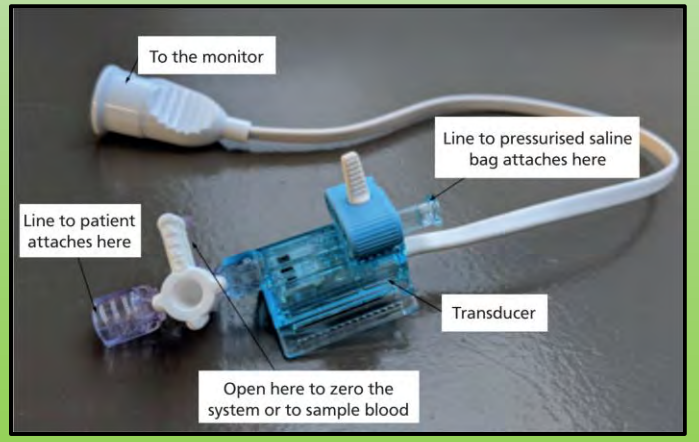
- ***Clinical signs*** Weak palpable pulse, prolonged CRT, tachycardia, SAP < 70mmHg and MAP < 60mmHg.
- Remember, a strong peripheral pulse does *NOT* = normal MAP. A palpable pulse is Δ of SAP and DBP. A large Δ the two pressures results in a strong pulse and yet *the MAP may be low.*

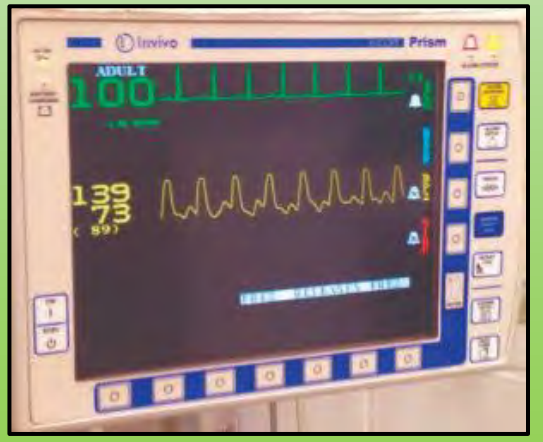


- **Direct Arterial Blood Pressure Monitoring** involves arterial catheter placement and continuous readings via a pressure transducer





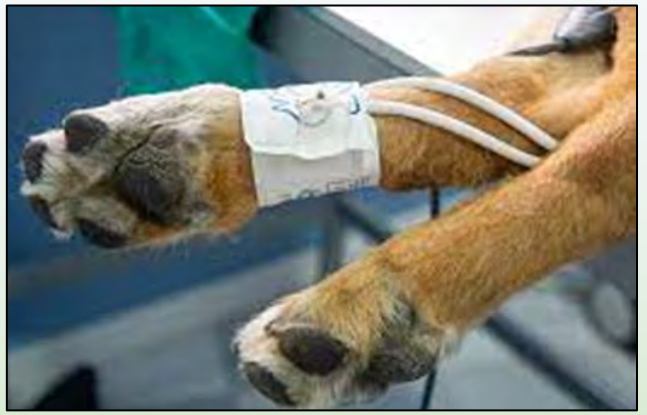




HYPOTENSION

Indirect BP Monitoring (Doppler and Oscillometric devices)

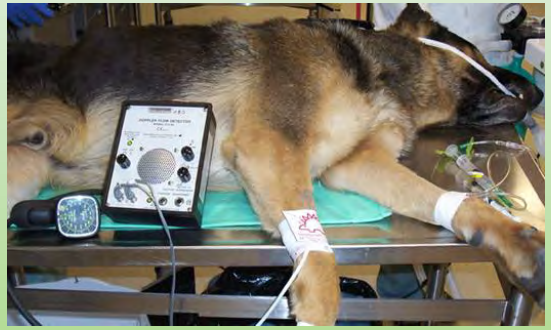
- **Dopplers** use a sphygmomanometer; best in pets <10kg
- **Oscillometric** monitors automatically inflates/deflates a cuff to determine near continuous BP



Treatment

Hypotension may be due to one or a combination of:

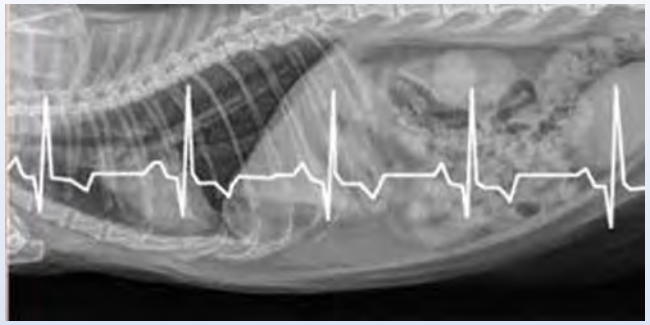
- ↓ cardiac preload to the heart
- ↓ cardiac contractility +/- HR
- ↓ vascular resistance



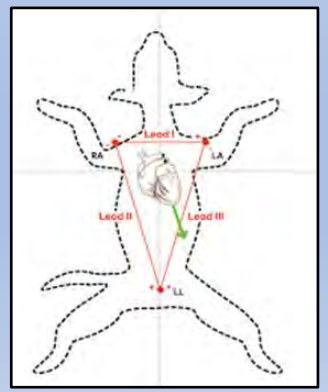
Consider…

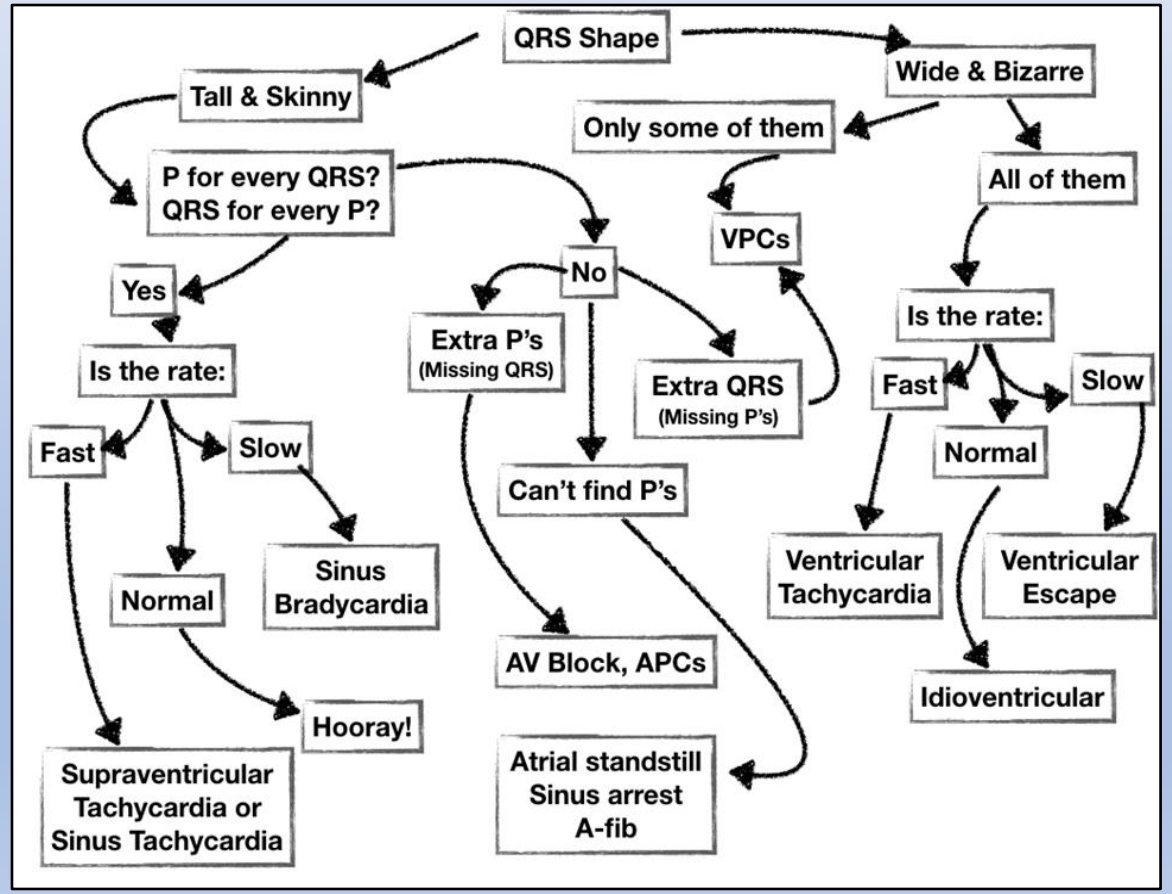
- IV fluid bolus up to 90ml/kg/hr
- IV anticholinergics (atropine or glycopyrrolate)
- ↓ Inhalant; reverse α2 adrenergic agonists (atipamezole)
- **Vasopressors/Positive Inotropes**… (doses in Proceedings)
  - Dobutamine, Dopamine
  - Ephedrine, Norepinephrine
  - Small doses and repeat to effect (or CRI!)

ARRYTHMIAS



- **Clinically significant if the hemodynamic state of the patient is affected, or likelihood of deterioration to a more significant arrhythmia**
- **Most common:** sinus tachycardia, sinus bradycardia, atrioventricular block, ventricular premature contractions and ventricular tachyarrhythmia
- **Monitor** via auscultation, ECG and by observing pulse–HR incongruity with Doppler ultrasound or SpO_2 waveform (Esophagael stethescopes are great!
- **Causes**: *Lots!* Drugs, laryngoscopes, intubation most common… autonomic disturbances, acid/base, cardiac dz

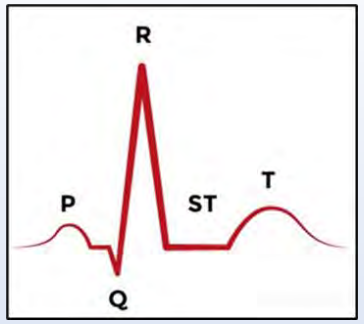


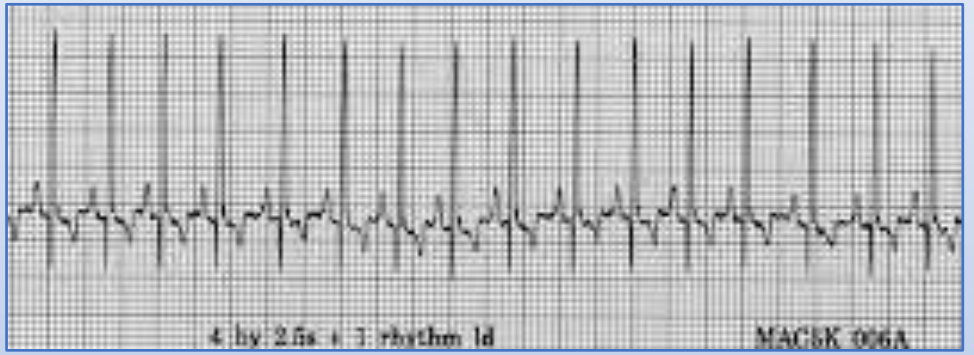


ARRYTHMIAS

Sinus Tachycardia (dog > 180 bpm, cat > 240 bpm)

- Rarely a true cardiac arrhythmia
- ↑ sympathetic tone 2^0 to pathologic/physiologic causes…
- Pain, hypovolemia, hypoxemia, fever, hyperthermia, cardiac failure, hypercapnia, hypotension, acute hemorrhage, and hyperthyroidism
- Excitement, stress, and fear
- **Tx:** Treat underlying cause; increase inhalant +/- pain mgmt

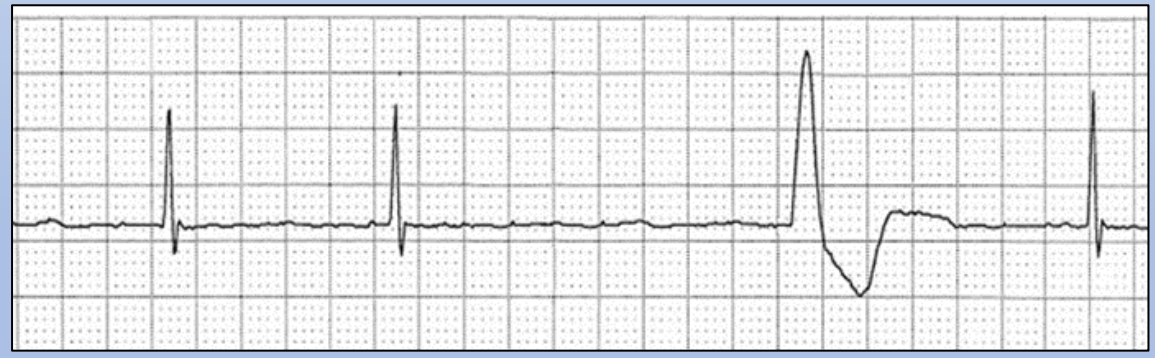




Sinus tachycardia

Sinus Bradycardia (< 70 bpm in small dogs; 100 bpm in cats)

- Rarely a true cardiac arrhythmia
- ↑ vagal tone: intubation, oculocardiac reflex, hypothermia, hypoxia, hyperkalemia
- Prevent and monitor!
- **Tx:** Check depth, anticholinergics, treat underlying cause(s)

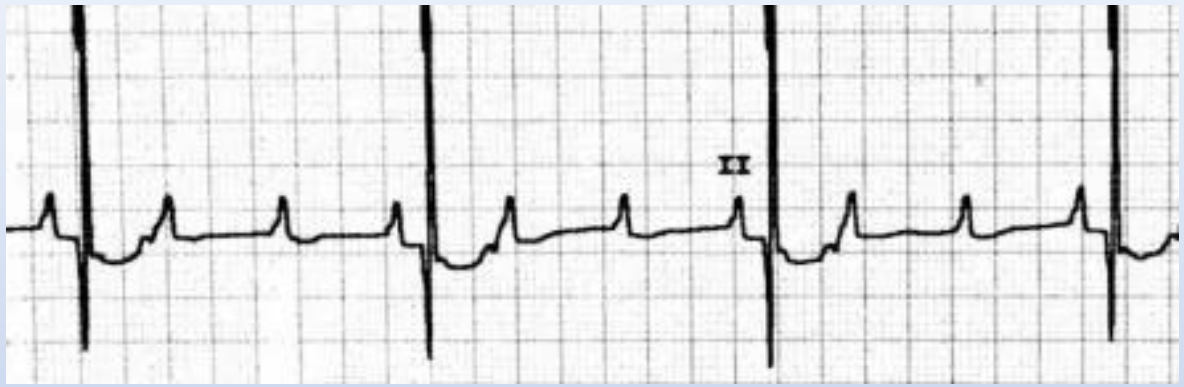


Sinus bradycardia w/ escape beat

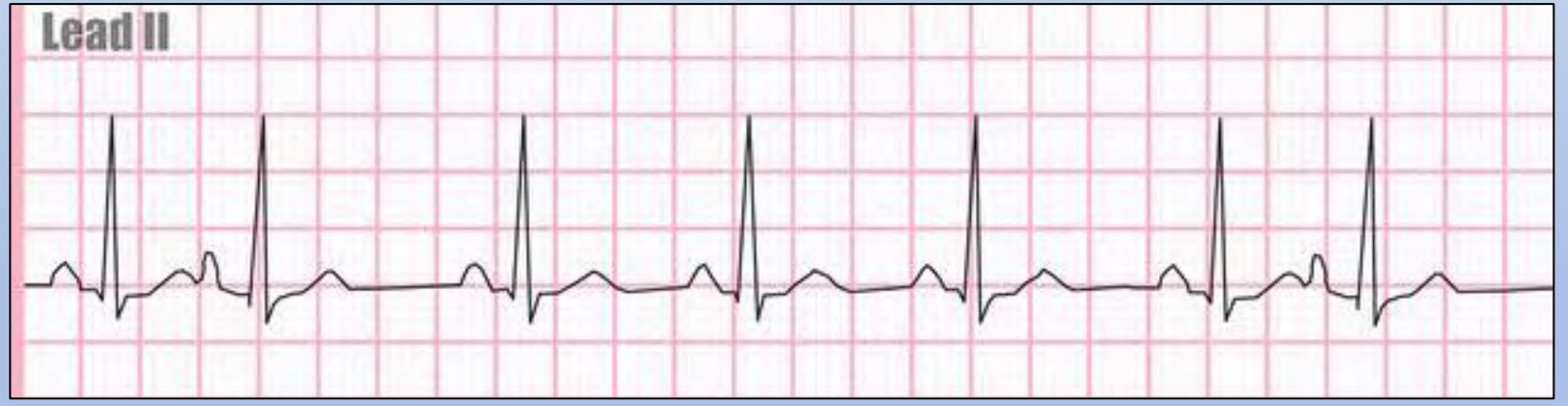
ARRYTHMIAS

AV Block

- **Supraventricular arrythmias** rarely require Tx
- TX w/ atropine/glycopyrrolate if hypotensive and bradycardic
- Consider Beta Blockers for supraventricular tachycardia and A-fib/A-flutter
- No need to treat premature atrial complexes; ventilate, oxygenate, annotate and monitor

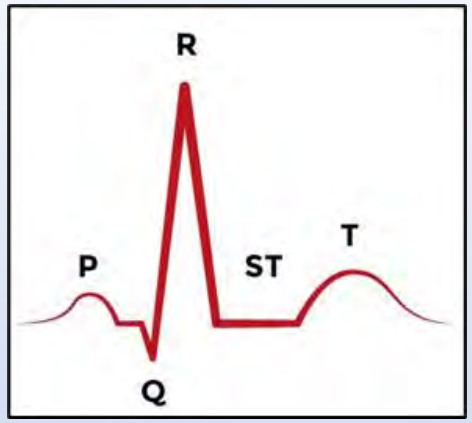


AV Block



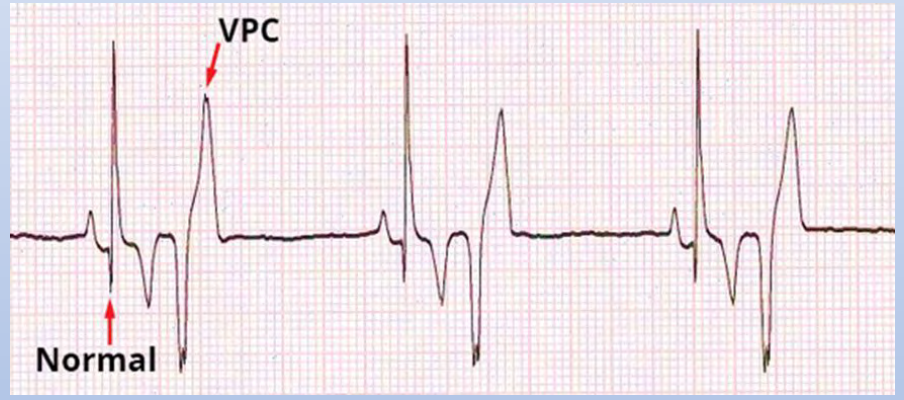
Premature Atrial Contraction (PAC)

ARRYTHMIAS

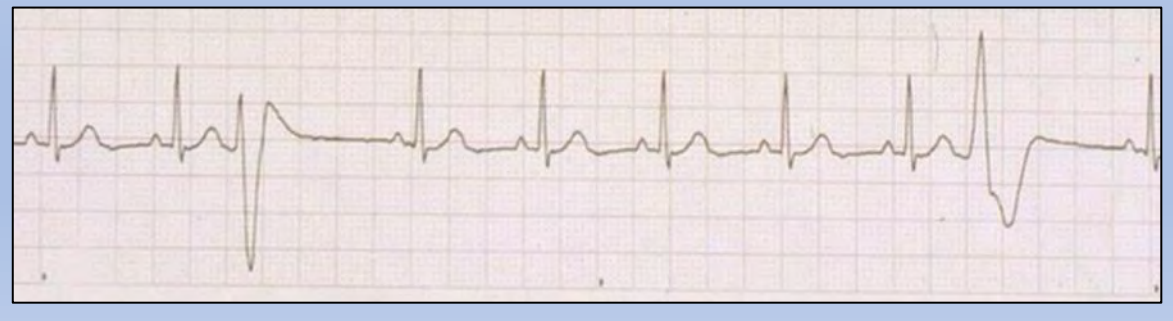


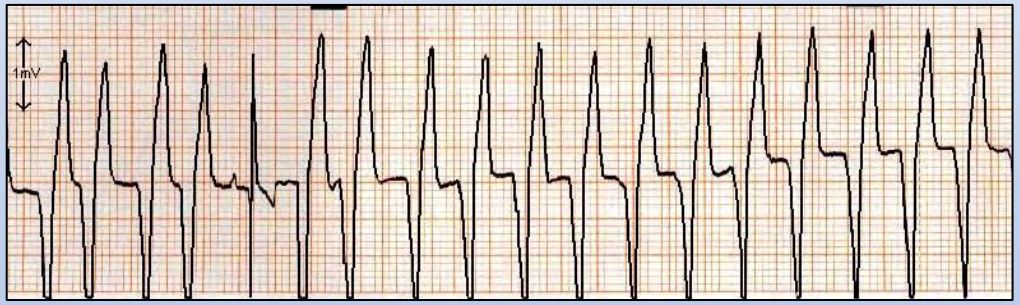
VPC's – Ventricular Premature Complexes

- Most common anesthetic ventricular arrythmia
- Rarely require Tx unless significant runs, multiform or hypotension
- Ventilate, oxygenate, annotate and Tx w/ lidocaine if needed
- Definitely Tx if V-Tach or V-Feb occur…

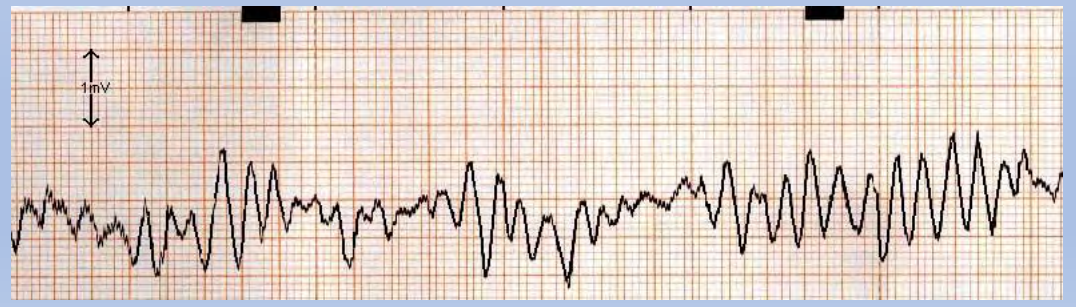


VPC's





Ventricular Tachycardia



Ventricular Fibrillation

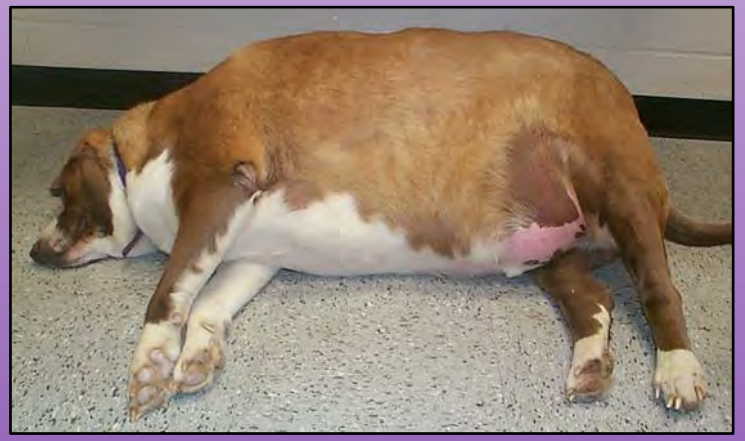
HYPOVENTILATION

Hypoventilation/Respiratory Depression: Inadequate ventilation to perform gas exchange ($PaO_2 < 60$ mmHg)

- ↑ CO_2 produces *hypercapnia* ($ETCO_2 > 45$mmHg) leading to hypoxemia and respiratory acidosis
- Usually, drug induced and dose dependent…
  - Opioids, propofol, alfaxalone and inhalants
  - Minimal with Acepromazine and benzodiazepines

Other Causes:

- Upper airway obstruction, brachycephalics, neurologic disease
- ↓ respiratory muscle effort (rib fractures, bandaging, obesity)



HYPOVENTILATION

***Prevent and Treat*:** Pre-oxygenate and *slow* inductions

- Check depth and ventilate; reverse opiods if necessary
- $ETCO_2$ at ~40– 55mm Hg in anesthetized

Remember, during recovery and while off supplemental oxygen SpO2 should be >90% !

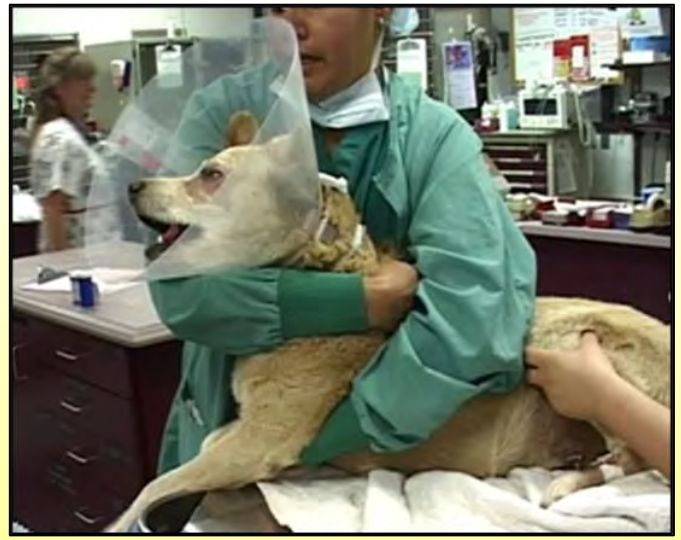
DIFFICULT RECOVERY

Studies of over 2million humans and small animals ***"Greater patient care in the post-op period could reduce fatalities"***

- **Prolonged Recovery** and **'Rough' Recovery** are most common complications
- **Prolonged Recovery** may be an indication of excessive depth, hypothermia or slow elimination of anesthetics (hepatic, renal disease, poor perfusion, etc.)

- **Tx**: Rewarm, oxygenate, reverse drugs if necessary, monitor and annotate

DIFFICULT RECOVERY



Rough Recovery Causes include *Emergence Delirium, Pain, Bladder Distension, Anxiety, Opioid Dysphoria, and Benzodiazepine Disinhibition*

Emergence Delirium Mental confusion and agitation (hyperexcitability, restlessness, uncontrolled thrashing, vocalization)

- Patients don't interact and unaware of their environment; abrupt signs following rapid emergence from anesthesia
- **Tx:** Low dose of induction agent, α2, propofol

Pain Anticipate/preempt, use Pain Scales, staff serial monitors

- **Tx:** Analgesics (Opiods, NSAIDs, MiLK or other CRI) Ice, good nursing

Bladder Distention Very uncomfortable; often hidden

- **Tx:** Express/catheterize bladder, walk outside/litter box

DIFFICULT RECOVERY

Anxiety Fear from anticipating a real or imaginary threat. Impairs physical and psychological functioning to include vocalization, panting, and restlessness.

- **Tx:** Low dose of induction agent, α2, propofol; oral trazadone, gabapentin. Consider holding, wrapping (Thundershirt)

Opioid Dysphoria Vocalization, restlessness, hyperthermia, panting, and lack of response to humans; usually w/ μ agonists (hydromorphone, fentanyl)

- **Tx:** Butorphanol, low dose Naloxone (slow IV) Stop drug when clinical signs subside.

Benzodiazepine Disinhibition Diagnosis of exclusion if no response to analgesics, sedatives, and tranquilizers.

- **Tx:** Reverse w/flumazenil. Monitor and annotate

SUMMARY

- **Managing complications** relies on thorough patient assessment, diligent monitoring, and supportive care through recovery. ***'Doorknob To Doorknob' care!***
- Anticipating and recognizing complications with early treatment prevents acute or long-term organ damage
- Early recognition and treatment of *hyperthermia, hypotension, arrythmias* and *hypoventilation* can prevent poor tissue perfusion and cellular hypoxia

- Ensuring a *smooth recovery* minimizes mortality and morbidity and reduces stress and injury for patients (*and staff!)*
- With modest investments in staff training and equipment, anesthesia monitoring becomes routine, the perceived disadvantages diminish, and the practice's standard of care is raised!

Top 5 Anesthetic Complications: *Are You Ready?*

Tim Loonam DVM, Director of University Relations – *Encore Vet Group* dawgdoc@gracepets.com

Helpful Links:

-2020 AAHA Anesthesia Guidelines https://www.aaha.org/aaha-guidelines/2020-aaha-anesthesia-and-monitoring-guidelines-for-dogs-and-cats/anesthesia-and-monitoring-home/

-AAHA Free Anesthetic Safety on-demand Webinar https://vetbloom.com/product?catalog=aaha-anesthetic-safety

-ACVAA Guidelines and Statements https://acvaa.org/veterinarians/guidelines/ Includes guidelines on the supervision of licensed technicians and assistants, and small animal monitoring guidelines

-**AAFP Anesthesia Guidelines** https://catvets.com/guidelines/practice-guidelines/anesthesia-guidelines

-Enhanced Recovery After Surgery (ERAS) Society website https://erassociety.org/

-Arrythmia EKG Cheat Sheets (Downloadable) https://nurseslabs.com/ekg-interpretation-cheat-sheet/

-Supraventricular Tachycardias https://www.sciencedirect.com/topics/veterinary-science-and-veterinary-medicine/supraventricular-tachycardia

-Reading ECG's in Veterinary Patients: An Introduction. https://www.dvm360.com/view/reading-ecgs-in-veterinary-patients-an-introduction

INTRODUCTION Successful anesthetic events require the anesthetist to monitor and manage a patient to a successful outcome. Successful outcomes are more than just 'surviving' the event (improved mortality) but also include limiting follow-on diseases and short and long-term complications (morbidity). Anesthetists, including our veterinary technicians and assistants must have a general understanding of the anesthetic agents, methods for delivering and assessing the anesthetic agent, and the appropriate action required in the event of an anesthetic-related complication or emergency. Anesthetic complications can still occur despite thorough patient monitoring and supportive care by the staff and veterinarians. The duration of the event can influence outcome; the longer the patient is anesthetized the greater the chance for a complication. Anesthesia time should be carefully planned out by the veterinarian, anesthetist, and staff to prevent a prolonged anesthetic experience and anesthetic complications. The most common anesthetic complications in small animal medicine include **Hypothermia, Hypotension, Arrythmias, Hypoventilation** and **Difficult Recovery.**

HYPOTHERMIA Hypothermia is a state of lower-than-normal body temperature. The normal body temperature for dogs and cats ranges from 100.5°F to 102.5°F. Hypothermia is classified as primary or secondary: Primary – due to environmental exposure despite normal heat production by the body, and Secondary – due to alterations in heat production because of illness, injury, or drugs. Our patient's bodies can lose heat through four basic mechanisms. **Convection** transfers heat from the body surface to air or water moving past the animal. **Conduction** transfers heat from the body surface to colder objects in contact with the skin. **Radiation** is the exchange of heat between the body and objects in the environment that are not in contact with the skin, independent of the temperature of the surrounding air. **Evaporation** occurs when moisture in contact with skin or the respiratory tract dissipates into the air.

During an anesthetic event the patient's thermoregulatory center is affected by opioids potentiating hypothermia. Acepromazine, propofol, alfaxalone, and inhalants decrease temperature due to vasodilation, eventually slowing their own metabolism. Additional causes of hypothermia include endotracheal intubation, clipped fur, open body cavities, cold IV fluids, cold table surfaces, increased high fresh oxygen flow, and surgical prep solutions. The consequences of hypothermia include decreased metabolism (therefore, decreased anesthetic requirements), decreased immune response, delayed wound healing, and coagulopathies. As hypothermia progresses patients become bradycardic and unresponsive to anticholinergic (atropine or glycoprryolate) therapy. This bradycardic episode will decrease the patient's cardiac output resulting in hypotension (decreased tissue perfusion) and ischemia (inadequate blood supply to tissues and vital organs). Cardiac arrhythmias secondary to altered electrical activity (atrioventricular block and ventricular premature complexes) can also occur as the patient's temperature continues to drop. Hypothermia also results in decreased ventilation, prolonged recoveries, and shivering. Shivering increases the patient's metabolic rate and oxygen consumption – this can compromise vital organ function.

Hypothermia treatment begins with prevention. In the premedication period, pre-warming can help minimize temperature loss. Warm laundry and circulating warm air blanket can be used to "tuck in" the patient providing they'll tolerate this. Peri-operatively, warming devices (circulating warm water and warm air blankets, Hotdog warming device, decreasing oxygen flow rates, warm environment, warm IV fluids and prepping solutions) should be instituted as best as possible. Minimizing anesthesia will also help prevent hypothermia. Hypothermic patients should NOT be submerged in warm water, as doing so can trigger life-threatening blood pressure changes and abnormal heart rhythms.

HYPOTENSION Hypotension is defined as mean arterial pressure (MAP) < 60mmHg, a systolic arterial pressure (SAP) < 80mmHg, and diastolic (DBP) < 40mmHg. Hypotension results in decrease perfusion to vital organs. The main factors during anesthesia contributing to hypotension are hypovolemia, decreased cardiac output and vasodilation. A few commonly used anesthetic agents contribute significantly to hypotension. Acepromazine and propofol cause vasodilation. Inhalants cause a dose-dependent decrease in cardiac contractility and systemic vascular resistance. Hypotension can be minimized by using low doses of acepromazine and reducing the vaporizer setting,. Other causes of hypotension include dehydration, blood loss, histamine release, and anaphylaxis. In healthy dogs and cats presented for elective procedures, the anesthetics drugs are the most common cause of arterial hypotension. It's important to ensure adequate oxygenation and ventilation in hypotensive patients. If inhalation anesthetic is being used, check the O_2 saturation. If the patient is not intubated and receiving injectable anesthetic agents, intubate the patient and assist ventilation. Blood loss during surgery can also result in hypotension. Preexisting conditions that can result in hypotension during anesthesia include hypovolemia, shock, cardiomyopathies, valvular heart disease, arrhythmias, hypothyroidism, hypoxemia, phaeochromocytoma and Addisonian crisis. Drugs, colloids or blood products administered during anesthesia can cause an anaphylactoid reaction. The most common manifestation of anaphylactoid reaction during anesthesia is hypotension.

Colorado State Small Animal Anesthesia Retrospective Studies on the Incidence of Hypotension During Anesthesia In summary, recent retrospective studies of over 100 ASA Class I and II dogs and cats undergoing routine surgical procedures with typical anesthesia drugs and maintained on iso- or sevoflurane, revealed that 27% had a hypotensive event during anesthesia (1/4 of dogs and 1/3 of cats). More than 50% of these hypotensive events were easily and inexpensively corrected by decreasing the vaporizer setting and administering an IV fluid bolus. The remainder of hypotensive cases were treated successfully with positive inotropes such as dobutamine or ephedrine. The important point is although these cases were easy to treat, they would've gone *undetected* in the typical small animal surgery/anesthesia setting if BP was NOT monitored. In a survey of 20 veterinary practitioners in Colorado published in 2002, the only veterinarian who considered hypotension to be a problem during anesthesia was also the only veterinarian who regularly measured blood pressure in all her patients. This is unlikely to be simple coincidence... Finally, in a recent human study, a

hypotensive event during anesthesia was a significant predictor of increased mortality during the year immediately following anesthesia.

Clinical Signs The clinical signs of hypotension include weak palpable pulse, prolonged CRT, tachycardia, systolic pressure less than 70mmHg and mean pressure less than 60mmHg. However, a strong peripheral pulse does not guarantee a normal MAP. The palpated pulse is the difference between the systolic and diastolic pressures. A large difference between the two pressures will result in a very strong pulse and yet the MAP may be low. Hypotension is best detected with either direct or indirect blood pressure monitoring.

Direct vs. Indirect Measurement of BP **Direct** arterial blood pressure measurement involves arterial catheter placement and continuous readings via a pressure transducer. An appropriately sized catheter is inserted into an artery such as the dorsal pedal artery. Critical patients undergoing surgery should be considered for this method, which is beneficial in the following scenarios:

- Hypovolemic patients due to (i.e., trauma, hemoabdomen)
- Pre-existing cardiovascular patients (i.e., severe dilated cardiomyopathy)
- Patients undergoing procedures where significant blood loss or large fluctuations in blood pressure are anticipated (i.e. pheochromocytoma)

Indirect methods of measuring BP, such as Doppler ultrasonography and oscillometric measurement, are used more frequently in small animal practices than indirect arterial placement. Doppler blood pressure measurement using a sphygmomanometer is preferred in cats and small dogs < 10 kg. Oscillometric measurement involves use of equipment that automatically inflates and deflates a cuff to determine blood pressure continuously. This is probably the easiest of all the blood pressure monitoring options. Regardless of which method you choose, keep in mind that a single reading is not used to determine treatment; instead, it's best to look at trends in BP readings. Also, remember that the placement and size of the BP cuff is important. The most consistent cuff location in small patients is mid-forelimb.

Treating Hypotension To manage hypotension during anesthesia, first determine the possible cause of the problem. Hypotension may be due to one or a combination of the following: 1) reduced inflow to the heart, 2) reduced pumping function of the heart, and 3) reduced vascular resistance. If the patient doesn't have any preexisting conditions, then hypotension is more likely anesthetic-induced. Treatment begins first by recording each patient's preoperative heart rate to establish an average resting rate for that individual. If your patient is bradycardic and hypotensive because of a decreased HR, consider an intraoperative intravenous dose of glycopyrrolate or atropine until the HR returns to an acceptable range. On the other hand, if your patient is bradycardic and hypotensive because of administration of an α2-adrenergic receptor agonist such as dexmedetomidine, consider administering a reversal drug, such as atipamezole.

If your patient is hypotensive due to the vasodilating effects of anesthetic inhalant agents, consider decreasing the dose of the agents. In severe hypotension, stopping anesthetic administration for 1-2 minutes may be necessary. Inhalant anesthetic agents can also cause a decrease in cardiac output and, when combined with vasodilation, may lead to decreased organ perfusion. Increased circulating volume can be achieved by administering boluses (5-10 mL/kg; up to 90ml/kg/hr) of intravenous crystalloid fluids, which will help if hypotension is secondary to hypovolemia and peripheral vasoconstriction. In some patients, reducing anesthetic depth and administering an increased volume of crystalloid fluids isn't enough to correct hypotension; if so, consider the use of positive inotropes. Dopamine is the most common inotrope used through stimulation of beta-1 receptors. If this high rate of dopamine infusion is required, reduced vascular resistance may be the dominant cause of hypotension. An alternative is the use of ephedrine, a mixed alpha and beta agonist. This drug will increase myocardial contractility and peripheral resistance. Be careful of the high concentration of ephedrine available and consider diluting with saline (50.0 mg/ml; 5.0 mg of ephedrine diluted with saline to make a total volume of 10.0ml). Repeat in 5 min if necessary. Note: sinus tachycardia can occur with higher doses.

In hypoproteinemia or severe blood loss cases requiring large amounts of fluid resuscitation, consider the addition of colloids. Colloidal solutions can be either natural (i.e., albumin) or synthetic (eg, dextran, hetastarch). If more than 20% of the blood volume is lost, whole blood or packed red blood cells is indicated. Patients not responding to these treatments will need intervention with drugs to improve systemic vascular resistance and

contractility. These drugs act on α- and β-adrenergic receptors. Stimulation of these receptors can have varying effects at varying doses.

Dobutamine is a synthetic catecholamine that acts on α- and β-adrenergic receptors, stimulating cardiac contractility, cardiac output, and coronary blood flow. Low doses can cause an increase in cardiac output while simultaneously initiating a moderate increase in heart rate. The therapeutic dose ranges from 2 to 20 μg/kg/min.

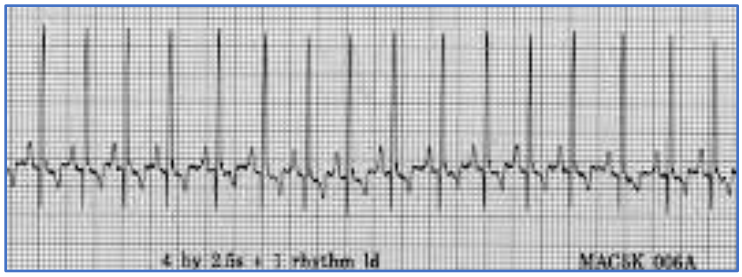
Dopamine is a short-acting norepinephrine precursor with α- and β-agonist properties (ie, binds to α1-, α2-,and β2-receptors plus 2 dopamine receptors). The dosing schedule is important with this drug, as different doses can stimulate other receptors and thus trigger different effects. Medium doses (eg, 3-5 μg/kg/min) can stimulate β-adrenergic receptors that act as a positive inotrope and increase heart rate. Higher doses (6 to 10 μg/kg/min) stimulate α-adrenergic receptors that cause an increase in systemic vascular resistance. Doses higher than 10 μg/kg/min can trigger tachycardia and increased afterload, leading to decreased cardiac output.

Ephedrine is a non-catecholamine sympathomimetic agonist that stimulates α- and β-adrenergic receptors. Another benefit of ephedrine is improved oxygen delivery to tissues via increased hemoglobin. Ephedrine can also be administered as a single-bolus intravenous injection of 0.10 mg/kg.

Norepinephrine acts on α- and β-receptors by increasing mean arterial pressure and peripheral vascular resistance. Coronary blood flow also increases. Norepinephrine may be beneficial in increasing mean arterial pressure in patients with sepsis or patients currently on β-blocking drugs such as atenolol. Often, norepinephrine infusions are started at 0.10 to 0.20 μg/kg/min and can be increased by increments of 0.10 to 0.20 μg/kg/min as needed. Norepinephrine is not usually the first choice for hypotensive patients that are otherwise healthy. It is often used in the treatment of vasodilatory shock and commonly administered with an inotrope (such as dobutamine) if myocardial depression is suspected.

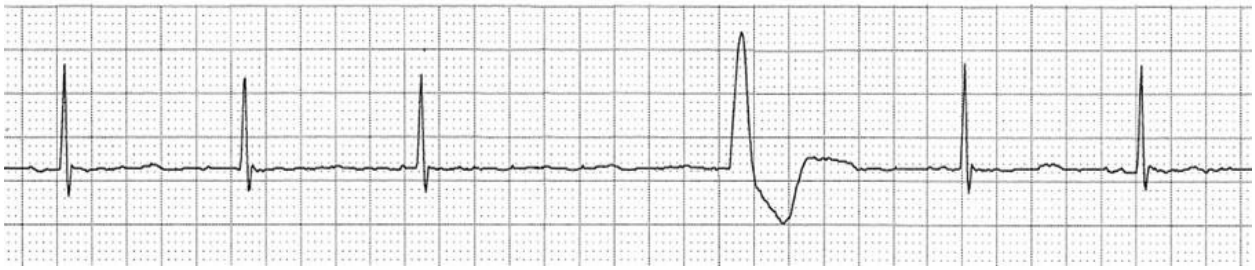
ARRYTHMIAS Throughout the anesthetic event the anesthetist closely monitors the patient's cardiovascular status. Mucous membrane color, capillary refill time, heart rate/rhythm are usually assessed in 5-minute intervals. An electrocardiogram (ECG) is used to monitor the heart's electrical activity – helpful in identifying arrhythmias. An esophageal stethoscope is an inexpensive piece of equipment used to obtain heart rate and sounds; this is a very valuable monitoring device for not only hearing heart sounds, but also good for airway sounds. The use of a Doppler blood pressure monitor can also aide the anesthetist in acquiring the patient's heart rate. Bradycardia is a very common anesthetic complication. Generally, bradycardia refers to heart rates < 70 bpm in small dogs, and 100 bpm in cats. Causes of bradycardia include use of vagotonic drugs such as alpha-2 adrenergic agonists or opioids, increased vagal tone secondary to intubation and the oculocardic reflex, hyperkalemia, hypothermia, hypoxia at the tissue level, and excessive anesthetic depth. Treatment first begins with prevention and monitoring and continues once the cause for bradycardia is determined. Vagal-induced bradycardia is treated with the use of IV anticholinergics (atropine, glycopyrrolate). Anticholinergics should be considered preemptively for patients suspected of having high vagal tone such as brachycephalic breeds. Reflex bradycardia caused by alpha-2 agonists need not be treated unless hypotension/reduced perfusion occur. Other sources should be consulted for a discussion of arrhythmogenic properties of various preanesthetic and anesthetic agents. Lastly, treat the underlying cause for bradycardia secondary to hyperkalemia, hypothermia, or excessive anesthesia depth.

Arrythmias during anesthesia become clinically significant if the hemodynamic state of the patient is affected. Not all arrhythmias occurring during anesthesia need to be treated. However, some arrythmias are potentially lethal and should be treated immediately. The most common arrhythmias occurring perioperatively include sinus tachycardia, sinus bradycardia, atrioventricular block, ventricular premature contractions and ventricular tachyarrhythmia. Monitor using auscultation or ECG and by observing pulse–HR incongruity with Doppler ultrasound or SpO_2 waveform. The decision of whether to treat an arrhythmia should be based on the severity, the effect on other hemodynamic parameters (i.e., hypotension), and the likelihood of deterioration to a more significant arrhythmia.



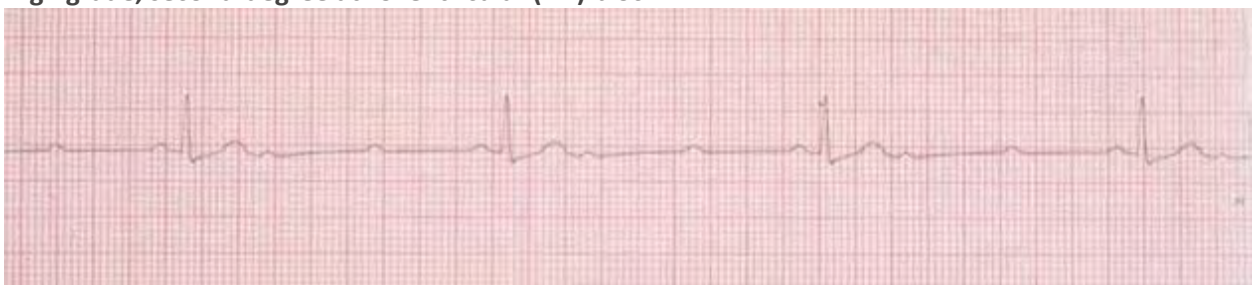
Sinus tachycardia (canine > 180 bpm, feline > 240 bpm) in the perioperative period is rarely a true cardiac arrhythmia, but, rather, a reflection of increased sympathetic tone from a wide variety of pathologic and/or physiologic causes. Physiologic causes include excitement, stress, and fear. Pathologic causes include pain, hypovolemia, anemia, acidosis, hypoxemia, fever, hyperthermia, toxemia, cardiac failure, hypercapnia, hypotension, acute hemorrhage, and hyperthyroidism. Administration of more anesthetic (IV or inhalant) and analgesic (typically opiates) will reduce the heart rate if the animal is in a light plane of anesthesia. Epidural morphine and/or local anesthetic before the surgery can prevent the sympathetic response to the surgical stimulation. Tachycardia due to hypovolemia or shock should be managed with fluid administration. Beta blocking agent (propranolol or esmolol) can be given in hyperthyroid cats with persistent tachycardia (heart rate >200 beats per minute).

Sinus bradycardia with a ventricular escape beat



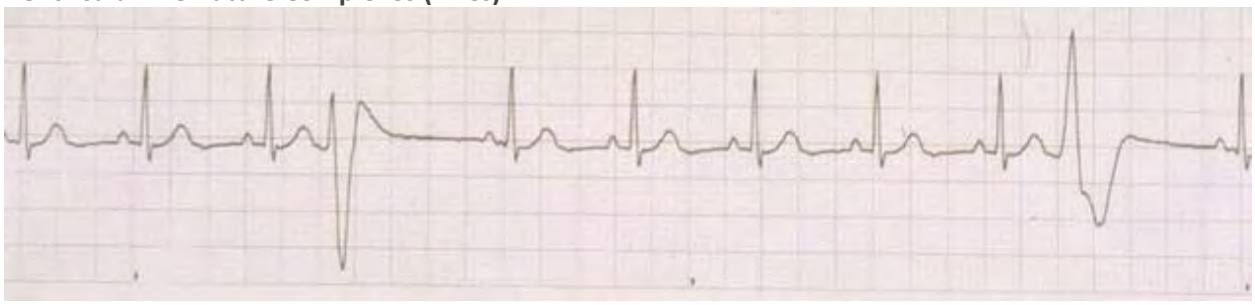
Sinus bradycardia with or without 2nd degree AV block is commonly seen during anesthesia. It may be due to drugs that increase the vagal tone, vagally mediated reflexes, hypothermia, and deep anesthesia. Bradycardia may decrease both cardiac output and blood pressure. The goal is to increase the heart rate as the escape beat is due to the slow sinus rate. Anticholinergic (atropine, 0.02-0.04 mg/kg IV or glycopyrrolate, 0.005-0.01 mg/kg IV) are effective in treating sinus bradycardia or other bradyarrhythmias associated with high vagal tone. If the bradycardia is caused by an anesthetic overdose or severe hypothermia, atropine may not be effective. Other forms of support will be needed to increase the heart rate. Specific reversal agents for the anesthetic agents used will help correct the bradycardia. Support of body temperature in hypothermic patients will slowly correct the sinus bradycardia.

High grade, second-degree atrioventricular (AV) block



Supraventricular arrythmias are tolerated by most anesthetized patients and do not require drug therapy. In some cases, deterioration of the hemodynamic state necessitates the use of drugs. Treat with atropine or glycopyrrolate when the patient is hypotensive and bradycardic. Beta blocking drugs (esmolol, propranolol, or diltiazem can be used for supraventricular tachycardia and atrial flutter/fibrillation. Quinidine can be used specifically for atrial flutter/fibrillation. Premature atrial complexes can occur during anesthesia and specific treatment for these arrythmias is not needed. However, ventilation and oxygenation should be assessed and improved if needed.

Ventricular Premature Complexes (VPCs)



Ventricular Premature Complexes PVCs are the most common ventricular dysrhythmias during anesthesia. They are well tolerated in healthy patients and don't require therapy in most cases. If significant runs of PVCs occur, if they become multiform or cause hypotension treat with lidocaine (1.0-4.0 mg/kg IV dogs; 0.5 mg/kg cats IV, +/- CRI). Ensure adequate oxygenation and ventilation in these patients, which will also often eliminate some PVCs. PVCs can progress to ventricular fibrillation which is of more concern. Lidocaine is also the drug of choice for ventricular tachycardia.

HYPOVENTILATION Hypoventilation, aka respiratory depression (ETCO2 > 45mmHg; PaO2 < 60 mmHg) is inadequate ventilation to perform essential gas exchange. It is insufficient elimination of CO2 from the body and a reduction of oxygen delivery to the tissues. The concentration of CO2 in the blood rises in the circulating blood and produces a state known as hypercapnia/hypercarbia, with subsequent respiratory acidosis, and hypoxemia. This is a common concern in the anesthetized patient because of insufficient ventilation. Hypoventilation is usually drug induced. Opioids, propofol, alfaxalone and inhalants can result in dose-dependent respiratory depression. Acepromazine and benzodiazepines cause minimal respiratory depression. Upper airway obstruction (brachycephalic syndrome, neurologic disease (chemoreceptor's sensitivity to carbon dioxide), and impaired respiratory muscle effort (rib fractures, obesity, bandage) are other causes for hypoventilation. Throughout the anesthetic event the anesthetist should closely maintain and monitor the patient's respiratory rate/rhythm/effort at 5-minute intervals. The anesthetist should be comfortable with "hands-on" monitoring – using one's own senses (sight, sound, touch) in determining patient's respiratory status. Mechanical monitoring by the anesthetist involves the use of equipment that will aide in assessing the patient's ventilation. A combination of devices, pulse oximetry (SpO2) and capnometry (CO2) can enhance anesthetic respiratory

management in the patient. The use of both devices in conjunction can provide the anesthetist with valuable information regarding gas exchange at the pulmonary level.

Besides prevention, treatment to correct hypoventilation begins once the cause is detected. Initially anesthetic depth should be assessed to rule out the possibility of the patient being too deep. $ETCO_2$ is ~35–45 mm Hg in awake patients and ~40– 50 (up to 55) mm Hg in patients in an appropriate surgical plane of anesthesia. To correct increasing $ETCO_2$, first ensure that the cause is not excessive anesthetic depth by checking the vaporizer setting and evaluating indicators of the patient's anesthetic plane. Intermittent manual or mechanical ventilation may be needed until the patient regains spontaneous ventilation, so initiate PPV if $ETCO_2$ is >60 mm Hg (hypercapnia). The anesthetist can deliver breaths by manually squeezing the reservoir bag while occluding the adjustable pressure limiting valve, taking great care to not leave the valve closed except when delivering a breath. A safety pop-off relief valve will prevent this complication. Partial or full reversal agents (for opioids) may need to be considered to improve respiratory depression once in recovery. During recovery and while off supplemental oxygen the SpO2 should be >90%

DIFFICULT RECOVERY The recovery period for some patients can be challenging and unpleasant. It is during the recovery period where most deaths occur. Patients in the recovery period should have supervision for at least the first few hours post-extubation. Two common recovery complications include delayed recovery (>30 mins since termination of anesthesia) and rapid recovery with or without pain. Delayed recovery may be an indication of excessive depth or slow elimination of anesthetic agents (hepatic, renal disease, poor perfusion, etc.). Hypothermia can also cause a delayed recovery. A prolonged recovery may be an indication of a serious condition that may eventually result in death of the patient. A slow recovery causes depressed ventilation and slow elimination of inhalant anesthetics; this will further exacerbate hypothermia and slow the metabolism of injectable anesthetics resulting in a slower return to consciousness. If a slow recovery is a result of hypothermia appropriate warming therapy should begin immediately. Pre-warming and minimizing anesthesia time can help prevent this from happening. If reversible anesthetic agents were used (opioids, alpha-2 agonists, benzodiazipines) reversal agents (antisedan, flumazenil) should be considered to expedite the recovery. On the other hand, a rapid recovery is also not desirable. Patients waking up too quickly can be very distressing to all involved. These patients are in danger of injuring themselves and staff. Ideally, all patients should be placed in a warm, quiet environment prior to extubation to minimize as much post-anesthetic excitement as possible. During a "rough"recovery it's important to determine what may have caused this inappropriate "wake-up". Is it a result of pain or dysphoria, anxiety/agitation for anesthetic agents? This can be a very challenging time not only for the patient but also for the anesthetist/recovery nurse. It may require a multi-step process to get these patients "settled". Various anesthetics (dissociatives, tranquilizers, opioids) can cause unwanted behavior changes. If dysphoria is suspected because of opioid use, a partial reversal may be required. Butorphanol 0.05mg/kg IV can be administered to take away some of the unwanted behavior. A low tranquilizer may be beneficial for mild sedation and calming. Acepromazine 0.01mg/kg IV or dexmedetomidine 0.002 mg/kg IV can be used. If pain is the cause of a rough recovery, additional analgesia should be administered

Apitherapy in veterinary medicine, what is the scientific evidence?

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Abstract:
The overuse and misuse of antibiotics have been linked to the emergence and spread of resistant microorganisms resulting in ineffective antibiotic treatments and posing a serious risk to public health. Bees produce a large number of products like honey, propolis, royal jelly, bee pollen, beeswax, and bee venom, which contain bioactive constituents which have been used by many different civilizations for centuries to treat a variety of illnesses.[1] Apitherapy refers to the use of these bee products for treating health disorders and this science has been practiced for thousands of years in Asia, Africa, and Europe. In English literature, Dr Bodog F. Beck used the term "Apitherapy" for the first time in 1935. He recommended the use of this word to describe the therapeutic use of bee products, while also acknowledging that the word is a heterogenous mix of Latin and Greek, and the more correct term would be "Melissotherapy".[2]
While there is much scientific evidence available regarding the efficacy of apitherapy, it still is not accepted by many practitioners of Western medicine. There are multiple reasons for this dichotomy and some of them include the following:
A lack of standardization of the products themselves does not allow for broad clinical trials, and trials that are attempted often do not yield repeatable results. This lack of standardization in the products also means that large-scale production is often not possible, which in turn hampers profit-making and leads to variabilities in product specifications regarding its shelf life, active ingredients, etc.
Also, most apitherapy products consist of an amalgamation of multiple biologically active substances which act in synergy to achieve results. Very often the mode of action is not well understood. For example, bee venom consists of a multitude of proteins, each of which might contribute to any given therapeutic effect, much like an orchestra where many different instruments are playing together to create the final musical experience. As an example of this oversimplification, Melittin is the major protein in bee venom, making up about 50% of the dry matter substance. Frequently medical studies on the effects of bee venom have used only this single protein when attempting to explain the effect of what is essentially a mix of many different proteins. Therefore, conclusions s to effect are understandably difficult to make.
Another factor that might cause skepticism regarding apitherapy is the fact that observations and publications are often anecdotal, and case-based and not based on clinical trials. These publications are also frequently published outside the USA in countries where apitherapy is more widely accepted. The scientific rigor of these publications is often questioned as knowledge of standards of publications and research is not well known to the readers in the USA.
A reason for the large number of publications being from outside the USA could be that integration of alternate therapies is more frequently seen as an option in health care in other countries. For example, in Brazil apitherapy tends to be an expanding practice and has become part of the National Policy of Integrative and Complementary Practices (PNPIC – Ministry of

Health, Regulation 702, March 21, 2018).[3] Cultural and philosophical aspects of society can also be a factor in promoting a more holistic approach to healthcare when compared to the USA. Economic factors are often yet another factor and promote apitherapy in populations that cannot afford more expensive pharmaceuticals.

A scoping review of the evidence for the medicinal use of natural honey in animals was recently published and highlights many of the details discussed in this lecture. [4] The bottom line is that scientific evidence exists that apitherapy has a multitude of beneficial effects which vary depending on the product being used. Some of the well-documented benefits include antibacterial, anti-inflammatory, anti-mutagenic, anti-proliferative properties, anti-oxidant, anti-parasitic, antitumor, cardiovascular protector, and healing. [5-8]

While the field of apitherapy still needs a great deal of research, it is clear that there are important therapeutic gains to be made through the use of these products. One of their benefits may lie in their use as adjuvant therapies in combination with other well-documented pharmaceuticals.

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Enucleation Tips and Tricks

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BASICS OF SURGERY NEAR THE EYE

A. Ophthalmic Instruments - Designed to be handled by the fingertips. Sharp, precision instrumentation, adequate lighting and magnification are essential. Ophthalmic instruments are easily damaged and quickly become worthless unless properly handled. Essential instruments include:

1. Derf needle holders
2. Steven's tenotomy scissors (curved)
3. Barraquer's wire lid speculum (adult)
4. Bishop-Harmon forceps (delicate 1x2 0.3 mm teeth)
5. #3 Bard-Parker scalpel and #15 blade
6. Optivisor head loupes 5x
7. Adson 1x2 forceps with delicate teeth

Additional supplies include cotton tipped applicators, tongue depressors or Yaeger lid plates, drapes, towel clamps, suture material, irrigation cannulas, Mayo scissors, thumb forceps

B. Instrument Care

1. **Storage:** Store in a separate pack and individually sterilize/wrap. If wrapped together, do not allow them to rub against each other. Various specialized instrument trays are available.
2. **Cleaning:** Ultrasonic cleaning followed by air drying is best. Inadequate cleaning results in rust, which can be removed by soaking for 12 hrs in equal parts ethyl alcohol and aqueous ammonia.
3. **Sterilization:** Gas sterilization is best. Steam autoclaving may be used but may cause corrosion and dull instruments. MOST DULLING AND CORROSION IS DUE TO IMPROPER CLEANING AND HANDLING. Small sections of silicone tubing may be slipped over the tips to prevent their being damaged during sterilization. Cold sterilization is not recommended.

D. Anesthesia

1. Traction on extraocular muscles occasionally incites an oculocardiac reflex, bradycardia or even cardiac arrest. This is most often seen in brachycephalic dog breeds.
2. In anesthetized animals, corneal damage may occur secondary to impaired palpebral reflexes, decreased tear production, and lagophthalmia. Un-operated eyes should be lubricated.

E. Patient and Surgeon Positioning

1. **The Patient:** The animal is usually placed in lateral recumbency with the head close to the end of the table. Ideally, if magnification is used, the palpebral fissure would be parallel to the ground so that all of one level of the eye (lids, cornea, or lens) will be in focus in the same plane and surgeon movement required to restore focus will be minimized.

2. **The Surgeon:** Sit at the head of the table and rest your forearms on the edge of the surgery table (not the patient).

F. Patient Preparation - Differs slightly with procedure, but in general:

1. Elevate the down eye off the table by placing a rolled towel under the neck to prevent it from contacting the table or a pool of Betadine that has run off from the other eye. Also, be careful to not let Betadine used in preparing the up eye run directly into the down eye.
2. To avoid excessive lid and conjunctival edema, BE GENTLE. All antiseptic preparations are toxic to intraocular structures, and should not be used to flush the conjunctival sac if the corneal/scleral shell has been breached.
3. Carefully clip an appropriately sized border around the margins of the lids using scissors coated with K-Y Jelly or a #40 blade on an electric clipper. Removing the hair at the skin line is not necessary and can cause undesirable trauma. The lashes may be trimmed with scissors lightly coated with K-Y Jelly.
4. Gently blot with tape to pick up any remaining loose hairs.
5. Conjunctival Sac: Alternate wipes of dilute (1:1 to 1:10) povidone iodine solution with flushes of sterile saline. Sterile cotton tipped applicators should be used to apply the povidone iodine taking care not to touch the cornea. The fornix should be swabbed first working out toward the eyelid margins. Rinse immediately with saline. Repeat 2 more times.
6. The periocular skin may be prepared by gentle alternate applications of dilute (1:1 or even 1:10) povidone iodine solution and sterile saline. Avoid chlorhexidine it causes a severe toxic keratitis. Gauze placed between the eye being prepared and the down eye is needed to prevent antiseptics from coming in contact with the down eye. Work from the eyelid margins outward.

G. Postoperative Care - Narcotics or NSAIDs may be used for analgesia. Elizabethan collars are needed in most small animal ophthalmic patients post-op.

ENUCLEATION

A. Indications - A painful and medically/surgically nonresponsive ocular condition or an inoperable intraocular neoplasm.

B. Presurgical Considerations

1. An enucleation is done when the condition is confined to the globe. If there is orbital extension an exenteration should be performed. Exenteration is the complete removal of all tissues within the orbit.
2. If an orbital implant is placed the wound must be closed meticulously and in 3 layers. The rejection rate of the sphere is 2-4% in dogs and higher for cats (up to 10%?).

C. Technique - Modified Transpalpebral Enucleation - Removes the globe, a short piece of the optic nerve and all glandular tissue except the lacrimal gland, e.g. lid margins with the meibomian glands, conjunctiva with goblet cells, the third eyelid and its gland.

1. **Antibiotics** - 20 mg/kg cefazolin (1/2 IV, 1/2 IM) at induction.
2. **Preparation** - The eyelashes are trimmed with scissors coated with K-Y Jelly so the hairs will not fall into the eye. Clippers are used to trim all the

hair for 2-3 inches around the eye. Try to save the animal's "whiskers". If necessary, a shave with a #10 Bard-Parker scalpel blade for about 1-2 cm around the eye at the eyelid margins will help remove some of the finer hairs on the muzzle which cannot be removed with clippers. Tape may be used to pick up fine hairs that remain after clipping.

Gently prep with either Betadine scrub or dilute Betadine solution (50:50 with saline) followed by saline or eyewash rinses (not alcohol). Work from the globe outwards and prepare the conjunctiva (bulbar and palpebral), lids and periocular area. Cotton tipped applicators can be used to swab out the conjunctival cul-de-sac. Since the eye is going to be removed one need not be concerned about betadine scrub getting into the eye. You should, however, protect the down eye from trauma from the table top and run-off betadine. A rolled towel under the animal's neck to elevate the head off the table, and a gauze square between the 2 eyes during the prep to collect run-off can be helpful. The periocular area is prepared until the area is free of dirt and extraneous hair.

One additional preparation using betadine solution can be done after the animal has been positioned on the table.

Positioning of the animal on the surgical table should be so the palpebral fissure is parallel with the table top. Sand bags, Vac-Pacs and/or towels are helpful.

3. Surgical Procedure

Some surgeons suture the eyelids closed if the ocular surface is infected to try to minimize the risk of contamination of the orbit during the procedure. A #15 Bard-Parker scalpel blade is then used to make a full-thickness skin incision about 2- 5 mm from the lid margin for 360° around the eye. Incisions wider than this risk severing the angularis oculi vein near the medial canthus. A combination of blunt and sharp dissection is used to separate the skin, subcutaneous tissues and orbicularis muscle down to the stroma of the conjunctiva. Care must be taken to avoid incising through the conjunctiva. If this occurs, simply grasp the margin on the globe side and continue.

The medial canthal ligament and the retractor anguli oculi muscle (felt as firm bands in the medial and lateral canthus respectively) are then transected with a scalpel and the gland of the third eyelid is seen bulging medially. A curved mosquito forceps or pair of scissors is used to develop the plane between the gland of the third eyelid and the orbital rim so as to ensure the gland is removed with the globe.

The development of this dissection is continued all the way around until all of the conjunctiva has everted to the limbus. Excessive traction on the globe may stimulate the oculocardiac reflex, especially brachycephalics and horses, and can traumatize the optic chiasm and the other optic nerve.

When the limbus is reached, the dissection continues to the sclera and the tendons of the rectus muscles and then those of the retractor muscles are transected with a tenotomy scissors or other suitable small scissors.

A curved Kelly or mosquito hemostats are used to clamp the nerve a few mm distal to the posterior pole of the globe. Special care needs to be taken to insure that the posterior pole of the globe won't be incised thereby allowing intraocular contents to enter the orbit. Once the nerve is clamped, the scalpel blade or scissors are directed flat and tight along the top surface of the forceps to sever the nerve. Usually now the globe can be lifted out and any extraneous tissues severed.

Hemostasis is achieved by several minutes of digital pressure through a gauze, ligation and/or cautery. Minor bleeding during the surgery is ignored. These small bleeders usually stop on their own

4. **Closure** - Normally a 3 layer closure

The periorbita/lid fascia (an extension of the periorbita) is closed with a simple continuous absorbable suture starting by inverting the knot. The periorbita can be identified by grasping the firm tissue near the orbital rim and pulling it across the orbital opening. Regrasp away from the rim and pull outward until it is clear where the outer extent of the periorbita lies. If this is not done then success at forming a complete closeable diaphragm is less likely. If insufficient periorbita remains, as is common following an exenteration, the deep subcutaneous tissue is closed instead.

A tight diaphragm should be made without gaps. If there are any gaps and additional simple interrupted or horizontal mattress stitch can be placed to close the gap. The subcutaneous tissue is closed routinely with absorbable material (frequently a subcuticular pattern is used) and the skin with a fine (4-0) nonabsorbable material in a simple interrupted pattern. If an implant is used the closure must be meticulous in all 3 layers (without gaps) and you should strive to get as much tissue over the sphere as possible.

D. Postoperative Care

1. Treatment with a systemic broad spectrum antibacterial is used if the eye was infected. If an orbital prosthesis was implanted systemic antibiotics are used for 7-10 days postoperatively.
2. An Elizabethan collar is generally unnecessary.
3. Post-op swelling tends to be the greatest at 24-48 hours. Usually by 72 hours a noticeable decrease in swelling should occur. Over the next one to three weeks the area will become depressed to a variable degree if an implant was not placed. Any return of swelling or drainage once the initial swelling begins to subside would indicate a problem (infection, seroma, retained secretory tissue - not lacrimal gland in my experience - but gland of third eyelid, conjunctiva, suture reaction, hemorrhage or tumor that was missed).
5. Post-op seromas may be slightly more likely with the subconjunctival approach for enucleation, but even in this case they are unvommon.
6. Skin sutures are removed usually in 8 to 10 days.
7. The excised tissues should be submitted for histopathology.

Canine Immune-Mediated Hemolytic Anemia - An Update

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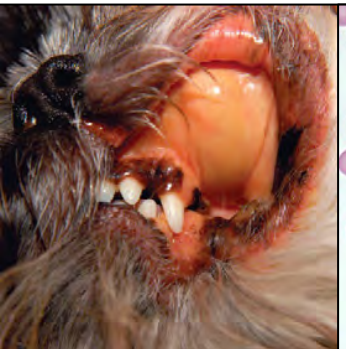
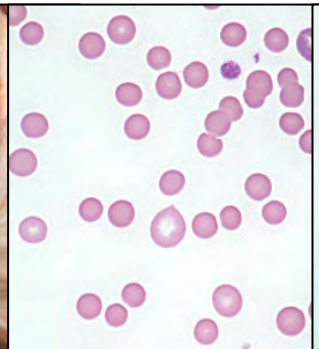
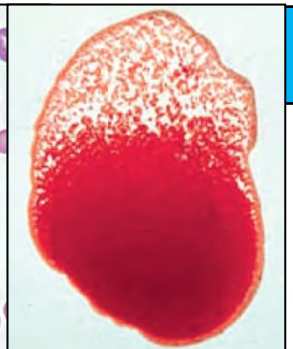
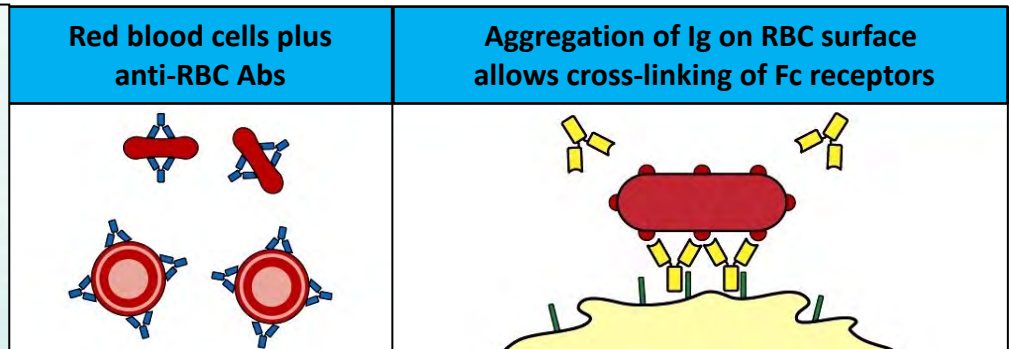
Associate Professor in SA Internal Medicine
Josiah Megis Distinguished Teaching Professorship

24 March, 2023





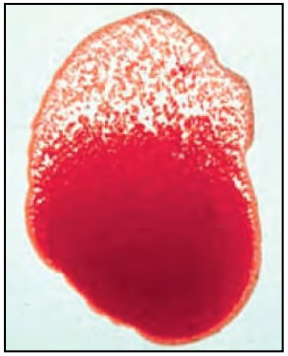




Learner outcomes – canine IMHA

Upon completion, the participant will be able to:

1. Describe the pathophysiology of 3 types of IMHA
2. Explain the rationale for different adjunctive immunosuppressive therapies
3. Describe additional supportive treatment strategies for IMHA



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CONSENSUS STATEMENT

Journal of Veterinary Internal Medicine Open Access

ACVIM American College of Veterinary Internal Medicine

ACVIM consensus statement on the treatment of immune-mediated hemolytic anemia in dogs

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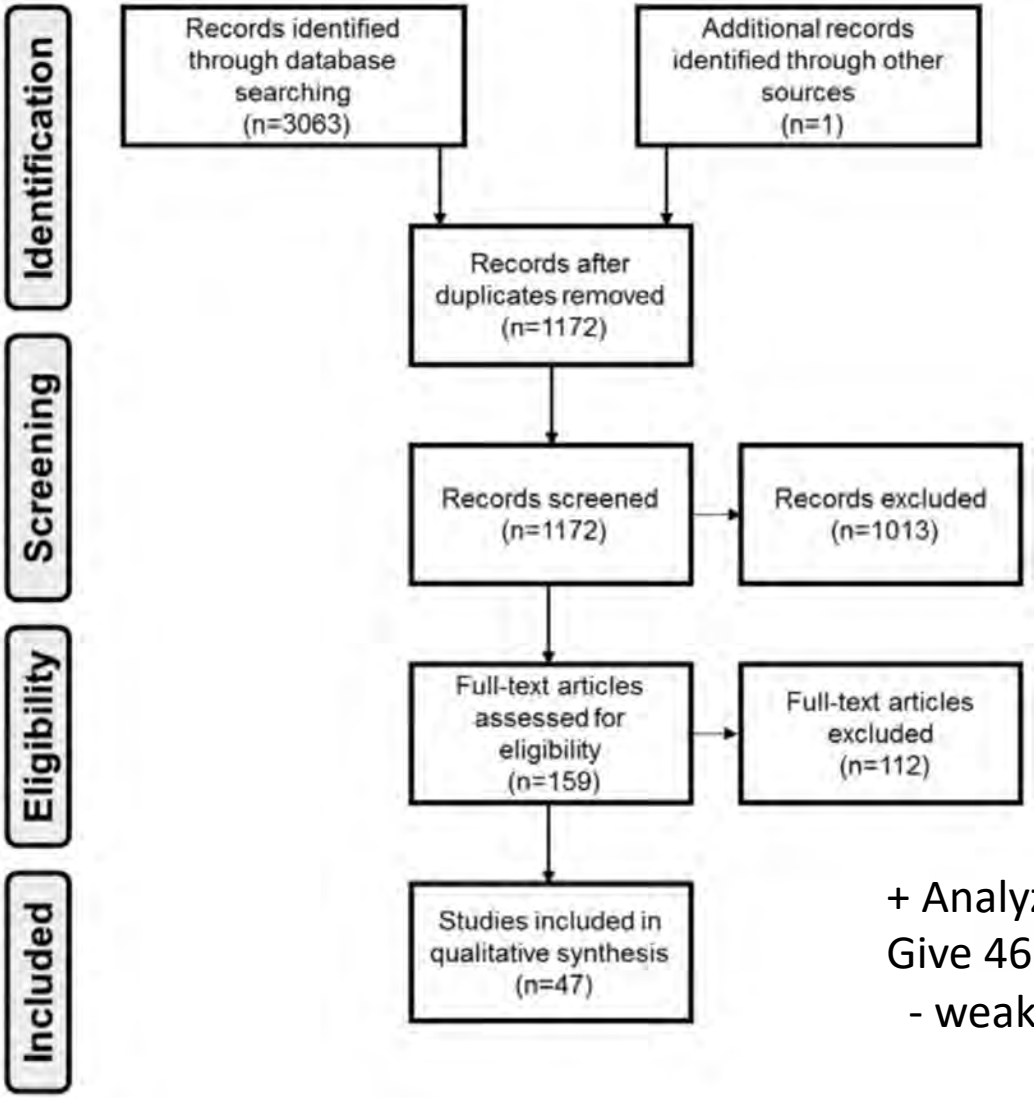
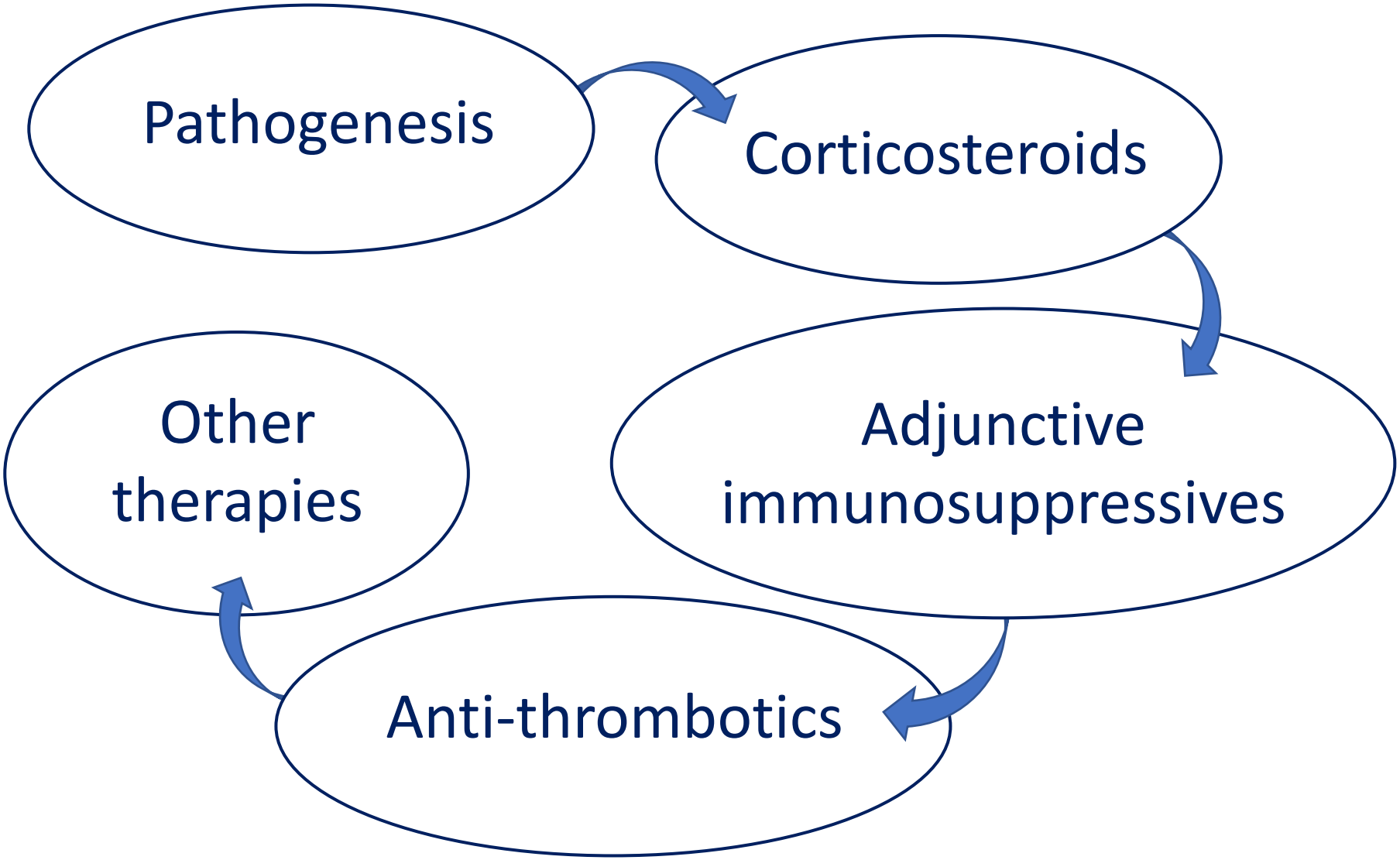
Immune-mediated hemolytic anemia (IMHA) causes severe anemia in dogs and is associated with considerable morbidity and mortality. Treatment with various immunosuppressive and antithrombotic drugs has been described anecdotally and in previous studies, but little consensus exists among veterinarians as to the optimal regimen to employ and maintain after diagnosis of the disease. To address this inconsistency and provide evidence-based guidelines for treatment of IMHA in dogs, we identified and extracted data from studies published in the veterinary literature. We developed a novel tool for evaluation of evidence quality, using it to assess study design, diagnostic criteria, explanation of treatment regimens, and validity of statistical methods. In combination with our clinical experience and comparable guidelines for humans afflicted with autoimmune hemolytic anemia, we used the conclusions of this process to make a set of clinical recommendations regarding treatment of IMHA in dogs, which we refined subsequently by conducting several iterations of Delphi review. Additionally, we considered emerging treatments for IMHA in dogs and highlighted areas deserving of future research. Comments were solicited from several professional bodies to maximize clinical applicability before the recommendations were submitted for publication. The resulting document is intended to provide clinical guidelines for management of IMHA in dogs. These guidelines should be implemented pragmatically, with consideration of animal, owner, and veterinary factors that may vary among cases.

Preferred Reporting Items for Systemic Reviews and Meta-Analyses

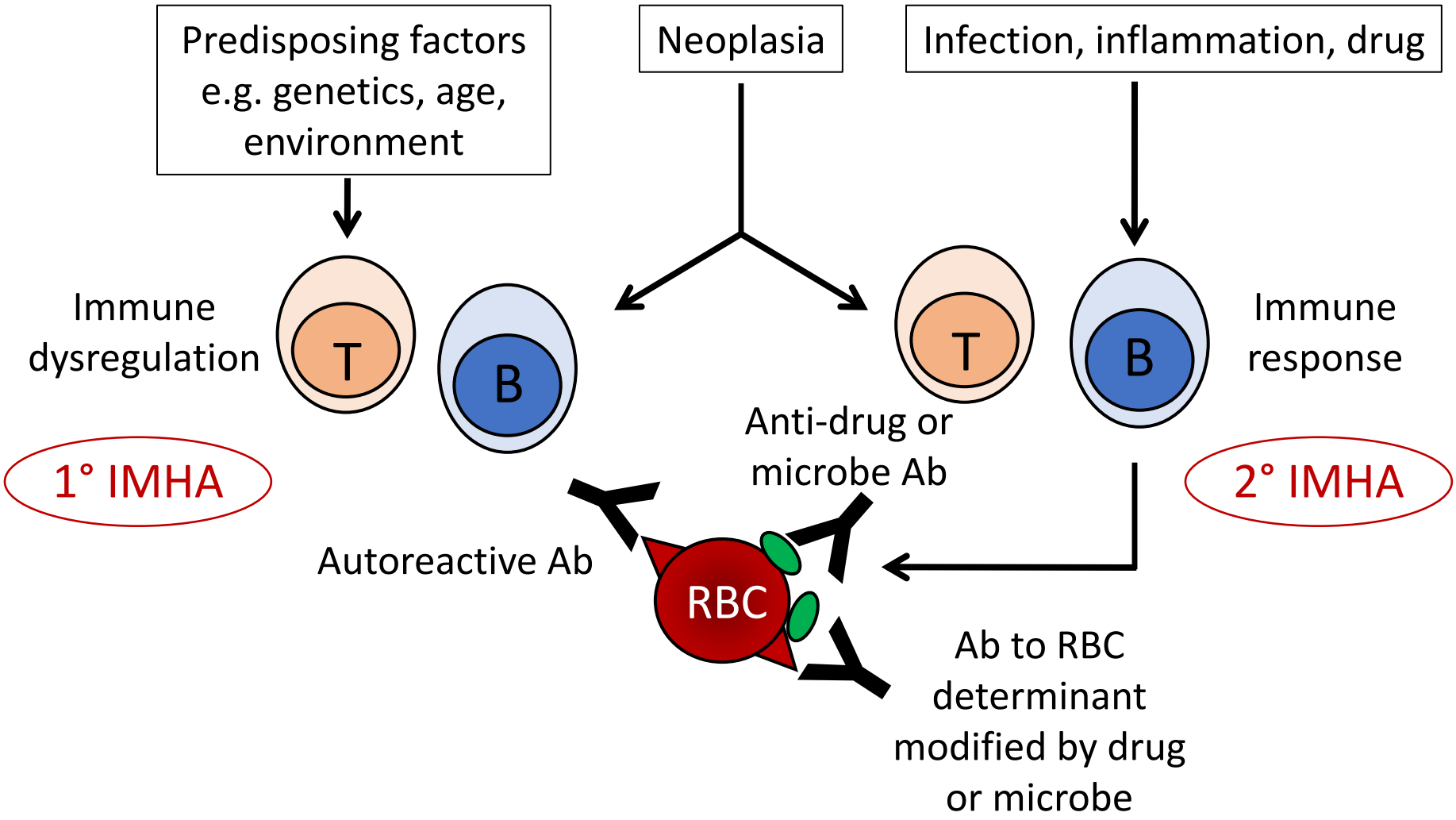


+ Analyze article bias
Give 46 recommendations
- weak or strong

Outline - IMHA



Pathogenesis of IMHA



Day M. in *Schalm's Veterinary Hematology (*6th ed.) 2010: 216

Pathogenesis of IMHA

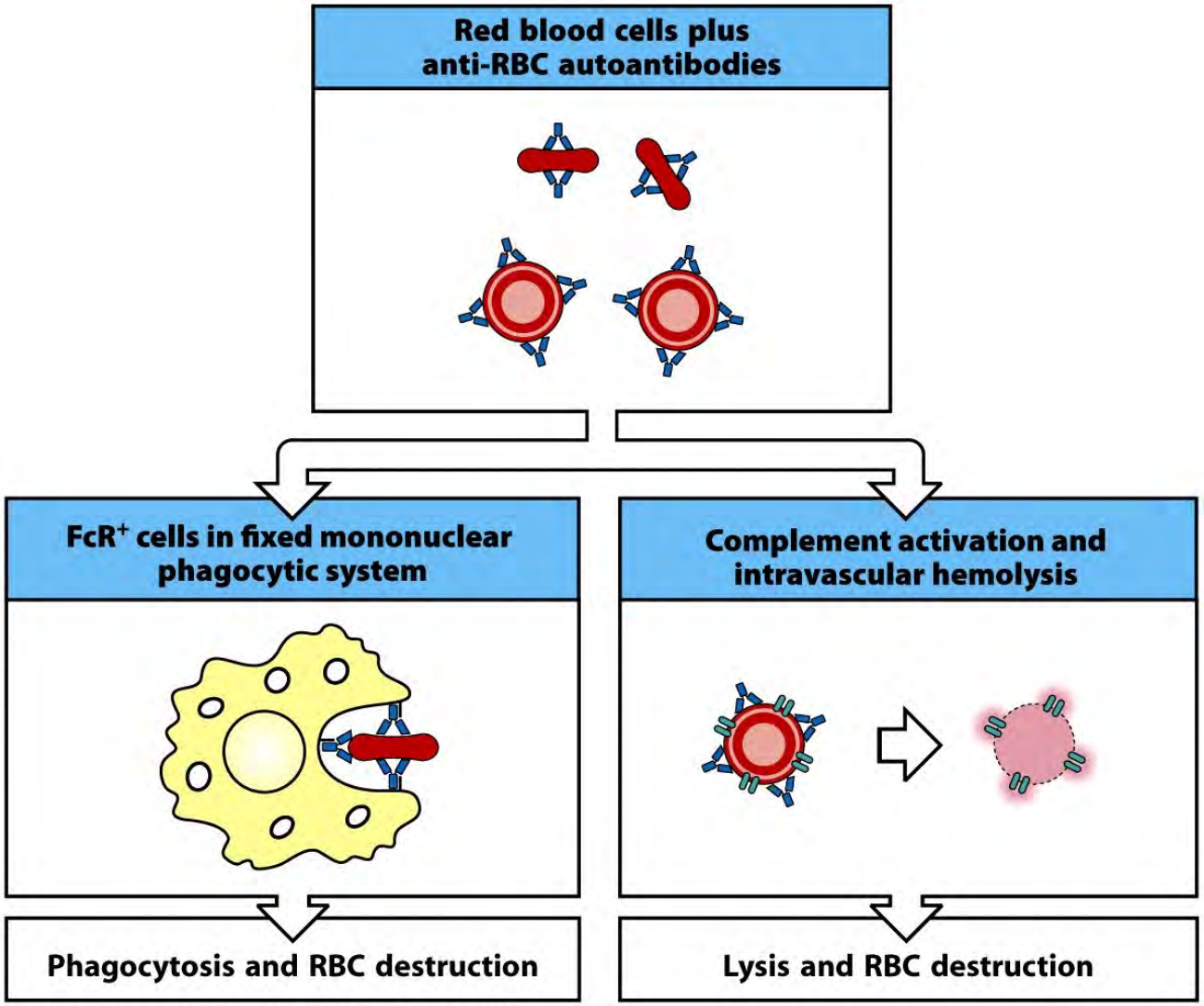


Figure 14-20 Immunobiology, 7ed. (© Garland Science 2008)

Extravascular hemolysis

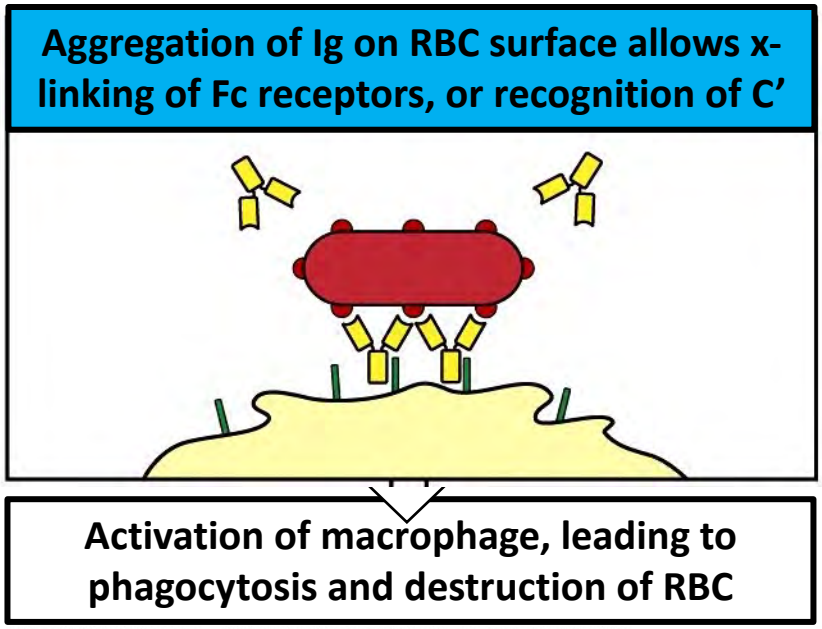
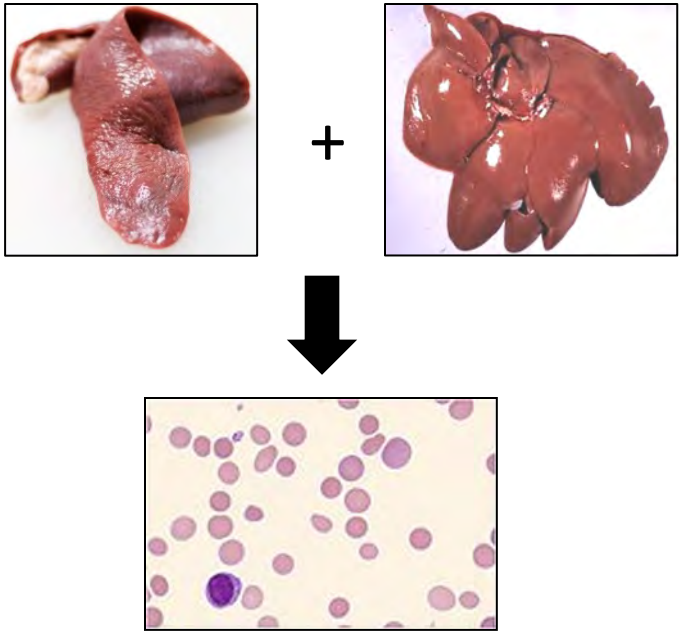
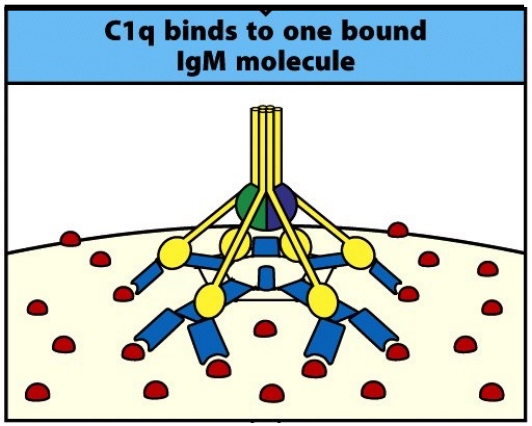


Figure 9-31 Immunobiology, 7ed. (© Garland Science 2008)



- Opsonization of erythrocytes → spherocytosis
- Excess hemoglobin enters bilirubin pathway
  → hyperbilirubinemia, hyperbilirubinuria

Intravascular IMHA



or

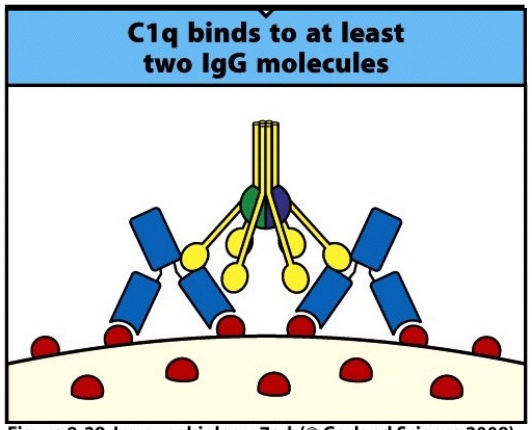


Figure 9-28 Immunobiology, 7ed. (© Garland Science 2008)

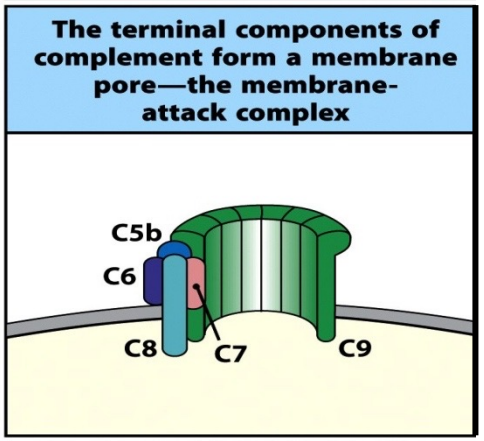
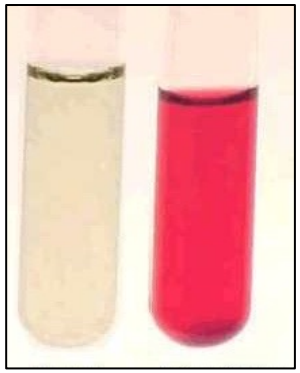


Figure 2-43 part 4 of 4 Immunobiology, 7ed. (© Garland Science 2008)

RBC

- Classical activation of complement
- Hemolyzed erythrocytes
  - → hemoglobinemia
  - → hemoglobinuria



http://drugline.org/img/term/hemoglobinuria-6958_1.jpg

Precursor IMHA

AKA pure red cell aplasia, erythrocyte maturation arrest

- Autoantibodies aimed at RBC precursors
- Persistent/chronic **non-regenerative** anemia

- Bone marrow aspirate
  - rubriphagocytosis and collagen myelofibrosis
  - rare to see mature RBC targeted
  - rare to see spherocytosis, autoagglutination

Clinical features of precursor-targeted immune-mediated anemia in dogs: 66 cases (2004–2013) JAVMA | AUG 1, 2019 | VOL 255 | NO. 3

Breed predispositions, clinical findings, and prognostic factors for death in dogs with nonregenerative immune-mediated anemia *J Vet Intern Med.* 2021;35:252–260.

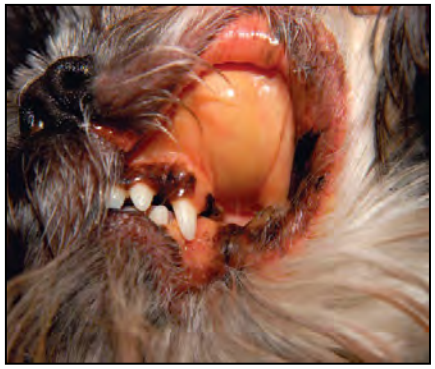
Parameter	JAVMA 2019 (range)	JVIM 202 (IQR)
Number of dogs	66 in US	59 in UK
Overrepresented breeds	Miniature dachshunds	Miniature dachshunds whippets, lurchers
Presenting Hct (%)	13 (4-28)	12 (10-17)
Regeneration (median days)	29 (2-111)	31 (16-38)
Non-regenerative anemia, euthanized after dx	11/66, 16%	21/51, 41% 34 d (22-65)
Remission (median days)	59 (12-177)	–
Relapse (median days)	302 (179-1,311)	585 (420-690)
Thromboembolic events Confirmed/suspected	9/2	At least 2
Median survival time (days)	913	277 (37-1925)

Non-immunologic hemolytic anemia

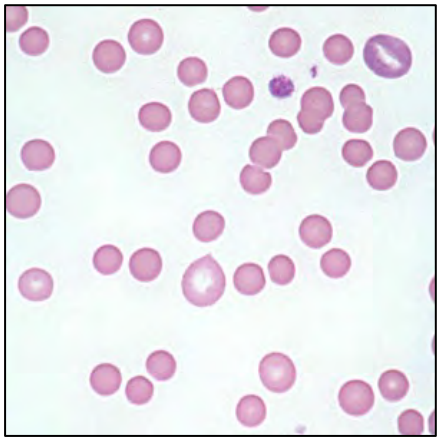
Microangiopathic HA
- Heartworm disease
- Hemangiosarcoma

Oxidative stress
- Onion or garlic
- Zinc
  - pennies
  - sunscreen

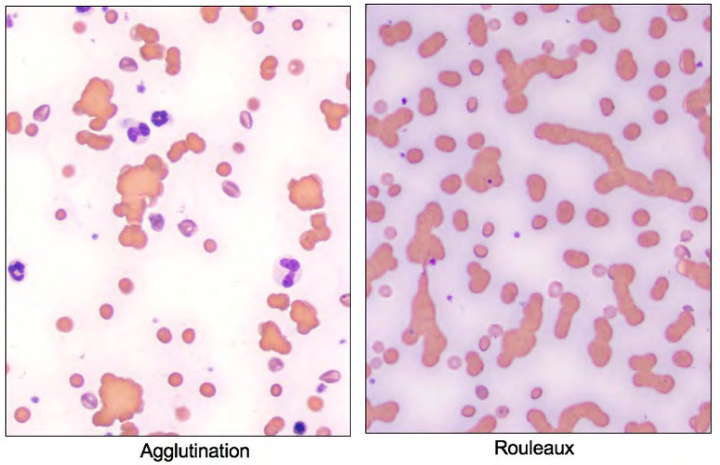
RBC fragility
- RBC enzyme deficiency
  - phosphofructokinase
  - pyruvate kinase
- Osmotic fragility
- Hypophosphatemia
  - DKA, re-feeding syndrome



Autoantibodies

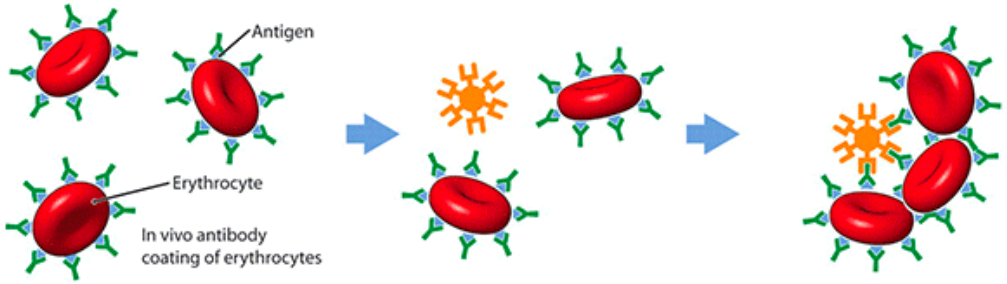


1. Spherocytosis



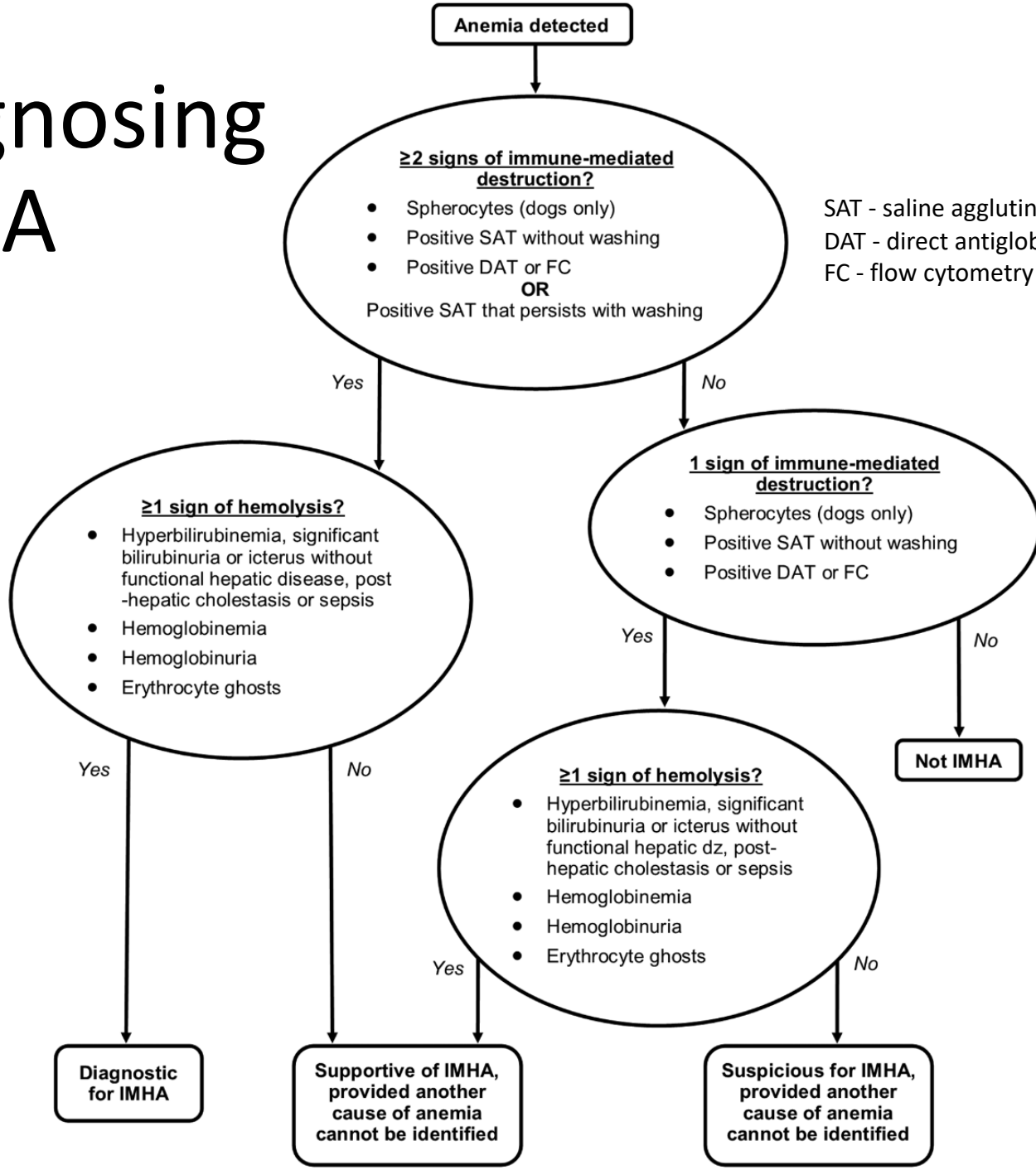
2. Saline agglutination test

3. Direct antiglobulin test
   AKA Coombs' test



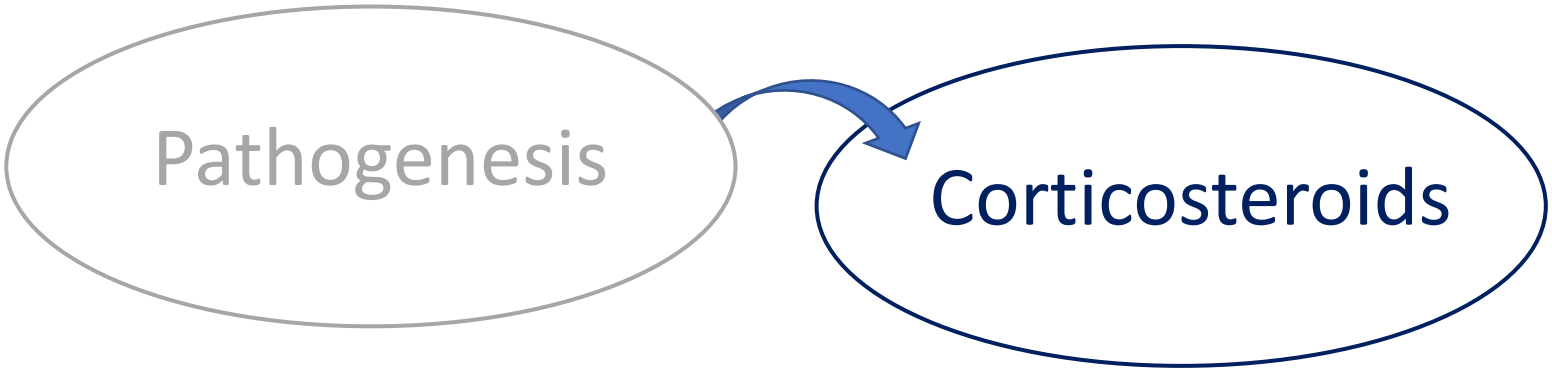
4. Flow cytometry

Diagnosing IMHA



SAT - saline agglutination test
DAT - direct antiglobulin/Coombs' test
FC - flow cytometry

Outline - IMHA



Corticosteroids

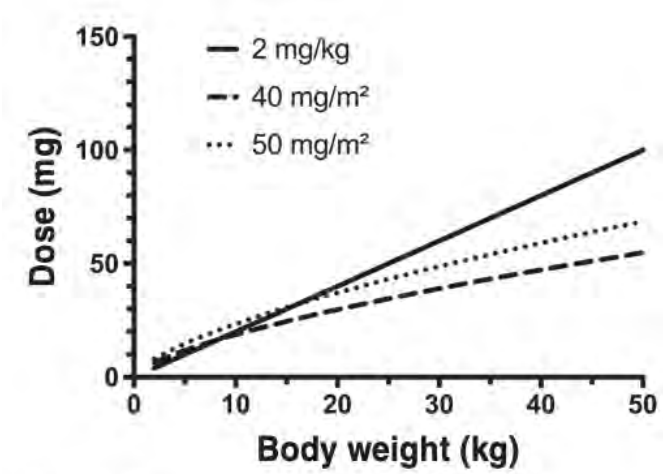
- Lymphocytes
  - ↓ antigenic recognition and presentation
  - ↓ circulating lymphocytes
  - ↓ T cell help for B cells
- Prednisone 2 mg/kg PO q 24h for 3 days [1]
  - flow cytometric assessment of lymph nodes
  - ↓ T and B cells and leukocytes for > 21 days
- Complement
  - ↓ in amplification pathways [2]

1. Ammersbach et al. *JVIM* 2006; 20: 1166-71
2. Rhen & Cidlowski *NEJM 2005;*353:1711-1723

Corticosteroids - dosing

- Prednisone – 2 to 4 mg/kg/day
- <60 mg/dog/day
- Chemotherapeutic dose = 30 mg/m^2

Weight	2 mg/kg	4 mg/kg	30 mg/m^2
10 kg	20 mg	40 mg	~ 20 mg
30 kg	60 mg	120 mg	~ 30 mg
50 kg	100 mg	200 mg	~ 40 mg



- Dexamethasone is x7-10 times as potent as prednisone

Tapering corticosteroids

- Aim for "remission" for 2 weeks before taper [1]
  - PCV > 30%
- Taper 25-50% q 2 to 4 weeks
  - discontinue once dose 0.25 – 0.5 mg/kg q 48h
  - complete withdrawal should take 2 to 4 months
- Taper 20-25% q 4 weeks, over total of 6 months [2]
- Taper 25% q 3 weeks [3]
  - typical duration 3-6 months
  - 50% ↓ in prevalence of severe PU/PD/PD by 3 months

1. McCullough. *Vet Clin North Am* 2003: 33: 1295
2. Ettinger (Garden, O.) 2017; www.expertconsult.com
3. Swann et al. JVIM *Consensus Statement* 2019; 33: 1141

Prednisolone

- Prednisone converted to prednisolone in the liver
- Prednisolone (theoretically) preferable in
  - patients with hepatic disease/dysfunction
  - "liver disease probably has minimal effect on activation"
  - dogs without an increase in AKLP on prednisone?
- Formularies typically recommend equivalent dosing
  - PK studies: ↑ prednisolone dose by x 2 dogs

1. Boothe. *SA Clinical Pharmacology & Therapeutics* 2001: 320

Corticosteroids – adverse effects

- "Acceptable"
  - PU/PD, PP, alopecia, muscle wasting, panting
- Once daily dosing versus q 12h?
  - ↑owner compliance, ↓ nocturia

- "Unacceptable"
  - GI bleeding, aggression, 2° infections, hepatopathy
  - Na retention – cardiac disease – more of a concern in cats
  - increase insulin requirement in diabetics

Torres et al. *JAVMA* 2005; 227: 239-43

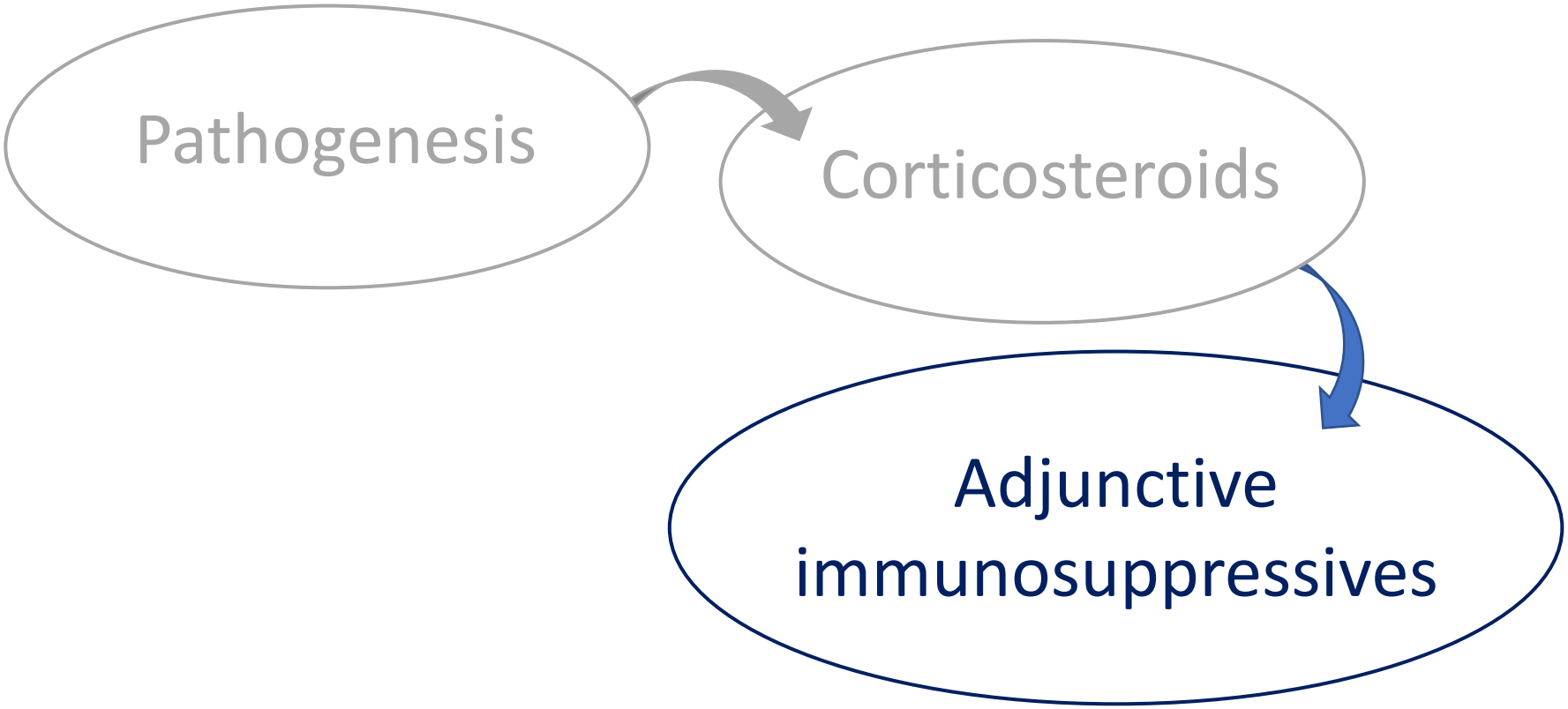
Increased risk of select glucocorticoid adverse events in dogs of higher body weight

Loren S. Sri-Jayantha, Michael T. Doornink, Bridget K. Urie

Can Vet J 2022;63:32–38

Abstract – There are limited data on glucocorticoid treatment in dogs. The purpose of this study was to investigate whether dogs of higher body weight experienced more adverse events when receiving glucocorticoid therapy. Data pertaining to glucocorticoid therapy was abstracted from the records of 61 dogs that were prescribed glucocorticoids for treatment of immune-mediated thrombocytopenia or hemolytic anemia from 2014 to 2019. The odds of developing muscle atrophy and polyphagia during therapy were increased by 30% for each 5 kg of additional body weight. Almost half of the dogs (44.3%) fluctuated > 15% from baseline weight during therapy. Dogs whose body condition scored as above ideal were at increased risk (odds ratio = 4.2) for being diagnosed with urinary tract infection. Our findings suggest that standard linear glucocorticoid dosing may place higher body weight dogs at increased risk of developing adverse events. Accelerated glucocorticoid tapering and/or alternative dosing schemes in dogs with higher body weights may be prudent in efforts to improve tolerance and client compliance.

Outline - IMHA



Indications for adjunctive therapy

1. Severe disease
   - intravascular hemolysis
   - spontaneous autoagglutination

➢ Adjunctive therapy
   - more rapid initial disease control
   - for relapses

2. Glucocorticoid monotherapy
   - high initial dose and long duration
   - adverse effects contribute to patient morbidity

➢ Adjunctive therapy
   - more rapid steroid taper

IMHA immunosuppressive options

Non-specific

Corticosteroids
- Prednis(ol)one
- Dexamethasone

Anti-metabolites
- Azathioprine

Specific

Novel anti-metabolites
- Mycophenolate mofetil
- Leflunomide

Calcineurin inhibitors
- Cyclosporine

Fc receptor/MPS antagonists
- Human IV immunoglobulin
- Therapeutic plasma exchange
- Splenectomy

Azathioprine

- Purine analogue
  - non-functional nucleic acid strands prevent cellular proliferation
- 2mg/kg PO q 24 h for 14d, then q 48 h …
  - clinical impression – it takes at least two weeks for effect
- Toxicity
  - myelosuppression (neutropenia, anemia, thrombocytopenia)
  - hepatopathy, acute pancreatitis
- Monitoring costs add to cost of therapy
  - CBC and ALT q 14d for 2 months
  - then q 1-2 months thereafter

IMHA immunosuppressive options

Non-specific

Corticosteroids
- Prednis(ol)one
- Dexamethasone

Anti-metabolites
- Azathioprine

Specific

Novel anti-metabolites
- Mycophenolate mofetil
- Leflunomide

Calcineurin inhibitors
- Cyclosporine

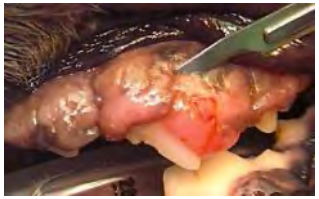
Fc receptor/MPS antagonists
- Human IV immunoglobulin
- Therapeutic plasma exchange
- Splenectomy

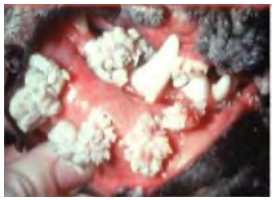
Cyclosporine

- Major effect is to reduce T cell proliferation
- Veterinary
  - Atopica® - microemulsified capsules/liquid
  - Cyclavance® 100mg/ml liquid
- Human
  - Neoral – microemulsified
  - Sandimmune oral - poor bioavailability – *avoid*
- "Compounded" formulations ≠ generic
  - absorption and efficacy?

Cyclosporine – adverse effects

- In humans
  - neurotoxicity due to reactive oxygen species and extracellular matrix deposition
  - Nephrotoxicity, diabetogenic
- In dogs
  - vomiting and diarrhea
  - gingival hyperplasia
  - hypertrichosis or excessive shedding
  - papillomatosis





- Predisposition to 2° infections, e.g. toxoplasmosis [1,2]

1. Last et al. *Vet Dermatol* 2004; 15: 194
2. Webb et al. *JAAHA* 2005; 41: 198

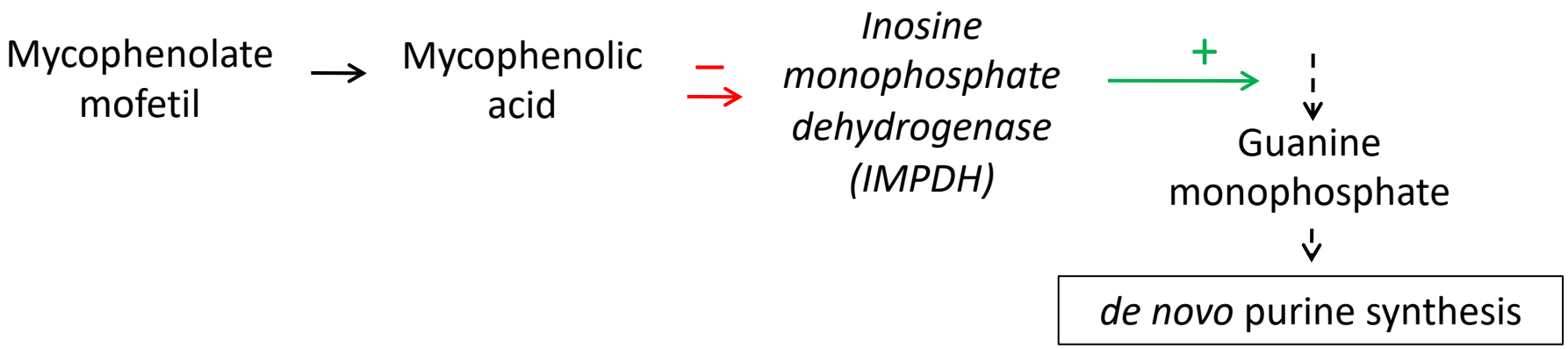
Cyclosporine

- 5-10mg/kg PO q 12h
- Give with or without food?
  - with food reduces bioavailability by ~ 20% [1]
  - however, also reduces GI adverse effects
  - no difference in clinical response to dermatitis [2]
- Monitor serum concentrations?
  - Atopica ® provides reliable bioavailability
  - lack of correlation with clinical response and [serum]
  - consider if using generic?
- Pharmacodynamic Lab closed

1. Steffan et al. *J Vet Pharacol Ther* 2004; 27: 231
2. Thelen. *Vet Rec* 2006; 159: 54

CellCept
(mycophenolate mofetil)
250 mg capsules and 500 mg tablets

Mycophenolate mofetil



- B and T lymphocytes
  - use *de novo* purine synthesis >>> salvage purine pathway
- Inhibits lymphocyte proliferation

Treatment of canine idiopathic immune-mediated haemolytic anaemia with mycophenolate mofetil and glucocorticoids: 30 cases (2007 to 2011)

- Canine primary IMHA retrospective study
  - dexamethasone/prednisone and MMF (10 mg/kg **q 12h**) (n=30)
  - dexamethasone/prednisone and other i/s drug (n= 22)
- No significant difference between two groups for survival
  - to discharge (most dogs with IMHA die in first 14 days)
  - to 30 or 60 days
- Adverse effects (n=5)
  - mild/self-limiting diarrhea

➢MMF is safe and effective for treating IMHA

Wang et al. *JSAP* 2013: 54(8): 399

Received: 29 June 2020 | Accepted: 18 June 2021
DOI: 10.1111/jvim.16209

STANDARD ARTICLE

Journal of Veterinary Internal Medicine Open Access
ACVIM American College of Veterinary Internal Medicine

A retrospective study of adverse effects of mycophenolate mofetil administration to dogs with immune-mediated disease

- Retrospective study, n= 131
  - IMHA - 31, ITP - 31, IMPA - 12
  - pemphigus foliaceous - 15, other – 42
- Median dose 17.5 mg/kg/d (IQR 15.1-20.6 mg/kg/d)

- Adverse events – 34/131, 26%
  - GI (hyporexia, vomiting, diarrhea) - 31/127, 24%
  - neutropenia - 3/76, 4%
  - anemia - 1/25, 4%
  - thrombocytopenia - 1/25, 4%
  - dermatologic “skin eruptions” - 2/131, 1.5%

CellCept
(mycophenolate mofetil)
250 mg capsules and 500 mg tablets

Mycophenolate mofetil

- IV formulation for inappentant or vomiting dogs
  - administer over 20 mins to 2 hours
- Adverse effects – vomiting and diarrhea

➢Oral form (250 mg capsules)

– empty stomach, or with food if GI effects severe
– ± anti-emetic for vomiting
– ± probiotic or metronidazole for diarrhea

Leflunomide

Leflunomide → A77 1726 ⊣ *Dihydrorotate dehydrogenase (mitochrondria)* → *de novo* synthesis of pyrimidine

- Lymphocytes - ↓proliferation
  - canine lymphocytes seems more sensitive than human
- Dog reports
  - research into renal transplantation with cyclosporine
  - immune-mediated polyarthritis
  - case of diabetic canine ITP with human IV immunoglobulin [1]
  - limited evidence for use in IMHA

1. Bianco & Hardy. *JAAHA* 2009; 45: 147

Retrospective analysis of immunosuppressive and anti-thrombotic protocols in nonassociative immune mediated hemolytic anemia in dogs

Received: 6 April 2022 | Accepted: 1 February 2023

DOI: 10.1111/jvim.16652

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Correspondence
Harry Cridge, Department of Small Animal Clinical Sciences, College of Veterinary Medicine, Michigan State University, East Lansing, MI 48824, USA.
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Abstract

Background: Evidence supporting the effectiveness of therapeutic protocols for non-associative immune-mediated hemolytic anemia (na-IMHA) is weak.

Hypothesis/Objectives: Investigate the efficacy of various drugs in na-IMHA.

Animals: Two hundred forty-two dogs.

Methods: Multi-institutional retrospective study (2015-2020). Immunosuppressive effectiveness was determined by time to packed cell volume (PCV) stabilization and duration of hospitalization through analysis by mixed model linear regression. Occurrence of disease relapse, death, and antithrombotic effectiveness, were analyzed using mixed model logistic regression.

Results: Use of corticosteroids vs a multi-agent protocol had no effect on time to PCV stabilization ($P = .55$), duration of hospitalization ($P = .13$), or case fatality ($P = .06$). A higher rate of relapse ($P = .04$; odds ratio: 3.97; 95% confidence interval [CI]: 1.06-14.8) was detected in dogs receiving corticosteroids (11.3%) during follow-up (median: 28.5 days, range: 0-1631 days) compared to multiple agents (3.1%) during follow up (median: 47.0 days, range: 0-1992 days). When comparing drug protocols, there was no effect on time to PCV stabilization ($P = .31$), relapse ($P = .44$), or case fatality ($P = .08$). Duration of hospitalization was longer, by 1.8 days (95% CI: 0.39-3.28 days), for the corticosteroid with mycophenolate mofetil group ($P = .01$) compared to corticosteroids alone. Use of clopidogrel vs multiple agents had no effect on development of thromboses ($P \geq .36$).

Conclusions and Clinical Importance: Addition of a second immunosuppressive agent did not alter immediate outcome measures but might be associated with a reduction in relapse. Use of multiple antithrombotic agents did not reduce incidence of thrombosis.

IMHA immunosuppressive options

Corticosteroids
- Prednis(ol)one
- Dexamethasone

Anti-metabolites
- Azathioprine

Non-specific

Novel anti-metabolites
- Mycophenolate mofetil
- Leflunomide

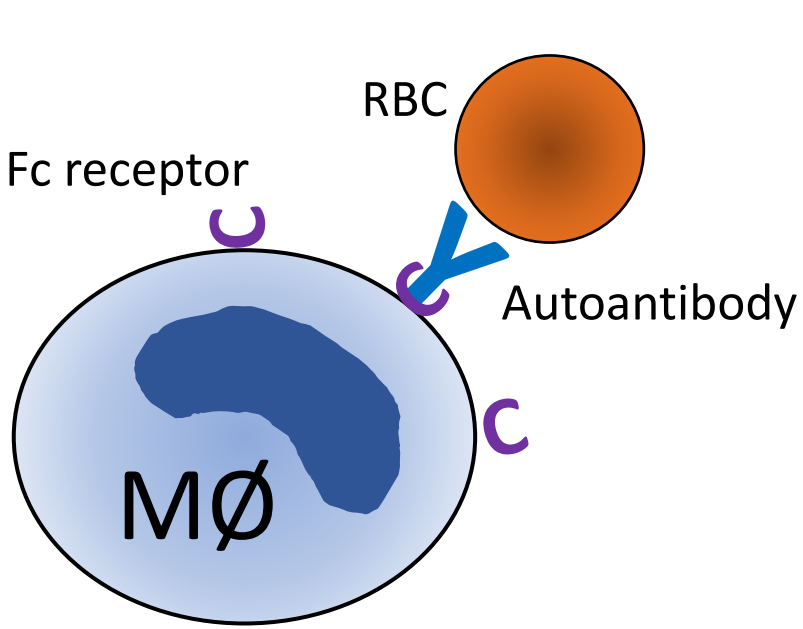
Specific

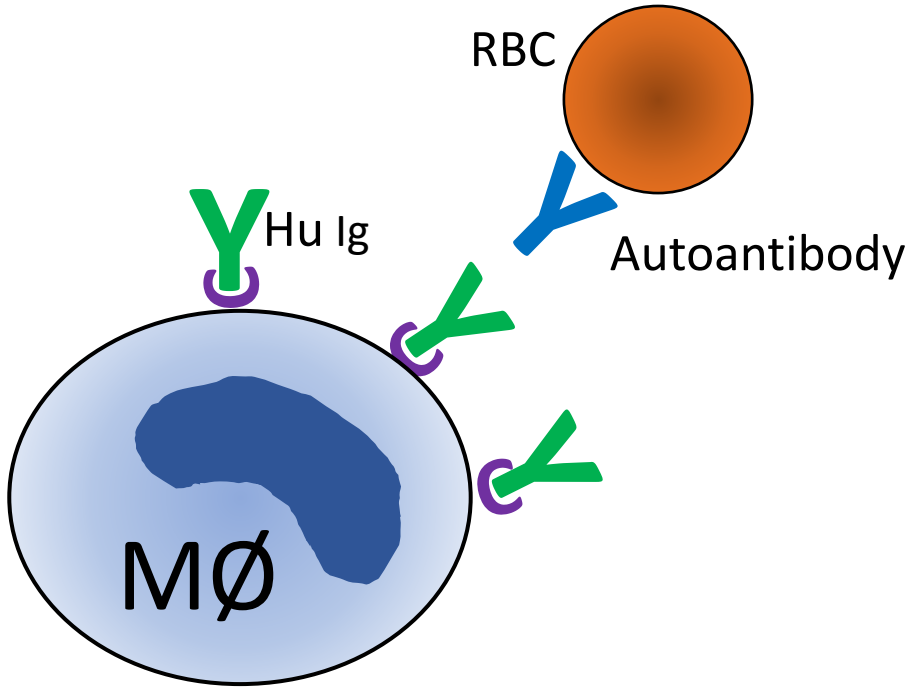
Calcineurin inhibitors
- Cyclosporine

Fc receptor/MPS antagonists
- Human IV immunoglobulin
- Therapeutic plasma exchange
- Splenectomy

Human IV immunoglobulin

- Blockade of Fc receptors on monocytes
  - inhibits antibody-dependent opsonization and cell cytotoxicity
  - "temporary" splenectomy
  - allows temporary respite of erythrolysis in IMHA





Reagan et al *Am J Vet Res* 1998; 59: 1568

Clinical Practice Review

Journal of Veterinary Emergency and Critical Care **21**(5) 2011, pp 471–483
doi: 10.1111/j.1476-4431.2011.00676.x

A review of current indications, adverse effects, and administration recommendations for intravenous immunoglobulin

Nicole K. Spurlock , DVM and Jennifer E. Prittie, DVM, DACVIM, DACVECC

Abstract

Objective – To review and summarize the body of literature regarding human intravenous immunoglobulin (hIVIG) therapy in veterinary medicine. Mechanism of action, usage in human medicine, adverse effects of therapy, implications for veterinary use, and administration recommendations are discussed.
Data Sources – Current human and veterinary peer-reviewed medical literature including original research articles and scientific reviews.
Human Data Synthesis – There are currently 6 labeled uses for hIVIG in human medicine, but preparations are used off-label to successfully treat multiple immune-mediated conditions. To maximize the potential of hIVIG use in animals and identify areas deficient in research, a review of the current literature is warranted.
Veterinary Data Synthesis – Investigation of hIVIG therapy in veterinary patients has been limited to the subjects of immune-mediated hemolytic anemia (IMHA), immune-mediated thrombocytopenia (ITP), Evan's syndrome, cutaneous disease, myasthenia gravis (MG), and sudden acquired retinal degeneration (SARDS). Proponents of veterinary hIVIG use believe administration may reduce transfusion requirements and decrease hospitalization time.
Conclusion – Immunoglobulin (Ig) has not been shown to decrease transfusion requirements in IMHA patients, but shows great promise for treatment of ITP and dermatological diseases. Although serial transfusion of hIVIG is employed in human medicine, repeated transfusion is not recommended in animals due to risk of severe allergic reaction. Other potential adverse effects of transfusion include delayed hypersensitivity reactions, thromboembolism, renal failure, hypotension, and aseptic meningitis.

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DOI: 10.1111/jvim.16315

Journal of Veterinary Internal Medicine Open Access
ACVIM American College of Veterinary Internal Medicine

STANDARD ARTICLE

The use of high-dose immunoglobulin M-enriched human immunoglobulin in dogs with immune-mediated hemolytic anemia

Abstract

Background: The IV use of human immunoglobulin (hIVIG) in dogs with primary immune-mediated hemolytic anemia (IMHA) has been described previously, but herein we describe the use of high-dose IgM-enriched hIVIG (Pentaglobin).

Hypothesis/Objectives: Dogs treated with high-dose Pentaglobin will experience shorter time to remission and hospital discharge and have decreased transfusion requirements compared to dogs receiving standard treatment alone.

Animals: Fourteen client-owned dogs diagnosed with primary IMHA at specialist referral hospitals in the United Kingdom.

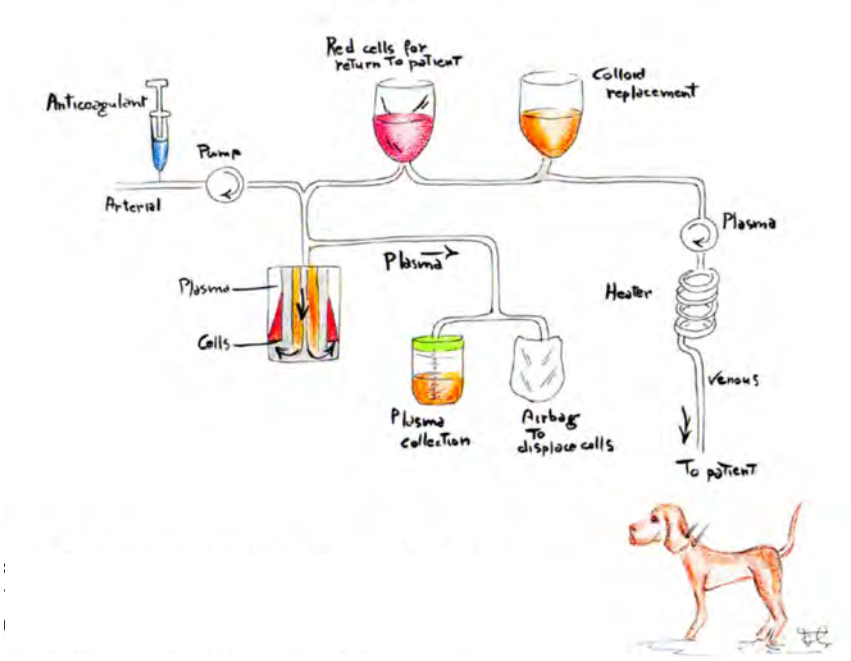
Methods: All prospectively enrolled dogs received prednisolone, dexamethasone or both along with clopidogrel. Patients were randomized to receive Pentaglobin at 1 g/kg on up to 2 occasions, or to serve as controls. No additional immunosuppressive drugs were allowed within the first 7 days of treatment. Remission was defined as stable PCV for 24 hours followed by an increase in PCV.

Results: Ten of 11 dogs from the treatment group and 2 of 3 dogs from the control group achieved remission and survived until hospital discharge. Survival and time to remission were not significantly different between groups. The volume of packed red blood cells transfused, normalized for body weight, was not significantly different between groups. Potential adverse reactions to Pentaglobin occurred in 2 dogs, but their clinical signs may have been related to the underlying disease.

Conclusions and Clinical Importance: Treatment with high-dose Pentaglobin was well tolerated by dogs with primary IMHA but no significant advantage was found in this small study. Additional studies examining larger groups and subpopulations of dogs with primary IMHA associated with a poorer prognosis are warranted.

Therapeutic plasma exchange

- Extracorporeal blood purification technique
- Plasma antibodies are separated from the cellular constituents of blood



Case Report

Journal of Veterinary Emergency and Critical Care **19**(4) 2009, pp 375–380
doi: 10.1111/j.1476-4431.2009.00431.x

Use of therapeutic plasmapheresis in a case of canine immune-mediated hemolytic anemia

Kathryn L. Crump, BVSc and Ravi Seshadri, DVM, DACVECC, DABVP

Effects of therapeutic plasma exchange on serum immunoglobulin concentrations in a dog with refractory immune-mediated hemolytic anemia

Alyssa M. Scagnelli DVM
Stuart A. Walton BVSc
Chin-Chi Liu PhD
Mark J. Acierno DVM, MBA

JAVMA • Vol 252 • No. 9 • May 1, 2018

RETROSPECTIVE STUDY

Received: 27 August 2020 | Revised: 10 December 2020 | Accepted: 29 December 2020
DOI: 10.1111/vec.13196

Centrifugal therapeutic plasma exchange in dogs with immune-mediated hemolytic anemia (2016–2018): 7 cases

Christine A. Culler DVM, MS[1,2] | Alessio Vigani DVM, DACVECC, DACVAA[1,3] |
Alexandra Z. Ripoll DVM[1,4] | Alexandra Gareau DVM, MS[1] |
Steven E. Suter VMD, MS, PhD, DACVIM[1,5]

Retrospective Study

Journal of Veterinary Emergency and Critical Care **19**(3) 2009, pp 254–261
doi: 10.1111/j.1476-4431.2009.00419.x

Splenectomy as an adjunctive treatment for dogs with immune-mediated hemolytic anemia: ten cases (2003–2006)

Jason Elliott Horgan, DVM; Brian Keith Roberts, DVM, DACVECC and
Thomas Schermerhorn, VMD, DACVIM

Abstract

Objective – To describe the patient population, disease severity, and outcome in dogs with immune-mediated hemolytic anemia (IMHA) that underwent splenectomy. To compare presurgical and postsurgical data.
Design – Retrospective case series.
Setting – Emergency clinic/referral hospital.
Animals – Ten dogs diagnosed with IMHA.
Interventions – Splenectomy in addition to standard medical management for IMHA.
Measurements – Medical records of 10 dogs with IMHA, in which a splenectomy was performed were reviewed. The population was analyzed with regards to physical and clinicopathologic data, severity, treatment, and outcome. Outcome was defined as survival at 30 days, percentage of dogs on medications at 30 days, and number of relapses documented by 30 days. The presurgical and postsurgical PCV and transfusion requirements were documented and compared for each dog.
Results – Nine of 10 dogs survived to 30 days. Four of the 9 that survived were not on any immunosuppressive medications. There were no relapses during the 30 days. The 3-day postsplenectomy PCVs were significantly higher than presplenectomy. The number of transfusions administered postsplenectomy was significantly less than those administered presplenectomy.
Conclusion – The use of splenectomy may be associated with an improved outcome in dogs with IMHA.

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DOI: 10.1111/jvim.16469

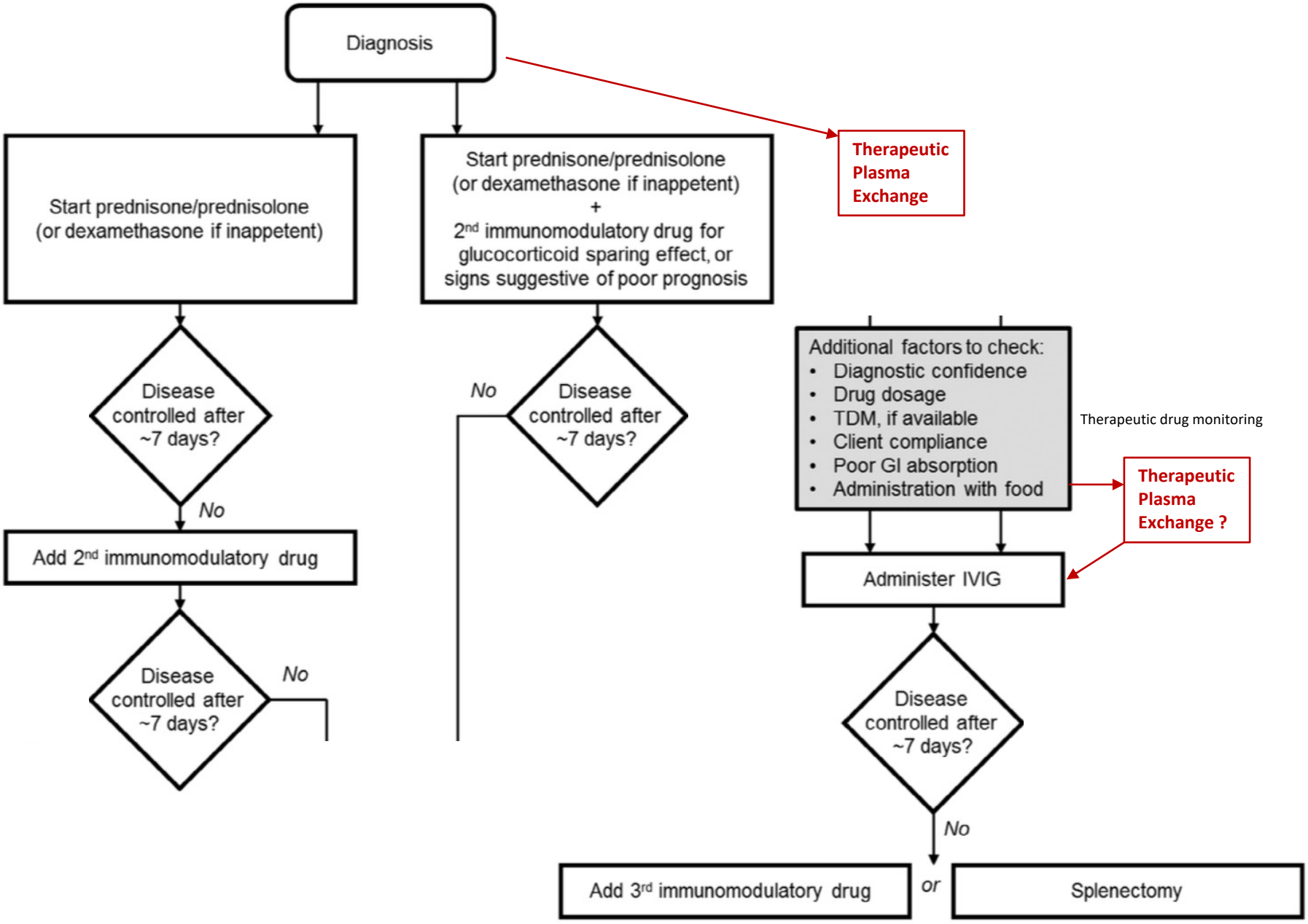
Journal of Veterinary Internal Medicine Open Access
ACVIM American College of Veterinary Internal Medicine

STANDARD ARTICLE

Splenectomy in the management of primary immune-mediated hemolytic anemia and primary immune-mediated thrombocytopenia in dogs

- 17 dogs
- IMHA – 4/7 successful (2 complete and 2 partial
- ITP – 6/7 successful (3 complete and 3 partial)
- IMHA and ITP – 1/3 successful (complete)

- Benefit for ITP
- Benefit not determined for IMHA and IMHA+ITP


Diagnosis
Start prednisone/prednisolone (or dexamethasone if inappetent)
Start prednisone/prednisolone (or dexamethasone if inappetent) + 2nd immunomodulatory drug for glucocorticoid sparing effect, or signs suggestive of poor prognosis
Therapeutic Plasma Exchange
Disease controlled after ~7 days?
No
Add 2nd immunomodulatory drug
Disease controlled after ~7 days?
No
No
Disease controlled after ~7 days?
Additional factors to check:
• Diagnostic confidence
• Drug dosage
• TDM, if available
• Client compliance
• Poor GI absorption
• Administration with food
Therapeutic drug monitoring
Therapeutic Plasma Exchange ?
Administer IVIG
Disease controlled after ~7 days?
No
Add 3rd immunomodulatory drug
or
Splenectomy

Using immunosuppressive drugs

- Adjunctive drug
  - often dictated by $, patient size, adverse effects
- Formulation
  - parenteral when oral meds cannot be used
    - dexamethasone + myophenolate mofetil
- Efficacy
  - generics cheaper but beware efficacy (cyclosporine)
  - compounding can help dosing but beware impact on efficacy

Using immunosuppressive drugs

- If use a second drug to spare effects of prednisone
  - then spare the pred!!!
- Remember concurrent disease
  - that could influence drug handling (hepatic or renal)
  - diabetes mellitus, cardiac disease, osteoarthritis and NSAIDS
- These are **not** benign medications
  - monitor for hematological and biochemical effects etc.
  - the secondary infection(s) may kill your patient, not IMHA
  - ask the owner to wear gloves when handling drugs

Tapering immunosuppressive drugs

- One drug at a time, unless fulminant infection
  - typically prednisone first to reduce adverse effects
  - can decrease physiologic dose (0.2 mg/kg/d) if infection
  - adjunctive drug if cost is an issue
- Taper drugs 25-50% every 2-4 weeks
  - reassess PCV/Hct after one week, or just before next taper
- Expected duration of therapy
  - corticosteroids for 3-6 months
  - all immunosuppressives for 4-8 mos

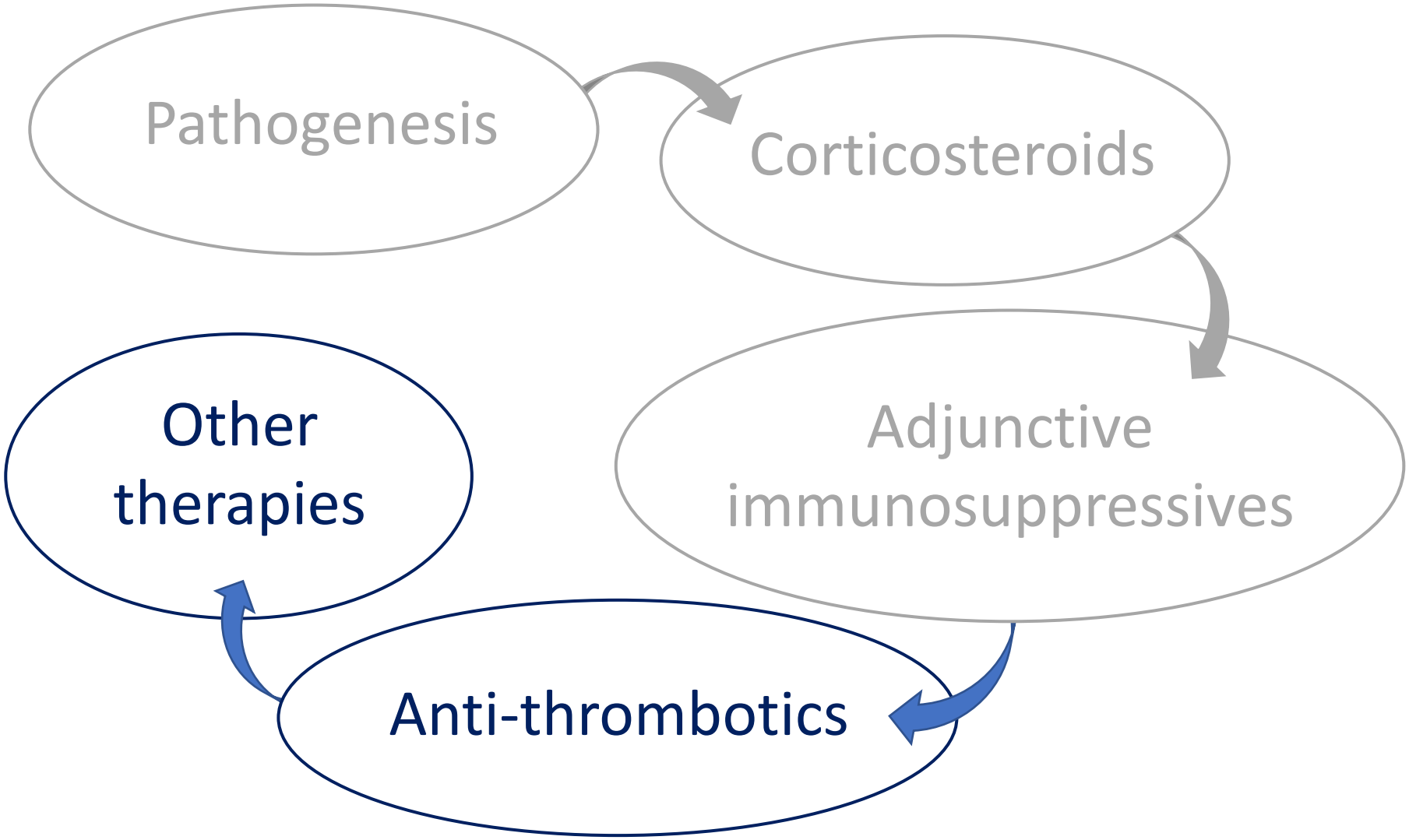
Ettinger. 2017 www.expertconsult.com
Swann et al. JVIM *Consensus Statement* 2019; 33: 1141

Tapering immunosuppressive drugs

- Relapses
  - 11-15 % of cases
  - add adjunctive therapy if not already used
  - go back up one step
  - taper more slowly, e.g. double interval
  - change choice of adjunctive drug

Ettinger. 2017 www.expertconsult.com
Swann et al. JVIM *Consensus Statement* 2019; 33: 1141

Outline - IMHA



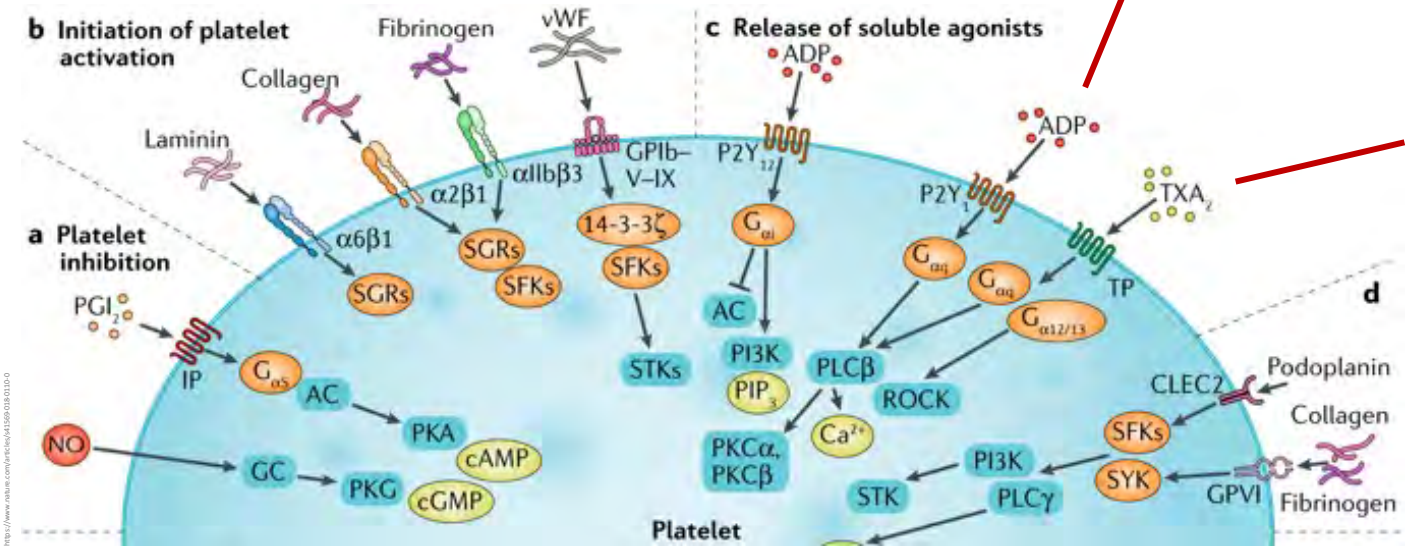
Anti-thrombotic therapy

- Thromboembolic disease leading of mortality in IMHA
  - endothelial activation
  - IV tissue factor expression
  - procoagulant microparticle generation
  - platelet activation
  - pro- and anti-coagulant factor imbalance
  - ± high dose steroids
- Increased risk in dogs with
  - intravascular IMHA or autoagglutination
  - marked leukocytosis or increased liver enzymes

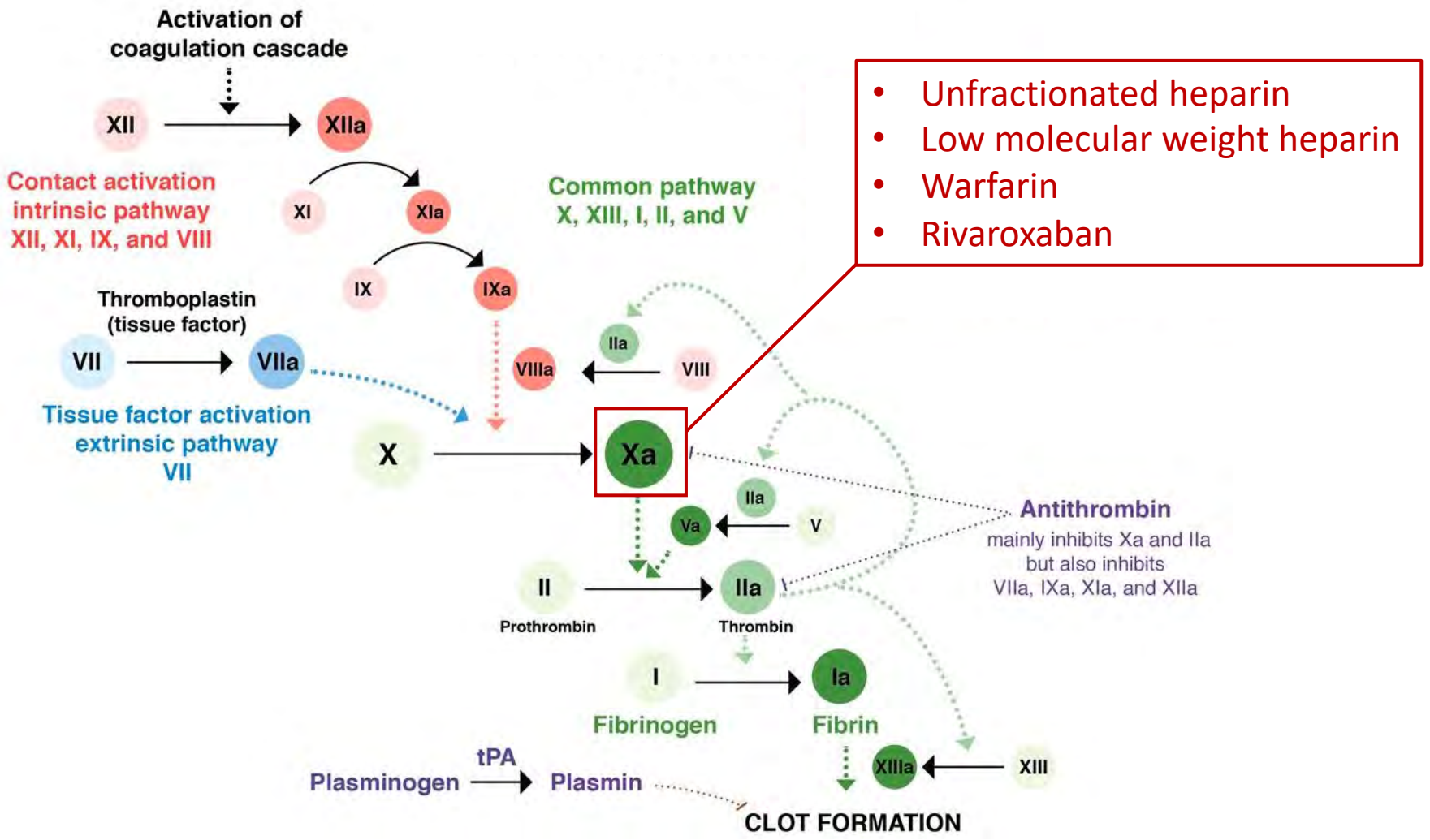
Anti-platelet therapy

Clopidogrel

Aspirin



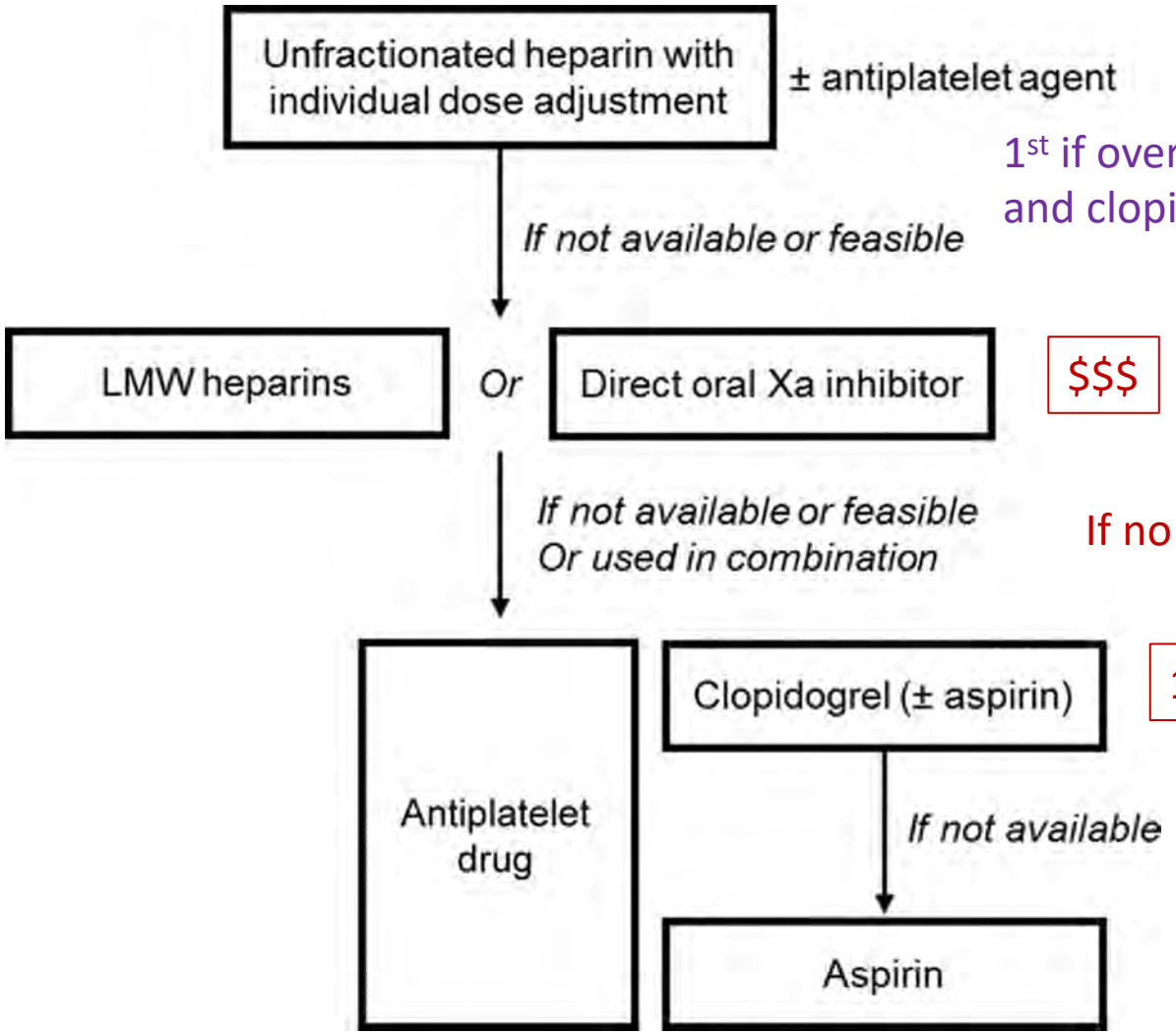
Anti-factor Xa drugs



Once daily oral anti-thrombotics

- Clopidogrel – 1.1-4 mg/kg
- Aspirin – 1-2 mg/kg
  - dissolve baby aspirin water to give 10 mg/ml solution
  - ↑ GI bleeding if ≥ 2mg/kg aspirin with prednisone
  - 30% resistance if use alone so use with clopidogrel
- Rivaroxaban – 1-2 mg/kg
  - use with clopidogrel, taper one drug at a time to avoid rebound
  - monitor factor Xa activity
- Precursor IMHA
  - previously thought to be at less risk that “typical” IMHA
  - 9/66 dogs had confirmed TE events, 5/66 suspected [~25%]
- When to discontinue?

Anti-platelet therapy



1st if overt clots, e.g. PTE and clopidogrel

$$$

If no overt clots

1st

Costs for a 10 kg dog for 2 weeks

Drug	Dose	UGA cost	External cost*
Prednisone PO	1 mg/kg q 12h	$9	$4
Mycophenolate IV	10 mg/kg q 12h	$210	For 5 doses
Mycophenolate PO	10 mg/kg q 12h	$15	$75
Cyclosporine [Atopica] PO	5 mg/kg q 12h	$100	$100
Azathioprine PO	2mg/kg q 24h	$20	$15
Aspirin PO	1 mg/kg q 12h	–	< $1
Clopidogrel PO	4 mg/kg q 24h	$6	< $1
Rivaroxaban PO*	2 mg/kg q 24h	–	$70
Human immunoglobulin	5 g IV once	$1,500	–
Plasmapheresis	–	$6,000 to 8,000	
Splenectomy	–	$2,000 to 3,000	If no complications
pRBC transfusion (120ml)	↑ Hct by 8%	$300+	–
ICU hospitalization	Per day	$400+	–

*CanadaRxConnection

Other therapies

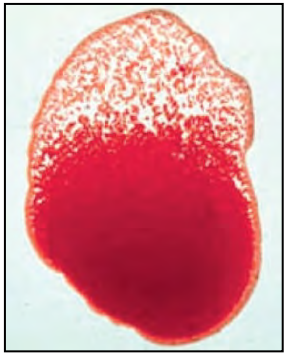
- IV fluid therapy
  - pigment nephropathy (hemoglobin, bilirubin)
  - fever
- Gastroprotectants with steroid use
  - only if overt GI bleeding/melena or risk factors for GI ulcers
  - omeprazole 0.5-1mg/kg q 12-24 h
  - until GI bleeding resolves or risk factors abate
  - famotidine is ineffective at decreasing gastric pH [1]
  - administer corticosteroids with food

1. Tolbert et al. *JVIM* 2011; 25: 47

Learner outcomes – canine IMHA

Upon completion, the participant will be able to:

1. Describe the pathophysiology of 3 types of IMHA
2. Explain the rationale for different adjunctive immunosuppressive therapies
3. Describe additional supportive treatment strategies for IMHA



Summary – adjunctive therapy for IMHA

Indications

1. Spare corticosteroid adverse effects (in big dogs)
2. Intravascular IMHA or autoagglutination
3. Relapses

- Choice – $, patient size, adverse effects, concurrent disease
- Ask the owner to wear gloves when handling drugs
- The secondary infection(s) may kill your patient, not IMHA

Summary – adjunctive therapy for IMHA

- Taper one drug at a time – 25-50% every 2-4 weeks
- Decrease steroid to physiologic dose for rapid taper
- If relapse
  - add adjunctive drug if not already used
  - go back one step, and taper more slowly
  - change adjunctive drug
- Don’t forget anti-thrombotic medication

What questions do you have?

- Email - jrsmith0@uga.edu

CONTROLLED SUBSTANCES 101: How and Why You Must Comply! Georgia & DEA Regs Explained

A Federal & Georgia Regulatory Controlled Substance Overview
Prepared Especially for Veterinary Practices In Three Hours

Presented By Jan Woods, Previous Practice Owner
Co-Founder of Ask Jan For Help!
Regulatory and Operational Consultant
Email: jan@askjanforhelp.com
Cellular: 913-302-4999

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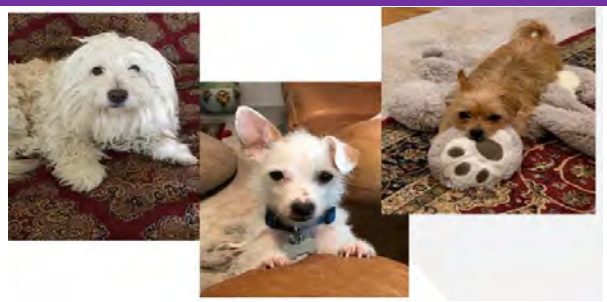
MY FURRY FAMILY MEMBERS



2

SPECIAL THANKS TO THE UGA TEAM

Questions? Ask Jan For Help!

- Previous Practice Owner
- Epicur Pharma Advisory Board Member
- Zoetis Key Opinion Leader
- Co-wrote, along with my retired DEA associate, the Controlled Substance Section of the 2021 AVMA PLIT Safety Manual
- Nationally Recognized Speaker, Author & Consultant
- RACE, NY, FL, GA & TX approved for CE Credit
- **If you have any regulatory questions, please feel free to contact me or your direct manager anytime:**
  - **Jan Woods, Co-Founder of askjanforhelp.com**
  - **Website: askjanforhelp.com**
  - **Email: jan@askjanforhelp.com**
  - **Cellular: 913-302-4999**

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WHAT IS ASK JAN FOR HELP, LLC?

- Would you like to go back to doing what you love most, practicing veterinary medicine? But somehow, you just cannot get away from the business aspects of your practice?
- Ask Jan For Help (www.askjanforhelp.com) offers you and your practice answers to many of the business questions that you have every day. Ask Jan For Help is like having an experienced HR Expert, Regulatory Expert, Practice Operations Expert, Finance Expert, Legal Expert and many other business experts available virtually to you and your practice, anytime you need additional help and/or information!
- Please feel free to contact me for more information, or just go online at www.askjanforhelp.com and sign up! We would love to have you join us.

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5

CONTROLLED SUBSTANCES 101: How and Why You Must Comply! Georgia and DEA Regs Explained

Part 1 = An Introduction to Georgia and DEA Controlled Substances Regulations and Why Controlled Substances Are the Practitioner's Biggest Risk!

Part 2 = Georgia Controlled Substances and DEA Regulatory Requirements When Ordering, Receiving, Storing, Recordkeeping, Logging, Administering, Dispensing, Prescribing, Inventorying, Transferring and Destructing Controlled Substances. Best Practice Tips, Saving Suggestions and Controlled Substance Daily Reconciliation Logs Will Be Shown and Discussed at length in Hour 2.

Part 3 = Recognizing and Handling Staff and Client Addiction and What the DEA Says the Practitioner Must Do About It. Improving Security and Prevention Theft per DEA Regulations. Proactively Preparing for a DEA Audit and How to Handle a DEA Audit When the DEA Knocks on Your Door!

SNAP QUIZ! TIME TO TEST YOUR KNOWLEDGE

1. Who takes precedence, the State government, Federal government, State Pharmacy Board or the Veterinary Board when setting the DEA controlled substance laws that impact your practice daily?
2. What is a Controlled Substance, What is an OTC? What is a Legend Drug? And how can you tell the difference in your pharmacy?
3. My clients can return their unwanted pet's legend drugs or controlled substances to my practice. T or F?
4. I can accept donated legend drugs/controlled substances from clients and give them to shelters, foster providers, pet charities, etc.? T or F?
5. I can destroy my controlled substance medical waste and expired/unwanted controlled substances in a substance such as coffee grounds or kitty litter, if there is a witness is present and it's documented correctly in the controlled substance logs? T or F?
6. I can administer and dispense controlled substances that have been compounded by a traditional compounding pharmacy to any patient in my practice. T or F?
7. What's the number one reason why a DEA Agent or government auditor would show up at your clinic/hospital?

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Can Legend & Controlled Substances Be Returned?

Sign Posted at Walgreens' Pharmacies

Due to State and Federal law, prescriptions are NON-returnable items.

Please verify the medications you are picking up before leaving the pharmacy.

We apologize for any inconvenience.

Thank you, Walgreens' Staff.

10

Client Resources for Prescription Drug Disposal

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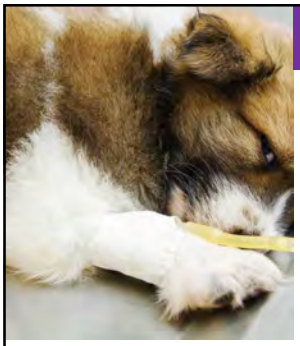

WANT MORE CONTROLLED SUBSTANCE DESTRUCTION INFORMATION TO SHARE WITH YOUR STAFF?

Please Access The Following Sites

1. **www.askjanforhelp.com, click the Blog Tab,**
   Article Entitled: **Commonly ignored controlled substance regulations that can increase your risk and cost you money when audited by the DEA.** By Jan Woods

2. **www.veterinarypracticenews controlledsubstancesnovember 2020janwoods**
   Article entitled: "**Destroying controlled substance waste vs. destroying expired or unwanted meds.** By Jan Woods

12

MOST COMMON VIOLATIONS CITED BY THE DEA

1. Incomplete or Inferior Record Keeping
2. Lack of Security
3. Failure to Prevent Drug Theft/Diversion
4. Reporting of Unresolved Discrepancies and Significant Losses
5. DEA Registration & Licensing Issues
6. Prescribing Outside the Scope of Practice
7. Failing to Maintain Required Documents
8. Failing to Dispose of Controlled Substances According to Regulations
9. Failing to Maintain Inventory Records According to State & Federal Regulations
10. Prescribing without a documented & established Veterinarian-Client-Patient Relationship (VCPR)

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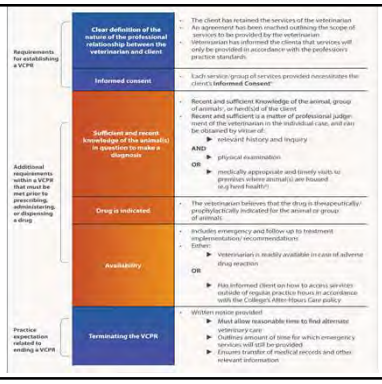
THE DEA AND YOUR STATE REQUIRES A VETERINARIAN-CLIENT-PATIENT RELATIONSHIP (VCPR) WHEN ADMINISTERING, DISPENSING AND PRESCRIBING A CONTROLLED SUBSTANCE. MAKE SURE YOU DOCUMENT CORRECTLY



15

DEA ISSUES NEW MARCHING ORDERS IN THE WAR AGAINST OPIOID ADDICTION

Written by Tony McReynolds, Oct 11, 2019

- "**Don't get caught in the crossfire**".
- "On October 1, 2019, the Drug Enforcement Administration (DEA) released its **2020 fiscal year work plan to its diversion investigators**. The plan outlines **increased enforcement efforts and administrative resources dedicated to the identification and investigation of prescribers (including veterinarians)** that are dispensing disproportionately large amounts of controlled substances".
- **"Boom—instant audit. And once they're in, it can be tough getting them out."**

Source: AAHA NewsStat Please note: The government creates, changes and updates regulations frequently. As of March 2023, information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your hospital/clinic. © Copyright Protected

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VETERINARIAN PAYS $226,000 AND SURRENDERS LICENSE TO RESOLVE ALLEGATIONS THAT HE FAILED TO PROPERLY TRACK AND CONTROL OPIOIDS!

According to the government, Dr. _____, over multiple years of practicing as a veterinarian and while running an active animal hospital, **failed to properly inventory, track, and maintain control over controlled substances,** including thousands of units of opioids such as fentanyl, hydromorphone, and morphine.

By not properly inventorying, tracking, and maintaining control over the controlled substances, he violated the Controlled Substances Act.

These violations were discovered by DEA investigators during an on-site inspection of Dr. _____ veterinary hospital, **which included an audit of his drug control practices.**

DEA investigators found CSA violations with respect to all twelve of the twelve controlled substances audited. DEA also found failures to properly destroy controlled substances.

This matter was investigated by the U.S. Drug Enforcement Administration, Diversion Control Division, in conjunction with the United States Attorney's Office.
The statements in this release are only allegations. In entering into a civil settlement, Dr. _____ did not admit to liability, and the agreement indicates that the parties entered into the settlement to avoid the uncertainty and expense of further litigation. Assistant U.S. Attorney Jacob Licht and Deputy Civil Chief Amanda Rocque handled this matter on behalf of the United States Government.

17

DEA's Citations, Civil and Criminal Fines

Each citation penalty has increased from $15,040 to $15,876

Each Criminal and Civil penalty can cost you $62,500 - $68,400 per citation and/or per pill!

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Subject	Law	Regulation	Violation	Violation 2	Penalty
ARCOS (Reports)	21 USC § 827(d)	21 CFR 1304.33(a),(b)	21 USC § 842(a)(5)		$15,876.00
Authorized Activities	21 USC § 822(b)	21 CFR 1301.21	21 USC § 841		Penalty
Central Recordkeeping	21 USC § 827(d)	21 CFR 1304.04(a)	21 USC § 842(a)(5)		$15,876.00
Complete & Accurate Records (Inventory)	21 USC § 827(b)(1)	21 CFR 1304.11(a)	21 USC § 842(a)(5)		$15,876.00
Inventories (Biennial Inventory)	21 USC § 827(a)(1)	21 CFR 1304.11(c)	21 USC § 842(a)(5)		$15,876.00
Inventories (Dispensers/Researchers)	21 USC § 827(b)(1)	21 CFR 1304.11(a)(3)	21 USC § 842(a)(5)		$15,876.00
Notification of Change of Address	21 USC § 827(d)	21 CFR 1301.51	21 USC § 842(a)(5)		$15,876.00
Order Forms (Missing Information)	21 USC § 828(a)	21 CFR 1305.15(a)	21 USC § 842(a)(5)		$15,876.00
Order Forms (No Signature)	21 USC § 828(a)	21 CFR 1305.06(d)	21 USC § 842(a)(5)		$15,876.00
Order Forms (Power of Attorney)	21 USC § 828(a)	21 CFR 1305.05	21 USC § 842(a)(5)		$15,876.00
Order Forms for CI & CII	21 USC § 828(a)	21 CFR 1305.03	21 USC § 843(a)(1)		Penalty
Order Forms for Dispensing of CS/Professional Practitioners	21 USC § 828(e)	21 CFR 1305.04(a)	21 USC § 841		Penalty
Order Forms for Two Years	21 USC § 828(c)(1)	21 CFR 1305.13(a)(c)	21 USC § 842(a)(5)		$15,876.00
Records (Destruction/DEA 41s)	21 USC § 827(b)(1)	21 CFR 1304.21(a)	21 USC § 842(a)(5)		$15,876.00
Records (Keep for Two Years/CS)	21 USC § 827(b)(1)	21 CFR 1304.04(a)	21 USC § 842(a)(5)		$15,876.00
Records (Keep for Two Years/Machines)	21 USC § 836(a)(1)	21 CFR 1304.04(a)	21 USC § 842(a)(10)		$15,876.00
Order Forms for Two Years	21 USC § 828(c)(1)	21 CFR 1305.13(a)(c)	21 USC § 842(a)(5)		$15,876.00
Reports (Theft/Loss of CS)	21 USC § 827(d)	21 CFR 1301.74(c)	21 USC § 842(a)(5)		$15,876.00
Complete & Accurate Records(Continuing Records)	21 USC § 827(a)(3)	21 CFR 1304.21(a)	21 USC § 842(a)(5)		$15,876.00

19

WHO CAN ADMINISTER, DISPENSE & PRESCRIBE CONTROLLED SUBSTANCES?

- **Do I need my own DEA number when I am practicing veterinary medicine?**
- **What if I am a part time Veterinarian?**
- **What if I am a relief (aka locum tenens) veterinarian?**

Reference: Page 7 of the DEA's Practitioner's Manual

20

Do I Really Need A DEA Number?

- "Under the CSA, the term "practitioner" is defined as a physician, dentist, **veterinarian,** scientific investigator, pharmacy, hospital, or other person licensed, registered, or otherwise permitted, by the United States or the jurisdiction in which the practitioner practices or performs research, to distribute, **dispense,** conduct research with respect to, **administer,** or use in teaching or chemical analysis, **a controlled substance in the course of professional practice** or research. **EVERY** person or entity that handles controlled substances **MUST be registered** with the DEA or be **exempt** by regulation from registration."
- **Is there an exception? Federally Yes, *But Not in Georgia*!**
- **Federal law requires that practitioners maintain a DEA number to write prescriptions for controlled substances.**
- **Under federal law, a DEA number is not technically required to write prescriptions for legend drugs such as antibiotics.**
- **Remember: If you don't have a DEA number you cannot prescribe controlled substances!**

Reference: Page 7 of the DEA's Practitioner's Manual

21

Do I need A DEA Number In Georgia If I am Administering, Dispensing and/or Prescribing Controlled Substances?

"Georgia Pharmacy Practice Act OCGA 26-4-130 Veterinarians (Practitioners) are also subject to the Rules of the Georgia State Board of Pharmacy". Source: Chapter 480-26 and the Rules of the Georgia State Board of Veterinary Medicine, Chapter 700-8"

"The Georgia Pharmacy Board requires that all DVMs handling and dispensing controlled substances for any reason be registered with the DEA. The Georgia regulation requires that a "Practitioner' or 'practitioner of the healing arts' means, notwithstanding Code Section 26-4-5, a person licensed as a dentist, physician, podiatrist, or veterinarian under Chapter 11, 34, 35, or 50, respectively, of Title 43." "May dispense prescription medications in accordance with Georgia Laws, Federal Regulations, and The Georgia Board of Pharmacy Board Rules. If controlled substances are being dispensed the physician must hold a valid DEA Registration number. No additional permits are required from the State of Georgia".
Source: Frequently Asked Questions for Dispensing.

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Relief/Mobile Veterinarian DEA License & Recordkeeping Requirements

1. DEA Certificates are location (i.e. address) specific
2. If you are ordering controlled substances for your use, they must be sent directly to the location where they will be used, and that location must correspond to the address listed on your DEA registration.
3. What Documents should I provide a practice when providing relief services inside a brick-and-mortar practice?
   - 4 documents in Georgia

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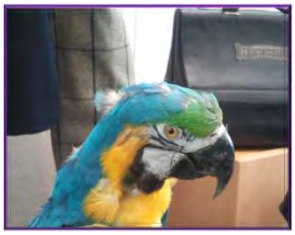
23

Question?

What is the Black Bag Rule?

Why is it prohibited?



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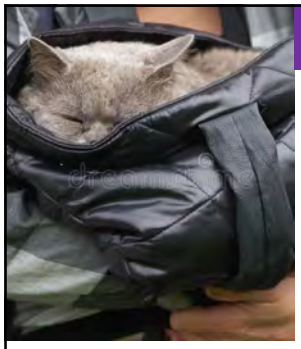

ANSWER

- The term "black bagging" refers to transporting prescription medications from one medical site to another. This is a common practice among practitioners who travel between offices and other medical facilities to perform procedures. However, it is also prohibited under the CSA.
- Why is so-called "black bagging" prohibited? Under the registration provisions of the CSA, practitioners are required to obtain separate registrations for "each principal place of business or professional practice where controlled substances are dispensed." Practitioners that prescribe and dispense medications qualify as "practitioners" under the CSA, as explained in the DEA's Practitioner's Manual:
  - *"Under the CSA, the term 'practitioner' is defined as a physician, dentist, . . . or other person licensed, registered, or otherwise permitted, by the United States or the jurisdiction in which the practitioner practices . . . to distribute, dispense, . . . administer, or use . . . a controlled substance in the course of professional practice. . . ."*
- The purpose of this provision is to allow the DEA to maintain oversight of the locations where prescription medications are stored and administered to patients. Without such a provision in the CSA, practitioners could ostensibly keep prescriptions at their homes or at inadequately-secured office locations where may be more susceptible to loss, theft, diversion, or abuse. While this is at least arguably a valid concern, the strict nature of the CSA's "place of business" provision means that various justifiable practices – including "black bagging" by oral surgeons – are outlawed as well.

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QUESTION

1. Can a practitioner transport controlled substances and administer at the patient's home residence (the so-called "black bag exception")?
2. Do these rules apply to me if I am seeing patients in their home, farm, pasture or ranch?
3. What about the Veterinary Medicine Mobility Act of 2014?

26

Answer

Administering and Dispensing

"Yes, with a limit. DEA will permit a practitioner who is registered with DEA to dispense controlled substances at a particular location in a state to travel to other unregistered locations in the *same state* to dispense controlled substances on an "as-needed and random basis," so long as the practitioner does not maintain a principal place of professional practice at any of those unregistered locations.

If a practitioner intends to dispense controlled substances from a particular location several times a week or month, he must first file a separate registration for the location. Registrants should keep themselves apprised of state and local laws otherwise consistent with DEA regulations regarding the dispensing of controlled substances in a patient's home residence".

Source: ***See Jeffery J. Becker, D.D.S.,* 77 FR 72387, 72388 (Dec. 05, 2012); *see also* 21 U.S.C. 822(e)(1), 21 CFR 1301.12(b)(3). Source: EO-DEA212, DEA-DC-047, October 8, 2020. Source:** ***See Moore Clinical Trials, L.L.C.,* 79 FR 40145-02, 40155 (July 11, 2014) citing *United States v. Clinical Leasing Serv., Inc.,* 930 F.2d 394, 395 (5th Cir. 1991).** Drug Enforcement Administration Diversion Control Division Guidance Document, EO-DEA212, DEA-DC-047, October 8, 2020

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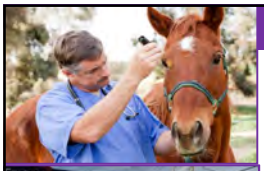

ANSWER: THE VETERINARY MEDICINE MOBILITY ACT OF 2014

Dear Registrant:

This correspondence outlines the policy of the Drug Enforcement Administration (DEA) regarding the Veterinary Mobility Act of 2014, which became effective on August 1, 2014. It is the DEA's position that the new law should be interpreted exactly as it is written.

The Veterinary Medicine Mobility Act of 2014 amended section 302(e) of the Controlled Substances Act, Title 21, United States Code, Section 822(e) (21 U.S.C. SS 822(e)) to address separate registration requirements for veterinarians. Specifically, the Act states that a "registrant who is a veterinarian shall not be required to have a separate registration in order to transport and dispense controlled substances in the usual course of veterinary practice at a site other than the registrant's registered principal place of business or professional practice, so long as the site of transporting and dispensing is located in a State where the veterinarian is licensed to practice veterinary medicine and is not a principal place of business or professional practice."

A non-office setting that the veterinarian visits to treat animals on an occasional, as-needed basis would not be a principal place of business or professional practice. Although the following is not the only example covered by 21 U.S.C. 822(e)(2), a prime example is that a veterinarian may dispense controlled substances while making "house calls" (e.g., at a stable) without being registered at that location. And, in such a scenario, the veterinarian does not need to be registered with the DEA in the State where the dispensing occurs, as long as the veterinarian is registered in some other State and is licensed to practice veterinary medicine in the State where the dispensing occurs.

Should you have any questions pertaining to this matter, please contact your local DEA Field office, or you may contact the DEA Office of Diversion Control, Liaison and Policy Section, at (202) 307-7297.

Sincerely,

Louis J. Milion
Deputy Assistant Administrator
Office of Diversion Control

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Question:

Which Medications are Subject to the Rule Against "Black Bagging"?

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Answer

All medications that are listed as Schedule I, II, III, IV, and V controlled substances under the CSA are subject to the prohibition against "black bagging." This includes (but is not limited to):

- **Clindamycin**
- **Penicillin VK**
- **Prescription-strength acetaminophen**
- **Metronidazole**
- **Erythromycin**
- **Ticarcillin**
- **Other prescription antibiotics and painkillers**
- **Various types of anesthetics**

In short, all medications that practitioners use are subject to the CSA's "place of business" restriction. As a result, practitioners must be extremely careful to avoid transporting *any* medication to a location where they are not registered with the DEA.

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Question

As a relief or mobile veterinarian working in multiple locations, am I required to have my own DEA Certificate?

Please note: The government creates, changes and updates regulations frequently. As of March 2023, the information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your practice.

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Answer

A DEA Registration (aka certificate) is required by the Federal DEA and the Georgia Pharmacy Board if you administer, dispense, and prescribe controlled substances at a practice where you are providing veterinary services.

CONTROLLED SUBSTANCE REGISTRATION CERTIFICATE
UNITED STATES DEPARTMENT OF JUSTICE
DRUG ENFORCEMENT ADMINISTRATION
WASHINGTON D.C. 20537

BH9207032	10-31-2017	$731
	PRACTITIONER	10-26-2014

PAL

HORTON, LAWRENCE B (DOM)
2202 MENUAL BLVD, NE
SUITE 20
ALBUQUERQUE, NM 87107-0000

Sections 304 and 1008 (21 USC 824 and 958) of the Controlled Substances Act (21 USC 801 et seq.) provide that the Attorney General may revoke or suspend a registration to manufacture, distribute, dispense, import or export a controlled substance.

THIS CERTIFICATE IS NOT TRANSFERABLE ON CHANGE OF OWNERSHIP, CONTROL, LOCATION, OR BUSINESS ACTIVITY, AND IT IS NOT VALID AFTER THE EXPIRATION DATE.

Form DEA-223 (4/97)

Source: 21 CFR §1301.22 & Chapter 11, 34, 35, or 50, respectively, of Title 43."

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Question

I'm a relief veterinarian and I practice at multiple clinics. Can I use my home address on my DEA Certificate?

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Answer

- Yes, you should use your home address!
- PO Boxes are not allowed
- DEA has the right to audit your home
- Check with your state Veterinary & Pharmacy boards if you have questions

Source: 21 CFR 1300.01(b)

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Question

I'm a relief and mobile veterinarian

1. I practice in a stationary, 4 walled clinic

-AND-

2. I see my patients at their home, farm or ranch

3. Do I need more than one DEA number?

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Answer

Source: 21 CFR 1300.01(b)

- Yes and No!
- If you work at stationary clinic and you are paid with a W-2 -AND- you also have your own mobile business that is separate from the stationary clinic, you will need two DEA certificates!
- One DEA certificate issued to the stationary clinic's name, your name and the clinic address where you work part time
- One DEA certificate issued to your mobile businesses name, your name and your home address
- NOTE: It will be the same DEA number on each certificate, just different addresses!
- Home is where you will receive your controlled substances for your mobile business
- *If you own (or work at) the clinic and provide home based services as part of the clinic's services, your DEA number assigned to the clinic that will be all that's needed. BUT contact your Vet Board, PLIT and Business Insurance to notify them of mobile services*

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Question

I am a relief or mobile veterinarian practicing in MULTIPLE states, how do I know which regulation to follow to stay compliant in each state?

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Answer

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Helpful hints that are <u>usually</u> consistent from State to State:

1. If you practice at multiple stationary facilities in the **<u>SAME</u>** state, and you have controlled substances **housed** at each location to administer and dispense, then you must have a **DEA registration at each facility** where you provide services.
2. "If you practice at multiple stationary facilities in the **<u>SAME</u>** state and you are **working under or acting as an agent or employee of another practitioner who is registered to dispense controlled substances,** you may, when acting in the normal course of business or employment, **administer or dispense** (other than by issuance of prescription) controlled substances if and to the extent that such individual practitioner is authorized or permitted to do so by the jurisdiction in which he or she practices, under the registration of the employer or principal practitioner in lieu of being registered him/herself". **Source exempted form CFR 21 §1301.22(b)**
3. If you practice at **multiple facilities in the <u>SAME</u> state** and only **<u>prescribe</u>** controlled substances, you only need one registration.
4. If you **do not administer, dispense or prescribe controlled substances** at the facility where you are providing relief services, **you do not** need a DEA certificate.
5. If you practice in **<u>DIFFERENT</u>** states, a DEA Registration **<u>is required in each state</u>** where you practice if you will be handling controlled substances.
6. **Check each State's regs**

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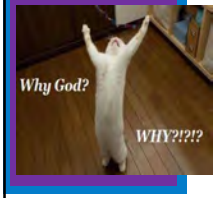
WHY DO I HAVE TO FOLLOW THE RULES? NO ONE ELSE DOES.....DO THEY?



Per the Controlled Substances Act (CSA), the Drug Enforcement Administration (DEA) was created in 1973. Created the compliance program in 1971. The CSA set forth federal laws around illicit and pharmaceutical controlled substances

The DEA is responsible for ensuring that all controlled substance transactions occur within a <u>CLOSED SYSTEM</u> from manufacturer to the ultimate end user, (aka the pet and/or pet parent).

"Ultimate user" mean a person who lawfully obtained, and who possesses a controlled substance for his own use, or for the use of a member of his household, or for an animal owned by him or a member of his household." Source: 21 USC 802 (27)

(111) The goal of the regulatory scheme is to create a <u>"closed system"</u> of distribution in which only authorized handlers may distribute controlled substances. (112) Central to the closed system of distribution is the requirement that individuals or entities that work with controlled substances register with DEA. Source: The Controlled Substances Act (CSA): A Legal Overview for the 116th Congress October 9, 2019

Additional Source: <u>HTTP://www.deadiversion.usdoj.gov/pubs/manuals/pract/index.html</u>

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WHAT DOES THE DEA SAY ABOUT BACKGROUND CHECKS?

- **§ 1301.76 Other security controls for practitioners.**
- **(a) The registrant shall not employ, as an agent or employee who has access to controlled substances, any person who has been convicted of a felony offense relating to controlled substances or who, at any time, had an application for registration with the DEA denied, had a DEA registration revoked or has surrendered a DEA registration for cause.**
- **For purposes of this subsection, the term "for cause" means a surrender in lieu of, or as a consequence of, any federal or state administrative, civil or criminal action resulting from an investigation of the individual's handling of controlled substances.**

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HR Law and Background Checks

- **You must extend a conditional job offer 1st, before running background check.**
- **Tell the applicant during the interview that if they are offered a job, it will be a conditional, based on findings of the background check.**
- **Reiterate that this is a conditional job offer based on the findings of the background check to the potential new hire.**

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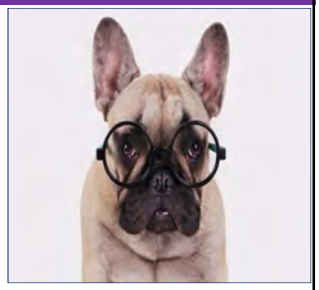
WHAT DOES THE DEA SAY ABOUT BACKGROUND CHECKS?

CSA § 1301.90 Employee Screening Procedures

"It is the position of DEA that the obtaining of certain information by non practitioners is vital to fairly assess the likelihood of an employee committing a drug security breach".

"It is, therefore, assumed that the following questions will become a part of an employer's comprehensive employee screening program:

- **Question: Within the past five years, have you been convicted of a felony, or within the past two years, of any misdemeanor or are you presently formally charged with committing a criminal offense? (Do not include any traffic violations, juvenile offenses or military convictions, except by general court-martial.) If the answer is yes, furnish details of conviction, offense, location, date and sentence.**
- **Question: In the past three years, have you ever knowingly used any narcotics, amphetamines or barbiturates, other than those prescribed to you by a physician? If the answer is yes, furnish details".**



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Today's DEA and State Controlled Substance Regulations Are So Complex & Confusing That Veterinarians & Staff Struggle To Understand What They Should Be Doing….

HAVE A PLAN

CONTROLLED SUBSTANCE POLICIES & PROCEDURES MANUAL

- **When audited, you may be asked for a copy of your controlled substance policy**
- **Why? It shows the DEA agent who and how your practice handles controlled substances from ordering to administration and/or dispensing.**
- **If you need a controlled substance policy, please contact me at jan@askjanforhelp.com to purchase one for your practice.**

Source: Title 21 Code of Federal Regulations. PART 1304 — RECORDS AND REPORTS OF REGISTRANTS. GENERAL INFORMATION §1304.04 Maintenance of records and inventories. Please note: The government changes laws frequently. As of March 2023, the information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your practice. © Copyright Protected

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ORDERING CONTROLLED SUBSTANCES

- **Schedule II Controlled Substances must be ordered on a 222 Form**
- **The DEA can be reached by calling 800-882-9539 or through the web at www.deadiversion.usdoj.gov**
- **222 forms must be ordered directly from the DEA**
- **Keep a permanent copy of all your order sheets**

Void & Keep Your Old Triplicate 222 Forms

NEW 222 SINGLE SHEET FORM - 10/30/2021
Void Your Old 222 Forms and Store In A Locked File Cabinet

When is a Power of Attorney & the Power of Attorney Revocation Required?

Source: 21 CFR 21, 1305, 1311, 1305.13 Procedure for filling DEA Forms 222, Sec.1305.12 Procedure for executing DEA Forms 222

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CSOS: Controlled Substance Ordering System
https://www.deaecom.gov/applycert.html

Power of Attorney for 222 Form & CSOS

Source: Code Federal Regulations Title 21SA Sec. 1305.05 Power of attorney.

Power of Attorney for DEA Forms 222 and Electronic Orders

_____
(Name of registrant)

_____
(Address of registrant)

_____
(DEA registration number)

I, _____ (name of person granting power), the undersigned, who am authorized to sign the current application for registration of the above-named registrant under the Controlled Substances Act or Controlled Substances Import and Export Act, have made, constituted, and appointed, and by these presents, do make, constitute, and appoint _____ (name of attorney-in-fact, AKA STAFF MEMBER), my true and lawful attorney for me in my name, place, and stead, to execute applications for Forms 222 and to sign orders for Schedule I and II controlled substances, whether these orders be on Form 222 or electronic, in accordance with 21 U.S.C. 828 and Part 1305 of Title 21 of the Code of Federal Regulations. I hereby ratify and confirm all that said attorney must lawfully do or cause to be done by virtue hereof.

_____
(Signature of person granting power)

I, _____ (name of attorney-in-fact, AKA STAFF MEMBER), hereby affirm that I am the person named herein as attorney-in-fact and that the signature affixed hereto is my signature. (signature of attorney-in-fact)

Witnesses:
1. _____
2. _____
Signed and dated on the ____ day of ____, (year), at ____ .

Power of Attorney Revocation for 222 Form & CSOS Form

Source: Source: Code Federal Regulations Title 21SA Sec. 1305.05 Power of Attorney.

Notice of Revocation

The foregoing power of attorney is hereby revoked by the undersigned, who is authorized to sign the current application for registration of the above-named registrant under the Controlled Substances Act or the Controlled Substances Import and Export Act. Written notice of this revocation has been given to the attorney-in-fact ____ this same day.

_____
(Signature of person revoking power. AKA DVM)

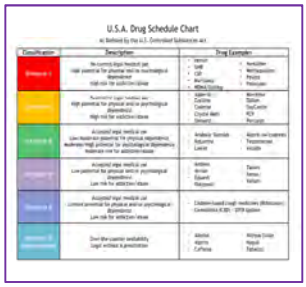
Witnesses:
1. _____
2. _____
Signed and dated on the _____ day of _____, (year), at _____.

- ✓ **A power of attorney must be executed by the person who signed the most recent application for DEA registration or reregistration; the person to whom the power of attorney is being granted; and two witnesses.**
- ✓ **A power of attorney must be revoked by the person who signed the most recent application for DEA registration or reregistration, and two witnesses.**
- ✓ **Contact Your Distributor Immediately**

SCHEDULES OF CONTROLLED SUBSTANCES

- Drugs and other substances considered controlled substances under CSA are divided into five classes
- Based on accepted medical use and likelihood of causing dependence and abuse
- Each class may have different rules around the prescribing, administering or dispensing
- States may place controlled substances on different schedules than federally recommended. For example, Tramadol, Gabapentin, etc.
  - You are required to know when a legend drug becomes a controlled substances and vice versa

Watch your State regulations carefully to determine if your controlled substances are placed in the right schedule!



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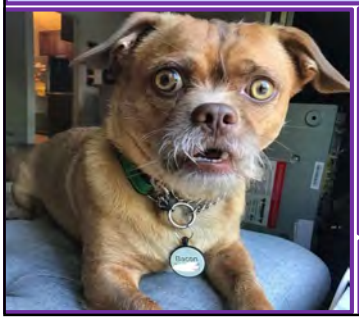
Drugs of Concern



1. Gabapentin
2. Proin
3. Propofol
4. Xylazine
5. Trazodone
6. Methocarbamol
7. Prozac
8. Insulin

Legend Drugs cannot be kept in the same lockbox with your controlled substances

What states consider gabapentin a controlled substance?
As of July 2022, these states consider gabapentin a schedule V controlled substance:

- Alabama
- Kentucky
- Michigan
- North Dakota
- Tennessee
- Virginia
- West Virginia

Other states have mandated gabapentin reporting. Every time you fill a gabapentin prescription, it's added to the PDMP system. These include:

- Connecticut
- Kansas
- Massachusetts
- Indiana
- Washington D.C.
- New Jersey
- Minnesota
- Nebraska
- Ohio
- Utah
- Wyoming
- Oregon

Source: GoodRx Health, Written by Makaela Premont, PharmD | Reviewed by Christina Aungst, PharmD,
Updated on July 26, 2022

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SEPARATION OF DUTIES BY KIMBERLY NEW, JD, BSN, RN

"Due to staffing limitations, in clinic settings without automated drug storage there is often a single person, typically a nurse, who oversees drug ordering, receives the drugs, and stocks them.

However, separation of ordering, receiving, and stocking duties is considered a best practice to prevent diversion during the procurement process.

Having a separate person witness each stage of procurement or independently verify ordering and stocking records may be a solution if complete separation is not feasible".

- The person who orders and purchases the drugs should be a different person from the person who receives the controlled substances, checks them in, logs them and adds them to either the closed or open inventory
- Ideally this should not be the person who pays your bills
- Separation of duties for ordering, receiving and paying invoices is a Best Practice recommendation and one that the DEA is paying close attention to currently

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REGULATORY & BEST PRACTICE SUGGESTIONS
Let's Talk Drug Scheduling and Recordkeeping Compliance

Follow all Federal, State, Veterinary Board & Pharmacy Board controlled substance regulations

Federal law requires Schedule II C.S. logs be kept separate from Schedule III, IV and V controlled substances logs.

Source: CFR, Title 21: §1304.04

(f) Each registered manufacturer, distributor, importer, exporter, narcotic treatment program and compounder for narcotic treatment program shall maintain inventories and records of controlled substances as follows:

(1) Inventories and records of controlled substances listed in Schedules I and II shall be maintained separately from all of the records of the registrant; and

(2) Inventories and records of controlled substances listed in Schedules III, IV, and V shall be maintained either separately from all other records of the registrant or in such form that the information required is readily retrievable from the ordinary business records of the registrant.

(g) Each registered individual practitioner required to keep records and institutional practitioner shall maintain inventories and records of controlled substances in the manner prescribed in paragraph (f) of this section.

This includes unexecuted & executed 222 forms, CSOS forms, invoices and all required documents

Suggest keeping your Schedule III, IV & V logs separate also to reduce human error

Keep a new page for each drug, by using a numerical & lettering system per bottle/box, per distributor, etc.

Different manufacturer, different distributor, different strength, different content count, i.e. (100 vs. 500 count bottle), different lot numbers, different expiration numbers– they should be entered on separate page in your logbook.

Source: CFR Title 21:Sec. 1304.04

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Georgia Recordkeeping Requirements And Examples of Controlled Substance Reconciliation Logs

Obligations of Registrants - Recordkeeping & Reporting

"The CSA and its implementing regulations impose multiple recordkeeping and reporting requirements on registrants. Registrants must undertake a biennial inventory of all stocks of controlled substances they have on hand, and maintain records of each controlled substance they manufacture, receive, sell, deliver, or otherwise dispose of. (130) In addition, controlled substances in Schedules I and II may only be distributed pursuant to a written order. (131) Copies of each order form must be transmitted to DEA. (132) Records of orders must be preserved for two years and made available for government review upon request. (133)" Source: The Controlled Substances Act (CSA): A Legal Overview for the 116th Congress October 9, 2019

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Georgia Registrants (aka Practitioner) Recordkeeping Requirements

Georgia requires the following documentation for the prescribing and dispensing of controlled substances and legend drugs.

(1). "Veterinarians (aka Practitioners) are also subject to the Rules of the Georgia State Board of Pharmacy, Chapter 480-26 and the Rules of the Georgia State Board of Veterinary Medicine, Chapter 700-8. It shall be unprofessional conduct for a licentiate to:

1. **Prescribe or dispense any controlled substance without actually having examined the animal;**
2. **Prescribe or dispense more than a thirty (30) day supply of a C-II controlled substance;**
3. **Prescribe or dispense more than the usual dosage as set forth in published references or as determined by documented clinical need; or**
4. **Refill any prescription for a C-II controlled substance without examining the animal."**

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Georgia Registrants (aka Practitioner) Recordkeeping Requirements

480-28-.02 General Requirements. Amended.
"All practitioners who dispense drugs shall comply with all record-keeping, labeling, packaging, and storage requirements imposed upon pharmacists and pharmacies with regard to such drugs and those regulations contained in this Chapter".

Source: Dispensing Practitioners Georgia Laws, Rules & Regulations

"(a) Nothing in this Rule is meant to prohibit veterinarians from meeting the prescription drug order record keeping requirements of this Chapter by utilizing a record keeping system in which a patient's prescription drug order is maintained in the patient's chart. However, nothing in such a system shall relieve a veterinarian from meeting the other requirements of this Chapter".

Source: Authority O.C.G.A. Secs. 26-4-4, 26-4-27, 26-4-28, 26-4-37, 26-4-130. History. Original Rule entitled "General Requirements" adopted. F. Sept. 15, 1987; eff. Oct. 15, 1987. Repealed: New Rule of same title adopted. F. July 24, 2002; eff. Aug. 13, 2002.

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Georgia Registrants (aka Practitioner) Recordkeeping Requirements

"Georgia "Rule 480-20-.02. Record-Keeping Requirements For Registrants

Each registrant shall maintain records of unusual orders of controlled substances received by the registrant and shall inform the Office of the Director of the Georgia Drugs and Narcotics Agency (GDNA) of unusual orders when discovered by the registrant. For purposes of this section, an unusual order shall include orders of greatly increased quantity, orders deviating substantially from a normal pattern, and orders of highly abnormal frequency".

"Georgia "Rule 700-12-.04. Record Keeping
A. All patient records must be maintained for a minimum of 3 years (including diagnostic imaging and other patient data) by the veterinary facility where the patient received treatment. If treatment is not performed at a veterinary facility, a patient record must be maintained by the veterinarian who provided treatment of the patient".

B. The veterinarian must furnish clients with an established mailing address for obtaining patient records.

The requirements of subparagraphs (a) shall not apply to a veterinarian who has retired or sold his or her professional practice if said veterinarian has notified the client of such retirement or sale and offered to provide the patient records or copies thereof to another veterinarian of the client's choice or has furnished the client with an established mailing address to submit a request for obtaining patient records".

Source: Georgia Administrative Code Department 700. RULES OF GEORGIA STATE BOARD OF VETERINARY MEDICINE Chapter 700-12. MINIMUM STANDARDS

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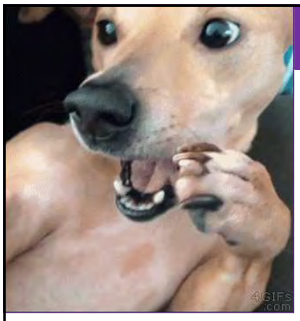

GEORGIA REGISTRANTS RECORDKEEPING REQUIREMENTS

Georgia Rule 480-28-.09 Practitioner in Charge of Common Inventory

"Whenever more than one practitioner dispenses drugs from a common inventory, one of the practitioners shall be designated "practitioner in charge" of said inventory. All practitioners in charge shall insure that a complete and accurate record of all controlled substances on hand, received, manufactured, sold, dispensed, or otherwise disposed of has been kept in accordance with the record-keeping requirements of federal law, state law, and the rules of the Board."

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GEORGIA "RULE 480-28-.03 NOTIFICATION OF INTENT TO DISPENSE

Any practitioner who intends for his/her agent to dispense drugs shall notify, at the time of the renewal of that practitioner's license to operate, that practitioner's respective licensing board of that practitioner's intention to dispense drugs.

The licensing board shall notify the Georgia State Board of Pharmacy regarding each practitioner whom that Board has received a notification of intention to dispense drugs. The licensing board's notification shall include the following information:

(a) The name and address of the practitioner;
(b) The state professional license number of the practitioner;
(c) The practitioner's Drug Enforcement Administration license number; and
(d) The complete name and address of the office or facility from which drugs shall be dispensed and the complete address where all records pertaining to such drugs shall be maintained."

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Georgia Registrants Recordkeeping Requirements

Georgia "Rule 480-28-.07 Storage

(1) "All practitioners shall exercise diligent care in protecting controlled substance drugs and records possessed from loss or theft. Agents of the Board shall have the responsibility of offering to practitioners written recommendations concerning the satisfactory storage, keeping, handling, and security of such controlled substances and records. When not in actual use, all controlled substance drugs shall be maintained in a place which is secured.

(2) All drugs which bear, or are required to bear, upon the package, the words "Caution, Federal Law Prohibits Dispensing Without Prescription", or "RX only" or words of like import, shall be stored in a secured area by a practitioner possessing such drugs. All drugs shall be stored beyond the normal reach of small children.

(3) There shall be provided within each practitioner's office sufficient space for the neat and orderly storage of all drugs. In addition, there shall be clear floor space within such office to permit a practitioner and his/her assistant employed therein to adequately, safely, and accurately fulfill his/her duties related to prescriptions and drugs.

(4) There shall be provided within each dispensing practitioner's office adequate facilities for the proper storage of drugs which require refrigeration, and such drugs shall be stored therein in such manner as to preserve their therapeutic activity.

(5) No dispensing practitioner shall operate in any manner or dispense any drugs under unclean, unsanitary, overcrowded, or unhealthy conditions, or under any condition which endangers the health, safety, or welfare of the public.

(6) A practitioner shall cause to be removed from stock all outdated and deteriorated drugs, at regular intervals of not more than six months duration, and under no circumstances will any practitioner permit any drug to be dispensed which bears a date of expiration which has been reached, or which is in a deteriorated condition."

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Georgia Registrants Recordkeeping Requirements

Georgia "Rule 700-12-.07. Drugs and Pharmacy

(1) A licensed veterinarian employed at a veterinary facility must ensure that the following criteria pertaining to drugs and the pharmacy are met:

(a) All controlled substances must be maintained in compliance with federal and state requirements,
(b) All pharmaceuticals dispensed must be properly labeled in accordance with state and federal requirements.
(c) Outdated pharmaceuticals must be separated, stored, returned or disposed of in accordance with federal, state and local requirements.
(d) The pharmacy must be maintained in a clean and orderly manner.
(e) If utilizing controlled substances, documentation of U.S. Drug Enforcement Administration certificates must be on premises.
(f) All pharmaceuticals on the premises must be properly labeled with drug name, concentration or activity, and expiration date.
(g) A valid veterinarian-client-patient relationship must be established before prescription medications can be dispensed, or prescriptions released."

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Establishing a VCPR in Georgia

(15) "Veterinarian-client-patient relationship" means that:

(A) The licensed veterinarian or his or her licensed designee has assumed the responsibility for making medical judgments regarding the health of the animal and the need for medical treatment, and the client (owner or caretaker) has agreed to follow the instruction of the licensed veterinarian;

(B) There is sufficient knowledge of the animal by the licensed veterinarian to initiate at least a general or preliminary diagnosis of the medical condition of the animal. This means that the licensed veterinarian has recently seen and is personally acquainted with the keeping and care of the animal by the virtue of examination of the animal or by medically appropriate and timely visits to the premises where the animal is kept; and

(C) A licensed veterinarian is readily available for follow up in the case of adverse reactions or failure of the regimen of therapy.

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Georgia Registrants Recordkeeping Requirements

Georgia "Rule 480-28-.04 Record-keeping and Filing

(1) Requirements of a prescription drug order. A practitioner shall write a prescription drug order for each drug dispensed. The prescription drug order shall contain the following information:

(a) The name and address of the person for whom the drug is prescribed; (Owner and pet)
(b) The name, quantity, and strength of such drug;
(c) The directions for taking or giving;
(d) The signature of the practitioner and the date the prescription was written; and
(e) For controlled substance drugs, the name, address, and Drug Enforcement Administration number of the dispensing practitioner.

(2) Documentation required for filling or refilling a prescription drug order. A practitioner who fills or refills a prescription drug order shall write on the prescription itself the date it was filled or refilled and the signature of the practitioner who fills or refills the prescription drug order.

(3) Prescription drug orders dispensed by a practitioner cannot be transferred to another practitioner or pharmacist for subsequent filling.

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Georgia Recordkeeping Requirements

"Retention of records: Prescription drug orders shall be maintained on file by a practitioner for a period of two years from the date the prescription is filled and shall be accessible for inspection by the Board and/or its agents from the Georgia Drugs and Narcotics Agency and its inspectors.

Special requirements for record-keeping and filing of controlled substance prescription drug orders.

(a) Invoices: A record of all controlled substance drugs received and disposed of by a dispensing practitioner must be maintained.
All invoices of Schedule II controlled substances must be kept or maintained in a separate file.
All invoices for Schedule III, IV or V controlled substances must be kept in or maintained in a separate file, provided that these invoices may be filed with other invoices only if the letter "C" in red ink is stamped on each invoice of Schedule III, IV or V controlled substances so that such invoice shall be easily accessible and retrievable.

(b) Inventory: An inventory of all controlled substances must be maintained separately and taken biennially on May 1st, or two (2) years from the day of the last inventory, of every odd-numbered year.

(c) Files: A prescription drug order for a controlled substance must be filed in one of the following ways:
1. A practitioner can maintain three separate files; one for all Schedule II controlled substances dispensed, one for all Schedule III, IV and V controlled substances dispensed, and one for all dangerous drugs dispensed, or

2. A practitioner can maintain two files, one for Schedule II controlled substances dispensed and one for all other drugs dispensed. If this method is utilized, the prescriptions for Schedule III, IV and V controlled substances must be stamped with the letter "C" in red ink, not less than one inch high, in the lower right-hand corner, so that such records are easily accessible and retrievable, or

3. A practitioner can maintain two files; one for all controlled substance drugs dispensed and one for all dangerous drugs dispensed. If this method is utilized, the prescriptions for Schedule III, IV and V controlled substances must be stamped with the letter "C" in red ink, not less than one inch high, in the lower right-hand corner so that such records are easily accessible and retrievable."

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Controlled Substance Refills in Georgia

Rule 480-22-.05. Refilling of a Schedule II (C-II) Controlled Substance Prescription Drug Order

The refilling of a prescription for a schedule II (C-II) controlled substance is prohibited.

Rule 480-22-.08 - Refilling of Schedule III, IV, and V (C-III, IV, V) Controlled Substance Prescription Drug Orders

(1) No prescription drug order for a C-III, IV, or V controlled substance shall be filled or refilled more than six (6) months after the date on which such prescription drug order was issued by the prescribing practitioner and no such prescription drug order may be authorized to be refilled for the quantity prescribed more than five (5) times.
(a) Nothing shall prohibit the refilling of such a prescription drug order in amounts less than the quantity prescribed as long as the total number of dosage units authorized for dispensing both the original quantity plus the refill quantities does not exceed six (6) months.

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DISPENSING AND PRESCRIBING CONTROLLED SUBSTANCES RECORDKEEPING REQUIREMENTS

1.) The prescribing of controlled substances (initial Rx and refills) must be ***clearly written*** in the medical record and in the pharmacy section of your practice software, (if dispensing).

2.) At a minimum, the med rec must include the ***reason*** for the controlled substance, Sig and refills (if allowed)

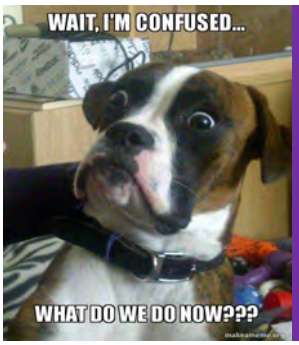
3.) The medical record and pharmacy section ***must match*** your controlled substance reconciliation logs!

4.) The medical record should contain the following information:

- Date
- Patient's name, species & sex
- Established VCPR
- Address
- Owner's name
- Drug name
- Drug strength
- **Quantity**
- **Limits**
- **Refills** (if any)
- Name of firm requesting authorization
- Name of employee/DVM transmitting approval

Abbreviated Source: Iowa Admin. Code r. 811-12.2 ARC 1465C, IAB 5/28/2014, effective 7/2/2014

5.) Remember: If you ***do not*** have a DEA number, you ***cannot*** prescribe controlled substances



HELP!
WHERE DO I BEGIN?

HOW CAN I POSSIBLY DO ALL THIS STUFF AND STILL PRACTICE VETERINARY MEDICINE?

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Recording Newly Received Controlled Substances

CONTROLLED SUBSTANCES SHIPMENT ARRIVAL

The employee unpacking the narcotics should be registered in the front of your controlled substance log(s)	Write on the copy of your 222 order form and the invoice the following required information	All invoices, packing slips and 222 Forms should be kept in in a locked file cabinet by schedule.	All controlled substances should be immediately entered into your inventory log(s). Reference: 21 CFR 21, 1305, 1311

Upon Receipt

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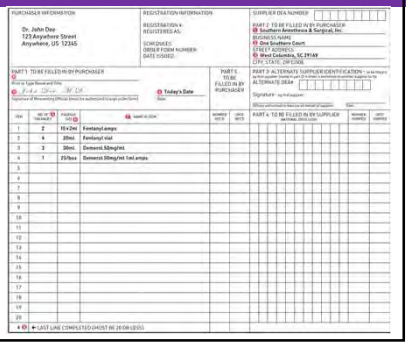
Upon Receipt of Your Schedule II-V Controlled Substances

Schedule II:
1. Fill in the two boxes in the middle of your copied 222 form, entitled "Part 5: To Be Filled In By The Purchaser".
2. On the invoice write the time, date, quantity/total quantity and the initials of who received the controlled substances
3. File the 222 form & the invoice separately
4. File both documents separately from your Schedule III-V documents.

Schedule III-V:
1. Retrieve the corresponding Invoice
2. Write the same information as you did on the Schedule II invoice.
3. File separately from your Schedule II documents.

Schedules II-V:
Immediately enter all controlled substances received into your closed and/or open logs



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BEST PRACTICE & REGULATORY REQUIREMENTS KEEP LOGS CURRENT, COMPLETE & ACCURATE

Enter new, unopened stock (aka Backstock) here.

1. Date
2. Number sequentially assigned to each bottle/box
3. Drug name, size, strength
4. Manufacturer AND Distributor
5. Lot number AND Invoice number
6. Date transferred from Closed to Open Inventory
7. Transferred from Closed to Open to a designated department, such as; main treatment floor, ER, OR, Dentistry, etc..
8. Balance on hand
9. DVM and employee's initials

Source: **657—10.16(124) Receipt and disbursement of controlled substances.**

All Info As Required on Closed PLUS:

1. **Date Dispensed**
2. **Owner's name & address**
3. **Species**
4. **Patient's name**
5. **Drug amount used**
6. **Diagnosis (aka Reason)**

Reference: Title 21 CFR 1304.06 &§1304.21
Reference: 21 CFR 21, 1305, 1311
Reference 16 CCR 2032.3(a)(8,12)

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Controlled Substance Reconciliation Log
Unopened Container (AKA Backstock or CLOSED) Example Only!

CONTROLLED SUBSTANCE RECONCILIATION LOG - UNOPENED/CLOSED/BACKSTOCK

DRUG NAME: SIZE: FORM: STRENGTH: DISTRIBUTOR:

MANUFACTURER: *BOTTLE OR BOX #: DATE RECEIVED: NDC #

Date	Invoice#	Bottle or Box #	Lot #	Expiry Date	Volume (total of each bottle in mls, tablets or patches)	Liquid Weight (in grams)	Transferred from Unopened to OPEN	Authorized Staff Initials	Witness I

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DISCLAIMER: This log reflects Federal regulatory requirements and Best Practice recommendations only. It may or may meet your State's regulations. Please stay abreast of all Federal and State regulations to assure DEA compliance in your practice, at all times. *Keep bottle numbers in sequential order Copyright 2020 ©

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Controlled Substance Administering & Dispensing Reconciliation Log
OPEN Container-LIQUID- Example Only

Controlled Substance Administering & Dispensing Reconciliation Log

OPEN CONTAINER - LIQUID

DRUG NAME

SIZE STRENGTH DATE REC'D

MANUFACTURER DISTRIBUTOR AMOUNT REC'D

BOTTLE# INVOICE# LOT # Expiry Date NDC# OPEN DATE

Date	Case Label or Owner & Patient Demographic Information	Diagnosis	Pre-Weight Balance Grams	Amount Dispensed or Administered mls	Post-Weight Balance Grams	Amount Wasted (if applicable) mls	Discrepancy Amount (if applicable) mls	Balance Post Weight of Waste or Discrepancy Grams	Waste or Discrepancy Reason	Ordered By	Authorized Staff Initials	Authorized Witness Initials

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Please stay abreast of all Federal and State regulations to assure DEA compliance in your practice

* Keep bottles in numerical order and start a new sheet each time a new bottle is opened

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RECOMMENDED SHORTCUTS

- For <u>Manual</u> LIQUID Logging-- Weigh Your Controlled Substances
- Example: Ohaus Scout Pro Portable Electronic Balance, 1,500gram Capacity, 0.01gram Readability
- Don't forget to calibrate your scale frequently to assure accuracy of weight
- <u>Technician Suggestion</u>: Use the Pill Eye app to count your pills. (Free on Apple or Google Play). Suggest deleting your picture immediately
- <u>DVM Suggestion</u>: "We also switched to hubless syringes for small doses of drugs like as Bup."

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Controlled Substance Administering & Dispensing Reconciliation Log <u>OPEN</u> Container-<u>PILLS</u>-Example Only

CONTROLLED SUBSTANCE ADMINISTERING & DISPENSING RECONCILIATION LOG

OPEN CONTAINER - PILLS

DRUG NAME: SIZE: STRENGTH: DATE RECEIVED:
MANUFACTURER: DISTRIBUTOR: AMOUNT RECEIVED:

*BOX #: Invoice #: LOT#: NDC# EXPIRY DATE: DATE OPENED:

Date	Case Label or Owner & Patient Demographic Information	Diagnosis	Number of Pills On Hand	Number of Pills Used	Balance of Pills Remaining	Amount Wasted (if Applicable)	Discrepancy Amount (if Applicable)	Balance Post Waste or Discrepancy	Waste or Discrepancy Reason	Ordered By	Authorized Staff Initials	Witness Initials

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Keep bottle/box numbers sequential and use a new sheet when each new bottle is opened.

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Controlled Substance Administering & Dispensing Reconciliation Log <u>OPEN</u> Container-<u>PATCHES</u>- Example Only

CONTROLLED SUBSTANCE ADMINISTERING & DISPENSING RECONCILIATION LOG

OPEN CONTAINER - PATCHES

DRUG NAME: SIZE: STRENGTH: NDC# DATE RECEIVED:
MANUFACTURER: DISTRIBUTOR: AMOUNT RECEIVED:
BOX #: DATE OPENED:
INVOICE#: LOT#: EXPIRY DATE:

Date	Case Label or Owner & Patient Demographic Information	Diagnosis	Number of Patches on Hand	Number of Patches Used	Number of Patches Remaining	Amount Wasted (if applicable)	Discrepancy Amount (if applicable)	Balance Post Waste or Discrepancy	Waste or Discrepancy Reason	Ordered By	Authorized Staff Initials	Witness Initials

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Keep box numbers in sequential order and start a new sheet each time a new box is opened.

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DISCREPANCY LOGGING

AS YOU RECONCILE YOUR CONTROLLED SUBSTANCE RECONCILIATION LOGS, YOU MAY DISCOVER A DISCREPANCY!

IF AN UNRESOLVED DISCREPANCY OCCURS, IT SHOULD BE ENTERED IN YOUR CONTROLLED SUBSTANCE LOGS SHOWING THE DISCREPANCY.

TWO WITNESSES AND A REASON IS ALWAYS REQUIRED

Breakage or spills do not need to be reported as lost. This type of loss must be documented by the registrant and witness on the inventory record as a discrepancy with a reason. Controlled substances that can be recovered after a spill, but cannot be used because of contamination (tablets), must be placed in the disposal/destruction neutralizing medical waste liquid (**Completion of DEA Form 41 required**).

Reference: Title 21 CFR §1301.74 & 1301.76 Please note: The government changes laws frequently. As of March 2023, the information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your hospitalclinic. © Copyright Protected

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Controlled Substance Administering & Dispensing Reconciliation Log OPEN Container-LIQUID- Example Only

Controlled Substance Administering & Dispensing Reconciliation Log

OPEN CONTAINER - LIQUID

DRUG NAME | SIZE | STRENGTH | DATE RECD

MANUFACTURER | DISTRIBUTOR | AMOUNT RECD

formula | INVOICE# | LOT # | Expiry Date | NDC # | OPEN DATE

Date	Case Label or Owner & Patient Demographic Information	Diagnosis	Pre-Weight Balance Grams	Amount Dispensed or Administered mls	Post-Weight Balance Grams	Amount Wasted (if applicable) mls	Discrepancy Amount (if applicable) mls	Balance Post Weight of Waste or Discrepancy Grams	Waste or Discrepancy Reason	Ordered By	Authorized Staff Initials	Authorized Witness Initials

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Please stay abreast of all Federal and State regulations to assure DEA compliance in your practice.

1 Keep bottles in numerical order and start a new sheet each time a new bottle is opened.

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CONTROLLED SUBSTANCE MEDICAL WASTE

Controlled Substances that are drawn up and not used due a change in the patient's condition or treatment change should be entered in your Controlled Substance Open Reconciliation Log as wasted (witness required) and/or entered into your Controlled Substance Medical Waste Log.

Two witnesses and a reason is always required

Reference: Title 21 CFR §1301.76 other security controls for practitioners Please note: The government changes laws frequently. As of March 2023, the information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your hospitalclinic. © Copyright Protected

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Controlled Substance Administering & Dispensing Reconciliation Log OPEN Container-LIQUID- Example Only

Controlled Substance Administering & Dispensing Reconciliation Log

OPEN CONTAINER - LIQUID

DRUG NAME | SIZE | STRENGTH | DATE RECD

MANUFACTURER | DISTRIBUTOR | AMOUNT RECD

NDT/UN | INVOICE# | LOT # | Expiry Date | NDC # | OPEN DATE

Date	Case Label or Owner & Patient Demographic Information	Diagnosis	Pre-Weight Balance Grams	Amount Dispensed or Administered mls	Post-Weight Balance Grams	Amount Wasted (if applicable) mls	Discrepancy Amount (if applicable) mls	Balance Post Weight of Waste or Discrepancy Grams	Waste or Discrepancy Reason	Ordered By	Authorized Staff Initials	Authorized Witness Initials

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Please stay abreast of all Federal and State regulations to ensure DEA compliance in your practice

Keep bottles in numerical order and start a new sheet each time a new bottle is opened

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How To Stay DEA Compliant When Destroying Your Controlled Substance Medical Waste

Title 21 Code of Federal Regulations PART 1304 — RECORDS AND REPORTS OF REGISTRANTS
CONTINUING RECORDS §1304.21 General requirements for continuing records.

- **e) *Record of destruction.*** In addition to any other recordkeeping requirements, any registered person that destroys a controlled substance pursuant to §1317.95(d) or causes the destruction of a controlled substance pursuant to §1317.95(c), shall maintain a record of destruction on a DEA Form 41. The records shall be complete and accurate and include the name and signature of the two employees who witnessed the destruction. **Except, destruction of a controlled substance dispensed by a practitioner for immediate administration at the practitioner's registered location, when the substance is not fully exhausted (e.g., some of the substance remains in a vial, tube, or syringe after administration but cannot or may not be further utilized), shall be properly recorded in accordance with §1304.22(c), and such record need not be maintained on a DEA Form 41.**

- **US Bio Clean States:** "Although the DEA states that it seeks to determine a variety of destruction methods, the only acceptable method of destruction for pharmaceutical wastage **(i.e., drugs dispensed to a patient and not fully used, such as a single syringe with remaining controlled substance) at this time is incineration**.
- Therefore, the only method that currently meets the DEA requirement for both the non-retrievable and destruction standards involves a two-part process:
  - **Wasting the medication into a suitable neutralizing media, such as a Cactus Smart Sink or an Rx Destroyer. A solidifier can also be used for liquid only waste.**
  - **Placing the neutralized container into a non-hazardous pharmaceutical waste container that will be sent out for incineration".**
- **Always check with your State Vet Board, Regional DEA Administration Office and/or Pharmacy Board to see if they will accept this destruction method or require another state-controlled substance medical waste destruction method.**

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Regulatory Requirements and Best Practice Recommendations

DAILY RECONCILIATION OF YOUR BACKSTOCK AND OPEN CONTROLLED SUBSTANCES?

What? Why? When? How?

DEA Wants Your Records To Be "Current, Complete and Accurate"

- **Every registrant is required to keep records pursuant to 21 CFR §1304.03 and shall maintain, on a current basis, a complete and accurate record of each controlled substance ordered, received, stored, administered and dispensed!**
- **Best Practice: Open and Closed Controlled Substance Reconciliation Logs should be reconciled once a day for a day practice and at every shift change in a multi-shift practice. (i.e., Urgent Care, Emergency and Specialty Practices)**

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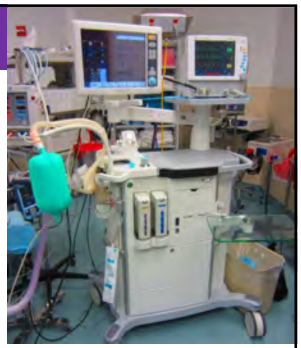
SURGERY & CONTROLLED SUBSTANCE LOGGING REQUIREMENTS

- ✓When controlled substances are removed for use with a patient, they should be logged in both your open controlled substance reconciliation log and your anesthesia monitoring sheet.
- ✓What if I have a separate Controlled Substance box in my OR?



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CLOSE YOUR CONTROLLED SUBSTANCE LOGS EACH YEAR & PERFORM YOUR FEDERALLY REQUIRED BIENNIAL INVENTORY.

1. Best Practice: An annual reconciliation inventory of all your scheduled drugs, (I-IV), should be taken on or about December 31st of each calendar year
2. Best Practice: The date the reconciliation inventory was taken should be written on your annual inventory documents
3. Best Practice: The annual reconciliation inventory form should state if it was taken at the opening or closing of the day
4. Best Practice: Transfer your controlled substances, by Schedule from last year's Controlled Substance Open and Closed Reconciliation Logs to your next logs, by Schedule. (written exercise only)
5. Best Practice: The past year's-controlled substance logs should be permanently closed and retained
6. DEA Federal Biennial Regulations: Require a complete inventory *biennially (every 2 years).*
7. Georgia requires that "a complete inventory of all controlled substances be maintained separately and taken biennially on May 1st, or two (2) years from the day of the last inventory, of every odd-numbered year. Source: 480-28-.04 5b".

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CONTROLLED SUBSTANCE INVENTORY FORM - SAMPLE ONLY -

Controlled Substance Inventory Form: Biennial _______ Annual _______Quarterly__________Initial________

The DEA requires a physical inventory of all controlled substances to be conducted every two years for each registered location. Your state inventory regulations may differ

Reference: 21 CFR 1304.04 & 21 CFR 1304.1 1 Inventory Requirements

Date: Opening of Business Close of Business Page _____ of _____

Registrant:

Registrant Address:

DEA Registration#:

Controlled Substance Name & DEA Schedule	Strength/Dosage Form (i.e. mls, mg, etc.)	Lot Number(s)	Expiration Number(s)	Bottle Volume	Total Number of Bottles	Total Volume

	Name:	Signature:	Date:
Inventory performed by:			
Inventory witnessed by:			

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Prescription Drug Monitoring Program

What is PDMP and do I have to participate?

- **"Georgia Chapter 13 - Controlled Substances, Article 2 - Regulation of Controlled Substances**
- **Part 2 - Prescription Drug Monitoring Program Data Base, § 16-13-65. Exceptions, Universal Citation: GA Code § 16-13-65 (2017)**
  - **Under the exemptions section of the Electronic Data Base Information, the law specifies that this part shall not apply to any Veterinarian**
    Source: GA Code Ann., & 16-13-35".

CHECK WITH YOUR STATE FREQUENTLY: PDMP is being discussed by most Vet Boards and Pharmacy Boards across the United States

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BEST PRACTICE SUGGESTIONS & REGULATORY REQUIREMENTS

STORING & RETAINING YOUR CONTROLLED SUBSTANCE RECONCILIATION LOGS

1. **All current controlled substance logs <u>should</u> be kept in a locked cabinet**
2. **All outdated controlled substance logs should be kept indefinitely, in a locked cabinet and available to any government official who can produce proper ID when he/she asks to see them**
3. **The Federal guidelines require that your Controlled Substance Reconciliation Logs be kept for 2 years.**
4. **<u>"Georgia "Rule 700-12-.04. Record Keeping</u>**

   All patient records must be maintained for a minimum of <u>3 years</u> (including diagnostic imaging and other patient data) by the veterinary facility where the patient received treatment. If treatment is not performed at a veterinary facility, a patient record must be maintained by the veterinarian who provided treatment of the patient".
5. ***Why should I keep my logs longer?***

STORAGE OF CONTROLLED SUBSTANCES

1. **DEA Regulations state that all Controlled Substances should be kept in a securely locked cabinet that is permanently adhered to the wall or floor**
2. **A double locked cabinet is frequently used, but not required by Federal DEA regulations**
3. **Example of differing State Regs: New York requires two locks on your controlled substance cabinet**
4. **If you have a double locked cabinet, you should:**
   a). Limit access to a few trusted nurses/doctors,
   b). Control and account for the keys at all times,
   c). Consider installing a camera above the lockbox,
   d.) Have two different locks and keys, or a key lock and finger pad or combination lock and a finger pad, etc.) to access the controlled substance cabinet,
   e.) Your front door can not be one of your locks.

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How Do I Safeguard My Controlled Substances If I Provide Mobile Services?



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WOULD YOU RATHER PRACTICE MEDICINE OR DO REGULATORY PAPERWORK?

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THREE WAYS TO COVER YOUR COSTS

1. Add a separate controlled substance handling fee
2. Increase your existing dispensing, administration and/or injection fee codes
3. Increase the mark-up on your controlled substances

SHOULD YOU REALLY BE CHARGING THE SAME FEE FOR YOUR LEGEND DRUGS AND YOUR CONTROLLED SUBSTANCES?

1. Admin Time (Logs & Reports)
2. Security Requirements
3. Storage Requirements
4. Regulatory Risk

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FOR EASE OF OPERATION, CONSIDER AN AUTOMATED SYSTEM

Benefits of an Automated System Such as VetSnap, Cubex or Care Direct

1. Logs are completed automatically
2. Digital narcotics logs reduce human error and save significant time
3. Fingerprint or Employee Code only access is more secure and faster than keys
4. Check to see if the system captures charges electronically
5. Check to see if its reports directly to PDMP

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DESTRUCTION OF EXPIRED & UNWANTED CONTROLLED SUBSTANCES (NOT MEDICAL WASTE)

DEA Warns: The destruction of expired or unwanted controlled substances & the destruction of controlled substance medical waste are two areas of extreme confusion! KNOW the DIFFERENCE!

Did you know that the EPA can fine you up to $37,500 per violation for disposing of your controlled substance medical waste incorrectly? That's in addition to the DEA's fines!

DEA's Preferred Method of Destruction? A Reverse Distributor

Georgia requires that all "Outdated pharmaceuticals must be separated, stored, returned or disposed of in accordance with federal, state and local requirements"

Source: Georgia "Rule 700-12-.07. Drugs and Pharmacy.

Reference: Title 21 CFR PART 1317(a)-Disposal of Controlled Substances by Registrants.

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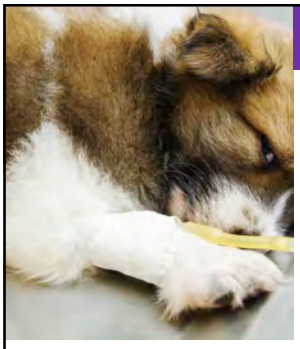

WANT MORE CONTROLLED SUBSTANCE DESTRUCTION INFORMATION TO SHARE WITH YOUR STAFF?

Please Access The Following Sites

1. **www.askjanforhelp.com, click the Blog Tab,**
   Article Entitled: **Commonly ignored controlled substance regulations that can increase your risk and cost you money when audited by the DEA.** By Jan Woods

2. **www.veterinarypracticenews controlledsubstancesnovember 2020janwoods**
   Article entitled: "**Destroying controlled substance waste vs. destroying expired or unwanted meds.** By Jan Woods

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CAN I TRANSFER CONTROLLED SUBSTANCES BETWEEN DEA REGISTRANTS?

1. Remember: Controlled Substances are a "***Closed System***"
2. Registrant's address are specific to location
3. Controlled Substances belong to the Registrant who signed the 222 form
4. You may "TRANSFER " controlled substances between DEA Registrants, if you closely follow the DEA's regulations
5. Schedule II Controlled Substances transfers require a 222 form from the requesting DEA Registrant
6. Schedule III, IV and V's Controlled Substance transfers require an invoice
7. No more than 5% of your annual Controlled Substance inventory may be transferred between DEA Registrants.
8. ***Exception*** *to the 5% Rule?*
9. Can I order and distribute Controlled Substances to my own satellite practices under the 5% Rule?

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PRE-MIXING OF CONTROLLED SUBSTANCES

Draw up and administer or dispense controlled substances when you are ready to use them…….

Large bottles of controlled substances should not be mixed in advance- why?

- Different lot numbers
- Expiration dates vary
- Different manufacturers
- Potential errors & theft
- Cannot guarantee the strength
- Not an FDA approved drug
- No Compounding

Mix controlled substances in the patient's syringe when you're ready to administer. Log completely and correctly.

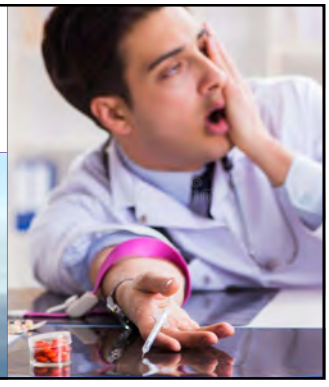
Reference: Title 21 CFR 1304.06 &§1304.21

Reference: 21 CFR 21, 1305, 1311

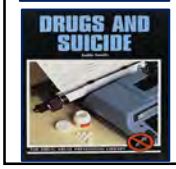
THE OPIOID CRISIS DOESN'T APPLY TO ME! DOES IT?

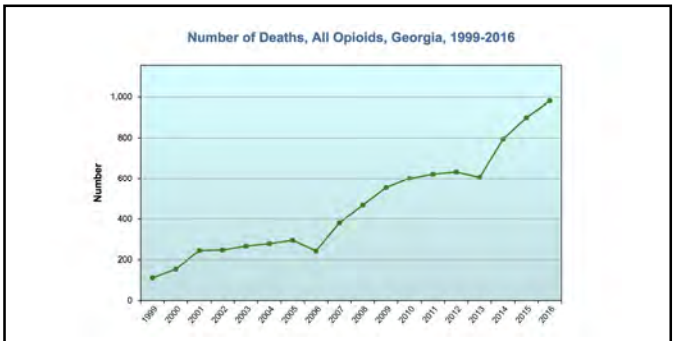
- On average, 130 Americans die every day from an opioid overdose!
- That's the same as an airplane crashing every week. Would you notice?

Source: Jessica Bursztynsky- CNBC-01/16/2019 Health & Science



SOBERING STATISTICS





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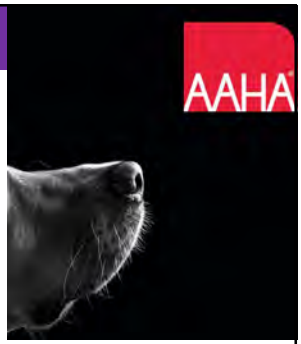
SOBERING STATISTICS

- September 1, 2020: "According to the most recently published CDC provisional data, "more than 87,200 people died from an overdose last year, marking the largest number of overdose deaths ever recorded in a 12-month period".
- "Synthetic opioids (**primarily illicitly manufactured Fentanyl**) appear to be the primary driver of the increases in overdose deaths, increasing 38.4 percent from the 12-month period leading up to June 2019 compared with the 12-month period leading up to May 2020".
- **Results from the first mental health survey of U.S. veterinarians show that the people who care for our beloved pets contemplate taking their own lives at three times the national average. Specifically, the recent study by the Centers for Disease Control and Prevention found that veterinarians suffer from serious psychiatric disorders and feelings of hopelessness and worthlessness at two to three times the rate of the general population.**
- An article published by AAHA.net in 2013 stated that "***over one-half* of AAHA members surveyed said they have worked with a veterinary professional that had an addiction problem".**



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IS THERE AN OPIOID PROBLEM IN VETERINARY MEDICINE?

- Easy Access to Controlled Substances
- Theft/Attempted Theft
- Conspiracy
- Unlawful Distribution
- Record Keeping
- Doctor Shopping
- Trafficking

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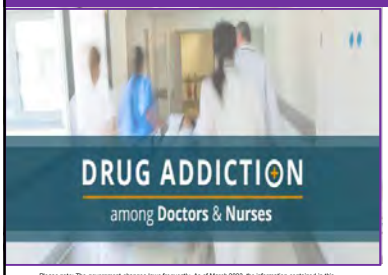
Health Care Professionals and Drug Abuse



Health Care Professionals With The Highest Rates of Drug Abuse

1. Nurses
2. Dentists/Oral Surgeons
3. Pharmacists
4. Anesthesiologists
5. Veterinarians

Preferred Controlled Substances

1. Benzodiazepines
2. Opiates

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WHAT ARE THE DRUG CLASSES WITH THE HIGHEST POTENTIAL FOR DRUG DIVERSION AND ABUSE?

Drug Class	Examples of Drugs Within a Drug Class
Anabolic Steroids	Methyltestosterone, Testosterone
Central Nervous System Depressants	Barbiturates: Pentobarbital Benzodiazepines: Alprazolam, Diazepam
Hallucinogens	Ketamine
Opioids	Diphenoxylate, Fentanyl, Hydrocodone, Hydromorphone, Meperidine, Methadone, Morphine, Oxycodone, Oxymorphone
Stimulants	Amphetamine, Dextroamphetamine, Methamphetamine, Methylphenidate

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Drug Addiction in Health Care Professionals

https://www.deadiversion.usdoj.gov/pubs/brochures/drug_hc.htm

How Do I Recognize a Drug Impaired Co-Worker?
Drug abusers often exhibit similar aberrant behavior. Certain signs and symptoms may indicate a drug addiction problem in a health care professional. Have you observed some of the following signs?

Work absenteeism: Absences without notification and an excessive number of sick days used;

Frequent disappearances from the work site: Having long unexplained absences, making improbable excuses and taking frequent or long trips to the bathroom or to the stockroom where drugs are kept;

Excessive amounts of time spent near a drug supply: They volunteer for overtime and are at work when not scheduled to be there;

Unreliability in keeping appointments and meeting deadlines;

Work performance: Alternates between periods of high and low productivity and may suffer from mistakes made due to inattention, poor judgment and bad decisions;

Drug Addiction in Health Care Professionals

https://www.deadiversion.usdoj.gov/pubs/brochures/drug_hc.htm

Confusion, memory loss, and difficulty concentrating or recalling details and instructions; Ordinary tasks require greater effort and consume more time;

Interpersonal relations with colleagues, staff and patients suffer: Rarely admits errors or accepts blame for errors or oversights;

Heavy wastage of drugs;

Sloppy recordkeeping: Suspect ledger entries and drug shortages;

Inappropriate prescriptions for large narcotic doses;

Insistence on the personal administration of injected narcotics to patients;

Progressive deterioration in personal appearance and hygiene;

Uncharacteristic deterioration of handwriting and charting;

Wearing long sleeves when inappropriate;

Personality changes: Mood swings, anxiety, depression, lack of impulse control, suicidal thoughts or gestures;

Client and staff complaints about health care provider's changing attitude/behavior;

Increasing personal and professional isolation.

What Are My Responsibilities?

https://www.deadiversion.usdoj.gov/pubs/brochures/drug_hc.htm

Even though the vast majority of DEA registered practitioners comply with the controlled substances law and regulations in a responsible and law-abiding manner, you should be cognizant of the fact that drug impaired health professionals are one source of controlled substances diversion. Many have easy access to controlled substance medications; and some will divert and abuse these drugs for reasons such as relief from stress, self-medication, or to improve work performance and alertness.

You have a legal and ethical responsibility to uphold the law and to help protect society from drug abuse.

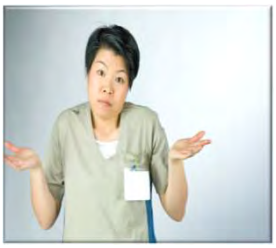
You have a professional responsibility to prescribe and dispense controlled substances appropriately, guarding against abuse while ensuring that patients have medication available when they need it.

You have a personal responsibility to protect your practice from becoming an easy target for drug diversion. You must become aware of the potential situations where drug diversion can occur and safeguards that can be enacted to prevent this diversion

Should I Become Involved?

https://www.deadiversion.usdoj.gov/pubs/brochures/drug_hc.htm

Health care professionals **often avoid dealing with drug impairment** in their colleagues. There is a natural reluctance to approach a co-worker suspected of drug addiction. There is the **fear that speaking out could anger the co-worker, resulting in retribution, or could result in a colleague's loss of professional practice.**



Many employers or co-workers **end up being "enablers" of health care practitioners whose professional competence has been impaired by drug abuse.** Addicted colleagues are often **given lighter work schedules, and excuses are made for their poor job performance. Excessive absences from the work site are often overlooked. Drug impaired co-workers are protected from the consequences of their behavior. This allows them to rationalize their addictive behavior or continue their denial that a problem even exists.**

If you **recognize the aforementioned signs or symptoms in a co-worker, it's time to demonstrate concern.** You may jeopardize a person's future if you cover up or don't report your concerns. Many well-educated, highly trained, and experienced health care practitioners **lose their families, careers, and futures to substance abuse. Tragically, some health care workers have even lost their lives to their drug addiction because the people who saw the signs and symptoms of their drug use refused to get involved.**

By becoming involved, you cannot only help someone who may be doing something illegal, but more importantly, your action could affect the safety and welfare of your addicted employee or coworker AND those patients or the public who may come in contact with him or her.

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AN INEXPENSIVE & VALUABLE RESOURCE

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Suggested Precautions to Avoid Being Taken Advantage of by Drug-Seeking Clients

Source: Partners in Integrity: What Is a Prescriber's Role in Preventing the Diversion of Prescription Drugs (umn.edu)

1. Exercising **caution** with **clients who request** combination of controlled substances;
2. **Determine** the **medical necessity** of controlled substances for your patients;
3. **Documenting thoroughly** when prescribing narcotics or **why choosing not to prescribe;**
4. **Protecting access to prescription pads**;
5. Keeping a **DEA or license number confidential**, **unless disclosure is required by State law;**
6. Ensuring that **prescriptions** are **written clearly** to minimize the potential for **forgery;**
7. Adhering to **strict refill policies and educating your staff why**;
8. Using **State Prescription Drug Monitoring Programs** where required, to monitor patient prescribing before refilling or adding new medications;
9. **Referring patients** with extensive pain management or prescription-controlled medication needs **to specialized veterinarians**;
10. **Communicating & collaborating with pharmacists or police** when suspicious behaviors are observed

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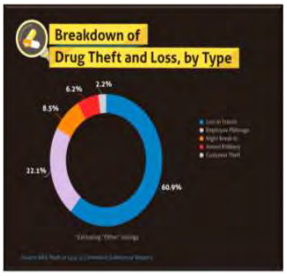
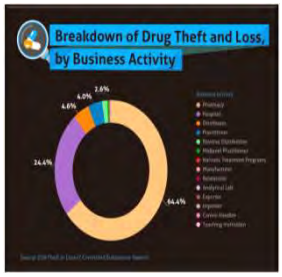
Sobering Statistics





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COMMON DIVERSION & THEFT AREAS IN A PRACTICE

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Procurement and Storage
- Purchase order and packing slip removed from records
- Unauthorized individual orders CS on stolen DEA 222 form
- Product container is compromised

Prescribing
- Prescription pads are diverted and forged to obtain CS
- Prescriber self-prescribes CS
- Verbal orders for CS created, but not verified by the prescriber
- Written prescriptions altered by patients

Preparation and Dispensing
- CS are replaced by product of similar appearance when prepackaging
- Removing volume from pre-mixed solutions
- Multi-dose vial overfill is diverted
- Prepared syringe contents replaced with saline solution

Administration
- CS are withdrawn from an ADC on discharged or referred patient
- Medication is documented as given but not administered to patient
- Waste is not adequately witnessed and subsequently diverted
- Substitute drug is removed and administered while CS are diverted

Waste, Removal, and Destruction
- CS waste is removed from unsecure waste container
- CS waste in syringe is replaced with saline
- Expired CS are diverted from holding area

REPORTING A THEFT OR SIGNIFICANT LOSS

1. Any discrepancy, without resolution, must be immediately reported to the Police & DEA as a theft or significant loss
2. In Georgia:

- Immediately call the police- (you will need the police report)
- A loss or theft of any controlled substance drugs must, within 48 hours of discovery, be reported to the Board, Drug Enforcement Administration and the GDNA.
- A written report on DEA Form 106 must be made regarding any theft or loss of any controlled substances.
- The original and one copy of the report must be sent to the Board, Drug Enforcement Administration and one copy must be sent to the GDNA (40 Pryor Street, #2000, Atlanta, GA 30303) within ten (10) days of the initial receipt of DEA Form 106. The report shall include the following information:

(a)Full name and address of practitioner;
(b)The practitioner's DEA registration number;
(c)The date of theft;
(d)The type of theft;
(e)A list of cost codes, or identification symbols on package(s) stolen; and
(f) A list of controlled substances missing."

Regulatory Reference: CFR 1301.76 & CFR 1301.74

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Employee Quick Theft PreTips

1. If you catch an employee in the act of stealing, causing a significant loss or diverting your controlled substances, call the police immediately and terminate that employee as the police officer escorts the employee out the door.
2. Don't forget to document the entire event in complete detail and place that information in the employee's file for future use. Additionally, if an employee is fired for egregious and provable reasons, most unemployment offices will not allow that employee receive unemployment benefits!
3. Ask your staff if they have any details about the theft or significant loss.
4. Minimally educate your staff about the theft or loss, as failure to do so may cause unnecessary fear and gossip throughout your hospital.
5. Do not compromise the integrity of the ongoing investigation.
6. Let your staff know that you will be pressing charges to the furthest extent of the law when the intruder has been identified!
7. If you suspect that your employee has stolen or caused a significant loss of your controlled substances immediately contact your lawyer, HR consultant and/or your EAP (Employee Assistance Program) professional.

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Your Safety, Your Staff's Safety & The Safety of The Client's & Patient's Should Be A Priority!

1. Do not confront any individual who demands access to a Controlled Substance.
2. Promptly meet the demands of the individual. However, if the individual is not aware that Controlled Substances are maintained in more than one area, attempt to limit loss by providing the requested item(s) from only one source.
3. Mentally create a picture of the individual's height, weight, color of hair and eyes, distinguishing marks, clothing, etc. If possible, to safely do so, observe the automobile or other methods of transportation.
4. Do not impede the individual's departure.
5. As soon as it is safe to do so, call #911 to report the theft or attempted theft.

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1. Form a Safety Committee
2. Staff need to know how to act and what to do. Have an active and well-rehearsed safety plan, with identified safe rooms and a fast escape route to make everybody feel safer.
3. Most local police departments have Education Officers, most are free.
4. Have the Education Police Officer talk with your staff at your next staff meetings.
   - From previous experience, this in-service was one of the most well-received staff meeting I held.
5. Perform background checks on all current and future employees.

INVESTIGATIONS

- The DEA does not make social calls
- If they show up, they want something!

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DEA & GEORGIA INSPECTIONS

"The CSA permits the DEA Administrator to inspect the establishment of any registrant or applicant for registration. (137) DEA regulations express the intent of the agency "to inspect all manufacturers of controlled substances listed in Schedules I and II and distributors of controlled substances listed in Schedule I once each year," and other manufacturers and distributors of controlled substances "**as circumstances may require**."

"(138) **Absent the consent** of the registrant or special circumstances such as an imminent danger to health or safety, **a warrant is required for inspection**. (139) "Any judge of the United States or of a State court of record, or any United States magistrate judge" may issue such a warrant "within his territorial jurisdiction." (140) **Issuance of a warrant requires probable cause. (141) The CSA defines probable cause as "a valid public interest in the effective enforcement of this subchapter or regulations thereunder sufficient to justify" the inspection at issue. (142)"**

Source: The Controlled Substances Act (CSA): A Legal Overview for the 116th Congress October 9, 2019

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DEA & GEORGIA INSPECTIONS

Georgia has the right to inspect any veterinary facility as stated in "Rule 480-28-.11 Inspection of Records:

The Board, GDNA and their representatives shall have the authority to conduct inspections or audits of all records of drugs received and/or disposed of by any practitioner. The Board or GDNA personnel shall have the authority to examine and copy all such records, and to examine and inventory all controlled substances. It shall be the responsibility of all practitioners possessing such drugs or records to make the same available for such inspection, copying, examination, or inventorying by said Board or GDNA representatives. Any practitioner possessing controlled substances or records may request that such an inspection be made, and upon receipt of such written request, the GDNA Director shall make, or cause to be made, without unreasonable delay, an inspection in compliance with said request."

"(a) Every dispensing practitioner shall ensure that all controlled substances and/or dangerous drugs are purchased from and returned to firms that have a current permit issued by the Georgia State Board of Pharmacy. The practitioner shall obtain and maintain a copy of each such firm's current Georgia State Board of Pharmacy permit which shall be made available during any GDNA inspection."

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MOST COMMON VIOLATIONS CITED BY THE DEA

1. Incomplete or Inferior Record Keeping
2. Lack of Security
3. Failure to Prevent Drug Theft/Diversion
4. Reporting of Unresolved Discrepancies and Significant Losses
5. DEA Registration & Licensing Issues
6. Prescribing Outside the Scope of Practice
7. Failing to Maintain Required Documents
8. Failing to Dispose of Controlled Substances According to Regulations
9. Failing to Maintain Inventory Records According to State & Federal Regulations
10. Prescribing without a documented & established Veterinarian-Client-Patient Relationship (VCPR)

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DEA's Citations, Civil and Criminal Fines

Citation Penalties are $15,876 each

Criminal and Civil penalties can easily exceed $65,000 per line and/or per pill!

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Subject	Law	Regulation	Violation	Violation 2	Penalty
ARCOS (Reports)	21 USC § 827(d)	21 CFR 1304.33(a),(b)	21 USC § 842(a)(5)		$15,876.00
Authorized Activities	21 USC § 822(b)	21 CFR 1301.21	21 USC § 841		Penalty
Central Recordkeeping	21 USC § 827(d)	21 CFR 1304.04(a)	21 USC § 842(a)(5)		$15,876.00
Complete & Accurate Records (Inventory)	21 USC § 827(b)(1)	21 CFR 1304.11(a)	21 USC § 842(a)(5)		$15,876.00
Inventories (Biennial Inventory)	21 USC § 827(a)(1)	21 CFR 1304.11(c)	21 USC § 842(a)(5)		$15,876.00
Inventories (Dispensers/Researchers)	21 USC § 827(b)(1)	21 CFR 1304.11(e)(3)	21 USC § 842(a)(5)		$15,876.00
Notification of Change of Address	21 USC § 827(d)	21 CFR 1301.51	21 USC § 842(a)(5)		$15,876.00
Order Forms (Missing Information)	21 USC § 828(a)	21 CFR 1305.15(a)	21 USC § 842(a)(5)		$15,876.00
Order Forms (No Signature)	21 USC § 828(a)	21 CFR 1305.06(d)	21 USC § 842(a)(5)		$15,876.00
Order Forms (Power of Attorney)	21 USC § 828(a)	21 CFR 1305.05	21 USC § 842(a)(5)		$15,876.00
Order Forms for CI & CII	21 USC § 828(a)	21 CFR 1305.03	21 USC § 843(a)(1)		Penalty
Order Forms for Dispensing of CS/Professional Practitioners	21 USC § 828(a)	21 CFR 1305.04(a)	21 USC § 841		Penalty
Order Forms for Two Years	21 USC § 828(c)(1)	21 CFR 1305.13(a)(c)	21 USC § 842(a)(5)		$15,876.00
Records (Destruction/DEA 41s)	21 USC § 827(b)(1)	21 CFR 1304.21(e)	21 USC § 842(a)(5)		$15,876.00
Records (Keep for Two Years/CS)	21 USC § 827(b)(1)	21 CFR 1304.04(a)	21 USC § 842(a)(5)		$15,876.00
Records (Keep for Two Years/Machines)	21 USC § 830(a)(1)	21 CFR 1304.04(a)	21 USC § 842(a)(10)		$15,876.00
Order Forms for Two Years	21 USC § 828(c)(1)	21 CFR 1305.13(a)(c)	21 USC § 842(a)(5)		$15,876.00
Reports (Theft/Loss of CS)	21 USC § 827(d)	21 CFR 1301.74(c)	21 USC § 842(a)(5)		$15,876.00
Complete & Accurate Records/Continuing Records)	21 USC § 827(a)(3)	21 CFR 1304.21(a)	21 USC § 842(a)(5)		$15,876.00

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DEA INSPECTIONS

- ✓ Make periodic, unannounced inspections to audit controlled substances
- ✓ Agents Include: Diversion and/or Enforcement and/or other regulatory officials
- ✓ Typically, Diversion Investigators are who visit first
- ✓ Expect at least two agents
- ✓ Assure that the Registrant & Licensees are compliant with the Controlled Substance Act
- ✓ The DEA is a law enforcement agency that can assess civil and criminal charges and penalties.

- ✓ *Civil and criminal penalties can include:*
  - ➢ *Letter of Admonition*
  - ➢ *Monetary fine to the Licensees and Registrant*
  - ➢ *Suspension or revocation of a DEA license*
  - ➢ *Permanent loss of DVM license*
  - ➢ *Prison Sentence*

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BE PREPARED

1. DEA inspections can occur at anytime of the day
2. All staff must be knowledgeable of and well rehearsed in all Federal, State, Veterinary Board and Pharmacy Board Regulations, so they can handle an audit or answer an Agent's questions
3. Staff should know your:
   a) Controlled Substance Policies and Procedures
   b) Security System
   c) Ordering System
   d) Storage System
   e) Logging System
   f) Administration and Dispensing Systems
   g) Medical Record Retrieval
   h) Controlled Substance Retrieval

Always Remember It's a Closed System

DEA Registration
Note: this should also be posted in a visible place in your office
- State Practitioner License. Check your State Regs

Note: this should also be posted in a visible place in your office
- Your most recent biennial(or annual) inventory. Check your state regs
- DEA form 222 records or CSOS for Schedule II substances

Your Purchasing Records
- Invoices for Schedule III, IV, and V substances

Your purchasing records
- Receiving and Closed Reconciliation Logs/Records
- Open Controlled Substance Reconciliation Logs/Records
- DEA Form 106 records

Report of Theft or Loss of Controlled Substances
- DEA Form 41 records

Registrant Record of Controlled Substances Destroyed
- Medical Waste Destruction logs/records
- Expired/Unwanted Destruction log/records
- Other records you keep that document accounting of controlled substances
- Power of Attorney
- Revocation of Power of Attorney
- Security System Company Information
- Copy of the Practice's Floor Plan
- Staff Training Manual, DEA's Practitioner's Manual and Controlled Substance Policy

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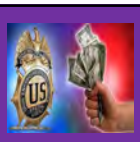
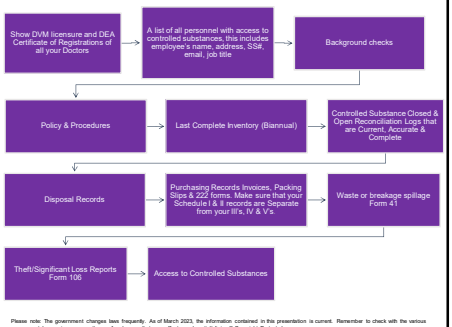
CREATE A DEA AUDIT READINESS FILE

SOURCE: CMS CONSULTING FIRM



Be Prepared to Provide Any or All of the Following to The DEA Agent(s)

ONLY When Asked & Be Specific!



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WHAT IS THE DEA REALLY LOOKING FOR WHEN THEY AUDIT MY VETERINARY PRACTICE?

Applicable Regulations Can Be Found In Sections of the 21 CFR, Section # 1300

- **DVM Registration**
  - Regulations Found in Part # 1301
- **Practice Security, Which Includes Theft and Theft Prevention**
  - Regulations found in Part #1301.7 - 1301.76
- **Employee Screening (aka Background Checks)**
  - Regulations found in Part #1301.90 – 1301.93
- **Labeling and Packaging**
  - Regulations found in Part #1302
- **Records and Recordkeeping**
  - Regulations can be found in Part #1304

Applicable Regulations Can Be Found In Sections of the 21 CFR, Section # 1300

- **Order Forms**
  - Regulations can be found in Part #1305
- **Prescriptions**
  - Regulations can be found in Part #1306
- **Destruction and/or Disposal**
  - Regulations can be found in Part #1307
- **Schedules of Controlled Substances & List I & II Chemicals**
  - Regulations can be found in Parts #1308 & 1310
- **Miscellaneous**:
  - Training
  - Policies & Procedures
  - SOP's
  - Loss and Diversion

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DEA AUDIT CHECKLIST

Controlled Substances Audit Checklist	Primary DEA Registrant's Name & DEA #:_____	Practice Name:_____		
APPLICABLE SECTIONS 21 CFR 1300- End	Date	Auditor's Name & Title:_____		
Registration - 21 CFR 1301	Audit Questions	Yes	No	Notes and/or Recommendations
	Does every DVM on site possess a current DEA registration?			
	If some of the DVMs are not registered with DEA, are they exempt from registration requirements as defined in 21 CFR 1301.22(b) "MANUFACTURERS, DISTRIBUTORS, AND DISPENSERS OF CONTROLLED SUBSTANCES EXCEPTIONS TO REGISTRATION AND FEES Source: §1301.22(b) (Abbreviated) Exemption of agents and employees; affiliated practitioners. (b) "An individual practitioner who is an agent or employee of another practitioner registered to dispense controlled substances may, when acting in the normal course of business or employment, administer or dispense (other than by issuance of prescription) controlled substances if and to the extent that such individual practitioner is authorized or permitted to do so by the jurisdiction in which he or she practices, under the registration of the employer or principal practitioner in lieu of being registered himherself". Special Note: A DVM may not prescribe controlled substances if he/she does not have a DEA number			
	Does the practice have a current Primary DEA Registrant who orders the controlled substances for all the DVM registrants in the practice to use?			
	Specify expiry date of each DVM's registration			
	What schedules of controlled substances are covered under registration (CI, CII, CIII, CIV, CV)?			
	Is the DEA registration assigned specifically to the practice that is being audited (e.g., does DEA Registration address match the practice's address)?			

What To Do When The DEA Arrives…..

1. Ask the reason for the inspection
2. Review the agent's credentials
3. Ask for a photo ID
4. Ask for their contact information
5. Ask for their business card(s)
6. You have the right to decline their visit.
7. Take the agents to a private conference room so they have room to work
8. Ask for an opening conference
9. Sign the Notice of Inspection (DEA Form 82)
   This form grants the DEA agents "informed consent" from the Registrant and Licensee permission to search your property/practice.

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Throughout The Inspection

- ✓ Expect the agents to walk around your practice for a physical inspection
- ✓ Go everywhere with the Agents and take copious notes
- ✓ May audit controlled substances to track your usage from the last annual and/or biannual inventory and/or purchase orders
- ✓ Expect the DEA agent to ask to see your controlled substance logs & ordering/storing/dispensing/administration/prescribing systems
- ✓ May ask the Registrant/Licensees to physically count, weigh or inventory the controlled substances
- ✓ May copy any records
- ✓ If any original documents off site, they must provide you a receipt, called a DEA Form 12
- ✓ Keep a list, copies and pictures of all records and controlled substances removed from your practice

Please note: The government changes laws frequently. As of March 2023, the information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your hospital/clinic. © Copyright Protected

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Throughout The Inspection

Most Importantly:

- ✓Take notes of all recommendations & observations
- ✓Be courteous, polite and cordial
- ✓Don't argue or debate with the Agent(s)
- ✓Ask questions regarding the DEA's findings, so corrective actions can be be taken
- ✓Answer all questions honestly and concisely as possible
- ✓Be truthful & don't speculate
- ✓Ask for clarification if you do not understand a question
- ✓Do not admit guilt
- ✓Do not offer your opinion or volunteer information
- ✓Do not talk about past audits, accidents or incidents
- ✓Walk around with the auditor during the inspection
- ✓If you don't have the answer, tell the agent you will find someone who does
- ✓Ask for a closing conference so you can learn how to "think like an auditor" in the future!

Please note: The government changes laws frequently. As of March 2023,the information contained in this presentation is current. Remember to check with the various governmental agencies or your attorney for changes that may affect your hospital/clinic. © Copyright Protected

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INSPECTORS MAY ALSO REQUIRE…

- ***List of up to three individuals for whom the Inspector should ask for upon arrival at the facility" "Primary Contact, Secondary Contact & Tertiary Contact. Information required: Name, Title, E-mail, Phone***
- **State Registration History: "Date registered with city, county, state, name, addresses, if moved, all owners by % of ownership, etc.".**
- **What is the current status of the Registrant's DEA Registration? (Valid, Name, Number, etc.)**
- ***Who is responsible for controlled substances? (Name or Names)***
- **Has the Registrant granted Power of Attorney to any individuals for ordering controlled substances? (Name or Names)**

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INSPECTORS MAY ALSO REQUIRE…

- ***Is each DVM registered with the DEA? (Y or N) If no, how do non-registered DVMs prescribe controlled substances?***
- **Does the registrant currently possess any controlled substance samples?**
- ***Primary and Secondary Supplier of Controlled Substances***
- **Storage and Security- How Stored and How Accessed, etc.**
- **How are the prescription pads stored? Electronic or manual?**

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INSPECTORS MAY ALSO REQUIRE…

- **How are unexecuted controlled substances order forms stored? (222's)**
- ***Does the facility take possession of patients' personal controlled substances? If so, describe how patient's personal controlled substances are stored and the records are maintained.***
- **Inventory Dates and system of maintenance. How recorded? Include receipts, 222s, invoices and other documents acknowledging receipt of controlled substance II's.**
- **Describe the system of ordering and receiving Schedules II, III, IV & V controlled substances. Provide forms, receipts, how maintained and logged, etc.**

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INSPECTORS MAY ALSO REQUIRE…

- Describe how the records are maintained for the administration of controlled substances? How are the logs maintained? How are the automated dispensing technology reports retrieved, etc.?
- Describe effective security measures to maintain effective control for the prevention of controlled substance theft and diversion".
- *HAVE A CONTROLLED SUBSTANCE POLICY that covers the above information*

Source: Extracted from North Carolina Clinic Application for Renewal DHHS 226-D and are a good resource for every state

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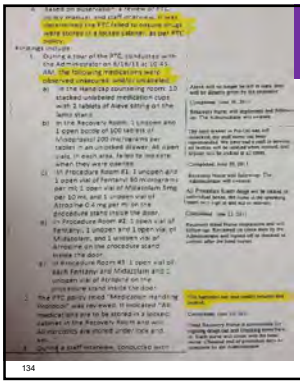

WHAT TO DO IF A PLAN OF CORRECTION (POC) IS REQUIRED BY THE DEA!

- ✓ You will receive a letter of findings
- ✓ The letter is from the government and requires your immediate attention
- ✓ You can expect to provide a very comprehensive written, Plan of Correction, (aka POC)
- ✓ Link each correction in your POC to the actual citation/regulation quoted in your letter
- ✓ You must assure that all identified areas are corrected precisely and concisely
- ✓ Meet or beat all required time frames
- ✓ Keep all copies
- ✓ Follow-Up with the Agent

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IN CLOSING: TO REDUCE YOUR RISK

1. REMEMBER THE DEA'S CLOSED SYSTEM

2. KNOW YOUR STATE'S-CONTROLLED SUBSTANCE REGULATIONS AND THE FEDERAL DEA REGULATIONS, AND FOLLOW THE MOST STRINGENT

3. LEARN HOW TO THINK LIKE A DEA AUDITOR!

4. ALWAYS STAY CURRENT, COMPLETE AND ACCURATE WITH YOUR CONTROLLED SUBSTANCE RECONCILIATION LOGS AND RECORDKEEPING TO HELP MINIMIZE YOUR RISK!

QUESTIONS? Ask Jan For Help!

If you have any regulatory or practice management questions, please feel free to contact me anytime

Jan Woods, Co-Founder of Ask Jan For Help, LLC

- Email: jan@askjanforhelp.com
- Website: www.askjanforhelp.com
- Cell/Text: 913-302-4999

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QUESTIONS?

AskJan
askjanforhelp.com

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