Question

A relative calls you to ask how she can stop her 4-year old Cockapoo from begging for food at the table. You advise her not to pay any attention to the dog when it is showing this behavior. What behavioral principle is this?

- Negative reinforcement
- Noncontingent reinforcement
- Extinction of operant conditioning
- Avoidance learning
- Negative punishment

Explanation - Operant conditioning is the use of consequences to modify the occurrence of a behavior. In this case, the dog has learned that begging behavior has previously been met with positive consequences (i.e. being fed or receiving attention). Extinction is the lack of any consequence following a behavior. When a behavior is inconsequential, producing neither favorable nor unfavorable consequences, it will occur with less frequency. When a previously reinforced behavior is no longer reinforced with either positive or negative reinforcement, it leads to a decline in the response.

Negative reinforcement occurs when a behavior is followed by the removal of an aversive stimulus thereby increasing that behavior's frequency. An example is a loud noise continuously sounding until a lever is pressed, upon which the loud noise is removed. This will encourage the behavior of pressing the lever.

Negative punishment, also called punishment by contingent withdrawal, occurs when a behavior is followed by the removal of a favorable stimulus, such as taking away a child's toy following an undesired behavior, resulting in a decrease in that behavior.

Avoidance learning is when a behavior results in the cessation of an aversive stimulus. For example, holding your ears to shield them from a loud, high-pitched sound helps avoid the aversive stimulation of that obnoxious sound.

Noncontingent reinforcement is the delivery of reinforcing stimuli regardless of the animal's behavior. This causes that behavior to decrease because it is not required in order to receive the reward.

Question

The two 9-week-old Weimaraners in the photo came in to see you about 4 hours ago for puppy exams. They both appeared healthy and you administered pyrantel orally, applied selamectin topically, and vaccinated both dogs against distemper and parvovirus. They now present and the dog on the left in the photo has developed angioedema primarily affecting the head. The sibling is unaffected. Before you complete your exam, the dog becomes very restless and starts vomiting. Which is the most appropriate intervention to reverse the signs of anaphylactic shock?

- Administer prednisone orally
- Administer diphenhydramine intravenously
- Administer meloxicam intravenously
- Administer diphenhydramine orally
- Administer epinephrine intravenously

Explanation - The dog's clinical presentation is consistent with anaphylaxis from a vaccine reaction. The most important intervention for dogs in anaphylactic shock is intravenous epinephrine, which can reverse bronchial constriction and portal-mesenteric vasodilation that occurs.

Additional supportive measures such as fluids to support the dog's blood pressure are also critical. Because of the rapid onset, antihistamines and oral medications do not provide sufficient benefit. Intravenous diphenhydramine can potentially cause severe hypotension and is not recommended.

Question

A 10 year old female spayed Schipperke dog presents to your emergency clinic for profuse vomiting for several days and weakness. You perform initial bloodwork and find that her blood pH is 7.6 and her potassium is 1.8 mmol/l. She weighs 12 kg. You immediately start her on intravenous fluids supplemented with potassium. What is the maximum rate of intravenous potassium that would be considered safe to administer to this dog?

- 3 mEq/hr
- 24 mEq/hr
- 18 mEq/hr
- 6 mEq/hr
- 12 mEq/hr

Explanation - The maximum safe rate of potassium infusion is 0.5 mEq/kg/hr. As this dog weighs 12 kg, the maximum is 6 mEq/hr. This is one of those rates that you need to know. Administering potassium more rapidly than this can result in fatal arrhythmias.

Question

The five-year old female Doberman Pincsher in the photo below whelped 8 puppies 4 weeks ago. She presents to you dehydrated and lethargic with temperature of 104.9 F. Her left inguinal mammary gland is hard, painful, hot, and reddish purple as seen in the image. What is the most likely diagnosis?

- Pyometra
- Hypocalcemia
- Mammary carcinoma
- Gynecomastia
- Mastitis

Explanation - With the recent history of whelping, fever, and a firm, red, painful mammary gland, the most likely diagnosis is mastitis. The puppies should be removed and weaned and warm compresses applied to the gland to promote draining. Antibiotics that penetrate the barrier between the bloodstream and mammary gland should be considered such as trimethoprim-sulfa, clindamycin, and cephalosporins.

Question

A 6-week old male intact puppy has presented to your clinic after being bitten 4 days ago. On physical examination, there is a moderate amount of purulent discharge noted from the bite wound on the left antebrachium. The wound is approximately 2 cm in length. Which antibiotic is LEAST appropriate for this patient?

- Doxycycline
- Metronidazole
- Penicillin

- Cephalexin

Explanation - Doxycycline can result in delayed bone growth and discoloration of the teeth in young growing animals and is thus contraindicated. The other medications listed do not have a direct effect on young growing animals and are safe to administer; however, one must consider the likely pathogen present in the wound, what type of susceptibility pattern it has, as well as the likely penetration of your antibiotic into the area where you want it to exert its effect prior to making a choice.

Question

Which of these is **not** an important potential side effect of **ketoconazole** administration?

- Decrease GFR
- Anorexia
- Adrenal insufficiency
- Elevated liver enzymes
- Inhibition of hepatic microsomal enzymes

Explanation - The answer is decrease GFR. Ketoconazole is **hepatotoxic** and will cause elevated liver enzymes that should be monitored closely. It is a potent inhibitor of P450 enzymes and can significantly affect metabolism of other drugs. It can cause **adrenal insufficiency** and actually is sometimes used as an **alternative treatment for Cushing's**. Anorexia is a common and important side effect, especially in cats. The kidneys and GFR are not significantly bothered by ketoconazole.

Question

On the morning of a beautiful summer day, a five-year old, male German Pointer played unattended in the backyard garden. During the following 24 hours the right side of the dog's face became swollen as seen in the image below. The dog developed urticaria and became lethargic, unable to walk and vomited several times. Which of the following are the best treatment options for the likely condition?

- Drain the swelling, administer antibiotics
- Furosemide, oxygen, and nitroglycerin
- Induce vomiting, administer activated charcoal, intravenous fluids
- Diazepam, methocarbamol, and non-steroidal anti-inflammatories
- Antihistamines, corticosteroids, and epinephrine

Explanation - The dog has angioedema +/- anaphylaxis, likely caused by an insect bite or sting. A snake bite should also ruled out by trying to visualize the bite or questioning the owners. This is a type I hypersensitivity reaction and is treated by removing the offending agent if possible and providing supportive care with anthistamines, corticosteroids, and epinephrine as needed.

Question

Two months ago, you prescribed one of your feline patients a course of pradofloxacin (Veraflox), a fluoroquinolone antibiotic, to treat an abscess. The owner of the cat also owns a small dog who now has pyoderma with Staphylococcus susceptible to fluoroquinolones. She asks you if she can use the remaining pradofloxacin for her dog that she has left over from her cat. What should you tell her?

- Pradofloxacin is not for use in dogs due to bone marrow suppression
- Pradofloxacin is not for use in dogs as it has been associated with development of acute blindness

- Pradofloxacin is not for use in dogs as it has been associated with renal toxicity
- Pradofloxacin is a good choice for her dog's skin infection
- Pradofloxacin is not a good choice for a skin infection because it is does not achieve adequate levels in the skin

Explanation - Pradofloxacin (Veraflox) is an orally administered, liquid fluoroquinolone antibiotic that was FDA approved in 2012 for use in cats to treat skin infections (wounds and abscesses) caused by Pasteurella multocida, Streptococcus canis, Staphylococcus aureus, Staphylococcus felis, and Staphylococcus pseudointermedius. The drug is not for use in dogs and it has been shown to cause **bone marrow suppression** resulting in severe thrombocytopenia and neutropenia.

Enrofloxacin has been associated with retinal degeneration in cats, particularly at high doses and is used with caution for this reason.

Question

What is the correct post-exposure prophylaxis protocol after being exposed to rabies for an unvaccinated human?

- Five injections of approved rabies vaccine
- Three injections of human rabies immune globulin followed by 2 injections of approved rabies vaccine
- Two injections of approved rabies vaccine
- Injection of human rabies immune globulin followed by 4 injections of approved rabies vaccine

Explanation - The correct answer is injection of human rabies immune globulin followed by 4-5 injections of approved rabies vaccine. If you are not vaccinated, then you will need an injection of human rabies immune globulin immediately after exposure followed by 4-5 injections of an approved rabies vaccine IM over 2-4 weeks. If you have been vaccinated, all that is needed are two injections of an approved rabies vaccine 3 days apart. PEP is not required for accidental injection of animal rabies vaccine into a human.

Question

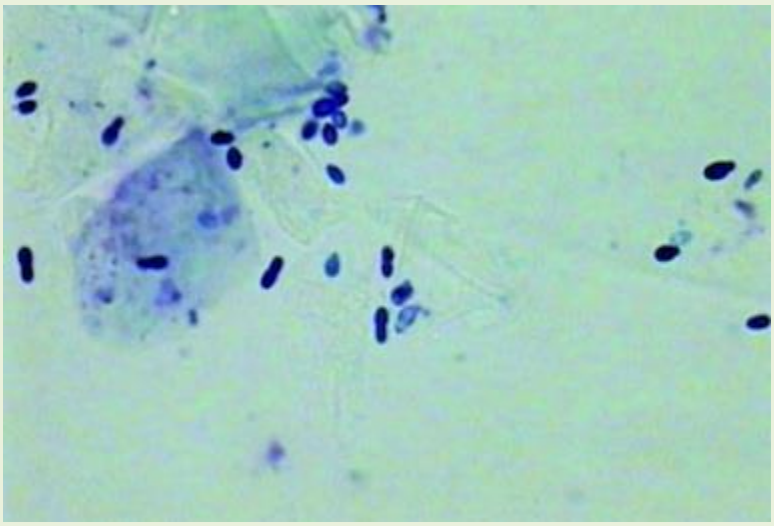
What adverse reaction are Dobermans predisposed to when using trimethoprim-sulfa?

- Vestibular disease
- Gastrointestinal ulcer formation
- Pancreatitis
- Hypersensitivity reaction

Explanation - The correct answer is **hypersensitivity reaction**. Doberman Pinschers are more susceptible to hypersensitivity reactions from sulfa drugs as compared to other breeds. Type III reactions can result in immune complex disease which can cause arthritis, nephritis, and uveitis. Other possible side effects from this class of antibiotics that are not specific to the Doberman include **KCS**, hepatitis, and blood dyscrasias.

Question

A four-year old Labrador Retriever presents with an aural hematoma of the right ear. Given the cytological findings from an ear swab as seen in this image, which one of the following ear cleaning combinations will you not send home with your patient?



- Thiabendazole, neomycin, and dexamethasone
- Neomycin, bacitracin, and polymyxin B
- mometasone, gentamicin, clotrimazole
- Gentamicin, betamethasone valerate, and clotrimazole

Explanation - This patient has a high number of malassezia yeast visualized on cytology. This organism can be responsible for perpetuating otitis externa. It is not unusual to see yeast in the ear canal of a dog; however, yeast numbers of greater than 5 per high powered field can be considered abnormal.

Other clinical signs of otitis externa may include ear pain, pruritis, aural discharge, bad odor, and neurologic signs.

Effective treatments for uncomplicated otitis externa typically contain an antifungal, antibiotic, and an anti-inflammatory. Since this dog primarily has a yeast infection it is imperative that the ear medication prescribed has an anti-fungal. The answer choices provided are commonly known as triple antibiotic ointment (neomycin, bacitracin, and polymyxin B), Tresaderm (thiabendazole, neomycin, and dexamethasone), Mometamax (mometasone, gentamicin, clotrimazole), and Otomax (gentamicin, betamethasone valerate, and clotrimazole). Note that the triple antibiotic

ointment does not contain an anti-fungal.

Additionally, the ears should be cleaned before applying the ear medication. Many ear cleaners contain antifungals too (Triz Ultra + Ketoconazole), which may enhance treatment response.

Question

A 9 year old German Shepherd Dog presents to you for a geriatric exam. The dog is difficult to handle and you need to sedate the dog with a combination of acepromazine and midazolam prior to completing your exam which is unremarkable. Due to the dog's age and breed, you recommend a complete minimum database including a CBC, chemistry panel, urinalysis, thoracic radiographs, and abdominal ultrasound, and the owner agrees. Which of the following findings could be expected in this patient and should not be considered abnormal?

- Proteinuria and low urine specific gravity
- Cardiomegaly and an enlarged vena cava
- Hepatomegaly and increased hepatic echogenicity
- Elevated blood urea nitrogen and creatinine
- Splenic enlargement and decreased hemoglobin concentration

Explanation - Acepromazine causes marked splenic dilation with blood and a corresponding decrease in hematocrit concentration. If you were to notice those findings, it is most likely iatrogenic and not due to underlying disease.

Question

Which of the following is an osmotic diuretic?

- Spironolactone
- Enalapril
- Mannitol
- Acetazolamide
- Furosemide

Explanation - The correct answer is mannitol. Mannitol is filtered at the glomerulus and osmotically pulls water into the tubules. Furosemide is a loop diuretic, acting at the loop of Henle. Enalapril is an angiotensin-converting enzyme (ACE) inhibitor. Spironolactone is an aldosterone antagonist. Acetazolamide is a carbonic anhydrase inhibitor.

Question

Which of the following problems is seen more frequently in male dogs than females?

- Addison's disease (hypoadrenocorticism)

- Aggression
- Urinary tract infections
- Mammary cancer
- Adenocarcinoma of the anal sac

Explanation - More males than females present to veterinary behaviorists for aggression. The other diseases listed have been reported or suggested to occur more frequently in females in some reports.

Question

You want to give a pre-surgical dose of antibiotics to your patient. You have a 1 gram vial of cefoxitin that is reconstituted with 5 mls of sterile water. You want to give a 20 mg/kg dose to a 25 kg dog. How many mls do you give?

- 5
- 7.5
- 2.5
- 1.25

Explanation - The resulting concentration of the cefoxitin solution is 1gm/5ml or 200mg/ml.

The desired dose is 20mg/kg x 25 kg = 500 mg
200 mg/ml x _____ ml= 500 mg,
Therefore the answer is 2.5

Question

Which of the following are effects of non-steroidal anti-inflammatory drugs that are non-selective COX inhibitors?

- Gastrointestinal ulcer formation, destruction of platelets, inhibition of neutrophil function
- Gastrointestinal ulcer formation, inhibition of platelet function, analgesia
- Inhibition of inflammation, destruction of platelets, reduction of fever
- Reduction of swelling, analgesia, inhibition of neutrophil function

Explanation - The correct answer is gastrointestinal ulcer formation, inhibition of platelet function, analgesia. NSAIDs reduce inflammation and pain by blocking the COX-1 and COX-2 pathways. Non-selective COX inhibitor side effects include GI ulcers, inhibition of platelet function, renal damage, and reduction of fever.

Question

What is a potential side effect of administering diethylstilbesterol in an incontinent bitch?

- Bone marrow suppression
- Hemorrhagic diarrhea
- Keratoconjunctivitis sicca
- Hemolysis

Explanation - The correct answer is bone marrow suppression. This is a hormone, and like many other hormones, can result in bone marrow suppression. This is one of the reasons veterinarians choose to use **phenylpropanolamine** for urinary incontinence. This drug is a weak alpha agonist and works on the muscles of the urethral which results in increased sphincter tone. KCS is more likely to occur with sulfa containing drugs. Most drugs can cause some sort of diarrhea as a side effect, but rarely will it be hemorrhagic.

DIETHYLSTILBESTROL
DES

Prescriber Highlights -

- Synthetic estrogen used in dogs primarily for estrogen responsive incontinence and other estrogen indications (prostatic hypertrophy, estrus induction, etc)
- Prohibited for use in food animals (potential carcinogen)
- Teratogen
- Many potential adverse effects: blood dyscrasias, GI effects, cystic endometrial hyperplasia and pyometra (non-spayed females), feminization (males), neoplasia
- Drug interactions
- Availability issues

PHENYLPROPANOLAMINE HCL

Prescriber Highlights -

- Sympathomimetic used primarily for urethral sphincter hypotonus
- Caution: glaucoma, prostatic hypertrophy, hyperthyroidism, diabetes mellitus, cardiovascular disorders or hypertension
- Adverse Effects: restlessness, irritability, hypertension, anorexia
- Drug Interactions

Question

What profile would you expect in a dog with hypervitaminosis D?

- Low Ca, High P
- High Ca, High P
- Low Ca, Low P
- High Ca, Low P

Explanation – The correct answer is High Ca, High P. Excessive intake of vitamin D is associated with an increase in 25-hydroxyvitamin D3 levels. At high levels, 25-hydroxyvitamin D3 competes

with 1,25-dihydroxyvitamin D3 for its receptors on the intestines and bone causing increased absorption of Ca and P from the intestinal tract and resorption of bone causing increased levels of circulating Ca and P. A common source of confusion is that this is in contrast to PTH which causes high Ca but generally causes unchanged or normal phosphorus because it also enhances renal phosphorus excretion.

Question

Which digit has been partially amputated in the picture below? (hint: this is the right forelimb of a dog)

- 3rd digit
- 2nd digit
- 4th digit
- 1st digit

Explanation - The correct answer is 3rd digit. Remember that a dog's digits are numbered from 1 to 5, starting medially with the small 1st metacarpal that is associated with the dewclaw (essentially like the thumb on a primate). This digit is not well visible in the photograph, but you should still be able to see that it is the third digit that has had the ungual crest and process cut.

Question

You have just arrived at the clinic at which you are working, and a clinician promptly approaches you and informs you that your Bichon Frise patient's CVP (central venous pressure) is -1 cmH2O. What is your assessment of the animal's condition?

- The animal is hypovolemic
- Normal

- CVP is not a good measure of circulating volume
- Overhydrated

Explanation - The correct answer is the animal is hypovolemic. CVP is a decent measure of circulating volume. A normal CVP can range from 0-10 cmH2O. It is important to interpret the CVP in light of your patient's clinical signs and to observe the trend in CVP measurements. Usually, a patient with a CVP ranging between -5 and 5 cmH20 is considered to be hypovolemic.

Question

Which of these drugs can cause aplastic anemia in humans?

- Sulfadiazine
- Enrofloxacin
- Clindamycin
- Chloramphenicol

Explanation - The correct answer is chloramphenicol. Even though this is a human question, this is something you do need to know for board exams. This potential side effect of chloramphenicol is why it is not allowed for use in food animals and that it is used with caution in companion animals. The person administering this drug should take precautions to avoid coming into contact with it.

Question

In a well-leveraged practice, which of the following jobs should be performed by a veterinarian?

- Induction and monitoring of anesthesia for a splenectomy
- Prescribing medications to a patient with roundworms
- Perform a complete blood count
- Taking a thoracic radiograph
- Restrain a patient for a rectal exam

Explanation - In a well-run practice, veterinarians should be performing the tasks that they alone are qualified to do, namely to make a diagnosis and prognosis, prescribe drugs, and perform surgery.

Technical tasks should be performed by technicians including surgical assisting, laboratory procedures, radiography, anesthesia, patient treatment and nursing, and client education.

Veterinary assistants have no AVMA-accredited training programs and act as support for veterinarians and technicians, for tasks that do not require the higher level of training or expertise.

These generally include patient handling and restraint and assisting with various radiographic, laboratory, and pharmaceutical tasks. It is critical that they have documented skill and safety training for any technical tasks that they perform.

Question

A 2-year old female spayed Coonhound presented for unilateral swelling of the muzzle. She lives on a large piece of property and has free reign of the backyard so the owners did not witness the event. They mentioned that coyotes and rattlesnakes have been seen in their yard before, as well as bees and spiders. On physical exam, there is significant firm swelling of the left muzzle and pain on palpation. There are no obvious signs of external trauma. You perform a blood smear in-house and find that she is thrombocytopenic and has 3+ echinocytes. PT and PTT were both severely elevated. What should be recommended to the owner?

- Pain medication and plasma transfusion to treat the coagulopathy
- Pain medication and antivenom
- Pain medication and warm compressing
- Pain mediation, sedation and thorough examination for wounds and a bee stinger

Explanation - Even without external evidence of fang punctures, the presence of echinocytes, thrombocytopenia and prolonged PT and PTT in conjunction with the unilateral painful muzzle swelling is supportive of a rattlesnake bite.

Other possible causes of echinocytes include hemangiosarcoma and liver disease which are not likely in the present scenario. Bee stings and spider bites can cause pain and unilateral or bilateral muzzle swelling depending on the location but echinocytes should not be present. 25% of rattlesnake bites are dry bites but the presence of echinocytes indicates toxin within the blood so antivenom should be administered immediately.

The main side effect of antivenom is anaphylaxis but serum sickness can occur 1-2 weeks post treatment. **Venom can be neurotoxic, coagulopathic, or a hybrid**. There are three different types of antivenom available. The product produced by Fort Dodge is FDA approved but only treats the coagulopathic venom. Antivipmin is USDA but not FDA approved and treats both neurotoxic and coagulopathic venom. Crofab is a human product that also treats both but is extremely expensive. Plasma will not correct the coagulopathy since the toxin directly affects clotting factors.

Question

What is the approximate resting energy requirement for a 25 kg dog?

- 800 kcal/day
- 500 kcal/day
- 1400 kcal/day
- 1000 kcal/day

Explanation - The correct answer is 800 kcal/day. There are many formulas for calculating RER and they all should work out to be pretty close to this. The formula used here is body weight (kg) to the 0.75 power times 70. (70 * BW^0.75).

Because you will not have access to a calculator on your exam, another formula that has been recommended for this calculation is **((30 X BW) + 70).** Note that the results will be different compared to the (70 * BW^0.75) formula but they both should get you close enough to the correct answer.

Question

If you have 25% mannitol and you wish to give 500 mg per kg to a 15 kg dog, how much should you give?

- 30 mls
- 60 mls
- 3 mls
- 300 mls

Explanation - The correct answer is 30 mls. 25% corresponds to 250 mg/ml strength. At a dose of 500 mg/kg, the total dose for a 15 kg dog should be 7,500 mg which divided by 250 mg/ml equals 30 mls.

Question

You have a 6-year old female spayed Cocker Spaniel with immune mediated hemolytic anemia (IMHA), and would like to start her on azathioprine and prednisone. Which one of the following is NOT a reported possible side effect of azathioprine?

- Nephrotoxicity
- Acute pancreatitis
- Gastrointestinal upset
- Bone marrow suppression
- Hepatotoxicity

Explanation - Nephrotoxicity is not a reported side effect of azathioprine. All others on this list have been reported as side effects or have been associated with the use of azathioprine. GI upset is the most common of the 4 listed, although it is still relatively infrequent. The other 3 listed side effects are uncommon, but can be life-threatening, so they must be discussed with the owner before starting treatment.

Cats are more sensitive to these side effects than dogs because of a deficiency in thiopurine

methyltransferase, the enzyme used to metabolize azathioprine. Azathioprine should be used with caution, if at all, in cats.

Question

The dog in the photograph was vaccinated earlier in the day. What type of allergic reaction is occurring?

- Type II
- Type IV
- Type I
- Type III

Explanation - The correct answer is type I. Type I hypersensitivity is IgE-mediated and results in immune mediated hypersensitivity. Type II hypersensitivity is an antibody-dependent reaction and occurs due to IgG or IgM made against normal self-antigens or some foreign antigen that resembles some molecule on the surface of host cells. Type III hypersensitivity is an immune complex-mediated reaction. This is caused when soluble antigen-antibody complexes form in large amounts and overwhelm the body instead of being normally removed by macrophages in the spleen and liver. Type IV is considered a delayed hypersensitivity and is cell-mediated. T8-lymphocytes will be sensitized to an antigen and differentiate into cytotoxic T-lymphocytes. T helper 1 type T4-lymphocytes become sensitized to an antigen and produce cytokines.

Question

Which of the following best describes Type III hypersensitivity?

- An immediate hypersensitivity reaction involving the interaction of IgE and mast cell degranulation
- A delayed hypersensitivity reaction involving antigen presenting cells, antigen and T lymphocytes
- An immune complex hypersensitivity involving the interaction of circulating antigen-antibody complexes in blood vessel walls causing neutrophil emigration and tissue damage
- An immediate hypersensitivity reaction involving the interaction of IgG to antigens on body tissues

Explanation - There are four types of hypersensitivity reactions. Type III is characterized by antigen-antibody complexes. Type I is the immediate hypersensitivity reaction mediated by IgE, whereas Type II involves IgG and body tissues (i.e. RBCs). The delayed hypersensitivity reaction (IV) involves the presentation of antigen through antigen presenting cells to lymphocytes.

Question

Blood lactate is a commonly measured parameter in clinical practice as a reflection of anaerobic metabolism. Which of the following is an end-product of glycolysis and is also converted to lactate under anaerobic conditions?

- Succinate
- Pyruvate
- Acetyl coenzyme-A (acetyl Co-A)
- Glucose 6-phosphate
- Citrate

Explanation - During the anaerobic process of glycolysis, a single molecule of glucose forms 2 molecules of **pyruvate** in the cell cytoplasm. Under aerobic conditions, pyruvate is converted to acetyl coenzyme-A and fed into the TCA cycle. In anaerobic conditions, pyruvate is preferentially transformed to lactate in an effort to maintain ATP production and allow regeneration of NAD (required for continued glycolysis).

Question

In health, lactate is primarily metabolized by what organ and should measure less than what value (mmol/L)?

- Liver; less than 5 mmol/L
- Kidney; less than 5 mmol/L
- Liver; less than 2.5 mmol/L
- Kidney; less than 2.5 mmol/L

Explanation - Lactate is primarily metabolized by the liver and, in health, it should be low (< 2.5 mmol/L). The kidneys and skeletal muscle also metabolize lactate to a lesser extent. Lactate is typically associated with anaerobic metabolism and has been used to predict survival in gastric dilatation volvulus in dogs and colic and sepsis in horses.

Question

An anti-inflammatory dose of corticosteroid, injected systemically, is CONTRAINDICATED in which of the following situations:

- A dog, pregnant 2 weeks
- A dog, pregnant 1 month
- A sow, pregnant 1 month
- A cat, pregnant 1 month
- A cow, pregnant 8 months
- A mare, pregnant 8 months

Explanation - Of the species listed, only the cow is known to be susceptible to corticosteroid-induced parturition. By injecting her with corticosteroids, you risk premature (by 1.5 months) delivery of her calf.

Question

You are evaluating the blood work of a dog that is hit by a car. These are the following findings: HCO3-12 mM/L, Total CO2-14 mM/L, Lactate-2.3 mM/L (normal= 0.5-2.0mM/L). What is your assessment?

- Respiratory alkalosis
- Metabolic acidosis
- Metabolic alkalosis
- Respiratory acidosis

Explanation - The correct answer is metabolic acidosis. A low bicarbonate and total CO2 level is consistent with a metabolic acidosis. An elevated blood lactate of greater than 2.0 mM/L implies that there is anaerobic metabolism occurring in this patient as a result of inadequate tissue perfusion, perhaps due to bleeding and trauma.

Nothing can be said about respiratory acidosis or alkalosis because no PaCO2 or pH is provided.

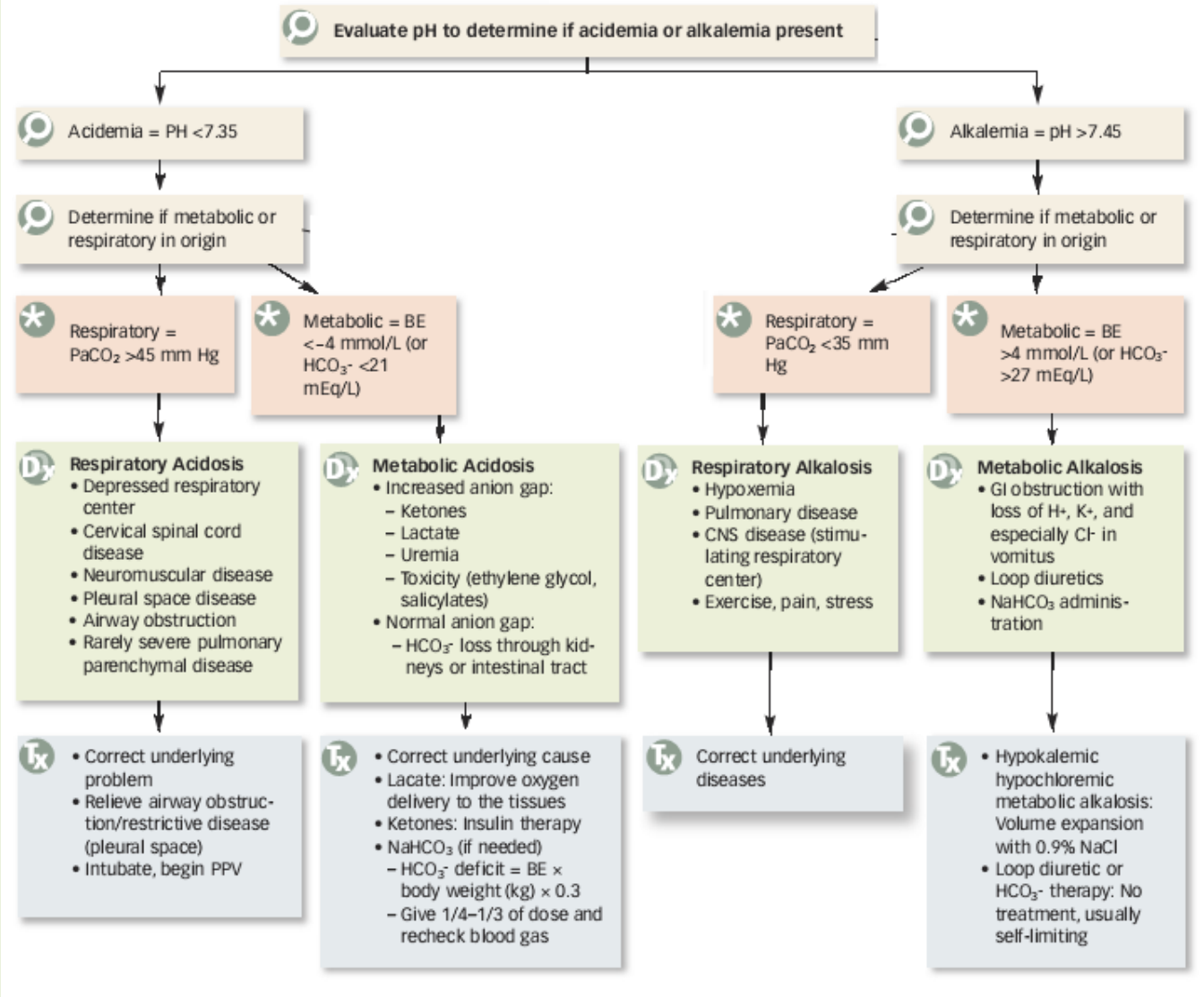

Evaluate pH to determine if acidemia or alkalemia present
Acidemia = PH <7.35
Alkalemia = pH >7.45
Determine if metabolic or respiratory in origin
Determine if metabolic or respiratory in origin
Respiratory = $PaCO_2$ >45 mm Hg
Metabolic = BE <–4 mmol/L (or HCO_3^- <21 mEq/L)
Respiratory = $PaCO_2$ <35 mm Hg
Metabolic = BE >4 mmol/L (or HCO_3^- >27 mEq/L)
Dx
Respiratory Acidosis
• Depressed respiratory center
• Cervical spinal cord disease
• Neuromuscular disease
• Pleural space disease
• Airway obstruction
• Rarely severe pulmonary parenchymal disease
Dx
Metabolic Acidosis
• Increased anion gap:
– Ketones
– Lactate
– Uremia
– Toxicity (ethylene glycol, salicylates)
• Normal anion gap:
– HCO_3^- loss through kidneys or intestinal tract
Dx
Respiratory Alkalosis
• Hypoxemia
• Pulmonary disease
• CNS disease (stimulating respiratory center)
• Exercise, pain, stress
Dx
Metabolic Alkalosis
• GI obstruction with loss of H^+, K^+, and especially Cl^- in vomitus
• Loop diuretics
• $NaHCO_3$ administration
Tx
• Correct underlying problem
• Relieve airway obstruction/restrictive disease (pleural space)
• Intubate, begin PPV
Tx
• Correct underlying cause
• Lacate: Improve oxygen delivery to the tissues
• Ketones: Insulin therapy
• $NaHCO_3$ (if needed)
– HCO_3^- deficit = BE × body weight (kg) × 0.3
– Give 1/4–1/3 of dose and recheck blood gas
Tx
Correct underlying diseases
Tx
• Hypokalemic hypochloremic metabolic alkalosis: Volume expansion with 0.9% NaCl
• Loop diuretic or HCO_3^- therapy: No treatment, usually self-limiting

Table 1. Normal Values for Blood Gases

	Arterial	Venous
Canine		
pH	7.35–7.45	7.35–7.45
PO_2 (mm Hg)	90–100	30–42
PCO_2 (mm Hg)	35–45	40–50
HCO_3^- (mEq/L)	20–24	20–24
BE (mmol/L)	–4– +4	–4–+4
Feline		
pH	7.34 ± 0.1	7.30 ± 0.08
PO_2 (mm Hg)	102.9 ± 15	38.6 ± 11
PCO_2 (mm Hg)	33.6 ± 7	41.8 ± 9
HCO_3^- (mEq/L)	17.5 ± 3	19.4 ± 4
BE (mmol/L)	–6.4 ± 5	–5.7 ± 5

Question

Interpret the following blood gas results from a 4 year old female spayed dog: Base excess= -8, Anion gap=18, pH 7.30, pCO2=29.

- Normal
- Metabolic Acidosis, Respiratory Alkalosis
- Metabolic Acidosis, Respiratory Acidosis
- Metabolic Alkalosis, Respiratory Alkalosis
- Metabolic Alkalosis, Respiratory Acidosis

Explanation - The correct answer is metabolic acidosis, respiratory alkalosis. The normal base deficit/excess of a dog is about -2 +/- 3. This means that this dog has a base deficit and therefore a metabolic acidosis. Although this dog has a base deficit, she still has a normal anion gap (18 +/-6 mM/L). There is a slight acidemia as normal pH is approximately between 7.35-7.45. Finally, normal pCO2 is approximately 40. This dog is hyperventilating and blowing off CO2. In other words, she is blowing off acid; therefore she has respiratory alkalosis. Causes of metabolic acidosis with a normal anion gap can include loss of bicarbonate due to diarrhea or vomiting.
