

Rabbit Medicine

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Introduction

Rabbits belong in the order Lagomorpha. Rabbits may be encountered as pets, commercial operations for fur and meat as well as colonies used in research. They are prone to many diseases that occur in other mammals but there are some that appear unique to rabbits. Improper husbandry, diet, and breeding schemes are likely the main factors that predispose rabbits to these diseases.

Anatomy and Special Features

Rabbits have open rooted teeth that grow continuously. In captivity, the incisors and molars may require trimming/floating to maintain normal conformation. Teeth abnormalities occur more commonly in rabbits with improper diets or those with trauma or malformations of the oral cavity. Rabbits do not have the ability to vomit and are prone to gastric impactions due to dehydrated feed material and trichobezoars. They have a long intestinal tract that ends in a thin-walled cecum. The cecum relies on a predominance of gram-positive bacteria for fermentation of feeds. This characteristic limit the type of antibiotics that can be used in rabbits since gut dysbiosis occurs commonly. This is also the site of production of cecotrophs or "night" feces. Cecotrophs are fecal material rich in nutrients which rabbits will re-ingest mostly at night. Signs of diarrhea in a rabbit should be addresses immediately. Rabbits have a gall bladder but cholestatic disease is not a common presentation.

Their urinary system is unique with a single papillae and calyx leading from the kidney to the ureters. Rabbits excrete a large amount of calcium in the urine as well as porphyrins. Urine color can vary from yellow to orange/red and the consistency can be very thick and viscous. Some owners will mistake normal urine coloration with hematuria. Examination of the patient and urine sample are necessary to differentiate the two. Cytologic exam of the urine is often enough to identify red blood cells. Alternatively, a urine test strip ca be utilized.

Other features include a well-developed dewlap on the neck region as well as multiple scent glands (submandibular, anal, and inguinal) used to mark territory. Rabbits require nail trims but should not be declawed. Their eyes are placed laterally and protrude from the orbit which makes them prone to corneal ulcerations. Also because of the location of the optic nerve, their visual fields dorsally and ventrally are very limited so they must move their head up or down respectively. A challenging anatomical feature is a small oral cavity which makes it challenging to perform endotracheal intubations for anesthesia. Blind intubation of rabbits requires skill and practice, alternatively the use of a semi-rigid endoscope can be used to visualize the glottis and guide the tube into the trachea. They are obligate nose breathers and can become dyspneic when stressed. Rabbits have large vascular ears that aid in thermoregulation.

Husbandry and Diet

Rabbits can be housed indoors, outdoors or both. They should not be allowed to roam free around the house as they are prone to chewing electric cords, furniture and other potentially harmful items. They can be litter trained and should be kept in a well-ventilated solid bottom cage. The cage should be large enough to accommodate an area for defecation, an area for food and water and an area for resting. If kept outside, part of the cage can be wired to allow for urine and feces to drain through. They can be trained to defecate on the wire section, but a solid section is recommended to avoid pododermatitis. In addition, the outside cage should be in a shaded, well-ventilated area and have a shelter from rain. Outside rabbits should be closely monitored during the summer as temperatures greater that 85°F and high humidity can lead to heat stroke.

Rabbits are herbivorous, hind gut fermenters. Their diet should consist of free choice grass hay with a limited amount of fresh vegetables and pellets. Hay is required to maintain proper wear of the teeth and promote gut motility. Leafy greens (red leaf and romaine lettuce) help provide fermentable fiber for production of cecotrophes. Foods high in calcium oxalate content (spinach, alfalfa, mustard and collar greens and dandelions) should be avoided because rabbits normally excrete a large amount of calcium in the urine as compared with other species. Therefore, any calcium rich feeds can increase the chances of urolithiasis. A small amount of rabbit pellets (1/4 cup per 4 pounds of body weight) can be offered but these should be high in fiber (>16% - 18%) and low in protein (<20%). Water should always be available, especially during the summer, and can be provided in a bottle or bowl. It is important to measure food intake and ensure the bottles do not leak.

Venipuncture

Venipuncture can be performed from the jugular, cephalic, lateral saphenous, or ear veins using a 25-to-27-gauge needle. If using the ear veins, you must be careful to avoid trauma to the vessel which may lead to necrosis of the distal ear. Catheters are best placed in the cephalic or lateral saphenous veins. The peripheral/marginal ear veins can be used for venipuncture and catheterization but if emboli occur, the distal aspect of the ear can necrotize. A central ear artery is also present and should be differentiated from the vein when placing catheters.

Therapeutics

Fluids can be administered at a maintenance rate of 60 to 100 ml/kg/day with the high end of the dose used in smaller species. Intravenous administration is preferred in critical patients. An important consideration is the avoidance of antibiotics with a strong predilection for gram positive bacteria as these can alter the gut flora and lead to enteritis/enterotoxemia. Fluoroquinolones, potentiated sulfa drugs, chloramphenicol and metronidazole have been used successfully in rabbits. Fipronil is toxic to rabbits and should never be used.

Diseases

Dental Disease

Malocclusions can occur in rabbits offered soft diets that do not allow proper wear of the teeth. Congenital abnormalities and trauma can also lead to malocclusions. The incisors and molars should be examined during every physical exam using a speculum or an otoscope. Look for evidence of excess growth of the maxillary molars on the buccal surface and on the lingual surface for the mandibular teeth. In severe cases this will be accompanied by ulceration of the tongue. Rabbits with dental disease often present for decreased appetite or difficulty eating and excess salivation with wet fur around the chin area. There are rabbit specific dental instruments available for trimming and floating their teeth. In addition to overgrown teeth, tooth root abscesses and periodontal disease are commonly seen in rabbits. In these cases, a CT scan is preferred over radiographs as it will allow to assess the full extent of the disease to better plan the therapeutic approach.

Gastrointestinal Disease - Ileus

Unfortunately, gastrointestinal disease is the cause of death for many rabbits. A comparison could be made with horses and colic although the etiologies differ slightly. Ileus can be functional or mechanical. Functional ileus may be associated with dehydration, stress, pain, and hypocalcemia. Mechanical ileus is caused by trichobezoars, dried feed material in the stomach or intestines, or foreign body. Ileus can also alter the gut flora creating a dysbiosis. Stress likely plays an important role in this process and rabbits should be maintained in a quiet environment away from barking dogs or loud noises. A diet low in fiber and high in proteins or carbohydrates also plays a role in the occurrence of gastrointestinal disease in rabbits. High fiber diets are essential for the health of the gut and maintenance of gut flora. Boredom or behavior problems leading to excess grooming can lead to trichobezoars. All these factors are linked and play a role in the clinical signs observed in rabbits. These patients will present with a history of improper diet and husbandry, anorexia or decreased appetite, and reduced fecal output. As the disease progresses, they will become painful, lethargic, and depressed. Physical exam may reveal dehydration and a painful abdomen. The abdominal palpation may reveal gas distention, a soft mass in the cranial abdomen or both. A complete blood count, chemistry panel, radiographs, and ultrasound are often needed for the diagnosis of ileus and to attempt differentiation between functional and mechanical although this is not always possible. Attempt to obtain radiographs without anesthesia to avoid further slowdown of the gut. Diagnosis of trichobezoars may not always be obvious and require serial radiographs in a 24 to 48 hours period. If ingesta or a mass is observed in the stomach, but it does not appear to change location, then you are likely dealing with a trichobezoar. Any rabbit presenting for ileus should be treated aggressively. Fluid therapy, analgesia and nutritional support are the mainstay of therapy. Antibiotics may also be considered if dysbiosis or enteritis is suspected. Intravenous or intraosseous fluid therapy is the preferred route. In addition, oral hydration is recommended to aid in rehydration of the dried feed material or trichobezoar. Nutritional support is also essential in these patients to help maintain the gut flora. However, it becomes a difficult decision if an obstruction is suspected. We recommend a commercial critical care diet formulated for small mammals (Oxbow Critical care or Lafeber Emer Aid IC Herbivore). Pain control is also essential in these cases as increased pain will continue to perpetuate the ileus. A combination of a mu opioid and an NSAID (meloxicam) is often used initially. The prognosis for these cases will depend on the severity upon presentation and the presence of a trichobezoar or an obstruction. Those with suspected obstruction usually have a worse prognosis and are more challenging to treat. Medical therapy with IV CRI combinations of lidocaine, ketamine, metoclopramide, and fentanyl or butorphanol may help some rabbits overcome functional ileus. If mechanical

ileus with obstruction at the stomach is suspected or diagnosed, surgery should be performed as soon as possible while the rabbit is more metabolically stable to increase the prognosis for survival. When gastrotomies are performed soon after presentation the prognosis for recovery is good. Prognosis decreases significantly when surgery is delayed.

In addition to bloat and trichobezoars, rabbits can present for enteritis because of an infectious agent, improper diet, or related to antibiotic use. Salmonellosis, colibacillosis (*E. coli*), and Tyzzer's disease (*Clostridium piliforme*) are some of the bacterial causes of enteritis in rabbits. These should be treated with enrofloxacin pending culture and sensitivity. Some viruses and parasites can also lead to enteritis but are less common.

Respiratory Disease

Pasteurella multocida is the most common pathogen of the respiratory system in rabbits. This bacterium causes what is commonly known as snuffles, a disease that shows up as a rhinitis with nasal and ocular discharge with progression into the ear leading to torticollis, ataxia, and a permanent head tilt. Other systemic effects can occur but are less common. Treatment with antibiotics will help suppress the disease but is rarely curative. Proper hygiene and isolation will prevent the spread to other rabbits. Other bacteria can also cause signs of respiratory diseases and pneumonia.

Parasitic Disease

Rabbits are susceptible to many of the common gastrointestinal parasites as other mammals with coccidia being one of the most common. An important parasite of rabbits is *Encephalitozoon cuniculi*, an obligate, intracellular microsporidian parasite that causes neurologic, ovular and/or renal disease. Affected animals will undergo progressive deterioration leading to severe head tilt, ataxia, and paresis/paralysis. While some thrive for a long period with only a head tilt, these animals can deteriorate quickly. The diagnostic test of choice is both IgM and IgG antibody titers. Treatment with fenbendazole or ponazuril is recommended but response to therapy is widely varied depending on severity of the disease.

There are various ectoparasites (fleas, mites) that can infect rabbits. Fipronil is toxic to rabbits and should never be used. Other flea and mite products such as ivermectin, imidacloprid and selamectin are safe and effective in rabbits.

Liver Lobe Torsion

Rabbits are prone to liver lobe torsion, which the right or caudate liver lobe being more commonly affected. Most rabbits present with non-specific clinical signs of hyporexia, lethargy and depression. Chemistry panel usually reveals elevated AST and ALT. Abdominal ultrasound is used to confirm liver lobe torsion via doppler showing decreased or lack of blood flow to the liver lobe(s). Surgery is the preferred treatment but there are reports of some cases recovering with supportive care, however there is no long term follow up to determine if those animals survive the event. Prognosis with early detection and surgery is good.

Rabbit Syphilis

Treponema cuniculi is a gram-negative spirochete that causes rabbit syphilis, which is sexually transmitted or by direct contact with the lesions. Typical lesions are hyperkeratosis and sores on the anogenital, nasal, lips, and eyelid regions. Treatment of choice is injectable penicillin, and they have good response to therapy.