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RABBITS

Intestinal Disorders

BASIC INFORMATION

DEFINITION

Disorders and diseases of the intestine

SYNONYMS

Enteritis, foreign body, intestinal stasis, gut stasis, ileus, obstruction, gastrointestinal hypomotility/stasis, rabbit gastrointestinal syndrome, typhlitis, clostridial enteritis, clostridial enterotoxemia, enterotoxicosis, coccidiosis, proliferative enteritis/enteropathy/enterocolitis, histiocytic enteritis

SPECIAL SPECIES CONSIDERATIONS

- Rabbits are unable to vomit owing in part to a well-developed cardiac sphincter.
- Rabbits produce two types of feces: hard fecal pellets and cecotrophs. The latter are derived from the cecum and are re-ingested by the rabbit.
- As hindgut fermenters, rabbits host a wide variety of nonpathogenic microbes (bacteria, fungi, protozoa) in their cecum, many of which are vital to normal fermentative and digestive processes.
- Rabbits are vulnerable to dietary imbalances, which can result in cecal dysbiosis and alterations in proper gastrointestinal tract motility. Rabbits require regular ingestion of high-fiber diets consisting of grass and grass hays. Diets insufficient in fiber (such as seed mixes or pellet-only rations) can lead to gastrointestinal hypomotility and prolonged cecal retention times.
- Reduced food intake can rapidly result in hepatic lipidosis and ketoacidosis.

EPIDEMIOLOGY

SPECIES, AGE, SEX

- Infectious causes of enteritis are rare in adults. Adult rabbits have highly acidic gastric contents (pH 1 to 2), the acidity of which increases slightly during cecotroph ingestion (pH 3). Suckling rabbits have less acidic gastric contents (pH 5 to 6.5); this allows passage of some microbes to colonize the cecum and may also allow the passage of potentially pathogenic bacteria (e.g., susceptibility to pathogenic bacteria [*Escherichia coli, Clostridium* spp.] is greater in 3-week-old than in 6-week-old).
- Gastrointestinal hypomotility is seen most often in middle-aged to older rabbits.

GENETICS AND BREED PREDISPOSITION

- Gastric pyloric hypertrophy reported in New Zealand white breed
- Megacolon syndrome of homozygous spotted rabbits
- Long-haired breeds may be more susceptible to the development of intestinal obstruction secondary to re-ingestion of compressed fecal hair pellets.

RISK FACTORS

- Low-fiber diets linked with gastrointestinal hypomotility and increased cecal retention time
- Inappropriate diets containing grains, cereals, and fruits and lacking sufficient fiber may increase risks of hypomotility and cecal dysbiosis. High-carbohydrate diets are linked with increased risk of bacterial enteritis, especially clostridial enteritis, owing in part to their utilization of carbohydrates as fermentable substrate.
- Recent stressor or underlying disease: any underlying disease in rabbits can accompany gastrointestinal hypomotility, hence it is imperative to carry out a thorough physical examination
- Obesity may increase risk of hepatic lipidosis in anorectic rabbits.
- Inappropriate antibiotic use

- Contaminated environments and unsavory husbandry conditions
- Presence of multiple potential pathogens may induce a synergistic "copathogen" scenario in enteritis complex.

CONTAGION AND ZOONOSIS Salmonellosis presents potential zoonosis.

GEOGRAPHY AND SEASONALITY Rabbits moult biannually (spring and fall). Moulting rabbits may ingest more hair during these times, and this may predispose to the development of compressed fecal hair pellets and to subsequent re-ingestion and gastrointestinal obstruction.

ASSOCIATED CONDITIONS AND DISORDERS

- Gastrointestinal hypomotility/stasis
- Mucoid enteropathy
- Dysautonomia
- Coccidiosis
- Bacterial enteritis (e.g., *E. coli, Clostridium* spp.)
- Viral enteritis (e.g., rotavirus, coronavirus)
- Intestinal neoplasia
- Toxins (e.g., lead)

CLINICAL PRESENTATION

DISEASE FORMS/SUBTYPES Gastrointestinal hypomotility/stasis, enteritis, typhlitis

HISTORY, CHIEF COMPLAINT Anorexia, reduced appetite, weight loss, lethargy, weakness, small fecal pellets, reduced fecal output, perineal fecal soiling, diarrhea

PHYSICAL EXAM FINDINGS

- General: range from no abnormal findings to hunched posture/bruxism indicative of pain, shock, and dehydration
- Rabbits with gastrointestinal obstruction present acutely with pain, hypovolemic shock (bradycardia, weakness, pallor, hypothermia), and collapse and require immediate emergency care.
- Fecal staining of perineum or diarrhea: true diarrhea in rabbits accompanies lack of hard fecal pellets. The concurrent presence of hard fecal pellets and perineal fecal soiling indicates soft, poorly formed, or noningested cecotrophs rather than diarrhea. Cecotrophal soiling of the perineum is often mistaken for diarrhea.
- True diarrhea is more common in young rabbits and is uncommon in adults.
- Hematochezia and melena are rarely seen in rabbits.
- Stomach palpation is important in distinguishing hypomotility, ingesta accumulation, and obstruction.
  - Normally, the stomach is readily palpated as nonpainful, soft, and supple.
  - In hypomotile states, accumulated ingesta may result in a palpably enlarged stomach with doughy contents that can remain pitted when depressed, and that progress to firm noncompressible contents in more severe cases.
  - In acute gastrointestinal obstruction, gastric dilatation results (air, fluid), especially on the left side caudal to the ribs. Extreme distention and tympany of the stomach can occur.
- Intestinal palpation can vary with the underlying disorder.
  - Normally, the intestines are readily palpated as nonpainful and devoid of large areas of gas or ingesta accumulation. Depending on the phase of digestion, hard fecal pellets may be palpated in the distal colon.
  - In gastrointestinal disease, there may be no abnormal findings, intestinal dilatation, intestinal fluid distention, intestinal impaction, or intestinal "doughiness," and pain is possible. Large fluid and gas accumulation in the intestines is often indicative of less acute conditions.

ETIOLOGY AND PATHOPHYSIOLOGY

- Normal transit time for ingesta through small intestine is 10 to 60 minutes.
- Small intestine is relatively devoid of resident microbes.
- Much HCO_3^- is secreted into the duodenum to neutralize acidic digesta.
- Terminal portion of ileum (sacculus rotundus) contains an ileocecocolic valve that prevents backflow into the ileum.
- Colonic transit time for cecotrophs is 1.5 to 2.5 times faster than for hard feces.
- Rabbits produce on average 150 hard fecal pellets per day.
- The cecum, the largest organ in the abdominal cavity, holds about 40% of total ingesta. Fermentation of digestible fiber and production of volatile fatty acids occur within the cecum, with resulting cecotrophs passed and re-ingested by the rabbit. Cecotrophs serve as an important source of volatile fatty acids (energy), protein, and vitamins, and are important for cecal recolonization.
- Diet plays a key role in gastrointestinal well-being. A healthy cecal environment is governed by many factors and relies on a steady supply of fermentable fiber substrate. Cecal microflora is predominated by *Bacteroides* spp.; however, a mix of aerobic and anaerobic organisms is also present, including some potentially pathogenic bacteria in small numbers (e.g., *Clostridium* spp.). Alterations in the cecal environment (pH and floral population) can favor the proliferation of pathogenic bacteria.
- The fusus coli is a section of colon (separating proximal and distal portions) that is responsible for governing colonic motility. It is particularly sensitive to catecholamines, which can produce a reduction in gut motility.
- Rabbit stomachs are vulnerable to dilatation (gaseous/fluid) in cases of outflow obstruction and hypomotility. With severe dilatation secondary to obstruction, compression of the caudal vena cava may impair venous return and cause significant pain.
- Foreign body obstruction most commonly occurs in pylorus, proximal duodenum, and distal ileum.
- Many factors can affect gastrointestinal motility, including dietary fiber levels, pain and stressors, phase of fecal excretion, hormonal influences (e.g., catecholamines, prostaglandins, motilin), cecal volatile fatty acid fractions, underlying diseases, medications, and activity level.
- Physiologic effects of reduced gut motility can include gastric dilatation/impaction, gastric ulceration, gastric trichobezoar formation, alterations in water/electrolyte secretion and absorption, hypovolemia, acid-base and electrolyte imbalance, and dehydration.
- Reduced food intake can rapidly result in hepatic lipidosis and ketoacidosis in rabbits.
- Gastrointestinal obstruction: rapid accumulation of fluid proximal to the site of an intestinal obstruction due to rabbit's inability to vomit, continual production of saliva, water secretion into stomach, and subsequent fermentation of contents can lead to severe gastric dilatation
  - Obstruction secondary to re-ingestion of a compressed fecal hair pellet (most common) or to ingestion of other foreign bodies and tumors
  - Compressed hair pellets are different from trichobezoars and hairballs. Compressed hair pellets are thought to be formed after compression of ingested hair into matted pellets in the large intestine; these are then re-ingested during cecotrophy. This may occur more commonly in long-haired breeds or during moulting.
  - Obstructions also occur secondary to ingestion of nonfood item such as fabrics and clay-based cat litters.
  - Obstruction secondary to strictures, adhesions, intussusception, neoplasia, and extraluminal compression (e.g., abscessation, parasitic cysts, neoplasia, cystolith) is also possible.

- Cecotrophal soiling of perineum ("clagging," intermittent soft stools): often misinterpreted as diarrhea. Many factors influence cecotrophy. Diet especially plays an important role, with protein and fiber levels influencing this. Increased dietary fiber levels increase the level of cecotrophy, and increased dietary protein levels reduce cecotrophy. Other physical factors affecting cecotrophy include perineal pain (urine or fecal scalding), long-haired breeds, inflexibility, arthritis, spondylosis, obesity, dental disease, restrictive confinement, conformational anomalies, anorexia, neurologic disease, and cecotroph consistency.
- Infection: a host of bacterial, viral, and protozoal organisms can lead to gastrointestinal disease. Many may act synergistically as co-pathogens in the enteritis complex.
  - Protozoal
    - Coccidiosis: several *Eimeria* spp. are pathogenic to the intestinal tract. Infection may be dose-dependent, and the region of the intestines affected may be species-specific. Younger rabbits are more commonly affected. Diarrhea produced may be hemorrhagic but usually is green/brown and odiferous. Chronic infection may result in intussusception and rectal prolapse. Hepatic coccidiosis *(Eimeria stiedai)* may result in secondary diarrhea caused by severe hepatic dysfunction.
    - Cryptosporidiosis: *Cryptosporidium parvum* and *Cryptosporidium cuniculus* may affect young rabbits, resulting in transitory diarrhea and growth retardation; most likely acts as a co-pathogen
    - Flagellates: a host of nonpathogenic normal flora found in cecum and cecotrophs (e.g., *Entamoeba cuniculi, Giardia duodenalis, Monocercomonas cuniculi, Retortamonas cuniculi*)
  - Bacterial
    - Clostridial enterotoxemia: most commonly due to *C. spiroforme*, although *C. difficile, C. perfringens,* and *C. welchii* have also been implicated. Disruption of normal gut flora is considered to be an important predisposing factor (especially in adult rabbits). Low-fiber and high-carbohydrate diets and disruption of the normal cecal environment are more likely to influence disease, especially in younger (recently weaned) rabbits. Virtually all *C. spiroforme* isolates are toxigenic. Disease is usually severe and acute, with diarrhea, collapse, and death within 1 to 3 days. Antibiotic-associated dysbiosis of the cecum can lead to clostridial overgrowth. Avoid use of oral preparations of lincomycin, clindamycin, erythromycin, and penicillins.
    - Tyzzer's disease: caused by *Clostridium piliforme*; seen most often in weanling rabbits, leading to high morbidity and mortality. Transmitted by ingestion of spores. Organism colonizes cecum, resulting in typhlitis, and spread via portal circulation to liver leads to hepatitis. Further systemic spread can lead to myocarditis. Acute diarrhea and sudden death may be seen. Chronic forms of the disease may result in intestinal fibrosis, stenosis, hepatonecrosis, and myocarditis.
    - Coliform enteritis: *E. coli* is normally absent (or present in small numbers) in rabbit intestines. Suckling young and weaners are most susceptible (strain dependent). Enteropathogenic strains are most commonly seen in rabbits. Usually associated with concurrent disease or poor diet and act as co-pathogens. May produce yellowish diarrhea and death.
    - Proliferative enteritis/enterocolitis: *Lawsonia intracellularis* infection can result in proliferation and thickening of intestines (especially ileum). Mostly affects weanling and young rabbits, resulting in acute diarrhea. Rarely causes death unless coinfection occurs (e.g., *E. coli),* and can be difficult to eliminate.
    - Salmonellosis: *S. typhimurium* and *S. enteritidis* can cause diarrhea, septicemia, and rapid death
    - Other bacterial infections (rare): *Klebsiella pneumoniae, Pseudomonas* spp., *Campylobacter* spp., *Yersinia pseudotuberculosis, Mycobacterium paratuberculosis, Vibrio* spp.
  - Viral
    - Rotavirus: infection can result in enterocolitis and diarrhea. Severity of disease depends on viral strain and presence of co-pathogens (e.g., *E. coli, Eimeria* spp.). Mostly seen in weanlings because maternal immunity subsides at this time.
    - Coronavirus: coronaviral enteritis usually affects 3- to 10-week-old rabbits, resulting in diarrhea, lethargy, abdominal distention, and death
    - Other viral infections (rare): adenovirus, parvovirus
  - Yeasts
    - Cecotrophs and hard feces normally contain large numbers of yeasts (e.g., *Cyniclomyces guttulatus*). These are considered normal florae.
- Nematodiasis: *Passalurus ambiguus* (and *P. nonannulatus*) often found in large numbers in cecum and colon; usually nonpathogenic in adults but may be associated with enteritis complex in young rabbits
- Dysautonomia: suspected neurotoxin involved in producing constellation of signs associated with dysfunction of the autonomic nervous system. Anorexia, obtundation, tooth grinding, palpable cecal impaction, and passage of mucus are characteristic clinical signs. Prognosis is poor.
- Mucoid enteropathy: Unclear origin; may be associated with diet, co-pathogens, stressors, dysbiosis, toxins, and dysautonomia. Mostly affects weanlings and occasionally adults (usually after stressor). Diarrhea ± mucoid diarrhea features early and an impacted cecum. Stomach and small intestine may be distended with fluid and gas. Prognosis poor.
- Neoplasia: leiomyoma, leiomyosarcoma, papilloma, and polyps all reported as primary neoplasias of gastrointestinal tract; metastatic involvement of uterine adenocarcinoma also reported
- Toxicity: range of toxins potentially cause gastrointestinal signs (e.g., diarrhea, hypomotility) in rabbits, including lead, aflatoxins, some herbicides, and a variety of plants
- Neuromuscular disease: spinal disease or peripheral neuropathy can alter intestinal function and motility
- Inflammatory bowel disease and dietary intolerance are very rare in rabbits. An intestinal plasmacytosis has been reported in research rabbits.
- Megacolon syndrome of homozygous spotted rabbits: hereditary condition associated with impaired intestinal sodium absorption; increasing liquefaction of cecal and colonic contents leads to characteristic obstipation of cecum in end-stage disease

DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- Gastric hypomotility
- Anorexia
- Gastrointestinal obstruction
- Gastric trichobezoar
- Gastrointestinal infection (protozoal, bacterial, viral)
- Mucoid enteropathy
- Gastric pyloric hypertrophy (New Zealand white breed)

- Gastric neoplasia (adenocarcinoma, leiomyoma reported)
- Dysautonomia
- Stomach worms
- Accompanying underlying disease

INITIAL DATABASE

- Minimum database: blood biochemistry, hematologic examination, and urinalysis (often unremarkable; however, may indicate dehydration, electrolyte imbalance, hepatopathy, and hyperglycemia)
- Fecal analysis: especially for cases exhibiting diarrhea
  - Direct fecal smear exam ± fecal flotation: coccidiosis, nematodiasis; commensal yeast *C. guttulatus* often mistaken for coccidial oocysts or bacteria
  - Fecal Gram stain: may demonstrate *Clostridium* spp. or excessive Enterobacteriaceae
  - Fecal culture: more useful for suspect *Salmonella* infection because both *E. coli* and clostridial species may be present in small numbers in feces (culture of cecal contents may be more useful for isolation of latter two organisms in postmortem samples)
- Abdominal radiography: gastric distention/impaction (gas, fluid, ingesta), intestinal distention/impaction, other organomegaly, free gas in abdominal cavity (gastrointestinal rupture), abdominal effusion
- Abdominal radiography: important diagnostic tool
  - Serial radiography can serve an important role in monitoring patient progress: monitoring of distention of gastrointestinal tract, gas patterns, and formation of feces
  - Normal gastrointestinal radiography
    - Stomach and cecum should nearly always contain ingesta.
    - Small amounts of gas may normally be present in the stomach and cecum (and very small amounts in the small intestine).
    - Stomach is located caudal to the liver, usually within the confines of the rib cage. Gastric axis (angle formed between center of fundus and pyloris) in lateral view should be parallel with ribs (lateral projection) and perpendicular to spine (in ventrodorsal view).
    - Small intestines are typically located in the cranial abdomen dorsal to the cecum on the lateral projection and in the left cranial abdomen on the ventrodorsal projection. The jejunum can extend into the midcaudal abdomen. The small intestines may be obscured by the large bowel.
    - Cecum typically occupies most of the right and ventral abdomen.
    - Distal colon and rectum can be more easily identified when spherical hard fecal balls are present.
    - Radiographic appearance of a rabbit's abdomen is largely affected by its current "phase" of digestion. During periods of cecotrophal ingestion, feeding tends to cease, and the digestive tract is relatively emptier during this phase. When ingesting food, hard feces may be evident in the colon (rabbits often ingest food and pass hard feces simultaneously). The relative difference in radiographic appearance of an individual's abdomen can alter significantly during a 24-hour cycle.
  - In hypomotile states, accumulated gastric ingesta may be crowned by a gas halo. The stomach can normally contain small amounts of gas (gas cap), although a larger "crescenteric" gas cap may be indicative of increased gas buildup. Gas accumulation may also be evident in the intestines (especially the cecum).
  - In acute gastrointestinal obstruction, severe gastric dilatation results (air, fluid) with the stomach extending well beyond the rib cage. The intestines may have little gas accumulation, although a small intestinal gas pattern suggestive of foreign body obstruction may be evident. Foreign body may not be discernible radiographically.
  - Other organomegaly may be evident (e.g., hepatomegaly).
  - Free gas in abdominal cavity (gastrointestinal rupture) and abdominal effusions (e.g., peritonitis, cardiogenic) may be noted.
  - Gastrointestinal contrast studies (e.g., pneumogastrogaphy, barium sulfate) are not usually diagnostically beneficial, carry procedural risks, and are difficult to interpret.
- Abdominal ultrasound: may be hindered by the presence of large amounts of gastrointestinal gas, although may be useful to delineate gastrointestinal disease (obstructions, intussusception, neoplasia, extraluminal compression) and other structures of other organs
- Radiography of skull for investigation of dental disease
- Radiography of spine/pelvis for investigation of musculoskeletal and neurologic disease

ADVANCED OR CONFIRMATORY TESTING

- Postmortem
  - *C. spiroforme* infection: iota toxin isolation in cecal contents
  - Serotyping for suspect *E. coli* infection
  - Histopathologic examination of intestinal tract for *C. piliforme, E. coli, L. intracellularis*, salmonellosis, *K. pneumoniae, M. paratuberculosis,* rotavirus, *C. parvum*
  - Electron microscopy: identification of rotavirus and coronavirus
  - PCR: *L. intracellularis*
  - Histopathologic examination of intestinal ganglia for dysautonomia
  - Histopathologic examination of suspect neoplasia or area of intestinal strictures
  - Mucoid enteropathy: presence of much mucus in colon
- Advanced imaging
  - CT imaging of skull (further investigation of dental disease)
  - MRI/myelography of spine (further investigation of neurologic disease)
- Blood lead level determination: normal range considered 0.09 to 1.3 µmol/L (2 to 27 µg/dL)

TREATMENT

THERAPEUTIC GOALS

- Return to normal appetite and gastrointestinal function
- Treatment of underlying cause
- Relief of obstruction if present

ACUTE GENERAL TREATMENT

- In cases of gastrointestinal hypomotility, it is essential to support hydration and nutritional needs.
  - Monitor vital signs closely, including heart rate, body temperature, and systolic blood pressure.
  - Provide parenteral fluid therapy via intravenous or intraosseous route. Crystalloids may be used. Maintenance fluid rates are considered 100-120 mL/kg/d.
  - Provide assist feeding through use of commercial assist feeding formulas (e.g., Oxbow Critical Care Feeding Formula; Oxbow Pet Products, Murdock, NE).
  - Provide gut prokinetics (only in nonobstructive cases) via use of cisapride 0.5 mg/kg PO q 8 h; ranitidine 2-5 mg/kg PO, SC q 12 h.
  - Treat suspect gastric ulceration via ranitidine 2-5 mg/kg PO, SC q 12 h; omeprazole 0.5-1 mg/kg PO, IV q 24 h.
  - Offer analgesia (e.g., opioids; buprenorphine 0.03-0.05 mg/kg SC q 8-12 h), nonsteroidal antiinflammatory drugs (NSAIDs; avoid use of NSAIDs in hypovolemic patients); meloxicam 0.3-0.5 mg/kg PO, SC q 12-24 h.
  - Encourage regular movement/exercise and a quiet environment.

- Surgical intervention for gastrointestinal hypomotility cases is rarely indicated and is likely to exacerbate hypomotile state.

- If gastric dilatation is present and gastrointestinal obstruction is suspected, treat as emergency.
  - Promptly institute supportive care measures for shock while monitoring heart rate, body temperature, and systolic blood pressure.
    - Fluid therapy via IV or IO crystalloids at shock rates (60 mL/kg/h) for 1 hour; alternatively, combine crystalloids (10-15 mL/kg) with colloids (5 mL/kg over 5-10 min q 15 min) to achieve systolic blood pressure >90 mm Hg
    - Active warmth is provided via use of heat mats, hot water bottles, warmed fluids, insulatory body wrapping; more advanced external heat sources such as forced-air warmers can also be used.
  - Rapid decompression of stomach necessary: some patients may tolerate passage of orogastric or nasogastric tube, or sedation (e.g., midazolam 0.2-1 mg/kg IM, IV) may be necessary. Avoid percutaneous gastric trocarization because thin-walled stomach may rupture severely.
  - Relieve obstruction via exploratory laparotomy (gastrotomy/enterotomy), although short period of patient stabilization may be required before surgery.
  - Avoid per os medications and gut prokinetics until relief of obstruction is achieved.
- Coccidiosis: treatment via limiting access to hard feces (sporulation occurs in hard feces after about 3 days) and medicating with toltrazuril 25 mg/kg PO q 24 h × 2, repeated after 5 days
- Bacterial infections: based on results of culture and sensitivity testing. First-line choices include enrofloxacin 10 mg/kg PO, SC q 12 h; trimethoprim/sulfonamide 30 mg/kg PO q 12 h. For severe diarrhea, consider loperamide 0.1 mg/kg PO q 8 h.
  - *C. spiroforme* infection: try metronidazole 20 mg/kg PO q 12 h. Consider use of ion-exchange resin to aid in absorption of toxins (e.g., cholestyramine 0.5 g/kg PO q 12 h). Vitamin C 100 mg/kg PO, SC q 24 h may decrease toxin production/absorption.
  - *L. intracellularis* infection: try chloramphenicol 30-50 mg/kg PO q 8-12 h

CHRONIC TREATMENT

- Chronic intermittent gastrointestinal stasis occurs in some individuals. Underlying cause may be difficult to discern. Ensure that adequate dietary fiber is provided, and regularly groom long-haired rabbits.
- Nematodiasis can be treated via benzimidazoles (e.g., fenbendazole 20 mg/kg PO q 24 h × 5 d) or avermectins (e.g., selamectin 6-18 mg/kg topically).
- Lead toxicity: Calcium EDTA 27 mg/kg SC q 6-12 h as needed (usually 5 d minimum treatment). Dilute to <10 mg/mL with 0.45% NaCl/2.5% dextrose. Repeat blood lead level 5 days after last treatment. Repeat calcium EDTA therapy until blood levels return to normal (<40 μg/dL).

DRUG INTERACTIONS

- Avoid use of oral preparations of lincomycin, clindamycin, erythromycin, and penicillin.
- Avoid use of NSAIDs in dehydrated and renally compromised patients.

POSSIBLE COMPLICATIONS

Surgical intervention success rates relatively low; likely due to rapid decompensation in rabbits with gastrointestinal obstruction

RECOMMENDED MONITORING

Appetite, fecal production, and consistency

PROGNOSIS AND OUTCOME

- Prognosis for gastrointestinal hypomotility is generally good in most cases, although this depends on underlying causes.
- Prognosis is guarded for gastrointestinal obstruction unless intervention is swift.

CONTROVERSY

- *Helicobacter* spp. have been isolated from rabbit stomachs, but significance is unknown.
- Metoclopramide may have little effectiveness in promoting gut motility but may have some benefit in reducing nausea in rabbits.
- Routine use of antibiotics in gastrointestinal disease is not warranted. Limited cases may require antibiotics (bacterial overgrowth, gastrointestinal surgery). Choose broad-spectrum antibiotics such as enrofloxacin or trimethoprim/sulfonamides.
- Use of products to enzymatically dissolve ingested hair (e.g., pineapple juice, papaya extract) is unlikely to achieve desired result.
- Use of orally medicated lubricants is unlikely to improve the passage of foreign bodies or trichobezoars.
- Re-establishing cecal flora: commercial probiotics may not survive gastric transit owing to low pH. Process of "transfaunation" (collecting cecotrophs from healthy rabbit to feed to sick rabbit) may circumvent problem. However, cecotrophs need to be consumed whole by recipient without chewing to maintain protective mucous covering.
- Simethicone (an oral antifoaming agent): may reduce size of gas bubbles (not reduce or prevent gas formation) within gastrointestinal tract, facilitating their passage

PEARLS & CONSIDERATIONS

COMMENTS

- Gastric trichobezoars are often the result, rather than the cause, of gastrointestinal disease.
- Gastric ulceration is a common postmortem finding.

PREVENTION

- Ensure adequate dietary fiber.
- Avoid high-carbohydrate diets.
- Perform regular grooming of pet rabbits.
- An oral vaccine developed for coccidiosis (consists of nonpathogenic strains of *Eimeria magna*) is used mainly in commercial rabbitries.

CLIENT EDUCATION

- Emphasize importance of appropriate feeding. Pet rabbit diets should consist largely of grass or grass hays (at least 80% of diet) (e.g., timothy, oaten hays). A variety of fresh leafy green vegetables can be added to the diet. Pellets (if fed at all) should be of the highest quality, viewed as a supplement, and fed in very limited amounts. Seed mixes, cereals, etc., should not be fed or should be offered only in very small amounts intermittently as treats.
- Educate clients on importance of monitoring food intake, fecal production, and activity level of rabbits.
- Encourage regular grooming of rabbits, especially long-haired breeds.
- Ensure that regular exercise and activity are provided to pet rabbits.

SUGGESTED READINGS

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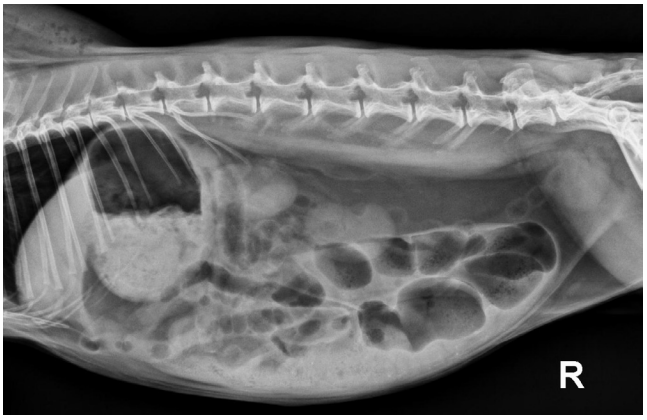
CROSS-REFERENCES TO OTHER SECTIONS

Anorexia
Coccidiosis
Dental Disease
Dysautonomia (Grass Sickness)
Endoparasites
Gastric Disorders
Hepatic Disorders

AUTHOR & EDITOR: **DAVID VELLA**



Intestinal Disorders Right lateral abdominal radiograph image of rabbit with gastrointestinal stasis. Note the gas accumulation in the cecum and gas cap in stomach. *(Photo courtesy Jörg Mayer, The University of Georgia, Athens.)*