

Second Edition



Barbara L. Oglesbee

BLACKWELL'S FIVE-MINUTE VETERINARY CONSULT: SMALL MAMMAL



 WILEY-BLACKWELL

**BLACKWELL'S
FIVE-MINUTE
VETERINARY
CONSULT
SMALL MAMMAL
SECOND EDITION**

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EDITOR

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I dedicate this book with love to my husband, Michael, and my children, Alexandra and Ian, for their patience and support, and for the sacrifice required to give Mom time to write.

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PREFACE

The popularity of rabbits, ferrets, guinea pigs, chinchillas, and rodents as companion animals has increased exponentially in recent years. With this increase, veterinarians in general small animal practice, emergency clinics, and even canine and feline specialty practice are often faced with the difficult challenge of evaluating these often unfamiliar species. Although excellent in-depth textbooks exist, much of the current information available on these species is scattered in multiple journals, periodicals, conference proceedings, bulletins, veterinary magazines, and internet resources. For the busy practitioner to keep abreast of all of these resources is a daunting task, especially for those simultaneously striving to keep current in canine and feline medicine. *Blackwell's Five-Minute Veterinary Consult: Small Mammals* was designed to bring this information together in a concise, readily accessible format.

Blackwell's Five-Minute Veterinary Consult is a quick reference with a unique format that provides consistency and breadth of coverage unparalleled by other texts. Like other editions in the 5-Minute Veterinary Consult series, the Small Mammals edition is divided into topics based on presenting problems and diseases. Each topic has an identical format, which makes it easy to find information. Detailed, up-to-date information on the diagnosis and treatment options for all disorders commonly encountered in these species are readily accessible. Individual topics are thoroughly covered within a few pages so that there is little need to cross-reference to other topics within the text.

To make this information quickly available, the book is divided by species into separate sections for chinchillas, guinea pigs, ferrets, rabbits, and rodents, with tabs to help quickly identify the section required. Within each species section, topics are organized alphabetically so that each can be readily located. A detailed table of contents and index is also provided to help the reader efficiently find the desired topic. The appendix also contains a formulary of commonly used medications.

I am fortunate and pleased to have had the assistance of several outstanding experts in the field of small mammal medicine to serve as contributing authors and as a panel of reviewers for topics presented in this work. Their input has significantly strengthened the text and greatly enhanced the depth and scope of coverage of each topic. Unlike that of canine and feline medicine, the amount of information on the disorders of small mammals that has been generated by controlled studies is limited. Much of our cumulative knowledge is based on the shared experience of practicing exotic animal veterinarians. Because of this, many topics in rabbit and ferret medicine are controversial. I have made every attempt to present information with as little bias as possible, and having topics reviewed facilitated this. However, the reader is encouraged to utilize the list of suggested reading printed at the end of each topic for additional information and viewpoints.

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I would like to express my gratitude to the reviewers of the first edition of this text. The expertise of all of the reviewers has significantly strengthened the text and greatly enhanced the depth and scope of coverage of each topic. Thanks goes to Dr. Michael Murray, Dr. Evelyn Ivey, Dr. Tia Greenberg, Dr. Karen Rosenthal, Dr. Matthew Johnston, and Dr. Dave Chapman for their extensive effort and willingness to work within a limited timeframe.

I would like to acknowledge all exotic animal practioners who have contributed in one way or another to our cumulative knowledge base. Much of what we know of companion exotic animal medicine is based on the shared experience of these veterinarians, without which this text would not have been possible.

Last, I would like to gratefully acknowledge Drs. Larry P. Tilley and Francis W. K. Smith, whose insight and innovation pioneered the Five-Minute Veterinary Consult series.



CHINCHILLAS

ALOPECIA



BASICS

DEFINITION

Alopecia is common in chinchillas and is characterized by complete or partial lack of hair in expected areas. It may be multifactorial and can be either a primary or secondary disorder. As many as 60 hairs grow from a single hair follicle in the healthy chinchilla.

PATHOPHYSIOLOGY

- Multifactorial causes
- All disorders represent a disruption in growth of the hair follicle due to infection, inflammation, trauma, or blockage of the receptor sites for stimulation of the cycle.

SYSTEMS AFFECTED

- Skin/exocrine
- Behavioral—may cause self-inflicted chewing, biting
- Gastrointestinal—especially dental disease—may cause anorexia, dysphagia, ptyalism
- Hemic/lymphatic/immune
- Ophthalmic—ophthalmic or dental disease may cause epiphora, conjunctivitis resulting in alopecia surrounding one or both eyes.

GENETICS

- Dental disease: avoid breeding these animals as inheritance of dental disease is suspected.
- Fur chewing: avoid breeding animals that fur chew.

INCIDENCE/PREVALENCE

Common condition in chinchillas

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

No specific age or sex predilection

SIGNS

- The pattern and degree of hair loss is important for establishing a differential diagnosis.
- Multifocal patches of alopecia—most frequently associated with folliculitis from mycotic or bacterial infection
- Large, diffuse areas of alopecia—indicate follicular dysplasia or metabolic component—not reported in chinchillas but should be considered
- May be acute or slowly progressive in onset

Historical Findings

- Inappropriate diet—fiber deficiency, other nutritional deficiencies
- Inappropriate frequency or complete lack of dust bath; use of inappropriate dust bath materials
- Inappropriate sanitation, ventilation
- Self-inflicted or conspecific barbering
- Drooling, dysphagia
- Ocular or nasal discharge
- History of fur slip, fur chewing

Physical Examination Findings

- Alopecia with or without scaling, crusting—distribution may help differentiate disease process.
- Broken hair shafts—suggestive of barbering (self-inflicted or conspecifics)
- Ptyalism—associated with dental malocclusion; a thorough oral examination is critical for evaluating for premolar/molar malocclusion
- Epiphora—associated with dental malocclusion; a thorough oral examination is critical for evaluating for premolar/molar malocclusion

CAUSES

- Normal shedding pattern—some chinchillas may lose hair in patches when shedding
- Behavioral—barbering-dominant cagemates may chew or pull out hair of submissive chinchilla
- Parasitic—ectoparasites (fleas, lice, mites)—because of the dense coat of the chinchilla, ectoparasites are uncommon
- Infectious—dermatophytosis, bacterial pyoderma
- Trauma—fur slip due to excessive restraint; self- or conspecific-inflicted barbering, bite wounds
- Neoplastic—cutaneous lymphoma, trichofolliculoma, mast cell tumor
- Nutritional—especially protein and fiber deficiencies

RISK FACTORS

Poor husbandry: lack of dust baths, proper ventilation, and sanitation; nutritional deficiencies such as low-fiber diets leading to fur chewing and other deficiencies allowing for immunosuppression; traumatic handling leading to fur slip



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Differentiating Causes

Pattern and degree are important for differential diagnoses.

Symmetrical Alopecia

- Barbering—broken fur shafts identified on close inspection; most commonly on dorsal flanks, around face and ears; can have a “moth-eaten” appearance to the coat. Owners may or may not observe barbering between animals.
- Fur chewing—very common in chinchillas; may chew on fur constantly or intermittently and fur may regrow in between episodes. Usually chew dorsal flanks and sides, pregnant females may chew temporarily. Coat may have moth-eaten appearance.
- Matted fur associated with high environmental temperature (>80° F), humid environment, or if dust baths are inadequate or not provided.

Multifocal to Focal Alopecia

- Lack of proper dust bath—may cause poor, unkempt coat that may become matted and shed abnormally; may cause alopecia and accumulation of scale in matted areas
- Trauma
 - Bite wounds—alopecia with or without erythema, can abscess—secondary *Staphylococcus* spp. or *Streptococcus* spp. infections can occur
 - Fur slip—alopecia with or without erythema, no scaling
 - Ear trauma, including frost-bite alopecia with erythema, scaling, necrosis of pinnae
- Fur chewing—may chew on fur constantly or intermittently and fur may regrow in between episodes. Usually chew dorsal flanks and sides, pregnant females may chew temporarily.
- Dental disease—facial moist dermatitis associated most commonly with ptyalism or epiphora; alopecia; with or without erythema, scale, or ulceration. *Staphylococcus* spp. or *Streptococcus* spp. infections can occur secondary to moist dermatitis.
- Dermatophytosis—*Trichophyton mentagrophytes* most common but *Microsporum canis* and *M. gypseum* have been identified; partial or complete alopecia with scaling and pruritis; with or without erythema, not always ring-shaped; may begin as alopecia around eyes, nose, then spreads to feet, body, genitals. May be first identified on the “grooming claw” (medial first digit) of hind limbs.
- *Cheyletiella* sp.—reported in chinchillas, lesions usually located in the intrascapular or tail-base region and associated with large amounts of white scale. Mites readily identified on skin scrapes or acetate tape preparations on low power.
- Urinary tract infection—perineal moist dermatitis; alopecia; with or without erythema, scale, or ulceration
- Arthritis of hind limbs—perineal moist dermatitis; alopecia; with or without erythema, scale, or ulceration
- Lumbar spinal spondylosis—perineal moist dermatitis; alopecia; with or without erythema, scale, or ulceration
- Pododermatitis of hind limbs—perineal moist dermatitis; alopecia; with or without erythema, scale, or ulceration
- Abscesses—anywhere on body alopecia with or without erythema, scale, ulceration
- Ear mites—alopecia around base of ear; may extend to head, neck, abdomen, perineal region, intense pruritis; brown beige crusty exudate in ear canal and pinna
- Fleas—patchy alopecia; flea dirt will help differentiate; secondary pyoderma sometimes seen
- Contact dermatitis—alopecia with or without erythema; scale on ventral abdomen and other contact areas
- Moist dermatitis—alopecia; with or without erythema, scale, or ulceration associated with

(CONTINUED)

ALOPECIA

urinary disease (urine scald), diarrhea, unteaten ectoprophs, arthritis, pododermatitis, spinal spondylosis

- Neoplasia—cutaneous lymphoma, cutaneous epitheliotropic lymphoma (mycosis fungoides), trichofolliculoma, mast cell tumors; focal or diffuse alopecia; scaling and erythema; may see crust formation—not reported in chinchillas but should be considered.

CBC/BIOCHEMISTRY/URINALYSIS

To identify evidence of infection, inflammation, and organ function for underlying disease, especially with urine scald, perineal dermatitis, infectious organisms

OTHER LABORATORY TESTS

Fungal cultures: especially DTM for dermatophytes; two negative cultures should be obtained after diagnosis to ensure clearance of infection.

IMAGING

- Skull radiographs: to identify underlying dental disease in chinchillas with ptyalism, epiphora
- Whole body radiographs: to identify orthopedic, spinal, gastrointestinal, renal, reproductive diseases associated with perineal dermatitis or urine scald
- Abdominal ultrasound: to identify gastrointestinal, renal, reproductive diseases associated with perineal dermatitis or urine scald.

DIAGNOSTIC PROCEDURES

- Skin scraping—micro-spatula with flat-ended blade preferable; dull edge of scalpel blade
- Acetate tape preparation—evaluate on low power field for ectoparasites
- Trichogram—cytology of epilated hairs to examine for lice or parasite eggs
- Skin biopsy—especially with suspicion of neoplasia, infectious organisms
- Woods lamp ultraviolet evaluation of *Microsporum canis* lesions; but *T. mentagrophytes* does not fluoresce

PATHOLOGIC FINDINGS

Gross and histopathologic findings will differ depending upon the underlying condition.

**TREATMENT****APPROPRIATE HEALTH CARE**

- Patients that appear otherwise normal are typically managed as outpatients; diagnostic evaluation may require brief hospitalization.
- Diseases associated with systemic signs of illness (e.g., pyrexia, depression, anorexia, and dehydration) or laboratory findings of azotemia and/or leukocytosis warrant an aggressive diagnostic evaluation and initiation of supportive and symptomatic treatment.

NURSING CARE

Subcutaneous fluids can be administered (50–100 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider intraosseous (IO) catheterization if intravascular fluids are needed. Base fluid selection on the underlying cause of fluid loss. In most patients, Lactated Ringers solution or Normosol crystalloid fluids are appropriate. Maintenance fluids are estimated at 100 mL/kg/day.

ACTIVITY

Dust baths should be administered at least 2–3 times weekly—minimize during treatment for infectious organisms (especially dermatophytes); do not reuse dust bath. Use only good-quality dust bathing materials.

DIET

- Some chinchillas will develop inappetence. Be certain the chinchilla is eating, or provide assisted syringe feeding of an herbivore critical care diet if anorectic to prevent the development, or exacerbation of, gastrointestinal dysmotility/GI stasis.
- Increasing water content in foods or via oral or parenteral fluids may increase fluid intake. Provide multiple sources of fresh water, including supplementing fresh water with small amounts of pure fruit juice (no added sugars), high water content vegetables, or soaking or misting fresh vegetables before offering.

CLIENT EDUCATION

- Do not breed animals with malocclusion, or that chew their own fur, as both traits are potentially hereditary.
- Disinfect caging and cage materials if infectious organisms; for dermatophytes 10% bleach solution
- Discard wooden cage materials if infectious organisms
- Remove conspecifics if barbering is identified.

SURGICAL CONSIDERATIONS

N/A

**MEDICATIONS****DRUG(S) OF CHOICE**

- Varies with specific cause
- Fleas, mites (including *Cheyletiella* spp.), other ectoparasites—ivermectin 1% (0.4 mg/kg SC q10–14d × 3–4 doses); selamectin (Revolution 6–12 mg/kg applied topically q30d); flea shampoos for kittens without permethrins, pyrethrins can be used. Treat all affected animals and clean the environment.
- Dermatophytes—itraconazole (5 mg/kg PO q24h) for 6–8 weeks; fluconazole (16 mg/kg q24h) × 14 days; or griseofulvin (25 mg/kg PO q24h) for 4–6 weeks for refractory cases; lime sulfur dips q7d has been used

successfully—is odiferous and can stain; antifungal shampoos (ketoconazole/chlorohexiderm) and antifungal sprays (miconazole, enilconazole) are available but toxicity information not available for chinchillas.

- 0.5%–1% chlorohexidine solution for cleansing of affected areas
- Antihistamines (diphenhydramine, hydroxyzine) for severe pruritis—may cause drowsiness
- Nonsteroidal antiinflammatory medications (meloxicam 0.2–0.5 mg/kg PO, SC q24h; carprofen 2–5 mg/kg PO q12h) may be helpful with inflammatory conditions, analgesia for dental disease

CONTRAINDICATIONS

- Oral administration of antibiotics that select against gram-positive bacteria (penicillins, cephalosporins, macrolides, lincosamides) can cause fatal enteric dysbiosis and enterotoxemia.
- Metronidazole toxicosis has been previously reported in chinchillas.
- Potentially nephrotoxic drugs (e.g., aminoglycosides, NSAIDs) should be avoided in patients that are febrile, dehydrated, or azotemic or that are suspected of having pyelonephritis, septicemia, or preexisting renal disease.
- Glucocorticoids or other immunosuppressive agents should be used only when no alternative is available and should be used with precaution.
- Do not use fipronil or flea collars as toxicity in chinchillas is not known.
- Do not use organophosphate-containing products in chinchillas.

PRECAUTIONS

- Flea-control products are off-label use in chinchillas; safety and efficacy have not been evaluated in this species.
- Topical flea products such as permethrins and pyrethrins may be toxic in chinchillas.
- Prevent chinchillas and cagemates from licking topical spot-on products until dry.
- Toxicity—if any signs are noted, the animal should be bathed thoroughly to remove any residual products and treat appropriately.
- Griseofulvin—bone marrow suppression reported in dogs, cats as idiosyncratic reaction or with prolonged therapy; not reported in chinchillas but may occur; weekly or bi-weekly CBC should be performed. Neurological effects reported in dogs and cats, monitor chinchillas for these signs. Teratogenic in first two trimesters of pregnancy.
- Immunosuppressive agents should be avoided.

POSSIBLE INTERACTIONS

None

ALTERNATIVE DRUGS

Ketoconazole has been utilized for dermatophytes in other species—safety and

ALOPECIA

(CONTINUED)

efficacy are unknown in chinchillas. Hepatopathy reported in cats and dogs can be severe.



FOLLOW-UP

PATIENT MONITORING

Varies with cause

PREVENTION/AVOIDANCE

- Provide good-quality dust baths several times weekly to maximize coat quality.
- Feed diets with balanced protein and fiber for chinchillas.
- Separate animals that barber or fur chew from other animals.

POSSIBLE COMPLICATIONS

N/A

EXPECTED COURSE AND PROGNOSIS

- Treatment times for dermatophytosis are long (4–8 weeks); treatment diligence necessary to clear infection; continue until two negative cultures are obtained.



MISCELLANEOUS

ASSOCIATED CONDITIONS

- Dental disease
- Musculoskeletal disease

AGE-RELATED FACTORS

N/A

ZOO NOTIC POTENTIAL

Dermatophytosis and *Cheyletiella* can cause skin lesion in people.

PREGNANCY/FERTILITY/BREEDING

- Do not breed animals with malocclusion or that fur chew, as both traits are potentially hereditary.
- Griseofulvin contraindicated in pregnant animals during first two trimesters as it can be teratogenic.
- Avoid ivermectin in pregnant animals.

SYNONYMS

Ringworm (dermatophytes)
Fur chewing (self-inflicted barbering)

SEE ALSO

Dermatophytosis

ABBREVIATIONS

DTM = dermatophyte test medium
GI = gastrointestinal

INTERNET RESOURCES

N/A

Suggested Reading

- Donnelly TM. Disease problems of chinchillas. In: Quesenberry KE, Carpenter JW, eds. *Ferrets, Rabbits, and Rodents Clinical Medicine and Surgery*, 2nd ed. St Louis: WB Saunders, 2006:255–265.
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ANOREXIA AND PSEUDOANOREXIA



BASICS

DEFINITION

Absence of an appetite for food. The term *pseudoanorexia* is often used to describe the condition in which an animal does not eat because of an inability to prehend, chew, or swallow food rather than because of a lack of interest in food.

PATHOPHYSIOLOGY

- Anorexia is most often associated with systemic disease but can be caused by many different mechanisms.
- The control of appetite is a complex interaction between the CNS and the periphery.
- The regulation of food intake also depends on the peripheral control of appetite.
- The gastric distension theory suggests that gastric distension promotes satiety, which is probably hormonally mediated.
- Satiety can also be induced by placing food in the small intestine.
- Inflammatory, infectious, metabolic, or neoplastic diseases can cause inappetence, probably as a result of the release of a variety of chemical mediators.
- Pseudoanorexia is commonly associated with oral pain or inability to chew due to dental disease.

SYSTEMS AFFECTED

Virtually any body system can be affected by anorexia, especially if it persists for more than 24 hours.

INCIDENCE/PREVALENCE

Anorexia and pseudoanorexia are among the most common clinical presentations seen in the chinchilla.

SIGNALMENT

No specific age or sex predisposition to anorexia in general but signalment predispositions to many of the underlying conditions that cause anorexia

SIGNS

Historical Findings

- Refusal to eat is a common clinical complaint because chinchilla owners often associate a poor appetite with illness.
- Clinical signs associated with anorexia vary and are related to the underlying cause.
- Fecal pellets often become scant and small in size.
- Chinchillas with gastrointestinal tract disease (e.g., gastrointestinal stasis or bloat) often initially stop eating pellets or hay but continue to eat treats, followed by complete anorexia.
- Signs of pain, such as teeth grinding, a hunched posture, and reluctance to move, are extremely common in chinchillas with oral disease or problems with gastrointestinal motility.

- Patients with dental disease or disorders causing dysfunction or pain of the face, neck, oropharynx, and esophagus may display an interest in but be unable to complete prehension and swallowing (pseudoanorexia).
- Pseudoanorectic patients commonly display weight loss, excessive drooling, difficulty in prehension and mastication of food, halitosis, dysphagia, and odynophagia (painful eating); may be preceded by a preference for softer foods such as parsley or romaine lettuce.

Physical Examination Findings

- Reluctance to eat may be the only abnormality identified after an evaluation of the patient history and physical evaluation; this is typical in chinchillas with gastrointestinal tract diseases or pseudoanorexia from oral disease prior to thorough examination of the oral cavity.
- Most underlying causes of pseudoanorexia can be identified by a thorough examination of the face, mandible, teeth, neck, oropharynx, and esophagus for dental disease, ulceration, traumatic lesions, masses, foreign bodies, and neuromuscular dysfunction.
- A thorough examination of the oral cavity, including the incisors, molars, and buccal and lingual mucosa, is necessary to rule out dental disease. A bivalve nasal speculum (Welch Allyn, Skaneateles Falls, NY) or otoscope may be useful in identifying severe abnormalities; however, many problems will be missed by using this method alone. A thorough examination of the cheek teeth requires heavy sedation or general anesthesia and specialized equipment. Use a focused, directed light source and magnification (or a rigid endoscope, if available) to provide optimal visualization. Use a rodent mouth gag and cheek dilators (Jorgensen Laboratories, Inc., Loveland, CO) to open the mouth and pull buccal tissues away from teeth surfaces to allow adequate exposure. Identify elongation of cheek teeth, irregular crown height, spurs, curved teeth, oral ulcers, or abscesses.
- Significant tooth root abnormalities are commonly present despite normal-appearing crowns. Skull radiographs are especially useful to identify apical disorders in chinchillas; dorsoventral, lateral, and left and right oblique views are necessary for an accurate assessment.
- Abdominal palpation is an extremely valuable tool in the diagnosis of gastrointestinal hypomotility or stasis disorders. The presence of hair and ingesta is normal and should be palpable in the stomach of a healthy chinchilla. The normal stomach should be easily deformable, feel soft and pliable, and not remain pitted on compression. A firm, noncompliant stomach or stomach that remains pitted on compression is an abnormal finding.
- Gas distension of the stomach, intestines, or cecum is common in chinchillas with gastrointestinal tract disease.

- Abdominal palpation may also reveal the presence of organomegaly, masses, or gastrointestinal foreign bodies.
- Auscultation of the thorax may reveal cardiac murmurs, arrhythmias, or abnormal breath sounds.
- Auscultation of the abdomen may reveal decreased or absent borborygmus in chinchillas with gastrointestinal hypomotility. Borborygmus may be increased in cases with acute intestinal obstruction.

CAUSES

Anorexia

- Almost any systemic disease process
- Sudden diet change, insufficient water supply, change in husbandry, environmental stress
- Gastrointestinal disease—among the most common causes, especially problems related to gastrointestinal hypomotility or stasis; esophageal foreign body (“choke”); gastric trichobezoar; gas distension (“bloat”)
- Pain—acquired dental disease, malocclusion (“slobbers”), apical elongation; orthopedic disorders, urolithiasis
- Metabolic disease—diabetes, hepatic or renal disease, acid-base disorders
- Neoplasia involving any site—uncommon in chinchillas
- Cardiac disease
- Infectious disease—enterotoxemia, enteritis, salmonellosis, listeriosis
- Respiratory disease—bacterial pneumonia
- Reproductive—dystocia, hair ring/paraphimosis, pregnancy toxemia
- Neurologic disease—encephalitis (listeriosis), cerebrosplinal nematodiasis
- Psychologic—unpalatable diets, alterations in routine or environment, stress
- Toxicosis/drugs—lead poisoning, metronidazole toxicity
- Musculoskeletal disorders—fractures of the long bones of the limbs are relatively common
- Miscellaneous—heat stroke/high environment temperature, inappropriate use of antibiotics, carbohydrate overload, intestinal amyloidosis

Pseudoanorexia

- Any disease process that interferes with chewing or swallowing food
- Diseases causing painful prehension and mastication are extremely common, especially acquired dental disease (e.g., malocclusion, dental abscess, molar impaction, apical elongation); stomatitis, glossitis, gingivitis (e.g., physical agents, caustics, bacterial infections, foreign bodies, uremia), retrobulbar abscess, oral or glossal neoplasia, musculoskeletal disorders (mandible fracture or subluxation)
- Diseases causing oropharyngeal dysphagia (uncommon); glossal disorders (neurologic, neoplastic), pharyngitis, pharyngeal neoplasia, retropharyngeal disorders (lymphadenopathy, abscess, hematoma), neuromuscular disorders (CNS lesions, botulism)

ANOREXIA AND PSEUDOANOREXIA

(CONTINUED)

- Diseases of the esophagus—foreign body (“choke”), esophagitis, neoplasia, and neuromuscular disorders

RISK FACTORS

- Chinchillas on a diet containing inadequate amounts of long-stem hay are at risk for developing dental disease and gastrointestinal motility disorders.
- Chinchillas with limited exercise or mobility (cage restriction, orthopedic disorders, obesity) are at a higher risk of developing gastrointestinal problems.
- Anesthesia and surgical procedures commonly cause temporary anorexia.

**DIAGNOSIS****DIFFERENTIAL DIAGNOSIS**

- Pseudoanorexia from dental disease and anorexia due to gastrointestinal disturbance are the two most common causes of inappetence in chinchillas. Decreased gastrointestinal motility can result from improper diet and many disease processes.
- Obtain a minimum database (CBC, biochemistry, whole-body radiographs) to help delineate underlying medical disorders.
- Questioning about the patient's interest in food and ability toprehend, masticate, and swallow food, along with a thorough examination of the animal's teeth, oropharynx, face, and neck, will help identify pseudoanorexia. If the owners are poor historians, the patient should be observed while eating.
- Obtain a thorough history regarding the animal's environment, diet, other animals and people in the household. Recent changes involving any of these is suggestive of psychologic anorexia.
- A thorough history regarding the chinchilla's diet, food and water consumption, and physical activity, as well as volume and character of fecal production will aid in the diagnosis of gastrointestinal motility disorders.
- Abnormalities detected in the physical examination or historical evidence of illness indicate the need for a diagnostic workup.

CBC/BIOCHEMISTRY/URINALYSIS

Abnormalities vary with different underlying diseases and causes of anorexia and pseudoanorexia.

OTHER LABORATORY TESTS

Special tests may be necessary to rule out specific diseases suggested by the history, physical examination, or minimum database (see other topics on specific diseases).

IMAGING

- If underlying disease is suspected, but no abnormalities are revealed by the physical examination or minimum database, perform

abdominal radiography and abdominal ultrasonography to identify hidden conditions such as gastrointestinal tract disease, hepatic disease, urolithiasis, orthopedic disease, or neoplasia. Consider thoracic radiography to rule out cardiac or pulmonary disease.

- Skull radiographs may identify the presence of and extent of dental disease; dorsoventral, lateral, and left and right oblique views are indicated in most cases.
- The need for further diagnostic imaging varies with the underlying condition suspected.

DIAGNOSTIC**PROCEDURES/PATHOLOGIC FINDINGS**

Vary with underlying condition suspected

**TREATMENT**

- Treatment should be directed at the underlying cause.
- Symptomatic therapy includes attention to fluid and electrolyte derangements, reduction in environmental stressors, and modification of the diet.
- Most chinchillas that are anorectic have also refused water and are dehydrated to some degree. Lack of oral intake of fluid also contributes to desiccation of intestinal contents, gastrointestinal hypomotility, and further anorexia. The route of fluid therapy depends on the degree of dehydration, but most anorectic chinchillas will benefit from oral or subcutaneous fluids. Intravenous or intraosseous fluids are required in patients that are severely dehydrated or depressed; maintenance fluid requirements are estimated at 100 mL/kg/day.
- Encourage oral fluid intake: offer fresh water, administer oral fluids via syringe, wet the food, flavor water with fruit or vegetable juices.
- It is important that patients continue to eat during and following treatment. Continued anorexia will exacerbate gastrointestinal hypomotility and cause further derangement of the gastrointestinal microflora and overgrowth of intestinal bacterial pathogens.
- Chinchillas should be tempted often with parsley, cilantro, dandelion greens, and good-quality grass hay. Many patients will begin to eat these foods, even if they were previously anorectic. Also offer the patient's usual pelleted diet, as the initial goal is to get the chinchilla to eat.
- If the patient refuses these foods, syringe feed a gruel such as Critical Care for Herbivores (Oxbow Animal Health, Murdock, NE) 15–20 mL/kg PO q6–8h. Larger volumes and more frequent feedings are often accepted; feed as much as the chinchilla will readily accept. Alternatively, pellets can be ground and mixed with fresh

greens, vegetable baby foods, water, or juice to form a gruel.

- High-carbohydrate, high-fat nutritional supplements are contraindicated.
- The diet should be permanently modified to include sufficient amounts of roughage and long-stemmed grass hay; foods high in simple carbohydrates should be prohibited or limited to the occasional treat.
- Encourage exercise for 10- to 15-minute intervals every 6–8 hours, unless contraindicated by underlying condition.

**MEDICATIONS****DRUG(S) OF CHOICE**

- Depends on the underlying cause
- Anorexia, regardless of the cause, contributes to or causes gastrointestinal tract hypomotility. The use of promotility agents such as metoclopramide (0.2–1.0 mg/kg PO, SC, IM q12h) or cisapride (0.1–0.5 mg/kg PO q8–12h) may be helpful in regaining normal motility; cisapride is available through compounding pharmacies.
- Analgesics such as buprenorphine (0.01–0.05 mg/kg SC, IV q8–12h), meloxicam (0.2–0.5 mg/kg PO, SC q24h), or carprofen (2–5 mg/kg PO, SC q24h). Pain is common in chinchillas with orthopedic disorders, dental disease, and intestinal distention; pain impairs mobility, decreases appetite, and may severely inhibit recovery.

CONTRAINDICATIONS

Avoid promotility agents if gastrointestinal obstruction is present or suspected.

PRECAUTIONS

Meloxicam—use with caution in chinchillas with compromised renal function.

POSSIBLE INTERACTIONS

N/A

ALTERNATIVE DRUGS

N/A

**FOLLOW-UP****PATIENT MONITORING**

- Body weight, production of fecal pellets, and hydration can be used to determine if management is effective.

PREVENTION/AVOIDANCE

- Proper diet and husbandry; gradual changes to the diet, environment, or daily regiment when necessary; rapid changes tend to promote gastrointestinal hypomotility.
- Diet should include clean water and sufficient amounts of roughage and long-stemmed hay; inadequate dietary fiber can lead to constipation, stasis, and other disturbances of gastrointestinal motility.

(CONTINUED)

ANOREXIA AND PSEUDOANOREXIA

- Acquired dental disease in chinchillas appears to have a genetic component; therefore, animals with dental disease should not be allowed to breed.

- A dietary component to acquired dental disease is also considered likely; thus, owners should be advised to increase the amount of roughage in the animal's diet to increase the grinding motion of the teeth and increase wear.

POSSIBLE COMPLICATIONS

- Dehydration, malnutrition, and cachexia are most likely; these exacerbate the underlying disease.
- Hepatic lipidosis is a possible complication of anorexia, especially in obese chinchillas.
- Breakdown of the intestinal mucosal barrier is a concern in debilitated patients.
- Anorexia may cause enteric dysbiosis and subsequent enterotoxemia.

EXPECTED COURSE AND PROGNOSIS

Varies with different underlying diseases and causes of anorexia and pseudoanorexia.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

See Causes

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

N/A

SYNONYMS

Inappetence
Loss of appetite

SEE ALSO

Acquired dental disease
Gastrointestinal stasis and dilation
Diarrhea
Antibiotic-associated enterotoxemia
Constipation

ABBREVIATIONS

CBC = complete blood count
CNS = central nervous system

Suggested Reading

Harkness JE, Turner PV, VandeWoude S, et al. Harkness and Wagner's Biology and Medicine of Rabbits and Rodents, 5th ed. Ames, IA: Wiley-Blackwell, 2010:210–213, 219, 260–262, 292–302, 321–322, 324–326.

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BASICS

OVERVIEW

- The intestinal microflora of the chinchilla is a dynamic mixture of bacteria, protozoa, and fungi.
- The administration of antibiotics to chinchillas can disrupt enteric commensal microflora and lead to bacterial dysbiosis.
- Antibiotics that target gram-positive bacteria and some gram-negative anaerobes—such as lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins—destroy these beneficial bacteria.
- Because resident enteric microflora competitively inhibit pathogenic bacteria, inappropriate antibiotics permit the growth of pathogenic bacteria such as *Escherichia coli* and *Clostridium* spp. These and other opportunists proliferate, causing enteritis and producing numerous potent enterotoxins.
- Chinchillas are hindgut fermenters; therefore, the antibiotic-associated disruption in gut flora occurs primarily in the cecum and colon.
- In general, the oral route of antibiotic administration is considered more likely to cause problems than the parenteral route; however, enterotoxemia may also occur with parenteral antibiotic use.
- Pathologic effects are primarily due to toxemia; septicemia is not generally part of the disease.

SIGNALMENT

No specific age or breed predilection

SIGNS

Historical Findings

Antibiotic usage—the use of systemic antibiotics that are primarily gram-positive in spectrum (e.g., penicillins, cephalosporins, and macrolides)

Physical Examination Findings

- Peracute death with no clinical course
- Anorexia, lethargy, depression
- Diarrhea; severe, acute, profuse, often fatal
- Dehydration, hypotension, weakness, hypothermia
- Ileus, bloating, abdominal distension
- Tenesmus, fecal staining of the perineum, rectal prolapse
- Abdominal pain characterized by haunched posture, reluctance to move, stretching out, rolling, bruxism, and/or pain on abdominal palpation
- Respiratory distress, lateral recumbency, fever in end-stage cages

CAUSES

- Systemic (particularly oral) administration of lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins

- Dysbiosis and enterotoxemia can also occur secondary to stress, poor husbandry, or nutrition

RISK FACTORS

- Improper antibiotic usage
- Stress—improper temperature, poor sanitation, overcrowding, shipping
- Nutrition—sudden diet changes, weaning, insufficient dietary fiber, carbohydrate overload



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Consider all causes of enteropathy in chinchillas; more severe illness should prompt a more extensive evaluation:

- Dietary—abrupt change in diet, weaning, excessive fresh green foods or fruit, excessive carbohydrate or sugars, or spoiled food
- Bacterial infection—*Pseudomonas* spp., *Proteus* spp., *Pasteurella* spp., *Salmonella* spp., *Staphylococcus* spp.
- Obstruction—neoplasia, foreign body, intussusception
- Toxic—plant toxins; mycotoxins
- Parasitic—*Giardia* spp., coccidia, nematodes, cestodes, *Cryptosporidium* spp.
- Metabolic disorders—liver disease, renal disease
- Systemic illness may cause diarrhea as a secondary event
- Neoplasia—primary gastrointestinal tumor, or as a sequella to other organ involvement

CBC/BIOCHEMISTRY/URINALYSIS

- Increased PCV and TS seen with dehydration
- TWBC elevation with neutrophilia indicative of a toxic inflammatory response
- Electrolyte abnormalities secondary to anorexia, fluid loss, and dehydration

OTHER LABORATORY TESTS

- Serial antemortem fecal, rectal, or cecal cultures under strict anaerobic conditions
- Demonstration of enterotoxin via fecal assays

IMAGING

Radiographs frequently reveal an ileus with significant gas within the intestinal tract.

DIAGNOSTIC PROCEDURES

N/A

PATHOLOGIC FINDINGS

- Cecal hemorrhage, ulceration, edema
- Mucosal necrosis, pseudomembrane formation
- Dilation of gut; watery brown, occasionally hemorrhagic, fetid luminal content
- Microscopically, hemorrhages and edema within gut wall, sloughing of enterocytes, and inflammatory infiltrates within the submucosa and mucosa; identifiable bacilli

(i.e., *E. coli*) may line the mucosal surface on histologic sections

- Direct smear of mucosa may reveal typical gram-positive clostridial organisms.
- Nonspecific signs—enlarged mesenteric lymph nodes, congested kidneys



TREATMENT

APPROPRIATE HEALTH CARE

- Chinchillas with mild diarrhea that are otherwise bright and alert usually respond to outpatient treatment.
- Individuals with moderate to severe diarrhea usually require hospitalization and 24-hour care for parenteral medication, fluid therapy, and thermal support.
- Patients exhibiting signs of lethargy, depression, dehydration, and/or shock should be hospitalized even if diarrhea is mild or absent.

NURSING CARE

Fluid Therapy

- Rehydration and correction of electrolyte imbalances are the primary concern.
- Severe volume depletion can occur with acute diarrhea; aggressive shock fluid therapy may be necessary.
- Fluids may be administered by the oral, subcutaneous, intravenous, and/or intraosseous route as indicated by patient condition.
- Mildly affected patients usually respond well to oral and subcutaneous fluids.
- Intravenous or intraosseous fluids are indicated in patients that are severely dehydrated or depressed.
- Maintenance fluid requirements are estimated at 100 mL/kg/day.
- Rehydration is essential to treatment success in severely ill chinchillas. Initially, a balanced fluid (e.g., lactated Ringer's solution) may be used.
- A warm, quiet environment should be provided.

DIET

- It is imperative that chinchillas continue to eat during treatment and recovery. Prolonged anorexia promotes further derangement of gastrointestinal microflora, encourages overgrowth of intestinal bacterial pathogens, and negatively affects gastrointestinal motility.
- Assisted feeding is typically required until the patient is eating, eliminating, and maintaining body weight.
- Syringe-feeding formulas for rabbits/rodents: Critical Care or Critical Care Fine Grind (Oxbow Animal Health, Murdock, NE), Emerald Herbivore (Lafeber Co., Cornell, IL), pureed fruit/vegetable baby foods, and blenderized rodent pellets

(CONTINUED)

ANTIBIOTIC-ASSOCIATED ENTEROTOXEMIA

CLIENT EDUCATION

- Discuss the importance of prevention: appropriate use of antibiotics, proper husbandry, and good nutrition.
- Advise owners to monitor food consumption and fecal output; seek veterinary attention if there is a noticeable decrease in either.

SURGICAL CONSIDERATIONS

- If surgery is necessary (i.e., to correct rectal prolapse), then the patient should first be stabilized.
- Anesthesia, manipulation of the gut, hypothermia, anesthetic agents, and pain all exacerbate gastrointestinal ileus; gastrointestinal stasis is often worse postoperatively. This combination of factors may worsen the prognosis if surgery is indicated.



MEDICATIONS

DRUG(S) OF CHOICE

Antibiotic Therapy

- There is little evidence from controlled studies to indicate that antibiotics are efficacious in treating enterotoxemia.
- Antibiotics are indicated in patients with bacterial inflammatory lesions of the gastrointestinal tract, as well as patients with disruption of the intestinal mucosa evidenced by blood in the feces.
- Antibiotic selection should be broad-spectrum, based on results of culture and susceptibility testing when possible.
- Some choices for empirical use while waiting for culture results include chloramphenicol (30–50 mg/kg PO q12h), trimethoprim sulfa (15–30 mg/kg PO q12h), or metronidazole (10–20 mg/kg PO q12h; use with caution).

Gastrointestinal Agents

- Bismuth subsalicylate (0.3–0.6 mL/kg PO q4–6h PRN; dose cited is extrapolated from rabbit dose)
- Kaolin/pectin (0.2–0.3 mL/kg PO q6–8h PRN; dose cited is extrapolated from guinea pig dose)
- Cholestyramine (2 g/20 mL water PO q24h PRN) has been demonstrated to bind clostridial and other bacterial toxins in humans; anecdotal success in rabbits; may be useful in chinchillas
- Probiotic administration; transfaunation with healthy chinchilla feces may help to reestablish intestinal microflora

CONTRAINDICATIONS

- Anticholinergics (loperamide) in patients with suspected enterotoxin-producing bacteria and invasive bacterial enteritis
- Antibiotics that are primarily gram-positive in spectrum

PRECAUTIONS

- It is important to determine the cause of diarrhea. A general shotgun antibiotic approach may be ineffective or detrimental.
- Antibiotic therapy may predispose chinchillas to bacterial dysbiosis and overgrowth pathogenic bacteria. If signs worsen or do not improve, therapy should be adjusted.
- Chloramphenicol may cause aplastic anemia in susceptible people. Clients and staff should use appropriate precautions when handling this drug.
- Metronidazole neurotoxic if overdosed; anecdotal reports of hepatotoxicity in chinchillas
- Isolate affected and exposed animals when infectious disease is suspected.

POSSIBLE INTERACTIONS

N/A

ALTERNATIVE DRUGS

N/A



FOLLOW-UP

PATIENT MONITORING

- Fecal volume and character, appetite, attitude, and body weight
- If diarrhea and other clinical signs do not resolve, consider reevaluation of the diagnosis.

PREVENTION/AVOIDANCE

- Appropriate antibiotic selection
- Providing appropriate diet and husbandry
- Reducing stress and providing sanitary conditions
- When infectious disease is suspected, strict isolation of affected and exposed animals is indicated.

POSSIBLE COMPLICATIONS

- Antibiotic therapy can promote bacterial dysbiosis and overgrowth of pathogenic bacteria. Use antibiotics with caution, and only use those that are considered safe in chinchillas.
- Dehydration due to fluid loss
- Ileus, bloat, intussusception, tenesmus, rectal prolapse
- Septicemia due to bacterial invasion of enteric mucosa
- Shock, death from enterotoxigenic

EXPECTED COURSE AND PROGNOSIS

- Sudden death without any clinical signs is common.
- Acute, severe diarrhea and lethargy carries a poor prognosis.
- Mild cases where the patient is alert and maintains appetite carry better prognosis.



MISCELLANEOUS

ASSOCIATED CONDITIONS

- Dehydration
- Malnutrition
- Hypoproteinemia
- Anemia
- Ileus
- Bloat
- Rectal prolapse
- Intussusception, torsion, impaction of cecum/colon
- Hepatic lipidosis

AGE-RELATED FACTORS

- All ages susceptible
- Young and recently weaned animals more commonly affected

ZOO NOTIC POTENTIAL

- *E. coli* and *Clostridium* spp. are considered part of the normal gut flora in humans; however, both are also associated with disease.
- Clients should always be advised to follow standard disinfection and hygiene practices when working with affected animals.

PREGNANCY/FERTILITY/BREEDING

Severe diarrhea and associated metabolic disturbance may reduce fertility or cause abortion.

SYNONYMS

Dysbiosis
Clostridial enterotoxigenosis

SEE ALSO

Diarrhea
Anorexia
Gastrointestinal stasis and dilation

ABBREVIATIONS

PCV = packed cell volume
TS = total solids
TWBC = total white blood cell count

INTERNET RESOURCES

N/A

Suggested Reading

- Donnelly TM. Disease problems of chinchillas. In: Quesenberry K, Carpenter J, eds. *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*, 2nd ed. St. Louis: Saunders, 2004:259–263.
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BASICS

DEFINITION

- Constipation—infrequent, incomplete, or difficult defecation with passage of scant, small, hard, or dry fecal pellets
- Intractable constipation and prolonged retention of hard, dry feces can lead to obstipation, in which defecation becomes impossible

PATHOPHYSIOLOGY

- The most common cause of constipation is feeding too much concentrated diet, which is high in energy and protein, without supplying sufficient roughage or fiber.
- Inadequate dietary fiber can decrease gastrointestinal motility; as motility slows, fecal pellets become smaller, less numerous, and drier than normal.
- Diets low in fiber typically contain high simple carbohydrate concentrations, which provide a ready source of fermentable products that can alter the resident microflora and promote the growth of bacterial pathogens and further suppress gastrointestinal motility.
- Constipation can develop with any disease that impairs passages of feces through the colon. Delayed fecal transit allows removal of additional salt and water, producing drier feces.
- Anorexia due to infectious or metabolic disease, pain, stress, or starvation may cause or exacerbate gastrointestinal hypomotility.

SYSTEMS AFFECTED

Gastrointestinal

SIGNALMENT

- In chinchillas, constipation is more commonly reported than diarrhea.
- No breed or gender predilections reported

SIGNS

Historical Findings

- Scant or no production of fecal pellets
- Small, hard, dry feces; occasionally blood stained
- Infrequent defecation
- Inappetence or anorexia
- Signs of pain, haunched posture, stretching out, rolling, reluctance to move
- Inappropriate diet or abrupt diet change
- Recent illness or stressful event
- Weight loss or other evidence of systemic disease
- Confinement, lack of exercise

Physical Examination Findings

- Small, hard fecal pellets or absence of fecal pellets palpable in the colon
- Firm, dry contents may be palpable within the cecum (cecal impaction)
- Gas, fluid, or firm, doughy, or dry gastrointestinal contents may be palpable depending on the underlying cause

- Anorectal prolapse, mass, or other lesion
- Abnormal function of hind limbs
- Evidence of fur chewing (barbering)
- Obesity
- Other physical examination findings depend on the underlying cause; perform a complete physical examination, including a thorough oral examination.

CAUSES

Dietary and Environmental Causes

- Lack of dietary fiber—indigestible coarse fiber promotes gastrointestinal motility, adds bulk to the ingesta, and holds water, producing plump, moist fecal pellets.
- Excessive carbohydrate—feeding large amounts of simple carbohydrates can promote the growth of *E. coli* and *Clostridium* spp., which can cause enterotoxemia and ileus. Sugary treats and high-carbohydrate, seed-based diets can also promote obesity.
- Obesity—cage confinement, lack of exercise
- Stress—pain, fighting among cage mates, surgery, hospitalization, new environment
- Dehydration—water bottle malfunction, bad tasting water, accidental oversight
- Anorexia—acquired dental disease/malocclusion, excessive fasting, starvation
- Foreign material—ingestion of/impaction with bedding, fibers, or fur

Metabolic and Dental Disease

- Conditions that result in inappetence or anorexia may also promote gastrointestinal hypomotility. Common causes include dental malocclusion, metabolic disease (renal disease, liver disease), pain (oral, trauma, postoperative), neoplasia, and toxins.
- Debility—general muscle weakness, dehydration, neoplasia

Drugs

- Anesthetic agents, anticholinergics, opioids
- Barium sulfate, kaolin/pectin, sucralfate
- Diuretics

Painful Defecation

- Anorectal disease—rectal prolapse, anal stricture, abscess, rectal foreign body
- Trauma—fractured pelvis, fractured limb, dislocated hip, perineal bite wound or laceration, perineal abscess

Mechanical Obstruction

- Extraluminal—healed pelvic fracture with narrowed pelvic canal, intrapelvic neoplasia, intestinal compression secondary to large fetuses
- Intraluminal and intramural—intestinal torsion, intussusception, impaction of the cecum or colonic flexure, rectal prolapse, colonic or rectal neoplasia or polyp, rectal stricture, perineal hernia, congenital defect (atresia ani)

Neuromuscular Disease

- Central nervous system—paraplegia, spinal trauma/disease, intervertebral disk disease, cerebral trauma/disease

- Peripheral nervous system—sacral nerve trauma/disease

RISK FACTORS

- Diets with inadequate indigestible coarse fiber content
- Excessive dietary carbohydrate or sugar
- Inactivity due to pain, obesity, cage confinement
- Anesthesia and surgical procedures
- Metabolic disease causing dehydration
- Ingestion of bedding substrate, fibers, fabric
- Barbering, excessive grooming
- Underlying dental, gastrointestinal tract, or metabolic disease
- Spinal, pelvic, or hind-limb trauma



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- Dyschezia and tenesmus—may be mistaken for constipation by owners; associated with increased frequency of attempts to defecate and frequent production of small amounts of liquid feces containing blood and/or mucous
- Stranguria—may be mistaken for constipation by owners; can be associated with hematuria and abnormal findings on urinalysis

CBC/BIOCHEMISTRY/URINALYSIS

- Usually normal
- May be used to identify underlying causes of gastrointestinal hypomotility or dehydration
- PCV and TS elevation in dehydrated patients

OTHER LABORATORY TESTS

N/A

IMAGING

- Chinchillas should not be fasted prior to taking radiographs.
- A chinchilla's abdomen is much larger than its thorax.
- Ileus can be diagnosed radiographically by the presence of severely distended and gas-filled intestinal loops.
- In cases where there is significant gas in the intestines or cecum, radiographic contrast may be poor.
- Contrast radiography may be useful in evaluating gastrointestinal transit time and locating obstructions and displacement of the gastrointestinal tract.
- Abdominal radiography may reveal colonic or rectal foreign body, colonic or rectal mass, spinal fracture, fractured pelvis, or dislocated hip.

DIAGNOSTIC PROCEDURES

N/A

PATHOLOGIC FINDINGS

N/A

(CONTINUED)

CONSTIPATION (LACK OF FECAL PRODUCTION)



TREATMENT

APPROPRIATE HEALTH CARE

- Remove or ameliorate any underlying cause, if possible.
- Chinchillas that have not produced feces or have been anorectic for over 24 hours should be treated as soon as possible; emergency treatment should be considered in all cases.
- Outpatient care may be appropriate in some cases, but inpatient hospitalization and support should be considered for the majority.

NURSING CARE

- Add small amounts of fresh food such as apples, carrots, or lettuce.
- Increase dietary fiber by adding grass or alfalfa hay.
- Omit treats such as grains or raisins.
- Discontinue any medications that may cause constipation.
- A warm, quiet environment should be provided.

Fluid Therapy

- Fluid therapy is an essential component of the medical management of all chinchillas with anorexia, gastrointestinal hypomotility, and/or constipation.
- Fluids may be administered by the oral, subcutaneous, intravenous, and/or intraosseous route as indicated by patient condition.
- Mildly affected patients usually respond well to oral and subcutaneous fluids.
- Intravenous or intraosseous fluids are indicated in patients that are severely dehydrated or depressed.
- Maintenance fluid requirements are estimated at 100 mL/kg/day. Initially, a balanced fluid (e.g., lactated Ringer's solution) may be used.

ACTIVITY

If the patient is not debilitated, encourage exercise; activity promotes gastric motility.

DIET

- Patients should be encouraged to eat during and following treatment. Continued anorexia will exacerbate gastrointestinal hypomotility, promote dysbiosis, and encourage the overgrowth of intestinal pathogens.
- To encourage food intake, offer the patient's favorite foods and treats in addition to the usual pelleted diet.
- If the patient refuses these foods, syringe-feed a gruel such as Critical Care for Herbivores (Oxbow Animal Health, Murdock, NE) 8–12 mL/animal q6–8h. Larger volumes and more frequent feedings may be readily accepted. Alternatively, a gruel can be made from ground pellets, fresh greens, vegetable baby foods, water, or juice.
- Assisted or forced feeding is contraindicated in cases of intestinal obstruction (e.g.,

intussusception, intestinal impaction or torsion, rectal prolapse).

- High-carbohydrate, high-fat nutritional supplements are contraindicated.
- Encourage oral fluid intake by offering fresh water, fresh foods, or flavoring the water with fruit/vegetable juices.
- Based upon history, diet may need to be permanently modified to include sufficient amounts of indigestible, coarse fiber (e.g., long-stemmed grass hay) and limited simple carbohydrates.

CLIENT EDUCATION

- Discuss the importance of dietary modification, if indicated.
- Advise owners to regularly monitor food consumption and fecal output; seek veterinary attention with a noticeable decrease in either.
- Recommend regular follow-up and monitoring for chinchillas with acquired dental disease or malocclusion.

SURGICAL CONSIDERATIONS

- In many cases, constipation and lack of fecal production will resolve with medical treatment alone.
- Surgical manipulation of the intestinal tract, hypothermia, anesthetic agents, and pain all exacerbate gastrointestinal hypomotility; gastrointestinal stasis is often worse postoperative. The combination of these factors may worsen the prognosis with surgical treatment.
- Surgery may be indicated for torsion, intussusception, intestinal foreign body (e.g., bedding, hair), rectal prolapse, extraluminal compression of the gastrointestinal tract, intestinal neoplasia, abscesses, and orthopedic problems.



MEDICATIONS

- Dehydrated patients should be rehydrated with a balanced electrolyte solution.
- Use parenteral medications in animals with severely compromised intestinal motility; oral medications may not be properly absorbed; begin oral medication when intestinal motility begins to return (fecal production, return of appetite, radiographic evidence).

DRUG(S) OF CHOICE

- Motility modifiers—cisapride (0.1–0.5 mg/kg PO q8–12h), metoclopramide (0.2–1.0 mg/kg PO, SC, IM q12h); may be indicated in patients with gastrointestinal hypomotility (see contraindications)
- Analgesics—buprenorphine (0.01–0.05 mg/kg SC, IV q8–12h), carprofen (2–5 mg/kg SC, PO q24h), meloxicam (0.2–0.5 mg/kg PO, SC, IM q24h); intestinal pain, regardless of cause, impairs mobility and decreases appetite and may severely inhibit recovery
- Petroleum-based laxatives, vegetable oil, unsalted butter, or lactulose as indicated

- Antibiotics—may be indicated in patients with bacterial overgrowth that sometimes occurs secondary to gastrointestinal hypomotility; indicated in patients with diarrhea, bloat, abnormal fecal cytology, and disruption of the intestinal mucosa (evidenced by blood in the feces); always use broad-spectrum antibiotics, based on culture/sensitivity where possible: chloramphenicol (30–50 mg/kg PO, SC, IM, IV q12h), trimethoprim sulfa (15–30 mg/kg PO, SC, IM q12h), or enrofloxacin (5–15 mg/kg PO, SC, IM q12h); for *Clostridium* spp. overgrowth: metronidazole (10–20 mg/kg PO q12h; use with caution, associated with liver failure)

CONTRAINDICATIONS

- Anticholinergics
- Assisted or forced feeding is contraindicated in cases of gastrointestinal tract obstruction or rupture.
- Gastrointestinal motility enhancers in patients with suspected mechanical obstruction (e.g., impaction, torsion, intussusception, rectal prolapse, neoplasia)
- Antibiotics that are primarily gram-positive in spectrum will suppress the growth of commensal flora, allowing overgrowth of enteric pathogens. These include lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins.

PRECAUTIONS

- Chloramphenicol may cause aplastic anemia in susceptible people. Clients and staff should use appropriate precautions when handling this drug.
- Metronidazole—associated with liver failure in chinchillas; neurotoxic if overdosed
- Meloxicam—use with caution in cases with suspected renal function

POSSIBLE INTERACTIONS

N/A

ALTERNATIVE DRUGS

N/A



FOLLOW-UP

PATIENT MONITORING

Monitor appetite and fecal production. Chinchillas that are successfully treated will regain a normal appetite; fecal volume and consistency will return to normal

PREVENTION/AVOIDANCE

- Strict feeding of diets containing adequate indigestible coarse fiber and low simple carbohydrate content along with access to fresh water likely to prevent episodes.
- Obesity prevention; encourage exercise (e.g., provide running wheel) and limit the intake of high-calorie, high-carbohydrate foods
- Routine fecal examination; treatment of intestinal parasites

CONSTIPATION (LACK OF FECAL PRODUCTION)**(CONTINUED)**

- Reduction of stress and prompt treatment of conditions that cause pain
- Be certain that postoperative patients are eating and passing feces prior to release.

POSSIBLE COMPLICATIONS

- Chronic constipation can lead to intestinal torsion, intussusception, impaction of the cecum or colonic flexure, rectal prolapse
- Death due to gastrointestinal tract rupture, hypovolemic or endotoxic shock
- Postoperative gastrointestinal stasis
- Overgrowth of intestinal bacterial pathogens

EXPECTED COURSE AND PROGNOSIS

- Early medical management of constipation and gastrointestinal hypomotility due to dietary causes, obesity, anesthesia/surgery, or anorexia secondary to pain or other stress usually carries a good to excellent prognosis.
- Surgical removal of foreign material, neoplasia, or surgical correction of intussusception, torsion, impaction, or rectal prolapse carries a guarded to poor prognosis.
- The prognosis for other causes varies.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

- Dental disease
- Gastrointestinal hypomotility
- Intestinal torsion
- Intussusception
- Cecal/colonic impaction
- Rectal prolapse
- Hepatic lipidosis
- Renal disease

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

- Pregnancy can produce extraluminal intestinal compression, obstruction
- If mechanical obstruction due to narrowed pelvic canal, risk of dystocia increased

SYNONYMS

Fecal impaction
Gastrointestinal stasis
Ileus

SEE ALSO

Gastrointestinal stasis and dilation

ABBREVIATIONS

PCV = packed cell volume

TS = total solids

INTERNET RESOURCES

N/A

Suggested Reading

Donnelly TM. Disease problems of chinchillas. In: Quesenberry K, Carpenter J, eds. *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*, 2nd ed. St. Louis: Saunders, 2004:255–265.

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BASICS

DEFINITION

- “Malocclusion” is actually just a single aspect of dental disease. Since congenital abnormalities of the skull have not been documented, “acquired dental disease” is a more accurate terminology.
- Acquired dental disease is actually a syndrome—a complex of clinical symptoms and signs that may be associated with the syndrome alone or with related diseases (e.g., abscesses).

ANATOMY

- The chinchilla is a rodent species belonging to the suborder Caviomorph or Hystricomorph (“guinea pig–like” or “porcupine–like”).
- All rodent species are *Simplicidentata*. They have one single row of maxillary incisor teeth.
- All rodent species have one pair of well-developed maxillary and mandibular incisor teeth, representing the best-known anatomical peculiarity of this order.
- Dental formula of chinchilla is: $2 \times 1I \ 0C \ 1P \ 3M = 20$; as with all rodent species and rabbits, chinchillas lack canine teeth and there is a diastema between the incisor and the first premolar tooth.
- As true herbivores, the occlusal surface of cheek teeth of chinchillas and other caviomorphs is rough and uneven due to enamel crests and dentinal grooves

PATHOPHYSIOLOGY

- Chinchillas have elodont (continuously growing) incisors and cheek teeth (similar to rabbits), which are worn during normal chewing activity.
- The primary cause of dental disease in the chinchillas is insufficient or improper wearing of cheek teeth due to inappropriate diet, in particular, lack of fiber.
- Acquired malocclusion and severe deviation of incisor teeth occurs most often following acquired dental disease of cheek teeth and uneven chewing.

SIGNS

Historical Findings

- Chinchillas typically demonstrate clinical signs only when dental disease is advanced. Therefore, routine dental examinations starting at or before 2 years of age (before the onset of clinical signs) is imperative in the diagnosis of early disease to prevent or delay progression.
- When clinical signs develop, a history of reduced activity, decreased food intake, and reduced production of stools is most common.
- Weight loss and emaciation are often present but frequently missed by the owner due to the heavy fur typical of this species.

- Other historical signs are wet fur over the mouth, the chin, and the forelimbs as dental disease often leads to pyalism and pawing of the mouth.
- Malocclusion of incisors is common but is rarely a presenting complaint because it is usually missed by the owner.

Physical Examination Findings

- Epiphora and cortical bone deformities of the ventral mandible are common findings in early dental disease. Both are related to elongation of the reserve crowns (roots) and deformation of the apexes of maxillary and mandibular cheek teeth.
- The small size and natural chinchilla behaviors make effective oral examination less than optimal or impossible in the awake animal. Complete inspection and proper diagnosis of dental disease should be performed under general anesthesia.
- Oral inspection and treatment of dental disease in rodents requires specialized equipment. The “table top mouth gag and restrainer” is much easier to use than traditional mouth gags, which are difficult to keep in place due to small patient size. Smaller, modified “open blade” cheek dilators are available and are much more effective than those used in rabbits as they provide more effective hold on the well-developed buccal folds.
- Inspection by oral endoscopy provides optimal oral visualization for all rodent species. A 14- to 18-cm-long, 2.7-mm thick, 30-degree rigid endoscope is commonly used. Other magnification devices are helpful but not always sufficient, and many lesions can be missed without the help of stomatoscopy.
- Like rabbits, abnormalities of the occlusal planes can occur in a rostrocaudal direction, with the production of “step mouth” and “wave mouth” patterns.
- Excessive curvature of the reserve crowns leads to apical deformities of the cheek teeth, both maxillary and mandibular.
- Common abnormalities on oral examination include widened interproximal spaces on the mandibular arcades and sharp buccal spikes on the maxillary arcades. Crown elongation of maxillary cheek teeth is frequently accompanied by an increase in height of both the alveolar crest and the gingival margin.

CAUSES

- Feeding diets insufficient in hay; hay provides an abrasive surface to grind coronal surfaces



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

For anorexia—gastrointestinal disease, pain, metabolic disease

CBC/BIOCHEMISTRY/URINALYSIS

Usually normal unless secondary infection or other underlying metabolic disease is present

OTHER LABORATORY TESTS

N/A

IMAGING

- An optimal radiologic study includes five views (lateral; two obliques; ventrodorsal and rostrocaudal) using high-definition cassettes and films such as those for mammography.
- Modern spiral CT scanning provides excellent detail in small species. 3D volume and surface renderings of the skull can provide tremendous information for diagnosis of dental disease or related problems in these species.



TREATMENT

The goal of treatment is restoration of dental anatomy to as close to normal as possible. In most cases, treatment provides only palliation, as effective restoration of dental anatomy to normal is not possible.

APPROPRIATE HEALTH CARE

Unless severely debilitated, coronal reduction is performed on an outpatient basis.

DIET

- It is absolutely imperative that the patient continue to eat during and following treatment. Most chinchillas with dental disease present for anorexia and may be unable to eat solid food for some time following coronal reduction. Anorexia will cause or exacerbate GI hypomotility, derangement of the gastrointestinal microflora, and overgrowth of intestinal bacterial pathogens.
- Syringe-feed a gruel such as Critical Care for Herbivores (Oxbow Pet Products) or Emerald Herbivore (Lafeber Company, Cornell, IL), 10–15 mL/kg PO q8–12h. Larger volumes and more frequent feedings are often accepted; feed as much as the patient will readily accept.
- Return the patient to a solid food diet as soon as possible to encourage normal occlusion and wear. Increase the amount of tough, fibrous foods and foods containing abrasive silicates such as hay and wild grasses.

CLIENT EDUCATION

- The prognosis is directly related to the stage of dental disease when diagnosis is made. Unfortunately, severe to end-stage dental disease is frequently diagnosed at first presentation.
- Inform the owner that repeated coronal reduction will usually be necessary, often life-long, since treatment provides only palliation, and effective restoration of dental anatomy to normal is usually not possible.

DENTAL MALOCCLUSION

(CONTINUED)

• If early dental disease is found on routine examination in a young animal, increasing the amount of coarse fiber in the form of hay may prevent or delay progression of disease.

SURGICAL CONSIDERATIONS***Trimming of the Cheek Teeth (Coronal Reduction)***

- Coronal reduction requires general anesthesia.
- Use a focused, directed light source and magnification loops. Adequate visualization and protection of soft tissues requires specialized equipment (see "Physical Examination Findings" above).
- A rotating dental unit with a straight handpiece and small metal or silicon burs is used to reduce coronal surfaces.
- Coronal reduction of incisor teeth is usually performed in conjunction with dental treatment of cheek teeth.
- The goal of occlusal adjustment of cheek teeth is to shorten the elongated clinical crowns. This is often difficult to completely accomplish for the maxillary cheek teeth, because gingival proliferation limits the depth of reduction.
- Extraction is challenging unless the tooth is loose secondary to periodontal infection. Unfortunately, diseased teeth fracture easily, making complete extraction extremely difficult.

**MEDICATIONS****DRUGS OF CHOICE*****Antibiotics***

- Antimicrobial drugs are indicated if bacterial infection is evident.
- Antibiotics should be selected based on the bacterial culture and sensitivity but can be chosen empirically. Unfortunately, very few antibiotics are safe to use in chinchillas, as many cause potentially fatal antibiotic-associated dysbiosis and enterotoxemia.
- Use broad-spectrum antibiotics such as enrofloxacin (5–15 mg/kg PO, SC q12h) or trimethoprim-sulfa (15–30 mg/kg PO q12h) for aerobic infections. Anaerobic bacteria are usually causative agent of tooth root abscess; if

anaerobes are present, chloramphenicol (30–50 mg/kg PO, SC, IM, IV q12h) has good osseous penetration. Penicillin G (40,000–60,000 IU/kg SC q2–7d) may also be used in severe cases. Monitor closely for loose stool or diarrhea.

Pain Management

Analgesics such as buprenorphine (0.01–0.05 mg/kg SC, IV q8–12h), meloxicam (0.2–0.5 mg/kg PO, SC q24h), or carprofen (2–5 mg/kg PO, SC q24h). Pain is common in chinchillas with dental disease; pain impairs mobility, decreases appetite, and may severely inhibit recovery.

CONTRAINDICATIONS

- Oral administration of penicillins, macrolides, lincosamides, and cephalosporins will cause potentially fatal enteric dysbiosis.
- Use of immunosuppressive drugs such as corticosteroids
- Extensive surgery on a debilitated animal

PRECAUTIONS

- Oral administration of antibiotics may cause antibiotic-associated enteritis, dysbiosis, and enterotoxemia.
- Metronidazole toxicity has been reported in chinchillas.

**FOLLOW-UP****PATIENT MONITORING**

- Monitor appetite and the ability to eat following treatment. Many patients require assist feeding with hay-based gruel. The duration of assist feeding depends on the severity of disease.
- Reevaluate and trim as needed. Evaluate the entire oral cavity with each recheck.

PREVENTION/AVOIDANCE

Provide adequate tough, fibrous hay and grasses to encourage normal wear.

POSSIBLE COMPLICATIONS

Periapical abscesses, recurrence, chronic pain, or inability to chew

EXPECTED COURSE AND PROGNOSIS

In general, the prognosis for dental disease in chinchillas is much more guarded than in rabbits since severe to end-stage dental disease

is frequently diagnosed at first presentation. Repeated coronal reduction will usually be necessary, often life-long, since treatment is only palliative, and effective restoration of dental anatomy to normal is usually not possible.

**MISCELLANEOUS****AGE-RELATED FACTORS**

N/A

ZOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

N/A

SYNONYMS

N/A

SEE ALSO

Anorexia
Nasal discharge and sneezing

ABBREVIATIONS

N/A

INTERNET RESOURCES

N/A

Suggested Reading

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BASICS

DEFINITION

- A cutaneous infection affecting the quantified regions of hair, nails, and occasionally the superficial layers of the skin.
- Trichophyton mentagrophytes is the organism typically encountered in rodent dermatophytoses.
- *Microsporum canis* and *M. gypseum* are also infrequently isolated, and are thought to be acquired from other animals such as dogs and cats.
- Exposure to or contact with dermatophyte does not necessarily result in infection.
- Chinchillas can be asymptomatic carriers.

PATHOPHYSIOLOGY

Dermatophytes are fungal pathogens that use keratin as a nutrient source. Dermatophytes grow in the keratinized layers of hair, nail, and skin; they do not thrive in living tissue or persist in the presence of severe inflammation. Dermatophytes are readily transmitted by direct contact with spores on fur, in bedding, on grooming equipment, and elsewhere within the environment.

SYSTEMS AFFECTED

Skin/exocrine

GENETICS

Genetics has been implicated as a predisposing factor, but this has not been proven.

INCIDENCE/PREVALENCE

Reported prevalence rates of 5%–30% in rodents; unclear as to specific incidence in chinchillas

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

More common in young and/or debilitated animals

SIGNS

Historical Findings

- Few or no clinical signs of infection common
- Lesions often begin as alopecia and dry scaly skin.
- A history of previously confirmed infection or exposure to an infected animal environment is a useful but not consistent finding.
- Variable pruritis

Physical Examination Findings

- Often begins as focal areas of alopecia
- Classic, well-circumscribed areas of alopecia, crust, scale, and broken hairs often identified first around the eyes, nose, mouth, and feet, but may occur anywhere on the body.
- Scales, crust, erythema are variable, usually in more severe cases
- Variable pruritis

CAUSES

- Exposure to infected animals, including other chinchillas, other rodents, rabbits, cats, and dogs
- Poor management practices—overcrowding, poor ventilation, dirty environment, poor nutrition
- As another species, immunocompromised animals or treatment with immunosuppressive medications may predispose to infection, but this is not been clearly demonstrated in chinchillas.

RISK FACTORS

Overcrowding, inappropriate heat and humidity, genetics, age, and pregnancy have been implicated.



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- Fur mites—*Cheyletiella* spp. have been reported in chinchillas and may be concurrent with dermatophytosis. Fur mite lesions are usually located in the intrascapular or tail base region and are associated with large, white scale. Mites are readily identified from skin scrapes or acetate tape reparations under low magnification.
- Ear mites are very uncommonly reported in chinchillas.
- Fleas—Patchy alopecia usually appears in other areas in addition to the head and feet; finding flea dirt will help to differentiate.
- Demodicosis—extremely rare, may occur in association with corticosteroid use; might be identified on deep skin scrape
- Contact dermatitis—usually ventral distribution of lesions; acute onset
- Barbering—by cagemates or self-inflicted; causes hair loss alone without pruritis, scale, or skin lesions
- Lack of grooming due to obesity or underlying dental or musculoskeletal disease may cause an accumulation of scale, especially in the intrascapular region.
- Injection site reactions—especially with irritating substances such as enrofloxacin; may cause alopecia and crusting

CBC/BIOCHEMISTRY/URINALYSIS

Useful for identifying underlying disease.

OTHER LABORATORY TESTS

N/A

IMAGING

N/A

DIAGNOSTIC PROCEDURES

- Skin scraping—micro-spatula with flat-ended blade preferable; dull edge of scalpel blade
- Acetate tape preparation—evaluate on low power field for ectoparasites
- Trichogram—cytology of epilated hairs to examine for lice or parasite eggs

- Skin biopsy—especially helpful in confirming infection and ruling out other causes for lesions

KOH Preparation

A quick diagnosis can sometimes be achieved with a wet mount KOH preparation. Skin scrapings from the periphery of a lesion are placed on a slide with a drop of 10% KOH and gently heated. This dissolves the keratin (hair, keratinocytes), leaving the fungal organisms. A stain such as lactophenol blue may be added and the slide is examined under the microscope.

Wood's Lamp Examination

Not a very useful screening tool; many pathogenic dermatophytes do not fluoresce; false fluorescence is common. Lamp should warm up for a minimum of 5 minutes and be exposed to suspicious lesions for up to 5 minutes; a true positive reaction associated with *M. canis* consists of apple green fluorescence of the hair shaft; keratin associated with epidermal scales and sebum will often produce a false positive fluorescence.

Fungal Culture

- Best means of confirming specific diagnosis
- Hairs that exhibit a positive apple-green fluorescence under a Wood's lamp examination are considered ideal candidates for culture (*M. canis* only).
- Samples for traditional fungal culture should be collected using a sterile brush or spatula to collect skin and hairs from the periphery of an alopecic area; can be inoculated onto a suitable fungal culture media. Cultures can take 10 days or more for growth to become evident.
- Culture using DTM provides a color change to red when dermatophytes become alkaline; dermatophytes typically produce this color during the early growing phase of their culture; saprophytes, which also produces color, do so in the late growing phase; thus, it is important to examine DTM daily.
- A positive culture indicates existence of a dermatophyte, but this must be differentiated from environmental contamination with a geophilic dermatophyte. This can occur when the feet are cultured.
- Reculture when lesions have disappeared; two negative cultures give best confidence of clearance.

PATHOLOGIC FINDINGS

The diagnosis is usually made on direct microscopic examination of skin scrapings with KOH. Histopathological examination is rarely required to confirm dermatophytic infections. One classic histological pattern is the presence of neutrophils within the stratum corneum. Other common patterns include compact orthokeratosis and a layer of compact orthokeratosis underlying normal orthokeratosis (sandwich sign). Occasionally, the organisms may be seen with routine

DERMATOPHYTOSIS

(CONTINUED)

H and E stain, but commonly a special stain such as GMS or PAS must be used to identify fungal hyphae. Dermatophyte infections of the hair are termed endothrix if it invades the hair shaft and exothrix if it remains on the surface.



TREATMENT

APPROPRIATE HEALTH CARE

- Management of dermatophytosis must be directed at eradication of infectious material from affected animals, in-contact animals, and the environment.
- Environmental treatment is mandatory. Dilute bleach out (1:10) is a practical and relatively effective means of environmental decontamination; concentrated bleach and formalin (1%) are more effective at killing spores, but their use is not practical in many situations; chlorhexidine was ineffective in pilot studies. Gloves should be worn during cleaning.
- Patients that appear otherwise normal are typically managed as outpatients; diagnostic evaluation may require brief hospitalization.
- Diseases associated with systemic signs of illness (e.g., pyrexia, depression, anorexia, and dehydration) or laboratory findings of azotemia and/or leukocytosis warrant an aggressive diagnostic evaluation and initiation of supportive and symptomatic treatment.

NURSING CARE

- Gloves should be worn when handling animals with this disease due to the zoonotic nature of the organism.
- Subcutaneous fluids can be administered (50–100 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider interosseous (IO) catheterization if intravascular fluids are needed. Base fluid selection on the underlying cause of fluid loss. In most patients, lactated Ringer's solution or Normosol crystalloid fluids are appropriate. Maintenance needs are estimated at 100 mL/kg/day.

ACTIVITY

- Isolate patient and in-contact animals during treatment, as dermatophytosis is very infective and zoonotic.
- Dust baths should be administered less frequently (once weekly); do not reuse dust bath. Use only good-quality dust bathing materials.

DIET

- Some chinchillas will develop inappetence. Be certain the chinchilla is eating, or provide assisted syringe feeding of an herbivore critical care diet if anorectic to prevent the development, or exacerbation of, gastrointestinal dysmotility/GI stasis.
- Increasing water content in foods or via oral or parenteral fluids may increase fluid intake.

Provide multiple sources of fresh water, including supplementing fresh water with small amounts of pure fruit juice (no added sugars), high water content vegetables, or soaking or misting fresh vegetables before offering.

CLIENT EDUCATION

- Dermatophytosis is zoonotic to humans and other household pets.
- Wear gloves when handling animal or in-contact animals and when cleaning environment.
- Clean the environment of the animal, including all living areas, clothing of the owners, toys, etc. using 10% bleach. Discard wooden cage materials and toys as they cannot be disinfected adequately.
- Discard previously used dust bath materials.

SURGICAL CONSIDERATIONS

When obtaining biopsy specimens, care should be taken to avoid transfer of organisms to other noninfected sites via contaminated surgical instruments.



MEDICATIONS

DRUG(S) OF CHOICE

Regardless of therapy chosen, treatment should continue until two negative cultures 4 weeks apart are obtained. In general, combination topical therapy with systemic antifungals is required for successful treatment of severe infections.

Topical Therapy

- Prior to topical therapy, the affected areas should be gently clipped to expose the affected skin, realizing that organisms might be moved to another location with the clipping. Thoroughly cleanse clipper blades after use. Always wear gloves when handling the patient.
- Lime sulfur dip (1:16 in water) is safe and efficacious q3–7d. The animal should not be rinsed but should be towel dried. Avoid contact with the eyes and ears as it can be irritating. It is odiferous and can stain. It is the treatment of choice in pregnant chinchillas. Wear gloves when using.
- 2% chlorhexidine/2% miconazole shampoo: shown to have moderate success in cats and dogs, efficacy and toxicity unknown in chinchillas.
- 0.2% enilconazole rinse q3–7d: unpredictable toxicity of enilconazole has been reported in cats, recommend caution and advise clients of the concerns, as no information on the use of enilconazole in chinchillas
- Clotrimazole, ketoconazole, or miconazole creams or ointments are not recommended as they are not formulated to penetrate infected hair shafts and follicles. Unsuccessful in the dense fur of chinchillas.

Systemic Therapy

- Itraconazole 5 mg/kg PO q24h for 6–8 weeks (or until negative cultures) has been used successfully in chinchillas
- Fluconazole 16 mg/kg PO q 24h for 3–4 weeks (or until negative cultures) has been used with success in guinea pigs, no data for chinchillas
- Griseofulvin 25 mg/kg PO q24h for 4–6 weeks (or until negative cultures) for refractory or severe cases; less effective than itraconazole

CONTRAINDICATIONS

The use of corticosteroids (systemic or topical) can severely exacerbate dermatophytosis.

PRECAUTIONS

- The dosages for systemic antifungal medications are extrapolated from dog and cat doses, so caution should always be used and patient must be closely evaluated for idiosyncratic or toxic reactions.
- Griseofulvin can cause bone marrow suppression and pancytopenia as an idiosyncratic reaction; not yet reported in chinchillas but may occur; weekly or bi-weekly CBC during therapy warranted.
- Ketoconazole and fluconazole can be hepatotoxic; monitor hepatic enzymes during therapy.

POSSIBLE INTERACTIONS

The imidazole antifungal medications (especially ketoconazole) can induce hepatotoxicity, which could interfere with metabolism of other drugs metabolized by the liver.

ALTERNATIVE DRUGS

- Terbinafine 8–20 mg/kg PO q24h has also been used successfully in other species, unclear as to efficacy in chinchillas
- Ketoconazole 5–7 mg/kg PO q12h has been used, but adverse effects are often reported so use with caution. Adverse effects include gastric irritation, hepatotoxicity, and anorexia.



FOLLOW-UP

PATIENT MONITORING

Repeat fungal cultures toward the end of the treatment regimen and continue treatment until at least one negative culture result is obtained, but preferably two negative cultures 4 weeks apart give most confidence in clearing the infection.

PREVENTION/AVOIDANCE

- Quarantine new animals and obtain dermatophyte cultures of all animals entering the household to prevent reinfection from other animals.
- Avoid infected soil to reduce potential for geophilic dermatophyte.

(CONTINUED)

DERMATOPHYTOSIS

EXPECTED COURSE AND PROGNOSIS

- Many animals will “self clear” a dermatophyte infection over a period of a few months, but recontamination can occur and it is most prudent to treat affected animals.
- Treatment periods can be long; continue treatment until two negative cultures are obtained if possible.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

N/A

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

Dermatophytes are zoonotic.

PREGNANCY/FERTILITY/BREEDING

- Lime sulfur dip is the safest treatment in pregnant animals.
- Griseofulvin is teratogenic and should not be used in pregnant chinchillas.
- Ketoconazole can affect steroidal hormone synthesis, especially testosterone, so should not be used in breeding animals.

SYNONYMS

Ringworm

SEE ALSO

N/A

ABBREVIATIONS

DTM = dermatophyte test media

KOH = potassium hydroxide

GMS = Gömöri methenamine silver stain

PAS = periodic acid-Schiff

CBC = complete blood count

INTERNET RESOURCES

N/A

Suggested Reading

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DIARRHEA



BASICS

DEFINITION

Abnormal frequency, liquidity, and volume of feces

PATHOPHYSIOLOGY

- Caused by imbalance in the absorptive, secretory, and motility actions of the intestines
- Can result from a combination of factors: increased membrane permeability, hypersecretion, and malabsorption.
- Death occurs from loss of electrolytes and water, acidosis, and from the manifold effects of toxins.
- May or may not be associated with inflammation of the intestinal tract (enteritis)
- Many of the infectious causes of diarrhea are related to increased secretion. Normally, the intestinal epithelium secretes fluid and electrolytes to aid in the digestion, absorption, and propulsion of ingesta. In disease states this secretion can overwhelm the absorptive capacity and produce a secretory diarrhea.
- Inflammatory and infectious diarrheas are often produced by changes in secretion, motility, and absorptive ability. Inflammation can also cause changes in intestinal wall permeability, causing loss of fluid and electrolytes and decreased absorptive ability.
- Ingesta and the products of digestion exert osmotic forces within the intestinal lumen. Osmotically active or poorly digestible foods, dietary malassimilation, malabsorption, or osmotically active medications (e.g., lactulose) can increase intestinal lumen osmotic force, which holds and draws fluids into the gut lumen, producing osmotic diarrhea. Fiber content contributes to the osmotic force exerted by a diet. The clinical signs of osmotic diarrhea often abate or resolve with fasting.
- A common predisposing cause of diarrhea in chinchillas is disruption of enteric commensal flora by antibiotic usage, stress, or poor nutrition. In a process known as bacterial dysbiosis, resident enteric microflora populations are altered by changes in intestinal motility, carbohydrate fermentation, pH, and substrate production. Beneficial bacteria are destroyed while pathogenic bacteria such as *Escherichia coli* and *Clostridium* spp. are promoted. Bacterial dysbiosis can lead to acute diarrhea, enterotoxemia, ileus, chronic intermittent diarrhea, and/or bloating.
- Antibiotic usage alters normal gut flora, causing severe, acute, often fatal diarrhea. The antibiotics most likely to cause problems are those that are effective against gram-positive bacteria and some gram-negative anaerobes, such as lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins. These antibiotics are likely to cause problems regardless of the route of administration.

SYSTEMS AFFECTED

- Gastrointestinal
- Endocrine/metabolic—fluid, electrolyte, and acid-base imbalances
- Many of the bacteria responsible for enteritis can also cause septicemia

GENETICS

N/A

INCIDENCE/PREVALENCE

N/A

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

- Diarrhea is a common clinical condition of chinchillas.
- No specific age or gender predilection to noninfectious causes
- Breeding females and young chinchillas up to 4 months of age are most susceptible to infectious causes.

SIGNS

General Comments

- Diarrhea can occur with or without systemic illness.
- Signs can vary from diarrhea alone in an apparently healthy patient to severe systemic signs
- The choice of diagnostic and therapeutic measures depends on the severity of illness.
- Patients that are not systemically ill tend to have normal hydration and minimal systemic signs.
- Signs of more severe illness (e.g., anorexia, weight loss, severe dehydration, depression, and shock) should prompt more aggressive diagnostic and therapeutic measures.

Historical Findings

- Can range from a history of soft, formed stool to liquid consistency
- Feces smeared on resting board in the cage; fur around the anus matted with feces
- Fecal accidents, changes in fecal consistency and volume, blood or mucous in the feces, or straining to defecate
- Dietary—sudden diet change, weaning, overfeeding fresh green foods or fruit, excessive carbohydrates or sugars; spoiled food; damp, moldy, or immature hay
- Stress—hospitalization, transportation, environmental changes, and concurrent illness may contribute to alterations in intestinal commensal flora
- Antibiotic usage—the use of antibiotics that are primarily gram positive in spectrum, suppressing the growth of commensal flora and allowing overgrowth of enteric pathogens

Physical Examination Findings

- Vary with the severity of disease
- Anorexia, lethargy, depression, lateral recumbency, respiratory distress
- Fever, dehydration, hypotension, weakness, hypothermia
- Rough hair coat, decreased grooming behavior

- Fecal staining of the perineum; an animal may camouflage diarrhea by cleaning itself, therefore fecal staining of fur may not be apparent
- Abdominal pain characterized by haunched posture, reluctance to move, stretching out, rolling, bruxism, and/or pain on abdominal palpation
- Tenesmus, hematochezia, intussusception, intestinal impaction, rectal prolapse
- Abdominal distention—due to thickened or fluid-filled bowel loops, impaction, gas accumulation, masses, or organomegaly
- Weight loss in chronically infected animals
- Animals may die acutely without clinical signs

CAUSES

- Dietary—abrupt change in diet, weaning, excessive fresh green foods or fruit, excessive carbohydrate/sugar, or spoiled food
- Bacterial infection/enterotoxemia—*E. coli*, *Listeria* spp., *Pseudomonas* spp., *Proteus* spp., *Pasteurella* spp., *Salmonella* spp., *Staphylococcus* spp., *Yersinia* spp., and *Clostridium* spp.
- Obstruction—neoplasia, foreign body, intussusception
- Drugs/toxins—oral administration of lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins; plant toxins; mycotoxins
- Parasitic—*Giardia* spp., coccidia, nematodes, cestodes, *Cryptosporidium* spp.
- Metabolic disorders—liver disease, renal disease
- Systemic illness may cause diarrhea as a secondary event.
- Neoplasia—primary gastrointestinal tumor, or as a sequella to other organ involvement

RISK FACTORS

- Stress—improper temperature, poor sanitation, overcrowding, shipping
- Sudden diet changes, weaning, insufficient dietary fiber, carbohydrate overload
- Improper antibiotic usage
- Contaminated food
- Immunosuppressors (corticosteroids, concurrent disease), heavy parasite load, and poor nutrition are considered to be additional predisposing factors.



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Consider all causes of enteropathy, including diet change, inappropriate antibiotics, enterotoxemia, systemic or metabolic disease, and specific intestinal disorders. More severe illness should prompt a more extensive evaluation.

CBC/BIOCHEMISTRY/URINALYSIS

- Often normal in mild cases
- Increased PCV and TS seen with dehydration

(CONTINUED)

DIARRHEA

- Hemogram abnormalities consistent with sepsis and/or systemic infection
- TWBC elevation with neutrophilia indicative of a toxic inflammatory response
- Anemia possible with chronic gastrointestinal bleeding
- Hypoalbuminemia may be seen with protein loss from the intestinal tract
- Serum biochemistry abnormalities seen with renal or hepatic disease
- Electrolyte abnormalities secondary to anorexia, fluid loss, and dehydration

OTHER LABORATORY TESTS

Fecal Examination

- Fecal direct examination (with and without Lugol's iodine), fecal floatation, and zinc sulfate centrifugation may demonstrate gastrointestinal parasites or spore-forming bacteria.
- Fecal cytology—may reveal red blood cells or fecal leukocytes, which are associated with inflammation or infection of the intestines
- Fecal Gram's stain—may demonstrate large numbers of spore-forming bacteria consistent with *Clostridium* spp. or excessive numbers of gram-negative bacteria
- Fecal culture should be performed if bacterial infection is suspected; however, interpretation may be difficult since *E. coli*, *Salmonella*, and *Clostridium* spp. may be isolated from clinically healthy chinchillas.
- Fecal occult blood testing—to confirm melena when suspected

IMAGING

- Whole body radiographs should be taken to assess both body cavities.
- Varying amounts of gas and ingesta may be seen normally in chinchillas.
- With gastroenteritis, there is usually an increase in gas production and usually evidence of ingesta, despite persistent anorexia.
- With ileus there may be significant gas accumulation.
- Contrast radiography may aid in visualization and determination of motility.
- Abdominal ultrasonography may demonstrate intestinal wall thickening, gastrointestinal mass, foreign body, ileus, or mesenteric lymphadenopathy.
- Ultrasound may be difficult to interpret when large amounts of gas are present within the intestinal tract.
- Hyperechogenicity may be seen with hepatic lipidosis or fibrosis; hypochoic nodules are suggestive of hepatic necrosis, abscess, or neoplasia.



TREATMENT

APPROPRIATE HEALTH CARE

- Treatment must be specific to the underlying cause to be successful.
- Chinchillas with mild diarrhea that are

otherwise bright and alert usually respond to outpatient treatment.

- Individuals with moderate to severe diarrhea usually require hospitalization and 24-hour care for parenteral medication, fluid therapy, and thermal support.
- Patients exhibiting signs of lethargy, depression, dehydration, and/or shock should be hospitalized even if diarrhea is mild or absent.
- When infectious disease is suspected, strict isolation of affected and exposed animals is indicated.

NURSING CARE

Fluid Therapy

- Rehydration and correction of electrolyte imbalances are the mainstays of treatment in most cases.
- Severe volume depletion can occur with acute diarrhea; aggressive shock fluid therapy may be necessary.
- Fluids may be administered by the oral, subcutaneous, intravenous, and/or intraosseous route as indicated by patient condition.
- Mildly affected patients usually respond well to oral and subcutaneous fluids.
- Intravenous or intraosseous fluids are indicated in patients that are severely dehydrated or depressed.
- Maintenance fluid requirements are estimated at 100 mL/kg/day.
- Rehydration is essential to treatment success in severely ill chinchillas. Initially, a balanced fluid (e.g., lactated Ringer's solution) may be used.
- A warm, quiet environment should be provided.

DIET

- It is imperative that chinchillas continue to eat during treatment and recovery. Prolonged anorexia promotes further derangement of gastrointestinal microflora, encourages overgrowth of intestinal bacterial pathogens, and negatively affects gastrointestinal motility.
- Assisted feeding is typically required until the patient is eating, eliminating, and maintaining body weight.
- A highly digestible, liquefied, elemental diet may be indicated: Emeraid Herbivore (Lafeber Co., Cornell, IL); enteral liquid diets such as Ensure (Abbott Nutrition, Columbus, OH)
- Additional options include hand-feeding formula for rabbits/rodents Critical Care or Critical Care Fine Grind (Oxbow Animal Health, Murdock, NE), pureed fruit/vegetable baby foods, and blenderized rodent pellets.
- Encourage oral fluid intake: offer fresh water, administer oral fluids via syringe, wet the food, flavor water with fruit or vegetable juices

CLIENT EDUCATION

- Discuss the importance of dietary modification, if indicated.
- Advise owners to regularly monitor food

consumption and fecal output; seek veterinary attention with a noticeable decrease in either.

SURGICAL CONSIDERATIONS

- If surgery is necessary to correct intussusception or impaction, the patient should first be stabilized.
- Surgical manipulation of the intestinal tract, hypothermia, anesthetic agents, and pain may cause or exacerbate gastrointestinal hypomotility. The combination of these factors may worsen the prognosis with surgical treatment.
- Surgery may be indicated for rectal prolapse, intussusception, intestinal foreign body (e.g., bedding, hair), extraluminal compression of the gastrointestinal tract, intestinal neoplasia, abscesses, and orthopedic problems.



MEDICATIONS

DRUG(S) OF CHOICE

Antibiotic Therapy

- Indicated in patients with bacterial inflammatory lesions of the gastrointestinal tract; also indicated in patients with disruption of the intestinal mucosa evidenced by blood in the feces.
- Selection should be broad-spectrum antibiotics, based on results of culture and susceptibility testing when possible.
- Some choices for empirical use while waiting for culture results include chloramphenicol (30–50 mg/kg PO, SC, IM, IV q12h), trimethoprim sulfa (15–30 mg/kg PO q12h), or enrofloxacin (5–15 mg/kg PO, SC, IM q12h).
- For *Clostridium* spp. overgrowth: metronidazole (10–20 mg/kg PO 12h; use with caution)

Antiparasitic Agents

- Indicated based upon fecal examination for internal parasites, ova, or cysts
- For nematodes—fenbendazole (20 mg/kg PO q24h × 5 days)
- For cestodes—praziquantel (5–10 mg/kg PO or SQ, repeat in 10 days)
- For coccidia—sulfadimethoxine (25–50 mg/kg PO q24h × 10 days)
- For *Giardia*—metronidazole (10–50 mg/kg q12h × 5 days; use with caution), fenbendazole (20 mg/kg PO q24h × 5 days), albendazole (25 mg/kg PO q12h × 2 days)

Gastrointestinal Agents

- Bismuth subsalicylate (0.3–0.6 mL/kg PO q4–6h PRN; dose cited is extrapolated from rabbit dose)
- Kaolin/pectin (0.2–0.3 mL/kg PO q6–8h PRN; dose cited is extrapolated from guinea pig dose)
- Loperamide (0.1 mg/kg PO q8h × 3 days, then q24h × 2 days; give in 1 mL water) may be helpful in the treatment of acute diarrhea (see contraindications)

DIARRHEA

(CONTINUED)

- Cholestyramine (2 g/20 mL water PO q24h PRN) has been demonstrated to bind clostridial and other bacterial toxins in humans; anecdotal success in rabbits; may be useful in chinchillas
- Transfaunation with healthy chinchilla feces may help to reestablish intestinal microflora.

CONTRAINDICATIONS

- Anticholinergics (loperamide) in patients with suspected intestinal obstruction, glaucoma, intestinal ileus, liver disease, enterotoxin-producing bacteria, and invasive bacterial enteritis
- Antibiotics that are primarily gram-positive in spectrum will suppress the growth of commensal flora, allowing overgrowth of enteric pathogens. These include lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins.

PRECAUTIONS

- It is important to determine the cause of diarrhea. A general shotgun antibiotic approach may be ineffective or detrimental.
- Antibiotic therapy can predispose chinchillas to bacterial dysbiosis and overgrowth pathogenic bacteria. If signs worsen or do not improve, therapy should be adjusted.
- Choramphenicol may cause aplastic anemia in susceptible people. Clients and staff should use appropriate precautions when handling this drug.
- Metronidazole neurotoxic if overdosed; anecdotal reports of hepatotoxicity in chinchillas
- Isolate affected and exposed animals when infectious disease is suspected.

POSSIBLE INTERACTIONS

N/A

ALTERNATIVE DRUGS

N/A



FOLLOW-UP

PATIENT MONITORING

- Fecal volume and character, appetite, attitude, and body weight

- If diarrhea does not resolve, consider reevaluation of the diagnosis.

PREVENTION/AVOIDANCE

- Providing appropriate diet and husbandry
- Reducing stress and providing sanitary conditions
- Appropriate antibiotic selection
- When infectious disease is suspected, strict isolation of affected and exposed animals is indicated.

POSSIBLE COMPLICATIONS

- Antibiotic therapy can promote bacterial dysbiosis and overgrowth of pathogenic bacteria. Use antibiotics with caution, and only use those that are considered safe in chinchillas.
- Dehydration due to fluid loss
- Ileus, bloat, intussusception, tenesmus, rectal prolapse
- Septicemia due to bacterial invasion of enteric mucosa
- Shock, death from enterotoxigenic

EXPECTED COURSE AND PROGNOSIS

Depends on cause and severity of diarrhea



MISCELLANEOUS

ASSOCIATED CONDITIONS

- Dehydration
- Malnutrition
- Hypoproteinemia
- Anemia
- Septicemia
- Peritonitis
- Rectal prolapse
- Intussusception, torsion, impaction of cecum/colon
- Hepatic lipidosis

AGE-RELATED FACTORS

- All ages susceptible to diarrhea
- Young and recently weaned animals are most severely affected by infectious and parasitic organisms that may cause diarrhea.

ZOO NOTIC POTENTIAL

- Cryptosporidium
- Salmonella
- Giardia

PREGNANCY/FERTILITY/BREEDING

Severe diarrhea and associated metabolic disturbance may reduce fertility or cause abortion. *Salmonella* spp. infection has been associated with abortion in fur-ranched chinchillas.

SYNONYMS

N/A

SEE ALSO

Anorexia
Antibiotic-associated enterotoxemia
Gastrointestinal stasis and dilation
Giardiasis

ABBREVIATIONS

PCV = packed cell volume
TS = total solids
TWBC = total white blood cell count

INTERNET RESOURCES

N/A

Suggested Reading

- Donnelly TM. Disease problems of small rodents. In: Quesenberry K, Carpenter J, eds. *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*, 2nd ed. St. Louis: Saunders, 2004:299–315.
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BASICS

DEFINITION

Dyspnea is difficulty in breathing or labored breathing; tachypnea is rapid breathing but not necessarily labored. Dyspnea and tachypnea sometimes occur simultaneously.

PATHOPHYSIOLOGY

- Dyspnea and/or tachypnea are common symptoms of respiratory or cardiovascular system disorders.
- Primary respiratory diseases may be divided into upper respiratory tract (URT) and lower respiratory tract (LRT) disorders.
- Nonrespiratory causes of dyspnea may include abnormalities in pulmonary circulation (congestive heart failure), pulmonary vascular tone (CNS disease, shock), oxygenation (anemia), or ventilation (heat stress, obesity, ascites, abdominal organomegaly, musculoskeletal disease).

SYSTEMS AFFECTED

- Respiratory
- Cardiovascular
- Gastrointestinal
- Nervous system
- Musculoskeletal

GENETICS

Unknown

INCIDENCE/PREVALENCE

- Chinchillas are susceptible to both upper and lower airway disease.
- Choke or bloat due to esophageal or pharyngeal obstruction are reported to be common emergency presentations.
- Inflammation of the glottis and pharyngeal tissues is common following tracheal intubation or attempted intubation.
- Chinchillas are particularly prone to heat stress at temperatures higher than 75°F.
- Cardiac disease is commonly manifested as heart murmurs in chinchillas without clinical signs. There is one report of heart failure and acute dyspnea with radiographic evidence of pulmonary edema and cardiomegaly.
- Pulmonary metastatic neoplasia from the primary mammary tumor has been reported.

SIGNALMENT

- Chinchillas with previous history of dental disease
- All ages and genders affected

SIGNS

General Comments

- Dyspnea and/or tachypnea are signs associated with severe chronic pneumonia, cardiovascular disease, or acute onset associated with choke.
- Open-mouthed breathing is a poor prognostic sign in chinchillas because chinchillas are obligate nasal breathers. The rim of the epiglottis is normally situated

dorsal to the elongated soft palate to allow air passage from the nose to the trachea during normal respiration. Obstruction of the nasal passages may lead to attempts at open mouth breathing.

Historical Findings

- Sneezing or nasal-ocular discharge, facial abscess, dental disease, pyalism may be seen with upper respiratory infections.
- Exercise intolerance may occur with URT disease (chinchillas are obligatory nasal breathers), LRT disease, or CHF.
- Anorexia and lethargy often only historical complaint in chinchillas with pneumonia.
- Coughing and frantic pawing at the mouth may occur with choke.
- Prolonged exposure to environmental temperatures greater than 75°F.

Physical Examination Findings

- Stridor, stertor, open-mouth breathing can occur with upper airway obstruction or pharyngeal/esophageal obstruction compressing the trachea
- Seros or mucopurulent nasal discharge, ocular discharge, facial abscess, dental disease, pyalism with upper respiratory disease. May induce pain upon oral examination.
- Harsh inspiratory and expiratory bronchovesicular sounds sometimes auscultated with pneumonia
- Absent lung sounds over sites of consolidation—pulmonary abscesses or neoplasia
- Absent lung sounds ventrally, harsh lung sounds dorsally—pleural effusion
- Fine inspiratory crackles—pulmonary edema
- Pyrexia—hyperthermia due to heat stress or systemic infectious disease
- Gastric tympany—gastric outflow obstruction
- Weight loss and poor hair coat in chinchillas with chronic respiratory or dental disease
- Anorexic chinchillas may show signs of GI hypomotility; scant dry feces, dehydration, firm stomach or cecal contents, gas-filled intestinal loops
- Cardiac murmur—common incidental finding in chinchillas but may also be associated with congestive heart failure

CAUSES

Respiratory causes

Upper Respiratory Tract

- Nasal obstruction—rhinitis/sinusitis most commonly caused by gram-negative organisms, mycotic infections are rare, dental disease (periapical abscess, elongated maxillary tooth roots penetrating into nasal passages, associated with anaerobic bacteria), foreign body, neoplasia (rare)
- Laryngotracheal obstruction—common to have laryngeal edema following traumatic intubation or attempts at intubation
- Choke—pharyngeal or esophageal tracheal compression due to food mass or foreign body

- Traumatic airway rupture—rare
- Lower Respiratory Tract
- Pneumonia—most common bacterial agents reported in chinchillas are gram-negative bacteria: *Pseudomonas aeruginosa*, *Listeria monocytogenes*, or *Streptococcus pneumoniae*.
- Aspiration pneumonia can occur during force-feeding.
- Neoplasia (primary, metastatic both rare)
- Pulmonary edema (cardiogenic and noncardiac)
- Pneumonitis (allergic)
- Pneumothorax, hemothorax, pleural effusion caused by cardiac or pericardial disease
- Diaphragmatic hernia (rare)

Nonrespiratory causes

- Pain, fever, heat stress, obesity, anxiety
- Cardiac disease—CHF, severe arrhythmias, cardiogenic shock
- Hematologic—anemia
- Metabolic disease—acidosis, uremia
- Abdominal distension—bloat due to gastric obstruction or organomegaly, ascites, or pregnancy

RISK FACTORS

- Dental disease—extending periapical or tooth root abscesses into nasal sinuses, low-fiber diets may predispose to dental disease
- Dysphagia, force-feeding—can lead to aspiration
- Elevated environmental temperatures
- Poor husbandry—dirty, urine-soaked bedding (high ammonia concentrations); poor ventilation, prolonged exposure to dust baths
- Bleach, smoke or other inhaled irritants
- Immunosuppression—stress, corticosteroid administration, concurrent disease, debility increases susceptibility to and extension of bacterial infections



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- Tachypnea without dyspnea may be a physiologic response to fear, physical exertion, anxiety, fever, pain, or acidosis.
- Pneumonia usually presents with signs of systemic disease (emaciation, anorexia, depression, fever).
- URT dyspnea is often more pronounced on inspiration; nasal discharge, facial abscesses, or signs of dental disease usually present
- LRT dyspnea is more often associated with expiratory effort but can also include inspiratory effort.
- Pharyngeal mass may cause both inspiratory and expiratory dyspnea and orthopnea.
- Gastric tympany is an emergency and can be easily palpated, auscultated, and diagnosed radiographically.

DYSPNEA AND TACHYPNEA

(CONTINUED)

- Heat stress is an emergency and has history of exposure to elevated environmental temperatures.
- Primary cardiac disease often presents with a constellation of other signs (e.g., heart murmur, arrhythmias).
- Pleural space disease often presents as exaggerated thoracic excursions that generate only minimal airflow at the mouth or nose.
- Neoplasia—uncommon; rule out via imaging
- Trauma—history and physical examination findings of trauma

CBC/BIOCHEMISTRY/URINALYSIS

- Hemogram—TWBC elevations with neutrophil: lymphocyte ratio shift; toxicity of neutrophils \pm bands, monocytosis may suggest chronicity; thrombocytosis associated with active inflammation
- Biochemistry panel—may help to define underlying cause with metabolic diseases; increased liver enzyme activity or bile acids (liver disease), uremia (renal failure), increased CK (muscle wasting, heart disease or muscle damage if soft tissue abscesses are present)

OTHER LABORATORY TESTS

- Culture and sensitivity from deep nasal swabs may be useful if URT disease.
- Ultrasound to identify pulmonary abscessation. Ultrasound-guided FNA for cytology and culture of abscesses

IMAGING**Radiography**

- Skull—nasal obstructions, sinusitis, bone destruction from tooth root abscesses, neoplasia, mycotic or severe bacterial infections. CT scans or MRI are much more useful in the diagnosis of URT disease.
- Thoracic—pulmonary diseases (small airway disease, pulmonary edema and pneumonia), pleural space disease (effusions, mediastinal mass, pneumothorax)
- Cardiac shadow—cardiomegaly, lifting of the trachea
- Abdominal—gas-filled stomach due to outflow obstruction (bloat), aerophagia, organomegaly, ascites

Ultrasonography

- Thoracic ultrasound may be beneficial to locate pulmonary abscessation.
- Abdominal ultrasound may be used to evaluate masses, organomegaly, or renal abnormalities.

Echocardiography

Evaluate congenital defects and valvular disease, pericardial effusion, cardiomyopathy

CT Scan

Superior to radiographs for identifying bony changes and severity of dental disease. Can also evaluate the nasal cavity for evidence of fluid or exudates, and can evaluate the soft tissue structures in more detail to evaluate for signs of abscessation/neoplasia. Contrast is useful for evaluating if a tumor is suspected,

contrast CT is warranted to detail the extent of the tumor.

DIAGNOSTIC PROCEDURES

- Microbiologic and cytological examinations
- LRT samples—transtracheal washing and bronchoalveolar lavage are difficult procedures in chinchillas and only recommended if able to intubate. Fine-needle aspiration of abscess, fluid, or mass can be performed under ultrasound guidance.
- URT samples—Nasal flush rarely yields diagnostic sample; nonspecific inflammation is most commonly found. Deep nasal cultures and cytology showing intracellular bacteria in conjunction with culture results is more meaningful.
- Electrocardiogram—cardiac murmurs are common in chinchillas; subclinical valvular disorders are common; other cardiac disease is rarely reported but may be underdiagnosed due to lack of clinical investigation.

PATHOLOGIC FINDINGS

Varies with the primary disorder

**TREATMENT****APPROPRIATE HEALTH CARE**

- Severe dyspnea requires hospitalization for supplemental oxygen and stabilization. Supply O₂ enrichment (O₂ cage or induction chamber) in a quiet environment.
- Gastric bloat and heat stress require emergency critical care.
- If trauma to the glottis/pharynx has occurred during tracheal intubation attempts, prophylactic NSAID therapy is indicated if/when animal is well hydrated.
- Nebulization with saline for respiratory disorder—may contribute to a more rapid resolution if used in conjunction with antibacterials
- Systemic antibiotics for bacterial URT or LRT disease. Prolonged course of treatment may be indicated.
- Outpatient—if stable and can be managed at home pending further diagnostics or treatments as necessary

NURSING CARE

- Maintain normal systemic hydration—important to aid mucociliary clearance and secretion mobilization. Subcutaneous fluids can be administered (50 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider IO catheterization if intravascular fluids are needed. Base fluid selection on the underlying cause of fluid loss. In most patients, isotonic crystalloid fluids are appropriate. Maintenance needs are estimated at 100 mL/kg/day. Fluids by mouth should be avoided in patients with dyspnea or dysphagia.
- Gastric decompression in cases of gastric tympany can be accomplished by passing a

- large red rubber tube into the stomach through the oral cavity or, alternatively, a needle used as a trocar can be passed percutaneously. Trocarization carries the risk of gastric or cecal rupture or peritonitis.
- Clinical signs of hyperthermia and shock require reducing the chinchilla's core body temperature to approximately 103°F with cool crystalloid fluids and cool towels. Treat perfusion deficits with fluid therapy.
- Keep nares clear of nasal discharges in chinchillas with URT disease.
- Thoracocentesis may be both diagnostic and therapeutic in animals with pleural space disease.

ACTIVITY

Restrict activity if severe dyspnea or tachypnea

DIET

- Many chinchillas will develop inappetence. Be certain the chinchilla is eating to prevent the development, or exacerbation of, gastrointestinal hypomotility/stasis.
- If patient is eating on own, offer range of normal diet at home including fresh, moist, high-fiber vegetables; chopped hay; and pellets.
- If chinchilla is not eating sufficiently on own, anorexia will often cause GI hypomotility, derangement of the gastrointestinal microflora, and overgrowth of intestinal bacterial pathogens. Syringe-feeding of a high fiber diet such as Critical Care for Herbivores (Oxbow Animal Health, Murdock, NE) is critical for the anorexic chinchilla. Administer with caution when chinchilla has dyspnea or dysphagia. Calculate maintenance caloric requirements using $57 \times W^{0.75}$ (usually amounts to feeding Critical Care diet at 10–15 mL/kg PO q 6–8 hours via syringe) if anorectic. Alternatively, chinchilla pellets can be ground with high-fiber green vegetables to make slurry that can be syringe-fed as above. Ensure appropriate fiber intake to maximize nutrition.
- Rarely, esophagostomy tube is indicated.
- Encourage fluid intake with high-water vegetables or by soaking vegetables in water before feeding.
- CAUTION—patients with dyspnea are at risk for aspiration. Ensure patient is in a stable position and is willing to take foods before assisted feeding.

CLIENT EDUCATION

Chinchillas are long-lived and should receive annual physical examinations after reaching adult age. Proper husbandry including appropriate diet can help to reduce many of these problems.

SURGICAL CONSIDERATIONS

- Chinchillas are difficult to intubate due to the palatal ostium in the oropharynx, which complicates providing a secure airway during anesthesia. Chinchillas can be intubated endoscopically.
- Dental disease may be primary cause of URT disorder.

(CONTINUED)

DYSPNEA AND TACHYPNEA



MEDICATIONS

DRUG(S) OF CHOICE

- Systemic antibiotics—based ideally on results from culture and sensitivity testing. Depending on severity of infection, long-term antibiotics (6 weeks minimally). Use broad-spectrum antibiotics such as enrofloxacin (5–15 mg/kg PO, SC q12h) or trimethoprim-sulfa (15–30 mg/kg PO q12h) for aerobic infections; if anaerobes are present as in dental disease, chloramphenicol (30–50 mg/kg PO, SC, IV q12h) has excellent osseous penetration; penicillin G (40,000–60,000 IU/kg SC q2–7d) may also be used in severe cases.
- Topical antibiotics—for treatment of URT infection; use ophthalmic preparations of antibiotics without corticosteroids.
- Simethicone has also been suggested to treat gastric bloat to reduce gas in the GI tract; care must be taken to ensure that animal is well hydrated because simethicone can also dehydrate and create mass effect with dehydrated GI contents.
- Cardiac disease in rodents has been treated with similar therapeutics as other companion animals including diuretics, angiotensin-converting enzyme, and digoxin.
- NSAIDs such as meloxicam (0.2–0.5 mg/kg PO, SC q24h) and carprofen (2–5 mg/kg PO q24h) can provide both anti-inflammation and analgesia.
- Analgesia is a critical aspect of therapy if animal is painful such as with osteomyelitis and postsurgical intervention; therefore, addition of an opioid medication such as buprenorphine (0.01–0.05 mg/kg SC, IM, IV q8–12h) is necessary.

CONTRAINDICATIONS

- Metronidazole toxicity has been reported in chinchillas.
- Oral antibiotics that select against gram-positive bacteria (penicillins, macrolides, lincosamides, cephalosporins) can cause fatal enteric dysbiosis and enterotoxemia.
- Topical and systemic corticosteroids—chinchillas are also sensitive to their immunosuppressive effects; can exacerbate infectious disease.

PRECAUTIONS

In animals with CHF, blunt chest trauma, or renal disease, iatrogenic fluid overload and pulmonary edema is a potential problem. Intravenous administration of crystalloids should be used judiciously. Respiratory rate and effort should be monitored carefully and frequently in these patients.



FOLLOW-UP

PATIENT MONITORING

- Reevaluate patient at 7–10 days or sooner if patient's clinical signs are worsening.
- Radiographs—monitor response to therapy in animals with pulmonary disease. Pulmonary edema should be visibly improved within 12 hours of therapy if effective therapy is used. Monitor the recurrence of pleural effusion, based upon how quickly effusion accumulates. Radiographic lesions of pneumonia improve more slowly than the clinical appearance and may not improve with pulmonary abscesses.
- Cardiac ultrasound can be repeated every 3–12 weeks, depending on the condition and treatment.

PREVENTION/AVOIDANCE

Kept in dry cool environment to prevent respiratory disease. Maintain cool environmental temperatures below 73°F. Complete oral examination needs to be included in the physical examination of adult chinchillas.

POSSIBLE COMPLICATIONS

- Relapse, progression of disease, and death are common with pneumonia.
- Osteomyelitis is a common sequelae to severe, chronic dental infections.
- Surgical intervention for dental disease will involve repeated occlusal adjustments every 6–12 weeks.

EXPECTED COURSE AND PROGNOSIS

- LRT, URT, and dental disease infections may take months of multiple therapies to resolve.
- The prognosis for heat stroke and gastric outflow obstruction (bloat) are guarded to grave because most animals are affected severely by the time clinical signs are observed.



MISCELLANEOUS

ASSOCIATED CONDITIONS

- Upper respiratory infection
- Dental disease
- Facial abscesses
- Gastrointestinal hypomotility

ZOO NOTIC POTENTIAL

Streptococcus pneumoniae could be considered a potential anthroponozoonosis, but it is not known if rodents can acquire the infection from contact with humans.

PREGNANCY/FERTILITY/BREEDING

If dental disease is suspected as the inciting cause, breeders recommend not breeding

these animals as inheritance abnormalities are suspected.

SYNONYMS

Choke
Bloat
Snuffles

SEE ALSO

Otitis media and interna
Nasal discharge and sneezing

ABBREVIATIONS

CHF = congestive heart failure
CK = creatine kinase
CNS = central nervous system
CT = computed tomography
FNA = fine-needle aspiration
GI = gastrointestinal
LRT = lower respiratory tract
MRI = magnetic resonance imaging
NSAID = nonsteroidal anti-inflammatory
TWBC = total white blood cell count
URT = upper respiratory tract

INTERNET RESOURCES

Suggested Reading

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BASICS

DEFINITION

Dystocia is any difficult or abnormal parturition with or without assistance. Disorders of pregnancy include abortion or retained or mummified fetuses.

PATHOPHYSIOLOGY

- Normal gestation period is 105–115 days.
- Near end of gestation, females that become suddenly startled may spontaneously abort.
- Dystocia is rare in chinchillas but may occur if the fetus is oversized or deformed.
- Female chinchillas are sexually mature at 4–5 months and should be greater than 600 grams body weight prior to breeding. Young females bred too early may experience dystocia.
- Primary uterine inertia may develop if females are poorly conditioned.
- Obesity contributes to dystocia.
- Abortion or mummified fetuses may be caused by improper handling, trauma, inadequate nutrition, septicemia, fever, or interruption of the uterine blood supply.

SYSTEMS AFFECTED

Reproductive system

GENETICS

N/A

INCIDENCE/PREVALENCE

- Dystocia is uncommon.
- Abortion or mummified fetuses are more common.

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

Female chinchillas with a history of being with one or more male chinchillas. Breeding may not have been observed because it generally occurs at night.

Historical Findings

- Mating occurred 105–115 days prior to presentation.
- Mammary gland development occurs at 60 days gestation.
- It is normal for chinchillas nearing parturition to become less active, anorectic, and aggressive toward previously compatible cage mates.
- In late gestation the gravid female may become constipated.
- It is normal for female to writhe, stretch, and vocalize during delivery, but these behaviors terminate after all fetuses are delivered.
- Abnormal behaviors include intermittently straining for over 2 hours or biting at the lateral body wall.
- If fetuses get stuck in the birth canal, the female may cannibalize them.
- Vaginal discharge or perineal staining—serosanguinous or hemorrhagic

- Female may lick and bite at her vulva.
- Anorexia
- Lethargy
- Abortion may take place unnoticed because the female will immediately ingest the aborted kits. Abortion should be suspected if a female chinchilla suddenly loses weight.
- Female may ignore the newborn kits if dead or mummified fetuses remaining in the uterus.

Physical Examination Findings

- Palpation of fetal masses in caudal abdomen
- Painful abdomen
- Gentle abdominal palpation to determine if uterine contractions present
- Female may have an inappropriate body score, either underconditioned or overconditioned.
- Female may be restless, anxious, and irritable.
- Hunched posture, straining, or lethargy and weakness if labor has been prolonged
- Vaginal discharge may be bloody or green colored.

CAUSES AND RISK FACTORS

- Oversized fetuses—often associated with breeding young females
- Fetal malposition in birth canal
- Uterine inertia, ineffective uterine contractions
- Abnormality of vaginal vault such as stricture, hyperplasia, aplasia, intraluminal or extraluminal mass in vagina



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Differentiate from normal pregnancy by palpation as early as 60 days, radiographic evidence 6 weeks after mating, or abdominal ultrasound.

CBC/BIOCHEMISTRY/URINALYSIS

- Hemogram—depends on length and cause of dystocia. If fetal death has occurred, may see toxic heterophils. Anemia present with prolonged abortion or dystocia where blood loss is significant. Thrombocytosis with acute inflammation.
- Biochemistry panel—prolonged dystocia may result in hypoglycemia, dehydration, and hypocalcemia. Hypocalcemia can present with uterine inertia.

OTHER LABORATORY TESTS

N/A

IMAGING

- Radiography of the abdomen and pelvic area will determine number, size, and position of fetuses. Fetal skeletons are visualized beyond 6 weeks of gestation.
- Ultrasonography is useful for determining if fetuses are viable in addition to number of fetuses present.
- Ultrasonography can determine if uterine inertia present.

DIAGNOSTIC PROCEDURES

N/A



TREATMENT

APPROPRIATE HEALTH CARE

- Oxytocin can be administered to promote delivery within 30 minutes of administration.
- Glucose and calcium supplementation can be delivered orally if indicated by biochemistry values. Glucose can be added if intravenous fluids being administered. Do not administer calcium intravenously.
- Postabortion females can be treated with flushing the reproductive tract gently with an antiseptic solution and administration of appropriate parenteral antibiotics.

SURGICAL TREATMENT

- Cesarean section indicated if fetuses are viable and chinchilla does not response to oxytocin, or with fetal oversize or malposition.
- Cesarean section has a good prognosis if attended to within the first 2–3 hours, but less successful if dystocia has been ongoing for several hours.

NURSING CARE

- Fluid therapy with balanced electrolyte solutions should be initiated as soon as possible. Subcutaneous fluids can be administered (50 mL/kg) as needed.
- IV access is challenging in the chinchilla; lateral saphenous vein catheters or consider IO catheterization if intravascular fluids are needed and for venous access during surgery. Maintenance needs are estimated at 100 mL/kg/day.
- Postoperative management includes assisted feeding, fluids, analgesics, and broad-spectrum antibiotics.
- Bandage the abdomen if incision site in contact with the cage floor.

ACTIVITY

Reduced activity in the 2-week postoperative period.

CLIENT EDUCATION

- Owners should be educated about proper nutrition and cautioned about the detrimental effects of overfeeding chinchillas.
- Owners should know the sex of their pet and only breed if homes for offspring are previously established.
- A few days before expected parturition, the sand bath should no longer be offered to avoid sand entering the vagina and causing irritation.



MEDICATIONS

DRUG(S) OF CHOICE

- Administer oxytocin (0.2–3.0 IU/kg IM or SC) to induce uterine contractions. Can be

(CONTINUED)

DYSTOCIA AND DISORDERS OF PREGNANCY

repeated once within 15–20 minutes. If kits not delivered within 45–60 minutes, surgical intervention is indicated.

- Pain management is essential during and following surgery. Multimodal therapy is recommended for perioperative analgesia with an anxiolytic, opioid, and NSAID:

Midazolam (0.3–0.7 mg/kg IM), butorphanol (0.2–2.0 mg/kg SC, IM, IV q4h), or buprenorphine (0.01–0.05 mg/kg SC, IM, IV q 6–8h) plus meloxicam (0.2–0.5 mg/kg SC, PO q24h) or carprofen (2–5 mg/kg SC, PO q24h).

- Antibiotic therapy may be indicated if vaginitis present or surgical intervention occurred and incision is difficult to maintain in a clean environment. Antimicrobial choice should be broad spectrum or based upon results of culture and sensitivity if surgical tissues are cultured.

CONTRAINDICATIONS

- Oxytocin is contraindicated with obstructive dystocia (fetus too large for pelvic delivery), malposition, or if long-standing fetal death.

- Oral administration of antibiotics that select against gram-positive bacteria (penicillins, cephalosporins, macrolides, lincosamides) can cause fatal enteric dysbiosis and enterotoxemia.

- Avoid potentially nephrotoxic drugs (e.g., aminoglycosides, NSAIDs) in patients that are febrile or dehydrated, or have preexisting renal disease.

PRECAUTIONS

- Avoid drugs that reduce blood pressure or induce cardiac dysrhythmia until dehydration is resolved.

- During surgery avoid excessive handling of gastrointestinal tissues to reduce postoperative ileus or fibrous adhesions.

- The obese chinchilla has additional anesthetic risks.

POSSIBLE INTERACTIONS

None

ALTERNATIVE DRUGS

N/A

**FOLLOW-UP****PATIENT MONITORING**

- Ensure gastrointestinal motility by making sure the patient is eating, well hydrated, and passing normal feces prior to release.
- If vaginal delivery, use ultrasonography to insure all fetuses have been delivered.

PREVENTION/AVOIDANCE

- Breed chinchillas when mature and in good body condition after 6 months of age.
- Avoid overfeeding the breeding female.
- Chinchilla females do not typically build nests at parturition; however, a nesting box may decrease neonatal mortality caused by drafts or cold stress.
- OVH to prevent future pregnancies.

POSSIBLE COMPLICATIONS

- Loss of neonates if treatment is not provided promptly
- Postoperative gastrointestinal ileus may take days to weeks to resolve.

EXPECTED COURSE AND PROGNOSIS

- The prognosis is fair to good if neonates can be vaginally delivered.
- The chinchilla is fairly tolerant of Cesarean section if undertaken early in the course of dystocia and the patient is in good body condition.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

Following delivery of kits, vaginitis, metritis, or pyometra can occur from ascending bacterial infection.

AGE-RELATED FACTORS

Breeding young females may lead to dystocia if fetuses are oversized.

ZOOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING**SYNONYMS**

N/A

SEE ALSO

N/A

ABBREVIATIONS

NSAIDs = nonsteroidal anti-inflammatory drugs

OVH = ovariectomy

INTERNET RESOURCES

<http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/171509.htm>

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BASICS

DEFINITION

- Dysuria—difficult or painful urination
- Hematuria—the presence of blood in the urine. It is important to differentiate true hematuria from blood originating from the reproductive tract in females, and from orange, red, or red-brown colored urine caused by the excretion of dietary pigments via the urine.
- Pollakiuria—voiding small quantities of urine with increased frequency

PATHOPHYSIOLOGY

- Inflammatory and noninflammatory disorders of the lower urinary tract may decrease bladder compliance and storage capacity by damaging compliance of the bladder wall or by stimulating sensory nerve endings located in the bladder or urethra. Sensations of bladder fullness, urgency, and pain stimulate premature micturition and reduce functional bladder capacity. Dysuria and pollakiuria are generally caused by lesions of the urinary bladder and/or urethra, but these clinical signs do not exclude concurrent involvement of the upper urinary tract or disorders of other body systems.
- The most common causes of dysuria, pollakiuria, and hematuria in the chinchilla are cystitis, pyometra, dystocia, and in males, fur rings causing paraphimosis. Urolithiasis is less common in the chinchilla than in other small mammalian pets.
- Inadequate water intake leading to a more concentrated urine and factors that impair complete evacuation of the bladder, such as lack of exercise, obesity, cystitis, neoplasia, or neuromuscular diseases may be associated with these signs.
- “Fur rings,” a circumferential ring of hair around the distal penis, commonly occurs in boars and can cause paraphimosis and urethral obstruction, which can be very painful.

SYSTEMS AFFECTED

- Renal/urologic—bladder, urethra; fur rings
- Reproductive—pyometra, dystocia
- Integument—fur rings

GENETICS

N/A

INCIDENCE/PREVALENCE

Fur rings are very common in males, especially if dust baths are not provided on a routine basis.

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

- Breed predilections—N/A
- Mean age and range—can occur at any age
- Predominant sex—N/A

SIGNS

Historical Findings

- Straining to urinate; small, frequent urinations; and/or urinating when picked up by the owners
- Hematuria, or thick, white- or tan-appearing urine
- Urine staining in the perineal area, urine scald, moist pyoderma
- Anorexia, weight loss, lethargy, bruxism, and a hunched posture in chinchillas with chronic or obstructive lower urinary tract disease
- Gross hematuria—most often found in males with fur rings, females with dystocia, and also with urolithiasis
- Pollakiuria or stranguria; evidence of urine retention
- Hunched posture, vocalizing during urination may be associated with pain
- Hunched posture, ataxia, or difficulty ambulating in chinchillas with musculoskeletal or neurological disease
- Signs of uremia that develop when urinary tract obstruction is complete or partial—anorexia, weight loss, lethargy, bruxism, tenesmus, hunched posture

Physical Examination Findings

- If significant blood loss via hematuria has occurred, patient may have pale mucous membranes or generalized paleness of the skin, face, and legs.
- A circumferential ring of hair around the distal penis is consistent with fur rings.
- Large, turgid bladder (or inappropriate size remains after voiding efforts) upon palpation of the urinary bladder—can occur with pollakiuria or with uroliths
- Manual expression of the bladder may reveal hematuria or sometimes “sludgy,” thick, white-tan material, even in animals that have normal-appearing voided urine—this is less common in chinchillas than in rabbits/guinea pigs, but it does occur.
- Hematuria, stranguria, pollakiuria if some urine is being voided by patient
- A large kidney may be palpable if nephritis or nephrolithiasis is present.
- Signs of uremia—dehydration, anorexia, lethargy, weakness, hypothermia, bradycardia, high rate or shallow respirations, stupor, coma, and/or seizures occur rarely, often in terminal cases, tachycardia resulting from ventricular dysrhythmias induced by hyperkalemia
- Thick, palpable uterus may be found if pyometra; pups may be palpable if dystocia is the cause
- Bladder palpation may demonstrate cystoliths; failure to palpate calculi does not exclude them from consideration.
- Organomegaly may suggest other organ system involvement or neoplasia.

CAUSES

Urinary System

- Urinary tract infection—bacterial urethritis, cystitis, pyelonephritis, nephritis

- Urethral plugs, fur rings—in boars
- Urolithiasis—anywhere within the urinary tract
- Trauma—especially bite wounds
- Iatrogenic—catheterization, overdistention of the bladder during contrast radiography, or surgery
- Neoplasia (not common in chinchillas)

Reproductive System

- Endometrial hyperplasia
- Pyometra, vaginitis, dystocia
- Neoplasia (uncommon)

Other Organ Systems

- Neurological/musculoskeletal—any disease that inhibits normal posturing for urination (e.g., pododermatitis, arthritis) can lead to these signs.
- Urine scald—can cause ascending inflammation, leading to urethral spasm
- Other abdominal organomegaly may put undue pressure on the urinary system, causing straining to urinate.

RISK FACTORS

- Inadequate water intake—dirty water bowls, unpalatable water, inadequate water provision, changing water sources
- Urine retention—underlying bladder pathology, neuromuscular disease, painful conditions causing a reluctance to ambulate (pododermatitis, arthritis)
- Inadequate cage cleaning may cause some chinchillas to avoid urinating.
- Obesity has been suggested but not a proven cause in chinchillas.
- Lack of exercise
- Feeding exclusively alfalfa-based diet (hay, pellets, both)
- Calcium or vitamin/mineral supplements added to diet
- Diseases, diagnostic procedures, or treatments that (1) alter normal host urinary tract offenses and predispose to infection, (2) predispose to formation of uroliths, or (3) damage urothelium or other tissues of the lower urinary tract
- Mural or extramural diseases that compress the bladder or urethral lumen



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Differentiating From Other Abnormal Patterns of Micturition

- Rule out polyuria—increased frequency and volume of urine
 - Rule out urethral obstruction—stranguria, anuria, overdistended urinary bladder, signs of postrenal uremia
- Differentiate Causes of Dysuria, Pollakiuria, Hematuria
- Cystitis—hematuria; bacteruria; painful, thickened bladder
 - Uterine disease—female chinchillas; chinchillas with uterine disease often strain

(CONTINUED)

DYSURIA, HEMATURIA, AND POLLAKIURIA

and expel blood when urinating, blood may mix with urine and be mistaken for hematuria

- Fur rings or urethral plugs—should be identified on physical examination

- Neoplasia—hematuria; palpable masses in the urethra or bladder possible; radiographs ultrasound may differentiate
- Neurogenic disorders—flaccid bladder wall; residual urine in the bladder lumen after micturition; neurologic deficits to hind legs, tail, perineum, and anal sphincter
- Iatrogenic disorders—history of catheterization, reverse flushing, contrast radiography, or surgery
- Hypercalciuria—thick, white-to-beige urine, sometimes streaked with fresh blood; radiopaque bladder
- Urolithiasis—hematuria, palpable uroliths in the bladder, radio-opacities within the bladder

CBC/BIOCHEMISTRY/URINALYSIS

- CBC—TWBC elevations with neutrophil: lymphocyte ratio shift; toxicity of neutrophils \pm bands, monocytosis suggest inflammation/infection; thrombocytosis associated with active inflammation; may be anemic if hematuria is severe
- Biochemistry panel—lower urinary tract disease complicated by urethral obstruction may be associated with azotemia. With complete (or nearly complete) obstruction, changes in electrolytes such as hyperkalemia, hypochloremia, hyponatremia may occur.
- Patients with concurrent pyelonephritis have impaired urine concentrating capacity, leukocytosis, and azotemia.
- Disorders of the urinary bladder are best evaluated with urine specimen collected by cystocentesis.
- Urinalysis including both a standard dipstick and microscopic examination of the sediment. Reported urine specific gravity for chinchillas is >1.045 and urine pH is 8.5. Identification of neoplastic cells in urine sediment indicates urinary tract neoplasia (rare). Bacteruria, pyuria ($>0-1$ WBC/hpf), hematuria ($>0-3$ RBC/hpf), and proteinuria indicate urinary or reproductive tract inflammation but are not specific to differentiate infectious and noninfectious causes of lower urinary tract disease.
- Most normal chinchillas have few crystals in the urine; however, hypercrystalluria should increase suspicion for causing disease.
- Calcium carbonate, calcium oxalate, and struvite crystals are all commonly seen on sediment examinations, but similar to other small animals, crystal type(s) may not predict the mineralogy of calculi present.

OTHER LABORATORY TESTS

- Prior to antibiotic use, culture the urine or bladder wall if high numbers of red or white blood cells, bacteria, or a combination of these are present on sediment examination. Collect urine via cystocentesis as free-catch samples are commonly contaminated.

- Aerobic/anaerobic bacterial urine culture and sensitivity—the most definitive means of identifying and characterizing bacterial urinary tract infection; negative urine culture results suggest a noninfectious cause, unless the patient was on concurrent antibiotics or has an anaerobic infection. There are anecdotal reports of anaerobic urinary infections in chinchillas, so choose this culture technique if anaerobic infection suspected.
- If surgery is necessary to relieve obstruction from urolithiasis, collect and submit the calculi for analysis and culture and sensitivity, and submit the bladder wall for culture and sensitivity.
- Calculi containing calcium carbonate require specific methodologies to differentiate from calcium oxalate monohydrate crystals; the laboratory chosen for analysis must be able to perform these methods. Confirm the lab's ability to perform these techniques in advance, since human and some veterinary laboratories unfamiliar with exotic animal samples do not differentiate calcium oxalate from calcium carbonate.

IMAGING

- Survey abdominal radiography and abdominal ultrasound are important means of identifying and localizing causes of dysuria, pollakiuria, and hematuria.
- Urinary calculi in chinchillas are generally radio-opaque, allowing for ease of identification using survey radiography. However, if multiple calculi or significant GI gas are present, the anatomic locations of the calculi using survey radiography alone may be obscured. The majority of obstructive urinary calculi are located in the urethra of chinchillas but are also found in the kidneys, ureters, vagina, or sometimes in the seminal vesicles in males.
- Contrast (negative or positive) cystography can be employed to evaluate filling defects in the bladder or bladder masses.
- Ultrasound is useful for anatomic location of urinary calculi and for evaluating anatomic changes in the kidneys, ureters, or bladder such as hydronephrosis or hydroureter, ureteral or cystic mucosal thickening, or perforation, and for evaluating other organ systems.
- Excretory intravenous pyelograms (IVPs) are useful to further elucidate relative functional abnormalities in the kidneys or ureters.
- CT images are obtained more rapidly than IVP, using significantly less contrast material but at a greater cost.

DIAGNOSTIC PROCEDURES

Bacterial culture/sensitivity—of urine, bladder wall, or if exudates present; recommended if high numbers of RBC or WBC, bacteria, or a combination are present on urine sediment examination. If surgical urolithiasis patient, recommend bladder wall culture as generally more rewarding.

PATHOLOGIC FINDINGS

Gross lesions associated with hematuria or dysuria depend on the underlying disease. Refer to specific causes.

**TREATMENT****APPROPRIATE HEALTH CARE**

- Patients with nonobstructive urinary tract diseases are typically managed as outpatients; diagnostic evaluation may require brief hospitalization.
- Dysuria, pollakiuria, or hematuria associated with systemic signs of illness (e.g., pyrexia, depression, anorexia, and dehydration) or laboratory findings of azotemia and or leukocytosis warrant an aggressive diagnostic evaluation and initiation of supportive and symptomatic treatment.
- Chinchillas with urinary obstruction should be hospitalized, emergency supportive and symptomatic therapy should be provided until surgical intervention to relieve the obstruction can be performed. Medical treatment of urolithiasis has been unrewarding to date, and surgical removal of calculi is most often required. Postoperative management includes supportive and symptomatic treatment and pain management therapies.

NURSING CARE

- Subcutaneous fluids can be administered (50–100 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider intraosseous (IO) catheterization if intravascular fluids are needed. Base fluid selection on evidence of dehydration, azotemia, and electrolyte imbalances. In most patients, lactated Ringer's solution or Normosol crystalloid fluids are appropriate. Maintenance fluid needs are estimated to be 100 mL/kg/day. In obstructed patients, fluid therapy should be based on treatment modalities used in cats with obstructive urinary disease.
- Fur rings can be gently removed using lubricating products. The distal penis may need to be lubricated prior to removal attempts, to loosen the hair. The chinchilla may require sedation or anesthesia to remove if painful.
- In females, gentle flushing of urethral calculi back into the bladder can be attempted. In females, gently flush the bladder using a 3.5-Fr red rubber catheter under deep sedation and analgesia to attempt to remove the calculi. Catheterizing males is much more dangerous due to the small size of the urethra, and retropulsion into the bladder is therefore less likely to be successful.

ACTIVITY

- Long-term—increased activity level by providing large exercise areas to encourage voiding and prevent recurrence

DYSURIA, HEMATURIA, AND POLLAKIURIA**(CONTINUED)**

- Activity should be reduced during the time of tissue repair if surgery is required for urinary obstruction.
- Dust baths should be offered every 3 days or twice weekly to reduce the potential for fur rings.

DIET

- Many affected chinchillas are anorectic or have a decreased appetite. It is an absolute requirement that the patient continue to eat during and following treatments. Anorexia may cause or exacerbate gastrointestinal hypomotility and cause derangement of the gastrointestinal microflora and overgrowth of intestinal bacterial pathogens.
- Offer a large selection of fresh, moist greens such as cilantro, lettuces, parsley, carrots tops, dark leafy greens, and good-quality grass hay.
- If the patient refuses these foods, syringe-feed Critical Care for herbivores (Oxbow Animal Health, Murdock, NE) or Emerald Herbivore (Lafeber Company, Cornell, IL) diet at approximately 10 to 15 mL/kg PO q6–8h. Larger volumes and more frequent feedings are often accepted; feed as much as the patient will readily accept. Alternatively, pellets can be ground and mixed with fresh greens, vegetable baby foods, water, or sugar-free juice to form a gruel.

CLIENT EDUCATION

- Limiting risk factors such as obesity, sedentary life, and inappropriate diet combined with increasing water consumption is necessary to minimize or delay recurrence of lower urinary tract disease. Even with these changes, however, recurrence may occur.
- Surgical removal of urinary tract obstructions does not alter the causes responsible for their formation; limiting risk factors such as high-calcium diets is necessary to minimize or delay recurrence. Even with these changes, however, recurrence is likely.
- Fur rings are very common in males; owners should inspect the penis and prepuce frequently to reduce the potential for severe conditions. Dust baths at least twice weekly are recommended and reduce the potential for fur rings.

SURGICAL CONSIDERATIONS

- Surgery is necessary to relieve obstructions if medical attempts are unsuccessful.
- Surgery may be required if the distal penis of males becomes necrotic.
- Surgery may be required for patients with cystic hypercrystalluria or “sludge” that do not respond to medical therapy.
- Postoperative management includes assisted feeding, fluids, analgesics, and antibiotics based on culture and sensitivity results. However, recurrence of the disease is common.

**MEDICATIONS****DRUG(S) OF CHOICE**

- Antibiotic choice should be based upon the results of culture and sensitivity (see Contraindications). Until results are obtained, use broad-spectrum antibiotics such as enrofloxacin (5–15 mg/kg PO, SC q12h) or trimethoprim-sulfa (15–30 mg/kg PO q12h).
- Reduction of inflammation and analgesia should be provided, especially if pain is causing reduced frequency of voiding, and pain management is essential during and following surgery. Perioperative analgesic choices include butorphanol (0.2–2.0 mg/kg SC, IM, IV q4h) or buprenorphine (0.01–0.05 mg/kg SC, IM, IV q8–12h). Meloxicam (0.1–0.5 mg/kg PO, SC q24h) and carprofen (2–5 mg/kg PO, SC q24h) provide anti-inflammation as well as analgesia.
- Procedures for relief of obstruction generally require administering sedatives and/or anesthetics. When substantial derangements exist, begin with fluid administration and other supportive measures first. Calculate the dosage of sedative or anesthetic drug using the low end of the recommended range or give only to effect.

CONTRAINDICATIONS

- Oral administration of antibiotics that select against gram-positive bacteria (penicillins, cephalosporins, macrolides, lincosamides) can cause fatal enteric dysbiosis and enterotoxemia.
- Metronidazole toxicity has been reported in chinchillas.
- Potentially nephrotoxic drugs (e.g., aminoglycosides, NSAIDs) should be avoided in patients that are febrile, dehydrated, or azotemic or that are suspected of having pyelonephritis, septicemia, or preexisting renal disease.
- Glucocorticoids or other immunosuppressive agents

PRECAUTIONS

- Avoid drugs that reduce blood pressure or induce cardiac dysrhythmia until any dehydration is resolved.
- If obstructed or significant renal insufficiency is evident, modify dosages of all drugs that require renal metabolism or elimination.
- If obstructed or significant renal insufficiency is evident, avoid nephrotoxic drugs (NSAIDs, aminoglycosides).

POSSIBLE INTERACTIONS

None

ALTERNATIVE DRUGS

N/A

**FOLLOW-UP****PATIENT MONITORING**

- Response to treatment by clinical signs, serial physical examinations, laboratory testing, and radiographic and ultrasonic evaluations appropriate for each specific cause.
- Monitor for reduction and cessation of clinical signs. Generally, a positive response occurs within a few days after instituting appropriate antibiotic therapy for lower urinary tract infections and supportive therapy.
- Ensure gastrointestinal motility by making sure the patient is eating, well hydrated, and passing normal feces.
- Assess urine production and hydration status frequently while hospitalized, or have owners monitor daily at home, adjusting fluid administration accordingly.
- Verify the ability to urinate adequately; failure to do so may require urinary catheterization or cystocentesis to alleviate urine retention.
- Follow-up examination should be performed within 7 to 10 days of discharge from hospital, or sooner if the clinical signs are not reduced.
- Ideally, recheck of urine culture and sensitivity should be performed 3 to 5 days after the cessation of antibiotics when lower urinary tract infections are present.

PREVENTION/AVOIDANCE

- Prevention is based upon the specific underlying cause. Limiting risk factors such as obesity, sedentary life, and inappropriate diet combined with increasing water consumption is necessary to minimize or delay recurrence of urinary tract diseases. Even with these changes, however, recurrence may occur.
- Frequent dust baths should be provided to reduce the potential for fur rings.
- For animals with urolithiasis, water is the cornerstone to any stone prevention protocol. Prevention is targeted at increasing water intake and reducing (but not eliminating) dietary calcium. Avoid alfalfa-based diets. Diets containing a high percentage of timothy, oat, or grass hays, a lower overall percentage of pellets, and a wider variety of vegetables and fruits may decrease the risk of urolith development in pet chinchillas.

POSSIBLE COMPLICATIONS

- Anemia
- Urine scald; myiasis; pododermatitis
- Distal penile necrosis if fur ring is chronic
- Urinary tract obstruction with urolithiasis or hypercrystalluria
- Refer to specific chapters describing diseases listed in sections on causes.

(CONTINUED)

DYSURIA, HEMATURIA, AND POLLAKIURIA

EXPECTED COURSE AND PROGNOSIS

- Will depend upon the underlying disease. Generally, the prognosis for animals with uncomplicated lower urinary tract infection is good to excellent. The prognosis for patients with complicated infection is determined by the prognosis for the other urine abnormalities.
- The prognosis following surgical removal of uroliths is fair to good, but recurrence can occur and although dietary management may decrease the likelihood of recurrence, many chinchillas will develop clinical disease again.
- If dust baths are not provided on a consistent basis, fur rings may be seen with more frequency.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

- Urolithiasis
- Pyometra, other uterine disorders
- Gastrointestinal hypomotility or dysbiosis
- Pyoderma (urine scald)

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

- Lower urinary tract infections may ascend into the reproductive tract via the vagina. If untreated, the potential for development of vaginal or uterine infections increases.
- Dystocia may cause irreparable damage to the uterus, potentially precluding breeding in the future.

SYNONYMS

None

SEE ALSO

Lower urinary tract infection
Urinary tract obstruction

ABBREVIATIONS

CT = computed tomography
IVP = intravenous pyelogram
RBC = red blood cell
TWBC = total white blood cell count
WBC = white blood cell

INTERNET RESOURCES

N/A

Suggested Reading

- Harkness JE, Turner PV, Vande Woude S, et al. Clinical procedures. In: Harkness JE, Turner PV, Vande Woude S, et al, eds. Harkness and Wagner's Biology and Medicine of Rabbits and Rodents. Ames, IA: Wiley-Blackwell, 2010:107–193.
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- Hoefer H, Latney L. Rodents: urogenital and reproductive disorders. In: Keeble E, Meredith A, eds. BSAVA Manual of Rodents and Ferrets. Gloucester: BSAVA, 2009:150–160.
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BASICS

DEFINITION

- Gastrointestinal stasis—severe ileus of the digestive tract with little or no caudal movement of ingesta
- Gastrointestinal dilation—accumulation of ingesta (food, fluid, and fur) and gas in the stomach, intestines, and cecum

PATHOPHYSIOLOGY

- Chinchillas, like rabbits and guinea pigs, are monogastric, hind-gut fermenters; they have a functional cecum and require a high-fiber diet. Chinchillas produce two types of fecal pellets: nitrogen-rich cecotropes and nitrogen-poor fecal pellets.
- Fiber is broken down in the cecum by a variety of microorganisms that are nourished by a constant supply of water and nutrients from the stomach and small intestine.
- These same microorganisms produce volatile fatty acids (VFAs) which, in turn, affect appetite and gut motility.
- Any disturbance in this mutually beneficial relationship can result in gastrointestinal hypomotility—increased gastrointestinal transit time characterized by decreased frequency of cecocolonic segmental contractions; in severe cases, this leads to ileus with little to no caudal movement of ingesta (“gastrointestinal stasis”), and accumulation of ingesta and gas within the digestive tract (“gastrointestinal dilation”).
- Proper hind-gut fermentation and gastrointestinal tract motility are dependent on the ingestion of large amounts of roughage, long-stemmed hay, and water.
- Diets that contain inadequate amounts of long-stemmed, coarse fiber predispose the patient to gastrointestinal stasis. However, unlike rabbits and guinea pigs, gastrointestinal transit time in chinchillas is not directly affected by a reduction in dietary fiber; instead, decreased fiber intake alters large bowel ecology in a way that threatens favorable microorganisms and promotes bacterial pathogens (e.g., *E coli* and *Clostridium*) and toxin production.
- Diets that are low in coarse fiber typically contain high simple carbohydrate concentrations, which provide a ready source of fermentable products. These can alter cecal fermentation, pH, and substrate production such that enteric microflora populations are altered (“bacterial dysbiosis”) and result in diarrhea, enterotoxemia, ileus, or gas accumulation.
- As nausea and gastrointestinal discomfort lead to anorexia, fiber and water intake are further reduced and the process becomes self-perpetuating.
- Anorexia due to infectious or metabolic disease, pain, stress, or starvation may cause or exacerbate gastrointestinal hypomotility.

- If prolonged, gastrointestinal stasis often leads to hepatic lipidosis, dehydration, and other secondary complications.
- Like rabbits and guinea pigs, chinchillas cannot vomit. In the healthy digestive tract, a moderate amount of gas is normally produced by the fermentation process and eliminated by peristalsis. With gastrointestinal stasis, however, there can be excessive gas production and, without normal motility, the stomach and intestines can overflow with gas and become distended (“bloat”).
- Gastrointestinal stasis and dilation are not diseases but are symptoms that one or more of the factors governing gastrointestinal motility and commensal microorganisms are out of order.

SYSTEMS AFFECTED

- Gastrointestinal
- Musculoskeletal—loss of muscle mass may occur as a result of inappetence

INCIDENCE/PREVALENCE

Gastrointestinal stasis and dilation are among the most common clinical presentations seen in the chinchilla.

SIGNALMENT

No age or gender predilections for gastrointestinal stasis and gastrointestinal dilation, but signalment predispositions to many of the underlying conditions that cause gastrointestinal stasis and dilation

SIGNS

Historical Findings

- Decreased appetite—patients will often initially stop eating pellets or hay but will continue to eat treats, followed later by complete anorexia.
- Decreased fecal production—fecal pellets become small, hard, dry, scant to nonexistent; occasionally blood-stained
- Signs of abdominal pain—bruxism, haunched posture, reluctance to move, and failure to groom; affected animals may stretch out or roll in an attempt to relieve pain.
- Abdominal distension—animals affected by bloat are often swollen, lie on their sides, hesitate to stir, and may be dyspneic.
- Diarrhea in cases of dysbiosis
- Systemic (particularly oral) administration of antibiotics
- Inappropriate diet (e.g., cereals, grains, commercial pellets only, lack of long-stemmed hay), or abrupt changes in the diet
- Excessive fasting, inability to consume a normal quantity of food (e.g., dental disease)
- Recent illness, pain, or stressful event
- Fur chewing in cases of gastric trichobezoar
- Gastric tympany—recent parturition/lactating female, hay rich in clover, overeating

Physical Examination Findings

- Small, hard fecal pellets or absence of fecal pellets palpable in the colon

- Abdominal palpation may reveal gas, fluid, or firm, doughy gastrointestinal contents, depending on the underlying cause; a firm, noncompliant stomach or stomach that remains pitted on compression is an abnormal finding. The presence of firm ingesta in the stomach of a patient that has been anorectic for 1–3 days is compatible with the diagnosis of gastrointestinal stasis.
- Abdominal distention—due to ileus, fluid-filled bowel loops, gas accumulation
- Pain on abdominal palpation
- Decreased or absent borborygmus
- Soft stools, diarrhea, or perineal staining in some cases
- Initially patients are bright and alert, but with severe or prolonged stasis or dilation may present depressed, lethargic, or shocky
- Rough hair coat, failure to groom
- Signs of pain including bruxism, haunched posture, and reluctance to move
- Lateral recumbency, respiratory distress, dehydration, hypotension, weakness, hypothermia in severe cases
- Weight loss in chronically affected chinchillas
- Palpable gastric foreign body and evidence of fur chewing in cases of trichobezoar
- Other physical examination findings depend on the underlying cause; perform a complete physical examination, including a thorough oral examination.

CAUSES AND RISK FACTORS

Dietary and Environmental Causes

- Gastrointestinal stasis and dilation in chinchillas is most commonly associated with insufficient dietary fiber and/or excessive stress.
- Chinchillas that do not receive enough fiber are more susceptible to gastrointestinal hypomotility and dysbiosis, whereas those that have adequate fiber intake are more resistant. A diet high in roughage such as grasses and long-stemmed hay is ideal.
- Gastrointestinal disorders are promoted by a diet consisting primarily of commercial pellets, especially those containing seeds, oats, or other high-carbohydrate treats. Feeding cereal products (e.g., bread, crackers, and breakfast cereals) and foods high in sugar (e.g., fruits, yogurt drops, other treats) results in carbohydrate overload and further increases the risk.
- Stressful conditions such as improper temperature, poor sanitation, and overcrowding have a negative effect on gut motility. Gastrointestinal motility is regulated in part by the autonomic nervous system; stress increases the adrenal output of epinephrine and inhibits peristalsis.
- Common causes of stress include dental disease (e.g., malocclusion, molar elongation, odontogenic abscesses), metabolic disease (e.g., renal disease, liver disease), pain (e.g., oral, trauma, postoperative, urolithiasis),

(CONTINUED)

GASTROINTESTINAL STASIS AND DILATION

anxiety (e.g., dyspnea, fear, fighting, lack of hide box), neoplasia, infection, parasitism, and environmental changes (e.g., boarding, new pets, unfamiliar noises).

- Gastric trichobezoars in the chinchilla are associated with fur chewing rather than insufficient dietary fiber.

- Gastric dilation (bloat) is associated with overeating, feeding hay that has not matured or is rich in clover, sudden changes in diet (especially the addition of fresh greens and fruits), and gastrointestinal inflammation.

Anorexia or Inappetence

- Because intestinal microflora depend on a steady flow of water and nutrients, any event leading to inappetence or anorexia (e.g., presurgical fasting, sudden changes in diet) or dehydration (e.g., sipper malfunction, bad-tasting water, careless mistake) can trigger gastrointestinal dysbiosis, stasis, and/or dilation.

- Common causes of anorexia include dental disease (malocclusion, molar elongation, tooth root abscesses), metabolic disease (renal disease, liver disease), pain (oral, trauma, postoperative pain), neoplasia, toxins, changes in the environment, or accidental starvation.

Other Factors

- Other factors that can contribute to gastrointestinal stasis and dilation include toxin ingestion, foreign material (e.g., scoopable cat litter, fur, carpet fiber), obesity, inactivity, confinement, and certain drugs (e.g., anesthetics, anticholinergics, opioids, antibiotics).
- Inappropriate antibiotics can damage enteric microflora, promote the growth of pathogens associated with gastrointestinal stasis, and lead to antibiotic-associated enterotoxemia.
- Gastric tympany can result from overeating and sudden dietary changes. It has been reported in lactating females 2–3 weeks postpartum and may be related to hypocalcemia.

**DIAGNOSIS****DIFFERENTIAL DIAGNOSIS**

- Gastrointestinal stasis and dilation must be differentiated from acute pyloric or small intestinal obstruction, as acute obstruction represents a life-threatening emergency. With acute gastrointestinal obstruction, acute-onset of anorexia, abdominal pain, and reluctance to move often progress to lateral recumbency and signs of hypovolemic shock (e.g., pale mucous membranes, decreased capillary refill time, weak pulses, hypothermic). Stomach is severely distended, tympanic, and full of gas and/or fluid. Patients are often in shock and require emergency decompression. Monitor rectal temperature; hypothermic patients are critically ill.

- For palpable mass in the cranial abdomen—neoplasia, abscess, hepatomegaly, trichobezoar, normal gastric contents

- For gastric tympany—volvulus, esophageal foreign body (“choke”), acute pyloric or intestinal obstruction (e.g., hair, other foreign body), sudden dietary change, overeating, hypocalcemia-related condition of lactating females

- For anorexia—acquired dental disease, metabolic disease, pain, stress, neoplasia, cardiac disease, toxin, sudden diet change, infection

- For decreased fecal output—anorexia, constipation, intestinal foreign body, intussusception, intestinal neoplasia

- For diarrhea—bacterial or parasitic infections; dysbiosis secondary to stress, improper diet, or antibiotic use; partial obstruction by gastrointestinal foreign body, trichobezoar, or neoplasia; infiltrative bowel disease

CBC/BIOCHEMISTRY/URINALYSIS

- These tests are often normal.
- May be used to identify underlying causes of gastrointestinal hypomotility and/or dilation
- PCV and TS may be elevated with dehydration.

- Serum liver enzymes may be elevated with liver disease, especially with secondary hepatic lipodosis.

- If the intestinal tract has been perforated, an inflammatory leukogram may be seen.

OTHER LABORATORY TESTS

N/A

IMAGING

- Chinchillas should not be fasted prior to taking radiographs.

- Gastric contents are normally present and visible radiographically.

- Moderate to severe distension of the stomach with ingesta (food, fluid, and hair) is usually visible with gastrointestinal hypomotility; a distended stomach in spite of anorexia implies gastrointestinal stasis.

- A halo of gas can be observed around the inspissated stomach contents in some cases of gastrointestinal stasis, and there can be moderate to severe gas distension throughout the digestive tract, including the cecum.

- Small fecal balls or the absence of fecal balls in the colon is highly suggestive of hypomotility.

- Severe distention of the stomach with fluid and/or gas is radiographic evidence of acute small intestinal obstruction, which constitutes a surgical emergency.

OTHER DIAGNOSTIC PROCEDURES

N/A

PATHOLOGIC FINDINGS

N/A

**TREATMENT****APPROPRIATE HEALTH CARE**

- Outpatient care may be appropriate for chinchillas exhibiting mild decreases in appetite and fecal production, but inpatient hospitalization and support are recommended for the majority of patients.

- Chinchillas exhibiting anorexia and lack of fecal production should be treated as soon as possible; those that have been showing signs for over 24 hours should be seen on an emergency basis.

- Therapy should also be directed at the underlying cause (e.g., dietary, stress, pain, etc.), when known.

NURSING CARE**General**

- Medical management of gastrointestinal stasis and dilation centers on basic supportive care.

- Warmth, stress reduction, pain relief, fluid replacement, and nutritional support are important first aid measures.

- The clinician should consider hospitalization in a quiet environment so that the patient can be observed, its progress monitored, and additional nursing care provided as needed. Chinchillas should be housed in a dark, quiet space away from natural predators' noise and odors.

- Provide thermal support through the use of incubators, heating pads, or radiant heat emitters; to avoid causing heat stress, ambient temperature should not exceed 80°F (26.7°C).

Fluid Therapy

- Fluid therapy is an essential component of the medical management of all patients with gastrointestinal hypomotility. Administer both oral and parenteral fluids. Oral fluid administration will aid in the rehydration of inspissated gastric contents. Mildly affected chinchillas will usually respond well to oral and subcutaneous fluid administration, treatment with intestinal motility modifiers, analgesics, and dietary modification described below.

- Intravenous or intraosseous fluids are required in patients that are severely dehydrated or depressed and to replace fluid losses from acute diarrhea. Maintenance fluid requirements are estimated at 100 mL/kg/day. Initially, a balanced fluid (e.g., lactated Ringer's solution) may be used.

- Warm parental fluids prior to administration

- Supplemental fluids are continued and then gradually tapered once drinking and urine output return to normal.

ACTIVITY

- If the patient is not debilitated, encourage activity for at least 10–15 minutes every 6–8

GASTROINTESTINAL STASIS AND DILATION

(CONTINUED)

hours since activity promotes gastric motility.

- Supervised time out of the cage and access to a safe grazing area will provide additional enrichment and fiber intake.
- Gentle massage of the abdomen may assist in moving gas and ingesta through the digestive tract.

DIET

- It is important that patients continue to eat during and following treatment. Continued anorexia will exacerbate gastrointestinal hypomotility and cause further derangement of the gastrointestinal microflora and overgrowth of intestinal bacterial pathogens.
- Chinchillas should be tempted often with parsley, cilantro, dandelion greens, and good-quality grass hay. Many patients will begin to eat these foods, even if they were previously anorectic. Also offer the patient's usual pelleted diet, as the initial goal is to get the chinchilla to eat.
- If the patient refuses these foods, syringe-feed a gruel such as Critical Care for Herbivores (Oxbow Animal Health, Murdock, NE) 15–20 mL/kg PO q6–8h. Larger volumes and more frequent feedings are often accepted; feed as much as the chinchilla will readily accept. Alternatively, pellets can be ground and mixed with fresh greens, vegetable baby foods, water, or juice to form a gruel.
- High-carbohydrate, high-fat nutritional supplements are contraindicated.
- Encourage oral fluid intake: offer fresh water, administer oral fluids via syringe, wet the food, or flavor water with fruit or vegetable juices.
- The diet should be permanently modified to include sufficient amounts of roughage and long-stemmed grass hay; foods high in simple carbohydrates should be prohibited or limited to the occasional treat.

CLIENT EDUCATION

- Discuss the importance of dietary modification, making diet changes gradually, and reducing/preventing stress.
- Advise owners to regularly monitor food consumption and fecal output; seek veterinary attention with a noticeable decrease in either.

SURGICAL CONSIDERATIONS

- Gastrointestinal stasis and dilation usually responds to medical treatment alone; surgery is generally contraindicated. Surgical manipulation of the intestinal tract, hypothermia, anesthetic agents, and pain all exacerbate gastrointestinal hypomotility; gastrointestinal stasis is often worse postoperatively. The combination of these factors results in significantly worsened prognosis with surgical treatment.
- Gastric trichobezoars are often associated with fur chewing. Similar to the situation in rabbits, medical treatment usually resolves the

problem; however, surgery may be indicated in rare cases.

- Chinchillas affected by bloat should be treated by decompression, either by passing a stomach tube or using a transabdominal needle or trocar.

**MEDICATIONS**

Use parenteral medications in animals with severely compromised intestinal motility; oral medications may not be properly absorbed. Begin oral medication when intestinal motility begins to return (fecal production, return of appetite, radiographic evidence).

DRUG(S) OF CHOICE

- Motility modifiers such as metoclopramide (0.2–1.0 mg/kg PO, SC, IM q12h) or cisapride (0.1–0.5 mg/kg PO q8–12h) may be helpful in regaining normal motility; these may be used in alone or in conjunction; cisapride is available through compounding pharmacies. Promotility agents are contraindicated if intestinal obstruction or perforation are suspected.
- Analgesics such as buprenorphine (0.01–0.05 mg/kg SC, IV q8–12h), meloxicam (0.2–0.5 mg/kg PO, SC q24h), or carprofen (2–5 mg/kg PO, SC q24h) are essential for treatment of most chinchillas with gastrointestinal hypomotility. Intestinal pain, either postoperative or from gas distention and ileus, impairs mobility and decreases appetite, and may severely inhibit recovery.
- Anxiety can be safely reduced in chinchillas with injectable midazolam (0.25–0.5 mg/kg IM).
- Antibiotic therapy—indicated in cases where gastrointestinal stasis leads to secondary bacterial overgrowth, as indicated by diarrhea, abnormal fecal cytology, or bloody stool. Broad-spectrum antibiotics such as chloramphenicol (30–50 mg/kg PO q12h), trimethoprim sulfa (15–30 mg/kg PO q12h), or enrofloxacin (5–15 mg/kg PO q12h) should be selected.
- If *Clostridium* spp. overgrowth and enterotoxemia are suspected—metronidazole (10–20 mg/kg PO q12h; use with caution) and cholestyramine (2 g/20 cc water, divided q24h PO or by gavage; binds bacterial toxins; dose cited is for a typical rabbit)
- Simethicone (20 mg/kg PO q8–12h) may be indicated in cases of gas distention.
- Lactating females with gastric tympany may respond favorably to calcium gluconate (100 mg/kg IV) administered slowly to effect.
- Probiotics (lactobacillus, yogurt) are of questionable efficacy; however, transfaunation with cecotropes from a healthy individual may be indicated in cases of dysbiosis.

CONTRAINDICATIONS

- Avoid promotility agents if gastrointestinal obstruction or perforation are present or suspected.
- Anticholinergics (loperamide, atropine, glycopyrrolate) in patients with suspected intestinal obstruction, glaucoma, intestinal ileus, liver disease, enterotoxin-producing bacteria and invasive bacterial enteritis.
- Antibiotics that are primarily gram-positive in spectrum will suppress the growth of commensal flora, allowing overgrowth of enteric pathogens. These include lincomycin, clindamycin, erythromycin, ampicillin, amoxicillin, cephalosporins, and penicillins.

PRECAUTIONS

- NSAIDs (meloxicam, carprofen)—use with caution in chinchillas with compromised renal function.
- Choramphenicol—may cause aplastic anemia in susceptible people. Clients and staff should use appropriate precautions when handling this drug.
- Metronidazole—neurotoxic if overdosed; anecdotal reports of hepatotoxicity in chinchillas

POSSIBLE INTERACTIONS

N/A

ALTERNATIVE DRUGS

N/A

**FOLLOW-UP****PATIENT MONITORING**

Monitor hydration, appetite, and production of fecal pellets. Chinchillas that are successfully treated will regain a normal appetite and begin to produce normal volumes of feces.

PREVENTION/AVOIDANCE

- Gastrointestinal hypomotility (and the myriad problems related to it) can be avoided through strict feeding of diets containing adequate amounts of indigestible coarse fiber (long-stemmed hay) and low simple carbohydrate content, along with access to fresh water.
- Allow sufficient daily exercise.
- Prevent obesity.
- Minimize changes in the daily routine that might cause stress in small herbivores, and avoid sudden changes the diet.
- Be certain that clean water is available at all times, and is presented in a familiar manner (sipper vs. bowl).
- Avoid overfasting patients prior to surgery, control perioperative pain and stress, and encourage patients to eat as soon as possible following surgery.
- Be certain that all postoperative patients are eating and passing feces prior to release.

(CONTINUED)

GASTROINTESTINAL STASIS AND DILATION

POSSIBLE COMPLICATIONS

- Continued ileus leading to metabolic derangements and death
- Death due to gastric rupture
- Overgrowth of bacterial pathogens; clostridial enterotoxigenesis

EXPECTED COURSE AND PROGNOSIS

- Depends on severity and underlying cause
- Mild cases, if caught early, usually respond to outpatient medical management and diet correction; the prognosis is generally excellent to good.
- Moderately severe cases generally respond to several days of hospitalization and intensive supportive care. These cases carry a good to fair prognosis; the patient usually improves and is discharged for additional care at home.
- In advanced cases—those that went unnoticed for several days prior to presentation—the prognosis is usually guarded to poor; hepatic lipidosis, shock, and other complications frequently make treatment unrewarding.
- The prognosis following gastrotomy or enterotomy is guarded to poor. Surgical correction of gastric trichobezoar, if indicated, carries a better prognosis than for surgical treatment of acute intestinal blockage by hair.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

- Anorexia
- Acquired dental disease
- Diarrhea
- Dehydration
- Antibiotic-associated enterotoxemia
- Constipation
- Hepatic lipidosis

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

N/A

SYNONYMS

Ileus
Bloat

SEE ALSO

Anorexia
Diarrhea
Constipation (Lack of Fecal Production)
Antibiotic-associated enterotoxemia

ABBREVIATIONS

PCV = packed cell volume
TS = total solids
VFAs = volatile fatty acids

INTERNET RESOURCES

<http://www.merckvetmanual.com>

Suggested Reading

- Donnelly TM. Disease problems of chinchillas. In: Quesenberry K, Carpenter J., eds. *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*, 2nd ed. St Louis: Saunders, 2004:255–265.
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- Author** Dan H. Johnson, DVM, Dipl. ABVP

GIARDIASIS



BASICS

OVERVIEW

- Enteric infection with the protozoan parasite *Giardia* spp.
- Often found in low numbers in normal chinchillas
- Numbers increase and active infection develops with stress and poor husbandry.
- Motile (flagellated) organisms attach to surface of enterocytes in small intestine, especially duodenum through jejunum
- Malabsorption syndrome, severe diarrhea, and even death
- Severe *Giardia* infection can predispose animals to other opportunistic infections.
- Importance as a reservoir for human infection not known

SIGNALMENT

- No breed, age, or sex predilections have been described
- Most reports have been in group-housed chinchillas, in fur ranches, and research colonies
- Incidence in pet chinchillas is relatively low

SIGNS

- Infection may be asymptomatic
- Illness is typically chronic or intermittent
- Appetite loss
- Sticky black feces, diarrhea
- Weight loss, debilitation
- Poor condition of fur

CAUSES AND RISK FACTORS

- *Giardia* transmitted by oral ingestion of cysts, usually from contaminated water
- Animals housed indoors and bred in captivity are less likely to acquire infection
- Numbers increase and active infection develops with stress and poor husbandry.
- Infection is often innocuous until a high parasite load develops.



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Consider all causes of enteropathy, including diet change, inappropriate antibiotics, enterotoxemia, systemic or metabolic disease, and specific intestinal disorders. More severe illness should prompt a more extensive evaluation.

CBC/BIOCHEMISTRY/URINALYSIS

- Usually normal with mild illness
- Increased PCV and TS possible with dehydration

OTHER LABORATORY TESTS

- Motile organisms—tear-drop-shaped, 10–18 × 7–15 μm; “falling leaf” appearance with two nuclei and four pairs of flagella. Sometimes visible in fresh fecal wet mount with saline. Specimen should be <10 minutes old. Addition of Lugol's iodine may enhance appearance.
- Cysts—seen as crescent shapes with zinc sulfate fecal floatation; 8–13 × 7–10 μm
- Fecal ELISA not superior to zinc sulfate floatation; usefulness in chinchillas unknown
- Organisms are shed intermittently—lack of visualization does not rule out infection. Collect samples over several days to increase probability of identification.

IMAGING

N/A

DIAGNOSTIC PROCEDURES

N/A



TREATMENT

Treat as outpatients unless debilitated or dehydrated



MEDICATIONS

DRUG(S) OF CHOICE

- Metronidazole 10–20 mg/kg q12h × 5 days
- Fenbendazole 20 mg/kg PO q24h × 5 days
- Albendazole 25 mg/kg PO q12h × 2 days
- Fluid therapy if dehydrated

CONTRAINDICATIONS PRECAUTIONS

- Metronidazole—bitter taste; neurotoxic if overdosed; anecdotal reports of hepatotoxicity in chinchillas
- Albendazole—teratogenicity reported in mammals



FOLLOW-UP

Serial fecal examinations to confirm efficacy of treatment



MISCELLANEOUS

ZOO NOTIC POTENTIAL

- *Giardia* is the most common intestinal parasite in humans residing in North America.
- *Giardia* spp. may not be highly host specific; no conclusive evidence indicates that cysts shed by chinchillas are infective for humans.

PREGNANCY/FERTILITY/BREEDING

Albendazole reported to be teratogenic in mammals

SEE ALSO

Diarrhea

ABBREVIATIONS

ELISA = enzyme-linked immunosorbent assay

PCV = packed cell volume

TS = total solids

Suggested Reading

Donnelly TM. Disease problems of chinchillas. In: Quesenberry K, Carpenter J, eds. *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*, 2nd ed. St Louis: Saunders, 2004:262–263.

Harkness JE, Turner PV, VandeWoude S, et al. Harkness and Wagner's *Biology and Medicine of Rabbits and Rodents*, 5th ed. Ames, IA: Wiley-Blackwell, 2010:212.

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Author Dan H. Johnson, DVM, Dipl. ABVP

NASAL DISCHARGE AND SNEEZING



BASICS

DEFINITION

- Nasal discharge may be unilateral or bilateral, serous, mucoid, mucopurulent, purulent, hemorrhagic (epistaxis), or contain food material.
- Sneezing is the reflexive expulsion of air through the nasal cavity and is commonly caused by irritation of the nasal passages and associated with nasal discharge.

PATHOPHYSIOLOGY

- Mucous cells of the epithelium and glands produce secretions. Irritation of the nasal mucosa (by mechanical, chemical, or inflammatory stimulation) increases nasal secretion production.
- Mucosal irritation and accumulated secretions are a potent stimulus of the sneeze reflex; sneezing may be the first sign of nasal discharge. Sneezing frequency often decreases with chronic disease.
- Dental disease is very common in chinchillas and is often associated with mucopurulent oculonasal discharge.
- Bacterial rhinitis without dental disease can begin in the nasal cavity and may spread via the eustachian tubes to the inner or middle ears, into the sinuses, via the nasolacrimal duct to the eye, via the trachea to the lower respiratory tract.
- Allergic rhinitis has been proposed in the chinchilla but is very difficult to confirm.

Types of Nasal Discharge and Common Associations

- Serous—mild irritation, allergies, acute phase of inflammation, early bacterial infection
- Mucoid—allergies or contact irritation, acute inflammation or infection, early neoplastic conditions
- Purulent or mucopurulent—dental disease involving sinuses, bacterial infections, nasal foreign bodies, rarely mycotic in chinchillas
- Serosanguinous—destructive processes (bacterial pathogens, primary nasal tumors)

SYSTEMS AFFECTED

- Respiratory—mucosa of the upper respiratory tract, including the nasal cavities, sinuses, and nasopharynx
- Ophthalmic—extension via nasolacrimal ducts causing ocular discharge
- Musculoskeletal—primary dental disease with extension of infection into sinuses
- Neurologic—extension of infection via eustachian tube causing vestibular signs from otitis interna/media
- Gastrointestinal—secondary GI stasis due to anorexia or pain
- Hemic/Lymphatic/Immune—may develop leukocytosis due to infection and inflammation

- Hepatobiliary—may develop hepatic lipidosis if anorectic due to pain or head tilt

GENETICS

Unknown

INCIDENCE/PREVALENCE

Primary bacterial rhinitis is less frequent than in rabbits; however, dental disease is very common in chinchillas with concurrent nasal discharge, which can progress to otitis interna.

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

- Young animals—bacterial infections
- Middle-aged to older animals—nasal tumors, dental disease, bacterial infections
- Chinchillas with previous history of dental disease

SIGNS

General Comments

Related to the severity and extent of infection; may range from none to severe mucopurulent or serosanguinous nasal discharge

Historical Findings

- Nasal discharge and sneezing may be reported as concurrent problems. Information concerning both the initial and present character of the discharge and whether it was originally unilateral or bilateral are important historical findings.
- The response to previous antibiotic therapy may be helpful in determining bacterial involvement. Bacterial infections, dental disease, or foreign body will often respond initially to antibiotic therapy but commonly relapse after treatment. Nasal tumors typically show little response.
- History of ocular discharge; ptialism with tooth involvement; head tilt, vestibular signs, scratching at ears with extension into the ears
- History of feeding diets consisting of commercial pelleted foods without the addition of long-stemmed hay or grasses common in chinchillas with dental disease.

Physical Examination Findings

- Secretions or dried discharges on the hair around the nose and front limbs
- Concurrent dental disease, especially tooth root impaction. Findings may include ptialism, anorexia, nasal discharge, ocular discharge, and exophthalmia. Always perform a thorough oral exam (which requires sedation or anesthesia).
- Ocular discharge—may be serous with nasolacrimal duct occlusion or mucopurulent; conjunctivitis secondary to nasolacrimal duct obstruction or extension of upper respiratory infection; exophthalmos with retrobulbar abscess
- Head tilt if rhinitis or dental disease has progressed along eustachian tube(s) to middle or inner ear.

- Bony involvement (tooth root abscess, tumor, bacterial) may cause facial swelling and pain.
- Lethargy, anorexia, or depression with pain, extension to lower respiratory tract or hematogenous spread
- Dyspnea, stridor—especially with exertion with extension to lower respiratory tract or complete nasal occlusion (chinchillas are obligate nasal breathers)

CAUSES

- Bacterial—most common agents identified in chinchillas are *Pseudomonas aeruginosa* and *Listeria monocytogenes*.
- Odontogenic infections—common isolates from these sites include anaerobic bacteria
- Dental disease—periapical or tooth root abscesses, elongated maxillary premolar or molar tooth roots penetrating into nasal passages
- Foreign objects, especially hay, straw, or other bedding material
- Allergies or irritants—dust, bedding, plant material
- Neoplasia—rare
- Unilateral discharge often is associated with nonsystemic processes—dental-related disease, nasal tumors, or foreign bodies
- Discharge may be unilateral or bilateral with bacterial respiratory tract infections, allergies, nasal tumors, dental disease, or foreign bodies.

RISK FACTORS

- Dental disease—extending infection
- Poor husbandry—inappropriate diet; ammonia build up in urine-soaked bedding
- Immunosuppression—stress, corticosteroid administration, concurrent disease, debility increases susceptibility to and extension of bacterial infections



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Allergic, irritant, neoplastic, infectious, inflammatory, and traumatic disorders

CBC/BIOCHEMISTRY/URINALYSIS

- Hemogram—TWBC elevations with neutrophil: lymphocyte ratio shift; toxicity of neutrophils, bands; monocytosis may suggest chronicity; thrombocytosis associated with active inflammation
- Biochemistry panel—usually normal unless concurrent disease, elevations in CK with muscle damage if soft tissue abscesses are present. Hepatic enzymes elevated if concurrent anorexia and hepatic lipidosis.

OTHER LABORATORY TESTS

- Culture and sensitivity from deep nasal swabs may be useful; best to obtain during sedation
- Further evaluation of liver function can be obtained with bile acid concentrations.

NASAL DISCHARGE AND SNEEZING

(CONTINUED)

IMAGING

- Skull radiography—Radiography of the nasal cavities can be helpful in cases of chronic nasal discharge, especially to rule out bacterial rhinitis/sinusitis, neoplasia, foreign body, or associated dental disease. It is difficult to evaluate the nasal cavity of the chinchilla on skull radiographs; therefore, the patient should be anesthetized and carefully positioned. A full skull series is warranted to evaluate the entire skull. Radiographs should be evaluated for dental disease, as this is a common precursor to rhinitis. All other bones of the skull should be evaluated for signs of sclerosis or lysis, as damage to the nasal, temporal, and mandibular bones may be present with rhinitis or neoplasia. Examine bullae for evidence of concurrent otitis; sclerosis of the bullae and surrounding bones may indicate chronicity.
- CT or MRI—superior to radiographs for identifying dental disease and associated changes affecting the nasal cavity. Can evaluate the nasal cavity for evidence of fluid or exudates, and can evaluate the soft tissue structures in more detail to evaluate for signs of abscessation/neoplasia. Contrast is useful for evaluating vascular changes associated with neoplasia, but abscesses will not contrast.

DIAGNOSTIC PROCEDURES

- Bacterial culture and sensitivity testing
- Deep nasal cultures may be useful in chinchillas with rhinitis. A heavy growth of a single organism is usually significant. A lack of growth does not rule out bacterial disease, since the infection may be in an inaccessible, deep area of the nasal cavity or sinuses.
- Deep nasal cytology showing intracellular bacteria in conjunction with culture results is more meaningful. Nonspecific inflammation is most commonly found but is often difficult to interpret for allergic rhinitis.
- Rhinoscopy requires a narrow endoscope but can be extremely valuable to visualize nasal abnormalities, retrieve foreign bodies, or obtain biopsy samples; sometimes the only method of identifying foreign bodies
- Biopsy—when tumor is suspected

PATHOLOGIC FINDINGS

Purulent exudates within the nasal cavity, microscopic evidence of degenerative neutrophils with or without intracellular bacteria; variable degrees of osteomyelitis



TREATMENT

APPROPRIATE HEALTH CARE

- Inpatient—severe debilitating infection, anorexia, or concurrent hepatic lipidosis; indicated if neurological signs present due to concurrent otitis
- Outpatient—if stable and can be managed at home pending further diagnostics or treatments as necessary

- Treat associated dental disease—extractions, complete debridement of abscesses
- Remove environmental allergens/irritants (dust bath provided for limited time, moldy hay, or bedding; provide good ventilation)

NURSING CARE

- Provide oxygen supplementation if patient appears to be dyspneic; chinchillas are obligate nasal breathers; nasal discharge can cause severe dyspnea. Keep nostrils clear of discharge.
- Symptomatic treatment and nursing care are important in the treatment of chinchillas with sneezing and nasal discharge. Patient hydration, nutrition, warmth, and hygiene (keeping nostrils clean) are important.
- Subcutaneous fluids can be administered (50 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often fail; in most patients, crystalloid fluids are appropriate. Maintenance fluid needs are estimated at 100 mL/kg/day. Fluids by mouth should be avoided.
- Housing support—for chinchillas that are falling and rolling due to vestibular disorders; provide housing such that the chinchilla is propped up by towels or other bedding materials to minimize these signs.

ACTIVITY

Return to normal activity as soon as possible. Restrict activity if severe vestibular signs to avoid injury.

DIET

- Many chinchillas will develop inappetence. Be certain the chinchilla is eating to prevent the development, or exacerbation of, gastrointestinal dysmotility/GI stasis or hepatic lipidosis.
- If patient is eating on own, offer range of normal diet at home, including fresh, moist, high-fiber vegetables, chopped hay, and pellets.
- If chinchilla is not eating sufficiently on own, syringe-feeding of a high-fiber critical diet. The chinchilla usually accepts Critical Care for herbivores (Oxbow Animal Health, Murdock, NE) or Emerald Herbivore (Lafeber Company, Cornell, IL) diet at approximately 10 to 15 mL/kg PO q6–8h. Calculate caloric needs based on metabolic needs. Alternatively, chinchilla pellets can be ground with high-fiber green vegetables to make slurry that can be syringe-fed as above. Ensure high fiber intake to maximize dietary needs. High-carbohydrate, high-fat nutritional supplements are contraindicated.
- Encourage fluid intake with high-water vegetables, or by soaking vegetables in water before feeding.
- CAUTION—patients with vestibular signs are at risk for aspiration due to abnormal body posture. Ensure patient is in a stable position and is willing to take foods before assisted feeding.

CLIENT EDUCATION

- Discuss need to correct or prevent risk factors.
- Rhinitis due to bacterial infection may require long course of treatment.
- If dental disease is the underlying cause, this is a lifelong condition requiring consistent and repeated treatments for occlusal adjustments. By the time root elongations can be readily detected, they are irreversible; therefore, timely treatment of crown elongation is highly recommended.

SURGICAL CONSIDERATIONS

- If dental disease is the primary problem may require extractions followed by periodic (every 6–8 weeks) occlusal adjustments.
- Chinchillas are difficult to intubate due to the palatal ostium in the oropharynx, which complicates providing a secure airway during anesthesia. Chinchillas can be intubated endoscopically.



MEDICATIONS

DRUG(S) OF CHOICE

- Systemic antibiotics—based ideally on results from culture and sensitivity testing. Depending on severity of infection, long-term antibiotics: 6 weeks minimally, up to months or even lifelong treatment in chronic, recurrent, bacterial rhinitis/sinusitis. Use broad-spectrum antibiotics such as enrofloxacin (5–15 mg/kg PO, SC q12h) or trimethoprim-sulfa (15–30 mg/kg PO q12h) for aerobic infections; Anaerobic bacteria are usually causative agent of tooth root abscess; if anaerobes are present, chloramphenicol (30–50 mg/kg PO, SC, IV q12h) has good osseous penetration; penicillin G (40,000–60,000 IU/kg SC q2–7d) may also be used in severe cases. Monitor closely for loose stool or diarrhea.
- Intranasal antibiotics—use ophthalmic or otic preparations of antibiotics without corticosteroids.
- Nasal secretions clear more easily if the patient is well hydrated; fluid therapy should be considered if hydration is marginal.
- Antihistamines have been used for chinchillas with allergic rhinitis, and symptomatically for infectious rhinitis. Use is anecdotal and dosages have been extrapolated from other species. Diphenhydramine (2.0 mg/kg PO, SC q8–12h)
- Nebulization with saline ± antibiotics may be beneficial
- Topical ophthalmic preparations, such as those containing quinolones, to treat associated conjunctivitis
- Analgesia—pain relief is a critical aspect of therapy if concurrent dental disease, osteomyelitis, or neoplasia is present. Nonsteroidal anti-inflammatory such as meloxicam (0.2–0.5 mg/kg PO, SC q24h)

(CONTINUED)

NASAL DISCHARGE AND SNEEZING

and carprofen (2–5 mg/kg PO q24h) can provide both anti-inflammation and analgesia. However, with osteomyelitis or neoplasia addition of an opioid medication such as buprenorphine (0.01–0.05 mg/kg SC, IM, IV q8–12h) is recommended.

CONTRAINDICATIONS

- Metronidazole toxicity has been reported in chinchillas.
- Oral antibiotics that select against gram-positive bacteria (penicillins, macrolides, lincosamides, cephalosporins) can cause fatal enteric dysbiosis and enterotoxemia.
- Topical and systemic corticosteroids—chinchillas are also sensitive to their immunosuppressive effects; can exacerbate bacterial infections
- Nasal decongestants containing phenylephrine can exacerbate nasal inflammation and cause nasal ulceration and purulent rhinitis.

PRECAUTIONS

The bones of the skull are relatively thin in this species; potential for fractures of maxillary bones or nasal fistulas if dental extractions required

POSSIBLE INTERACTIONS

A number of topical otic medications may induce contact irritation; reevaluate all worsening cases.

ALTERNATIVE DRUGS

N/A

**FOLLOW-UP****PATIENT MONITORING**

- Reevaluate patient at 7–10 days or sooner if patient is worsening.
- Regular 6-month clinical assessment and monitoring for relapse of clinical signs
- Dental disease requires routine occlusal adjustments.

PREVENTION/AVOIDANCE

Treating otitis or upper respiratory infections in the early stages may prevent otitis media/interna.

POSSIBLE COMPLICATIONS

- Dyspnea as a result of nasal obstruction; chinchillas are obligate nasal breathers
- Osteomyelitis is a possible sequelae to severe, chronic infections
- Surgical intervention—because of the extensive compartmentalization of the chinchilla bullae, this procedure is not commonly performed.
- Loss of appetite, gastrointestinal stasis, hepatic lipidosis

EXPECTED COURSE AND PROGNOSIS

Rhinitis/sinusitis may resolve after one course of therapy or may take months of multiple therapies to resolve.

**MISCELLANEOUS****ASSOCIATED CONDITIONS**

- Lower respiratory infection
- Dental disease
- Gastrointestinal hypomotility

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

If dental disease is suspected as the inciting cause, breeders recommend not breeding these animals as inheritance abnormalities are suspected.

SYNONYMS

Snuffles

SEE ALSO

Dyspnea and tachypnea
Otitis media and interna

ABBREVIATIONS

CT = computed tomography
GI = gastrointestinal
MRI = magnetic resonance imaging
TWBC = total white blood cell count

Suggested Reading

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- Author** Joanne Paul–Murphy, DVM, Dipl. ACZM

OTITIS MEDIA AND INTERNA



BASICS

DEFINITION

Inflammation of the middle ear (otitis media) and inner ear (otitis interna) characterized by the accumulation of purulent material or fluid in the middle ear, pain associated with the ear, bulging of the tympanum, and if the tympanum is perforated, drainage of purulent material into the ear canal. The chinchilla is a model for otitis media in humans, and much literature is available as to the anatomy, physiology, diagnosis, and treatment of this disease because of this.

PATHOPHYSIOLOGY

May arise from extension of external ear disease, or via the eustachian tubes from the oropharynx and upper respiratory system.

SYSTEMS AFFECTED

- Behavioral—lethargy, anorexia, and abnormal neurological signs
- Gastrointestinal—secondary GI stasis due to pain
- Hemic/Lymphatic/Immune—may develop leukocytosis due to infection and inflammation
- Hepatobiliary—may develop hepatic lipidosis if overconditioned and anorectic due to pain or head tilt
- Musculoskeletal—abscesses may extend into soft tissues surrounding infected ear
- Nervous—may develop abnormalities associated with cranial nerve VII (facial nerve paresis/paralysis) or cranial nerve VIII (head tilt, torticollis, nystagmus)
- Ophthalmic—extension via nasolacrimal ducts from upper respiratory infections
- Respiratory—upper respiratory infections can also be a sequelae if disease ascends from oropharynx

GENETICS

Unknown

INCIDENCE/PREVALENCE

While less frequent than in rabbits, otitis media occurs in pet chinchillas and can progress to otitis interna.

GEOGRAPHIC DISTRIBUTION

N/A

SIGNALMENT

N/A

SIGNS

General Comments

Signs are related to the severity and extent of infection; may range from none to nervous system involvement and bullae discomfort

HISTORICAL FINDINGS

- Most common—acute onset of vestibular signs; often severe
- Torticollis can be severe; affected chinchillas often unable or unwilling to lift head

- May lean, veer, or roll toward side affected
- Head tilt
- Anorexia or bruxism due to nausea
- Pain manifested as reluctance to chew, shaking head, pawing affected ear, holding affected ear down, inappetence, reluctance to move
- Facial nerve abnormalities: facial symmetry, inability to blink, ocular discharge, decreased tear production

Physical Examination Findings

Neurological Examination Findings

- Damage to neurological structures depends upon severity and location of disease
- Vestibular component of cranial nerve VIII—ipsilateral head tilt
- Nystagmus—resting or positional (most common); rotatory or horizontal; doesn't appear to aid in differentiation of central from peripheral
- Strabismus—ipsilateral ventral deviation of globe with extension of neck
- Ipsilateral leaning, falling, rolling
- Cranial nerve VII—facial nerve signs include ipsilateral paresis/paralysis of the affected ear, eyelids, lips, and nares; reduced tear production, with chronic cranial nerve VII damage, the affected side of the face may be contracted caused by fibrosis of denervated muscles; deficits can be bilateral

Other Findings

- Aural erythema, white or tan creamy discharge from ear; thick, stenotic ear canals suggest chronicity of otitis externa
- Opaque, white, or bulging tympanic membrane on otoscopic examination indicates middle ear exudates.
- In some cases, otic examination may be normal, despite significant otitis media/interna.
- Nasal or ocular discharge
- Facial abscesses, or abscesses at base of the ear
- Pain—upon oral or aural examination or palpation
- Corneal ulceration—inability to blink and dry eye resulting from cranial nerve VII damage to eyelids

CAUSES

- Bacterial—most common agents identified in chinchillas are *Pseudomonas aeruginosa*, *Listeria monocytogenes*, and oral bacterial including various anaerobes
- Fungal—yeast (*Malassezia* spp., *Candida* spp.) are possible but not common
- Parasites—*Baylisascaris* spp.—aberrant larval migrants and *Sarcocystis neurona* (if housed outdoors); *Toxoplasma gondii* (if housed with cats)
- Trauma—cagemate aggression causing external infections
- Polyps—at tympanum causing external ear disease
- Foreign bodies
- Neoplasia—uncommon

RISK FACTORS

- Dental disease—extending infection via eustachian tubes
- Immunosuppression—stress, corticosteroid administration, concurrent disease, debility; increases susceptibility to and extension of bacterial infections
- Overexuberant external ear canal flushing
- Ear cleansing solutions—may be irritating to middle or inner ear; avoid if tympanum is ruptured
- Ototoxic or immunosuppressive ear medications—many otic medications contain corticosteroids which will reduce inflammation but may allow for more florid growth of bacteria if antibiotics are not effective. Based on research in chinchillas for human diseases, certain medications may be ototoxic.
- Chinchillas housed outdoors may be more prone to infections with parasites causing these signs.



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- Dental disease
- Pain from otitis externa causing chinchilla to hold ear abnormally can be confused with otitis media signs; chinchillas with otitis media commonly demonstrate neurologic abnormalities associated with vestibular disease such as nystagmus, torticollis, ataxia, and head tilt.
- Central vestibular disease—abscesses most common; may see severe lethargy, stupor, and other brainstem signs.
- History of use of ototoxic drugs
- Neoplasia—uncommon; rule out via imaging of the skull
- Trauma—history and physical examination findings of trauma

CBC/BIOCHEMISTRY/URINALYSIS

- Hemogram—TWBC elevations with neutrophil: lymphocyte ratio shift; toxicity of neutrophils ± bands, monocytosis may suggest chronicity; thrombocytosis associated with active inflammation
- Biochemistry panel—usually normal unless concurrent disease, elevations in CK with muscle damage if soft tissue abscesses are present

OTHER LABORATORY TESTS

- Culture and sensitivity from deep nasal swabs generally not useful; C/S from deep within the cleaned ear canal more helpful
- C/S may be obtained from the bullae via a pinhole approach to bullae osteotomy. Once entered, the bulla can be flushed gently with a small amount of warm sterile saline.
- Microscopic examination of ear swab if otitis externa is present

(CONTINUED)

OTITIS MEDIA AND INTERNA

IMAGING

- Skull radiography—a full skull series is warranted to evaluate the entire skull: bullae may appear cloudy if exudates are present, sclerosis of the bullae and surrounding bones may indicate chronicity; bony lysis indicates osteomyelitis; even with severe cases, bullae sometimes appear normal on radiographs. Radiographs should be evaluated for dental disease, as this is a common precursor to ear disease. All other bones of the skull should be evaluated for signs of sclerosis or lysis as damage to the nasal, temporal, and mandibular bones may be present. It is difficult to evaluate the nasal cavity of the chinchilla on skull radiographs.
- CT—superior to radiographs for identifying bony changes associated with bullae disease and severity of dental disease. Can also evaluate the nasal cavity for evidence of fluid or exudates, and can evaluate the soft tissue structures in more detail to evaluate for signs of abscessation/neoplasia. Contrast is not very useful for evaluating bullae and nasal disease, as abscesses will not contrast; however, if a tumor is suspected, contrast CT is warranted to detail the extent of the tumor.

DIAGNOSTIC PROCEDURES

- Bacterial culture/sensitivity—best samples are from myringotomy or bullae osteotomy
- Deep nasal cultures are not often useful in chinchillas; however, deep nasal cytology showing intracellular bacteria in conjunction with culture results is more meaningful.
- Biopsy—when deep tissue infection, tumor or osteomyelitis is suspected.

PATHOLOGIC FINDINGS

Purulent exudates within the middle ear cavity surrounded by a thickened bulla, microscopic evidence of degenerative neutrophils with or without intracellular bacteria; variable degrees of osteomyelitis

**TREATMENT****APPROPRIATE HEALTH CARE**

- Inpatient—severe debilitating infection, neurological signs
- Outpatient—if stable and can be managed at home pending further diagnostics or treatments as necessary

NURSING CARE

- Subcutaneous fluids can be administered (50–100 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider intraosseous (IO) catheterization if intravascular fluids are needed. Base fluid selection on the underlying cause of fluid loss. In most patients, lactated Ringer's solution or Normosol crystalloid fluids are appropriate. Maintenance fluids estimated to be 100 mL/kg/day. Fluids by mouth should be avoided in patients with head tilt.

- Concurrent otitis externa—clean ears and culture as deep as possible; warm saline should be used if tympanum not intact; if tympanum intact use nonirritating ear cleaning solutions followed by final warm saline flush; dry ear with cotton swabs \pm low vacuum suction; general anesthesia is necessary to provide thorough deep ear cleansings.
- Housing support—for chinchillas that are falling and rolling, provide housing such that the chinchilla is propped up by towels or other bedding materials to minimize these signs.

ACTIVITY

Restrict activity if severe vestibular signs to avoid injury; encourage return to normal activity as soon as possible

DIET

Many chinchillas will develop inappetence. Be certain the chinchilla is eating to prevent the development, or exacerbation of, gastrointestinal dysmotility/GI stasis.

- If patient is eating on own, offer range of normal diet at home, including fresh, moist, high-fiber vegetables, chopped hay, and pellets. May need to offer in more than one place in the cage so that patient can get to food if vestibular signs prevent normal activity.
- If chinchilla is not eating sufficiently on own, syringe-feed a high fiber diet. The chinchilla usually accepts Critical Care for herbivores (Oxbow Animal Health, Murdock, NE) or Emeraid Herbivore (Lafeber Company, Cornell, IL). Feed 10–15 mL/kg PO q6–8h via syringe if anorectic. Alternatively, chinchilla pellets can be ground with high-fiber green vegetables to make slurry that can be syringe-fed as above. Ensure appropriate fiber intake to maximize nutrition.
- Rarely, esophagostomy tube indicated
- Encourage fluid intake with high-water vegetables, or by soaking vegetables in water before feeding.
- CAUTION—patients with vestibular signs are at risk for aspiration due to abnormal body posture. Ensure patient is in a stable position and is willing to take foods before assisted feeding.

CLIENT EDUCATION

- Warn client that otitis media/interna can be extremely frustrating to treat, especially in chronic cases. Successful outcomes require long-term therapies, client compliance, and in severe cases, surgical intervention.
- Warn clients that neurological signs, especially head tilt and facial nerve damage, may be permanent. Some chinchillas improve minimally due to the extensive compartmentalization of the bullae in chinchillas; however, many will improve with a good quality of life.

SURGICAL CONSIDERATIONS

- Indicated when ear canal is severely stenotic, when evidence of middle ear exudates are

refractory to medical management, or when neoplasia is diagnosed

- Chinchillas are difficult to intubate due to the palatal ostium in the oropharynx, which complicates providing a secure airway during anesthesia. Chinchillas can be intubated endoscopically.
- Total ear canal ablation is not usually necessary in chinchillas since the external ear is upright but is indicated if otitis media is associated with recurrent otitis externa or neoplasia, especially when aural pain reduces quality of life.
- Bullae osteotomy—to date, there is little information regarding surgical approaches due to the extensive compartmentalization of the chinchilla bullae. Several research studies using the chinchilla as a model for human otitis media have reported successful bullae osteotomy, but the surgical procedures have not been clearly outlined. Some clinicians have attempted pinhole incisions into the dorsal aspect of the bullae using hypodermic needles or small Steinman or acrylic pins allowing a large enough entry for endoscopy and bulla flushing. This approach will not allow complete access to all compartments but could provide for sample collection for microbial identification.

**MEDICATIONS****DRUG(S) OF CHOICE**

- Systemic antibiotics—based ideally on results from culture and sensitivity testing. Depending on severity of infection, long-term antibiotics (6 weeks minimally, up to months or even lifelong treatment in some severe cases). Use broad-spectrum antibiotics such as enrofloxacin (5–15 mg/kg PO, SC q12h) or trimethoprim-sulfa (15–30 mg/kg PO q12h) for aerobic infections; if anaerobes are present, chloramphenicol (30–50 mg/kg PO, SC, IV q12h) has excellent bony penetration; penicillin G (40,000–60,000 IU/kg SC q2–7d) may also be used in severe cases.
- Topical antibiotics—for treatment of concurrent otitis externa; use otic preparations of antibiotics without corticosteroids.
- Analgesia—pain relief is a critical aspect of therapy. Nonsteroidal anti-inflammatory medications such as meloxicam (0.2–0.5 mg/kg PO, SC q24h) and carprofen (2–5 mg/kg PO, SC q24h) can provide both anti-inflammation and analgesia. However, with osteomyelitis and postsurgical intervention, addition of an opioid medication such as buprenorphine (0.01–0.05 mg/kg SC, IV q8–12h) is necessary.
- Severe vestibular signs or seizures—midazolam (1–2 mg/kg IM) during acute phase
- Meclizine (2–12 mg/kg PO q24h) may reduce clinical vestibular signs, control nausea, and induce mild sedation.

OTITIS MEDIA AND INTERNA

(CONTINUED)

CONTRAINDICATIONS

- Metronidazole toxicity has been reported in chinchillas.
- Oral antibiotics that select against gram-positive bacteria (penicillins, macrolides, lincosamides, cephalosporins) can cause fatal enteric dysbiosis and enterotoxemia.
- Topical and systemic corticosteroids—chinchillas are also sensitive to their immunosuppressive effects; can exacerbate otitis externa.
- Ruptured tympanum or associated neurological deficits—avoid the use of oil-based or irritating external ear preparations (chlorhexidine) and aminoglycosides, which can be ototoxic.

PRECAUTIONS

- Avoid overexuberant flushing of external ear as this can exacerbate signs of otitis media/interna.
- The bones of the skull are relatively thin in this species; potential for fractures of surrounding bones if pinhole or other surgical incision is made into the bullae

POSSIBLE INTERACTIONS

A number of topical otic medications may induce contact irritation; reevaluate all worsening cases.

ALTERNATIVE DRUGS

N/A



FOLLOW-UP

PATIENT MONITORING

- Monitor for corneal ulceration—secondary to facial nerve paresis/paralysis or abrasion during vestibular episodes.
- Reevaluate patient at 7–10 days or sooner if patient is worsening.

PREVENTION/AVOIDANCE

Treating otitis or upper respiratory infections in the early stages may prevent otitis media/interna.

POSSIBLE COMPLICATIONS

- Corneal ulceration
- Persistence of vestibular and facial nerve damage
- Severe infections may spread to the brainstem.
- Osteomyelitis is a common sequela to severe, chronic infections.
- Surgical intervention—because of the extensive compartmentalization of the chinchilla bullae, this procedure is not commonly performed.

EXPECTED COURSE AND PROGNOSIS

- Otitis media/interna—may take months of multiple therapies to resolve
- When medical management is ineffective, surgical considerations should be explored.
- Vestibular signs often resolve, but recurrence does occur in many patients.
- Residual deficits cannot be predicted until a long course of therapy has been attempted; long-term quality of life is good for chinchillas with mild-moderate residual head tilt or facial nerve damage.



MISCELLANEOUS

ASSOCIATED CONDITIONS

- Upper respiratory infection
- Dental disease
- Facial abscesses

AGE-RELATED FACTORS

N/A

ZOO NOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

If dental disease is suspected as the inciting cause, breeders recommend not breeding these animals as inheritance abnormalities are suspected.

SYNONYMS

Middle ear, inner ear disease

SEE ALSO

Nasal discharge and sneezing

ABBREVIATIONS

CK = creatine kinase
C/S = culture and sensitivity
CT = computed tomography
TWBC = total white blood cell count

INTERNET RESOURCES

Severe cases often presented and discussed via the Veterinary Information Network (VIN)

Suggested Reading

- Donnelly TM. Disease problems of chinchillas. In: Quesenberry K, Carpenter J, eds. Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery, 2nd ed. St Louis: WB Saunders, 2006;255–265.
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- Author** Michelle G. Hawkins, VMD, Dipl. ABVP (Avian)



BASICS

DEFINITION

Polyuria is greater than normal urine production, and polydipsia is greater than normal water consumption. The average water intake of the chinchilla is approximately 10 mL/100 g BW/day. Chinchillas fed large amounts of high-moisture leafy vegetables will drink less water than those on a diet primarily of hay and/or pellets. Urine production reported for rodents is approximately 3.3–4.2 mL/100 g BW/day; values are not available specifically for chinchillas.

PATHOPHYSIOLOGY

- Urine production and water consumption are controlled by interactions between the hypothalamus, the pituitary gland, and the kidneys.
- Polydipsia generally occurs as a response to polyuria to maintain circulating fluid volume. The patient's plasma becomes hypertonic, activating thirst mechanisms.
- Occasionally, polyuria may occur as a response to polydipsia. The patient's plasma becomes relatively hypotonic because of excessive water intake and ADH secretion, resulting in polyuria.

SYSTEMS AFFECTED

- Renal/Urologic
- Reproductive
- Hepatic
- Endocrine/Metabolic
- Cardiovascular—alterations in circulating fluid volume

CAUSES

Primary Polyuria

- Upper urinary tract disease—renal failure, pyelonephritis
- Lower urinary tract disease—infection, urolithiasis, neoplasia, anatomic or neurologic problem
- Pyometra
- Osmotic diuresis—diabetes mellitus (only reported in one chinchilla to date), postobstructive diuresis, ingestion or administration of large quantities of solute (sodium chloride, glucose)
- Ingestion of nephrotoxic plants (lilies)
- Iatrogenic—administration of nephrotoxic drugs (aminoglycosides), diuretics (furosemide and mannitol), corticosteroids, anticonvulsants (phenytoin), alcohol
- Hyperthyroidism (not reported in chinchillas)
- Diabetes insipidus—central, renal
- Hepatic failure
- Hypokalemia
- ADH deficiency (not reported in chinchillas)
- Traumatic, neoplastic

Primary Polydipsia

- Behavioral problems (especially boredom), pyrexia, pain
- Organic disease of the anterior hypothalamic thirst center of neoplastic, traumatic, or inflammatory origin (not reported in chinchillas)
- Psychogenic drinking

RISK FACTORS

- Renal or hepatic disease
- Selected electrolyte disorders
- Administration of diuretics, anticonvulsants, nephrotoxic drugs
- Exposure to nephrotoxic plants (lilies)



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

Differentiating Similar Signs

- Differentiate polyuria from an abnormal increase in frequency of urination (pollakiuria). Pollakiuria is often associated with dysuria, stranguria, or hematuria. Patients with polyuria void large quantities of urine, patients with pollakiuria generally void small quantities of urine.
- Measuring urine specific gravity may provide evidence of adequate urine concentrating capacity (>1.045).

Differentiating Causes

- If associated with progressive weight loss—consider renal failure, hepatic failure, pyometra, neoplasia, pyelonephritis, and possibly diabetes mellitus (one report in chinchillas)
- If associated with polyphagia or cataracts—consider diabetes mellitus.
- If associated with recent estrus in an intact female chinchilla—consider pyometra
- If associated with fever in an intact female chinchilla—consider pyometra
- If associated with abdominal distension—consider hepatic failure and neoplasia
- If associated with hypercrystalluria—consider nephrolithiasis or renal failure
- If postobstructive, diuresis can cause polyuria.
- Diabetes insipidus—central vs. renal
- Hypokalemia
- Iatrogenic—corticosteroids, anticonvulsants, nephrotoxic drugs

CBC/BIOCHEMISTRY/URINALYSIS

- CBC—elevated TWBC, neutrophilia suggests inflammation, infection; elevated platelet counts suggests inflammation
- Relative hyponatremia suggests primary polyuria; hyponatremia suggests primary polydipsia.
- Elevated BUN (>25 mg/dL) and creatinine (>1.0 mg/dL) are consistent with renal causes, but also consider prerenal causes such

- as dehydration resulting from inadequate compensatory polydipsia.
- Elevated hepatic enzymes suggest hepatic insufficiency.
- Hyperglycemia suggests diabetes mellitus, stress.
- Hypoalbuminemia suggests renal or hepatic disease.
- Hypercalciuria may occur in chinchillas fed a high-calcium diet (such as alfalfa-based hay and pellets)
- WBC casts and/or bacteriuria: should consider pyelonephritis
- Urinalysis, including both a standard dipstick and microscopic examination of the sediment should be performed, preferably from a cystocentesis sample. If voided, assume sample contamination.
- Urine sediment evaluation may reveal calcium carbonate, calcium oxalate, or struvite crystals; if excessive consider urolithiasis, cystitis.
- Glucosuria and ketonuria may be identified with diabetes mellitus. Ketonuria can also be associated with starvation or prolonged anorexia, especially during pregnancy.
- Bacteruria, pyuria ($>0-1$ WBC/hpf), hematuria ($>0-3$ RBC/hpf), and proteinuria indicate urinary or reproductive tract inflammation but are not specific to differentiate infectious and noninfectious causes of lower urinary tract disease.
- Identification of neoplastic cells in urine sediment indicates urinary tract neoplasia (rare).

OTHER LABORATORY TESTS

- Prior to antibiotic use, culture the urine or bladder wall if pyuria, hematuria, bacteriuria, or a combination of these are present on sediment examination.
- Aerobic/anaerobic bacterial urine culture and sensitivity—the most definitive means of identifying and characterizing bacterial urinary tract infection; negative urine culture results suggest a noninfectious cause, unless the patient was on concurrent antibiotics or has an anaerobic infection. Chronic pyelonephritis cannot be completely ruled out by negative pyuria, bacteriuria.
- If surgery is necessary to relieve obstruction from urolithiasis, collect and submit the calculi for analysis and culture and sensitivity, and submit the bladder wall for culture and sensitivity.

IMAGING

Abdominal radiography and ultrasonography may provide additional evidence for renal disease (e.g., primary renal disease, urolithiasis), hepatic disease, pancreatic disease, reproductive disease (e.g., pyometra).

PATHOLOGIC FINDINGS

Will depend upon the underlying cause.

POLYURIA AND POLYDIPSIA

(CONTINUED)



TREATMENT

APPROPRIATE HEALTH CARE

- Patients with uncomplicated PU/PD that appear otherwise normal are typically managed as outpatients; diagnostic evaluation may require brief hospitalization.
- Diseases associated with systemic signs of illness (e.g., pyrexia, depression, anorexia, and dehydration) or laboratory findings of azotemia and/or leukocytosis warrant an aggressive diagnostic evaluation and initiation of supportive and symptomatic treatment.
- Chinchillas with urinary obstruction should be hospitalized; emergency supportive and symptomatic therapy should be provided until surgical intervention to relieve the obstruction is performed. Medical treatment of calcium-based urolithiasis has been unrewarding to date, and surgical removal of calculi is most often required. Postoperative management including supportive and symptomatic treatment as well as pain management therapies.

NURSING CARE

- Ensure patient has adequate water available at all times until the causes for the PU/PD are understood, and that the patient has adequate water intake.
- Subcutaneous fluids can be administered (50–100 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider intraosseous (IO) catheterization if intravascular fluids are needed. Base fluid selection on the underlying cause of fluid loss. In most patients, lactated Ringer's solution or Normosol crystalloid fluids are appropriate. Maintenance fluids are estimated at 100 mL/kg/day.

ACTIVITY

- Activity should be reduced during the time of tissue repair if surgery is required for any disease.
- Dust baths should be administered daily, or at least 2–3 times weekly—minimize during treatment for infectious organisms; do not reuse dust bath.

DIET

- Many chinchillas with PU/PD develop inappetence. Be certain the chinchilla is eating, or provide assisted syringe-feeding of an herbivore critical care diet if anorectic to prevent the development, or exacerbation of, gastrointestinal dysmotility/GI stasis.
- Increasing water content in foods or via oral or parenteral fluids may increase fluid intake. Provide multiple sources of fresh water, including supplementing fresh water with small amounts of pure fruit juice (no added sugars), high-water-content vegetables, or soaking or misting fresh vegetables before offering.

- Following treatment, dietary changes to lower calcium intake (especially if eating high-alfalfa diets) may help prevent or delay recurrence of urolithiasis. Provide a high-fiber, low-calcium hay source such as timothy, oat, or grass hays and timothy-based pellets, and offer a large volume and variety of fresh vegetables.

CLIENT EDUCATION

- Limit risk factors and increase water consumption until the cause of the PU/PD is identified.
- Surgical removal of urinary tract obstructions does not alter the causes responsible for their formation; limiting risk factors such as described above is necessary to minimize or delay recurrence.

SURGICAL CONSIDERATIONS

If calcium-based urolithiasis is present, surgery may be the treatment of choice as medical dissolution is unsuccessful.



MEDICATIONS

DRUG(S) OF CHOICE

Based upon cause of underlying disease

CONTRAINDICATIONS

- Oral administration of antibiotics that select against gram-positive bacteria (penicillins, cephalosporins, macrolides, lincosamides) can cause fatal enteric dysbiosis and enterotoxemia.
- Metronidazole toxicosis has been previously reported in chinchillas.
- Potentially nephrotoxic drugs (e.g., aminoglycosides, NSAIDs) should be avoided in patients that are febrile, dehydrated, or azotemic or who are suspected of having pyelonephritis, septicemia, or preexisting renal disease.
- Glucocorticoids, or other immunosuppressive agents

PRECAUTIONS

Until underlying renal or hepatic disease have been excluded, use caution in administering any drug eliminated by these pathways.



FOLLOW-UP

PATIENT MONITORING

- Hydration status by clinical assessment of dehydration and serial evaluation of body weight
- Fluid intake and urine output—provide a useful baseline for assessing adequacy of hydration therapy

PREVENTION/AVOIDANCE

Will depend upon the underlying cause of these signs

POSSIBLE COMPLICATIONS

- Dehydration
- Gastrointestinal hypomotility/GI stasis
- Urine scald
- Pododermatitis, myiasis if sedentary

EXPECTED COURSE AND PROGNOSIS

Will depend upon the underlying cause of these signs



MISCELLANEOUS

ASSOCIATED CONDITIONS

- Bacterial urinary tract infections
- Hypercrystalluria, urolithiasis
- Diabetes mellitus

PREGNANCY/FERTILITY/BREEDING

Pyometra can affect fertility or decisions regarding suitability of this patient for future breeding.

SEE ALSO

Dysuria, hematuria, and pollakiuria
Gastrointestinal stasis and dilation

ABBREVIATIONS

ADH = antidiuretic hormone
BUN = blood urea nitrogen
RBC = red blood cell
TWBC = total white blood cells
WBC = white blood cell

Suggested Reading

- Donnelly TM. Disease problems of chinchillas. In: Quesenberry KE, Carpenter JW, eds. Ferrets, rabbits, and rodents clinical medicine and surgery, 2nd ed. St Louis: WB Saunders, 2006:255–265.
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- Author** Michelle G. Hawkins, VMD, Dipl. ABVP (Avian)



BASICS

DEFINITION

- Weight loss is considered clinically important when it exceeds 10% of the normal body weight and is not associated with fluid loss.
- Cachexia is defined as the state of extremely poor health and is associated with anorexia, weight loss, weakness, and mental depression.

PATHOPHYSIOLOGY

- Weight loss can result from many different pathophysiological mechanisms that share a common feature—insufficient caloric intake or availability to meet metabolic needs.
- Insufficient caloric intake or availability can be caused by (1) a high-energy need (e.g., the characteristic of a hypermetabolic state); (2) inadequate energy intake, including insufficient quantity or quality of food, or inadequate nutrient assimilation (e.g., with anorexia dysphagia or malabsorption disorders); and (3) excessive loss of nutrients or fluid, which can occur in patients with gastrointestinal losses, glucosuria, or proteinuria.
- There is little published regarding caloric requirements for chinchillas, but in general, growing, pregnant, lactating chinchillas will require higher caloric density than that necessary for adult maintenance.

SYSTEMS AFFECTED

Any can be affected by weight loss, especially if severe or the result of systemic disease.

SIGNALMENT

No sex or breed predilection

SIGNS

Historical Findings

- Clinical signs of particular diagnostic value in patients with weight loss are whether the appetite is normal, increased, decreased, or absent.
- Important historical information includes the type of diet, environment (chewing habits and access to potential gastrointestinal foreign bodies), signs of dental disease, chronic respiratory disease, abscesses, signs of gastrointestinal disease (including lack of fecal production or scant feces), diarrhea, or any signs of a specific disease.
- Signs of pain, such as bruxism, a hunched posture, or reluctance to move are extremely common in chinchillas with dental disease or gastrointestinal hypomotility.
- Pseudo-anorectic patients commonly display excessive drooling, difficulty in pretension and mastication of food, halitosis, dysphagia, bruxism, and odynophagia (painful eating).

Physical Examination Findings

- Most underlying causes of pseudo-anorexia can be identified by a thorough examination of the face, mandible, teeth, neck,

oropharynx, and esophagus for dental disease, ulceration, traumatic lesions, foreign bodies, masses, and neuromuscular dysfunction.

- A thorough examination of the oral cavity, including the incisors, molars, and mucosa is essential to rule out dental disease. Use of an otoscope, nasal speculum, or endoscope is required to adequately perform a thorough examination of the cheek teeth. A complete examination requires heavy sedation or general anesthesia.
- Examine the face for evidence of chronic upper respiratory disease, such as secretions or dried discharge around the nose and front limbs, ocular discharge, exophthalmos, facial swelling, or pain.
- Abdominal palpation is a valuable tool in the diagnosis of gastrointestinal stasis/hypomotility. The normal stomach should be easily deformable and feel soft and pliable; palpation may also reveal organomegaly, masses, or gastrointestinal foreign bodies.
- Gas distention of the stomach, intestines, or cecum can cause severe bloating in the chinchilla, which can be life-threatening. With bloating, the abdomen may be taut or tympanic.
- Auscultation of the intestines and cecum may reveal decreased borborygmi in patients with GI stasis.
- Auscultation of the thorax may reveal cardiac murmurs, arrhythmias, or abnormal breath sounds.

CAUSES

Increased Use of Calories

- Catabolism—fever, inflammation, cancer; very common, especially chronic upper respiratory disease, abscesses (subcutaneous, joint, facial, intrathoracic, intra-abdominal)
- Increased physical activity
- Pregnancy, lactation, growth

Pseudoanorexia

Dental disease is extremely common and can cause dysphagia—inability toprehend or chew food

Maldigestive/Malabsorptive Disorders

- Gastrointestinal hypomotility/gastrointestinal stasis—very common
- Intestinal dysbiosis, chronic intermittent diarrhea—common
- Coccidiosis—young or debilitated animals

Metabolic Disorders

- Organ failure—cardiac, hepatic, and renal failure are common
- Secondary hepatic lipidosis can develop in an overconditioned chinchilla with significant weight loss.
- Cancer cachexia—many neoplastic conditions can cause weight loss

Dietary Causes

- Insufficient particle size of hay, or excessive simple carbohydrates—very common, leads

to secondary gastrointestinal disorders and dental disease

- Insufficient or poor-quality diet

Neuromuscular Disease and Pain

- Dental disease—very common
- Degenerative joint disease (arthritis)
- Facial abscesses—often associated with dental disease or trauma
- Ulcerative pododermatitis—very common
- CNS disease—brain abscesses or other infections (Listeria monocytogenes, LCM) can be associated with anorexia or pseudoanorexia
- Fur rings of the penis in male chinchillas are common and, if left undetected, can cause necrosis of the penis and pain.

Excessive Nutrient Loss

- Protein-losing enteropathy (secondary to infectious or infiltrative disease)
- Protein-losing nephropathy—may be seen in older chinchillas with chronic renal failure

RISK FACTORS

Any disease process in the chinchilla can cause weight loss; cachexia can occur if the disease process is chronic.



DIAGNOSIS

- If a previous body weight is not available, subjectively assess the patient for thin body condition, emaciation, cachexia by using a body condition scoring system (e.g., BCS 1–9). Assess patient for dehydration by evaluating skin/eyelid turgor, evidence of sunken eyes, and the mucous membranes.
- Once weight loss is confirmed, seek the underlying cause.

DIFFERENTIAL DIAGNOSIS

- Categorize the weight loss as occurring within normal, increased, or decreased appetite.
- Differential diagnoses for a patient with weight loss despite a normal or increased appetite are much different and shorter than for patients with decreased appetite or anorexia.
- Determine what the patient's appetite was at the onset of the weight loss; any condition can lead to anorexia if it persists long enough for the patient to become debilitated.
- Dental disease is one of the most common causes of pseudoanorexia and weight loss in chinchillas.
- Some loss of muscle mass occurs in chinchillas as a normal aging change.

CBC/BIOCHEMISTRY/URINALYSIS

- Used to identify infectious, inflammatory, and metabolic diseases, including organ failure and secondary hepatic lipidosis
- A minimum database is always important, but especially when the history and physical examination provide little information.

WEIGHT LOSS AND CACHEXIA

(CONTINUED)

OTHER LABORATORY TESTS

- Based upon the most likely differential diagnoses and the specific findings of the history and physical examination
- Fecal direct examination, fecal flotation to rule out coccidiosis

IMAGING

- Abdominal radiography and ultrasonography should be utilized to evaluate gastrointestinal disorders, hepatic, renal, and urogenital diseases, or internal abscesses. Secondary hepatic lipidosis is best evaluated through imaging using ultrasonography.
- Skull radiography may help rule out dental disease, but CT provides a broader evaluation of the relationship of the teeth to one another, the nasal cavity, and the bones of the skull.
- Thoracic radiography is used initially to evaluate for cardiac and respiratory diseases. Because of the small thorax, ultrasonography can sometimes be used to localize and guide aspiration of respiratory masses/abscesses. Echocardiography is used to evaluate for specific cardiac diseases.

DIAGNOSTIC PROCEDURES

Will vary depending upon the suspected underlying cause of the weight loss

PATHOLOGIC FINDINGS

Will vary depending upon the suspected underlying cause of the weight loss



TREATMENT

APPROPRIATE HEALTH CARE

- Inpatient—severe debilitating disease with anorexia that requires hospitalization and support
- Especially if patient was previously obese, secondary hepatic lipidosis may develop and must be aggressively treated in the hospital if identified.
- Outpatient—if stable and can be managed at home pending further diagnostics or treatments

NURSING CARE

- Subcutaneous fluids can be administered (50–100 mL/kg) as needed; IV access is difficult in the chinchilla; lateral saphenous vein catheters often kink; consider intraosseous (IO) catheterization if intravascular fluids are needed.
- Base fluid selection on the underlying cause of fluid loss. In most patients, lactated Ringer's solution or Normosol crystalloid fluids are appropriate. Fluids can be administered by mouth in some stable patients. Maintenance fluid needs are estimated at 100 mL/kg/day.

ACTIVITY

- Dust baths should be administered daily, or at least 2–3 times weekly—minimize during treatment for infectious organisms; do not reuse dust bath.

- Activity should be reduced during the time of tissue repair if surgery is required for any disease.

DIET

- Be certain the chinchilla is eating, as it is imperative that the chinchilla began eating as soon as possible, regardless of the underlying cause. Continued anorexia exacerbates gastrointestinal hypomotility and can cause further derangements in intestinal bacterial pathogens.
- Offer a large selection of fresh, moist greens such as Romaine lettuce, carrot tops, spinach, collard greens, parsley etc., and a good quality grass hay, as well as the chinchilla's usual pelleted diet, as the initial goal is to get the chinchilla to eat.
- If the patient refuses these foods, syringe-feed Critical Care for herbivores (Oxbow Pet Products, Murdock, NE) or Emeraid Herbivore (Lafeber Company, Cornell, IL) diet at approximately 10–15 mL/kg PO q6–8h. Larger volumes and more frequent feedings are often accepted; feed as much as the patient will readily accept. Alternatively, pellets can be ground and mixed with fresh greens, vegetable baby foods, water, or sugar-free juice to form a gruel.
- High-carbohydrate, high-fat nutritional supplements are contraindicated in these hind-gut fermenters.

CLIENT EDUCATION

- Virtually any disease in the chinchilla can cause weight loss, and in a previously obese patient may lead to hepatic lipidosis, which requires hospitalization, aggressive supportive care, and can still carry a guarded prognosis.
- Evaluate the environment and husbandry and ensure appropriate general care; modify as necessary depending upon the disease process identified.

SURGICAL CONSIDERATIONS

Heavy sedation is usually necessary for complete oral examination; benzodiazepines are relatively safe even in the very ill animal. General anesthesia evaluation should be used with caution until the underlying disease processes are identified.



MEDICATIONS

DRUG(S) OF CHOICE

Depends on the underlying cause of a weight loss.



FOLLOW-UP

PATIENT MONITORING

The level of patient monitoring depends upon the underlying cause of the weight loss. Regardless, the patient should be weighed 1–2 times daily until weight is stabilized.

Inexpensive gram scales can be purchased by the owner for home monitoring.

PREVENTION/AVOIDANCE

Breeders and owners should weigh their chinchillas routinely, to identify potential problems before they become chronic. In general, if the chinchilla steadily decreases body weight without any untoward clinical signs, a veterinarian should be consulted.

POSSIBLE COMPLICATIONS

- Cachexia can lead to irreversible organ failure and even sudden death if not identified and treated as quickly as possible.
- Significant weight loss in a previously obese chinchilla can lead to a negative energy and hepatic lipidosis.

EXPECTED COURSE AND PROGNOSIS

- Will depend upon the underlying cause of the disease
- Hepatic lipidosis carries a guarded prognosis, even with aggressive supportive care.



MISCELLANEOUS

PREGNANCY/FERTILITY/BREEDING

Pregnancy and lactation can be associated with weight loss due to increased caloric expenditure.

SEE ALSO

Dental malocclusion
Anorexia
Gastrointestinal hypomotility and gastrointestinal stasis

ABBREVIATIONS

CNS = central nervous system
CT = computed tomography
LCM = lymphochoriomeningitis

INTERNET RESOURCES

Suggested Reading

- Capello V. Diagnosis and treatment of dental disease in pet rodents. *J Exotic Pet Med* 2008;17:114–123.
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FERRETS

ADRENAL DISEASE (HYPERADRENOCORTICISM)



BASICS

DEFINITION

- Spontaneous hyperadrenocorticism is a disorder resulting in excessive production of estrogens, androgens, and estrogen-related compounds by the adrenal cortex.
- Clinical signs are due to the deleterious effects of the elevated circulating estrogen and androgen concentrations on multiple organ systems. Clinical signs caused by the space-occupying effects of the tumor may also be seen.
- Cortisol concentrations are not significantly elevated in most ferrets with adrenal disease. However, one case of luteinizing hormone-dependent hypercortisolism has been reported in a ferret with signs of polyuria, polydipsia, polyphagia, and lethargy.

PATHOPHYSIOLOGY

- Ferret adrenal disease is caused by excessive secretion of sex steroids from adrenocortical hyperplasia, adrenal adenomas, or carcinoma.
- Unilateral disease is somewhat more common than bilateral adrenal disease.
- Hyperadrenocorticism resulting from pituitary corticotroph tumors or hyperplasia oversecreting ACTH has not been documented in the ferret.
- Iatrogenic hyperadrenocorticism resulting from excessive exogenous administration of glucocorticoids has not been reported in ferrets.

SYSTEMS AFFECTED

- Ferret adrenal disease is a multisystemic disorder.
- Signs referable to the skin or reproductive tract predominate.
- Bone marrow suppression may also occur. The degree to which each system is involved varies; in some patients, signs referable to one system may predominate; others have several systems involved to a comparable degree.

GENETICS

Unknown; however, a genetic predisposition is suspected since many of the ferrets in North America come from similar breeding stock

INCIDENCE/PREVALENCE

Considered one of the most common disorders in ferrets, affecting up to 70% of pet ferrets in the United States. More than 95% of ferrets with bilaterally symmetric progressive alopecia have ferret adrenal disease.

GEOGRAPHIC DISTRIBUTION

Ferret adrenal disease is seen more commonly in ferrets in North America as compared with Europe. This may be due to genetics, early neutering practices, or differing husbandry practices.

SIGNALMENT

Breed Predispositions

N/A

Predominant Sex

Seen primarily in neutered animals—equal incidence in male and female animals. Females may be presented for evaluation more frequently than males because of the prominent appearance of vulvar swelling.

Mean Age and Range

Generally a disorder of middle-aged animals, 3–4 years old. The reported age range is 1–7 years.

SIGNS

General Comments

- Severity may vary greatly, depending on the duration and magnitude of sex steroid excess.
- In some cases, the space occupying and catabolic effects of the neoplastic process contributes.

Historical and Physical Examination Findings

- Alopecia is the most common clinical sign. Hair loss may be sudden and progressive, or may begin in spring and regrow later in the year, followed by progressive alopecia the following spring. In most cases, bilaterally symmetric alopecia begins in the tail region and progresses cranially. Other patterns, such as diffuse thinning of the hair coat or alopecia over the shoulder region, can also be seen. In severe cases, the ferret will become completely bald. The skin usually has a normal appearance but can appear thickened.
- About 30% of affected ferrets are pruritic; secondary pyoderma is sometimes seen.
- Swollen vulva in spayed females is extremely common.

- Stranguria due to paraurethral/urogenital cysts, abscesses, or prostatic hyperplasia in both males and females—common, often life-threatening consequence; large cysts can be palpable
- Sexual aggression or return of sexual behavior in neutered animals
- Thinning of the skin, muscle atrophy, and pot-bellied appearance in chronic disease
- Occasionally, mammary gland hypertrophy
- Rarely—anemia, polydipsia, and polyuria
- Occasionally, affected adrenal gland is palpably enlarged.
- Splenomegaly is a common, usually incidental finding.

CAUSES

Functional adrenal hyperplasia, adenoma, or adenocarcinomas most common

RISK FACTORS

Evidence suggests that adrenal disease may be related to neutering at an early age. The gonads and adrenals arise embryonically from the urogenital ridge; some gonadal cells are likely present in the adrenals. Stimulation of these cells by pituitary gonadotropin may cause hypertrophy of these steroid-secreting cells.



DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

- For alopecia and pruritus: seasonal alopecia, pyoderma, flea allergy dermatitis, dermatophytes, mast cell tumor, cutaneous lymphoma
- For swollen vulva in spayed females: ovarian remnant, intact female
- For stranguria: cystitis, urolithiasis

CBC/BIOCHEMISTRY/URINALYSIS

- Usually normal
- Rarely, in chronic cases, hemogram may show nonregenerative anemia, leucopenia, or thrombocytopenia due to estrogen excess.
- Leukocytosis is seen in ferrets with abscessed urogenital cysts, or stump pyometra.
- Hypoglycemia may be present—usually due to concurrent insulinoma since many ferrets in this age range will also have pancreatic tumors

(CONTINUED)

ADRENAL DISEASE (HYPERADRENOCORTICISM)

- Urinalysis may reveal decreased specific gravity in polyuric animals (rare).

OTHER LABORATORY TESTS

- Elevations plasma estradiol, androstenedione, and 17-hydroxyprogesterone combined are most diagnostic (available through the Clinical Endocrinology Laboratory, Department of Comparative Medicine, University of Tennessee). Plasma concentration of these steroids often declines precipitously following surgical removal of the affected gland and resolution of clinical signs.
- Elevation in serum estrogens alone in males is diagnostic; however, in females estrogens may be elevated due to either adrenal disease or an ovarian remnant.
- Elevations in serum cortisol are rarely seen.
- Unlike the diagnosis in dog, ACTH response test and low-dose dexamethasone suppression tests are not diagnostic, and are not pertinent to the diagnosis.
- Urinary cortisol:creatinine ratio may be elevated in ferrets with hypercortisolism, although this is rare.

IMAGING

- Radiographs occasionally demonstrate enlarged adrenal glands in ferrets.
- In ferrets with prostatomegaly or urogenital cysts, single or multiple soft tissue density structures may be visible around the urinary bladder.
- Ultrasonography can be very useful for demonstrating adrenal gland enlargement, depending on the experience of the ultrasonographer. Ideally, the affected gland should be identified prior to surgery. Normal adrenal glands average 2–3.7 mm in width and 4–8 mm in length. Diseased glands often have an enlarged pole (>3.9 mm wide), appear rounded, have abnormal echogenicity, or may be mineralized. Keep in mind that some ferrets with functional adrenal disease may initially have normal-appearing glands on ultrasound.
- Examine the prostate and paraurethral tissues, spleen, pancreas, mesenteric lymph nodes, and liver for concurrent disease, especially in older ferrets.

DIAGNOSTIC PROCEDURES

Human chorionic gonadotropin (hCG) challenge has been used to rule out ovarian remnant in spayed females with swollen vulva. 100 IU of hCG IM once, administered at least 2 weeks following onset of vulvar swelling. If swelling subsides 3–4 days postinjection, an ovarian remnant is likely. Some ovarian remnants do not respond to a single injection of hCG, requiring a second injection 7–10 days later. If the vulva remains swollen after repeat injection, adrenal disease is most likely the cause.

PATHOLOGIC FINDINGS

- Gross examination reveals enlargement of the adrenal gland, irregular surface or discoloration of the affected gland, or cysts or differences in texture within the affected gland.
- Occasionally, bilateral tumors are found.
- Invasion into the liver, kidney, vena cava, or other abdominal organs in some patients with adrenal adenocarcinoma
- Metastasis rarely occurs.
- In females, stump pyometra may be seen.
- Microscopically—adrenocortical hyperplasia, adrenocortical adenoma, or carcinoma or leiomyosarcoma

**TREATMENT****APPROPRIATE HEALTH CARE**

- Ferret adrenal disease may be treated with adrenalectomy or managed medically. The decision as to which form of treatment is appropriate is multifactorial; which gland is affected (left vs. right), surgeon's experience and expertise, severity of clinical signs, age of the animal, concurrent diseases, and financial issues should be considered.
- Surgical removal of the affected adrenal gland(s) is often curative. This procedure may require special surgical expertise, especially if the right adrenal gland is diseased (See Surgical Considerations, below).
- Medical treatment (see Medications, below) may cause a sufficient reduction in clinical signs. Depending on the circumstances, medical treatment may be preferred. However,

medical treatment is not curative, must be administered lifelong, and has no effect on adrenal tumor size or potential metastasis.

- If clinical signs are limited to cosmetic appearance (alopecia), some owners may elect not to treat at all. Owners should be advised that metastasis, although rare, does occur; the space occupying and catabolic effects of neoplasia may become significant; and males may develop prostatic disease that can cause life-threatening urethral obstruction.
- Hospitalization is usually required for patients with urethral obstruction due to prostate disease, severely depressed patients, and during postsurgical recovery period for those undergoing adrenalectomy.

NURSING CARE

N/A

DIET

Normal diet is returned 2–6 hours postsurgery

CLIENT EDUCATION

- If surgical treatment is opted, the affected adrenal can usually be identified and removed during exploratory laparotomy, even if the affected gland could not be identified by preoperative imaging techniques.
- If the right or both adrenal glands are affected, surgical treatment is more difficult and referral may be required, depending on the surgeon's experience.
- If medical treatment is opted, owners should be advised that medical treatment is lifelong; that metastasis, although rare, may occur; the space occupying and catabolic effects of neoplasia may become significant; and males may develop prostatic disease that can cause life-threatening urethral obstruction.

SURGICAL CONSIDERATIONS

- Adrenalectomy is often curative for unilateral adrenocortical hyperplasia, adenomas, and adenocarcinomas.
- Both adrenals should be observed and palpated. Normal glands are light pink with homogenous color and density, 2–3.7 mm in width and 4–8 mm in length. Indications for removal include gross enlargement of the adrenal gland, irregular surface or discoloration, and cysts or differences in texture within the affected gland.

ADRENAL DISEASE (HYPERADRENOCORTICISM)

(CONTINUED)

- Several techniques for adrenalectomy have been advocated, and problems may be associated with each surgical option, depending on the surgeon's expertise. Refer to suggested reading list for more detailed description of surgical procedures.
- Left adrenalectomy is generally a relatively uncomplicated procedure.
- Right adrenalectomy requires special surgical expertise. Proximity of the right adrenal to the vena cava, and the potential for vena cava invasion by malignant tumors, make complete excision a high-risk procedure. Referral to a surgeon or clinician with experience is recommended when possible.
- Many practitioners advocate debulking, rather than complete removal of the right adrenal, as this procedure carries less risk of life-threatening complications. If this method is chosen, signs of clinical disease will return, necessitating repeat surgery or medical therapy alone.
- If both adrenals are affected, removal of the left adrenal gland and a subtotal adrenalectomy of the right gland is often recommended. Eventually, however, the ferret is likely to become symptomatic, requiring complete removal of the remaining gland or medical management.
- Removal of both adrenals may cause iatrogenic adrenal insufficiency (Addison's disease), requiring close monitoring and medical management.
- Always explore the entire abdominal cavity during surgery since concurrent liver disease, gastrointestinal tract disease, insulinoma, lymphoma, or other neoplastic diseases are extremely common. Biopsy the liver and any enlarged lymph nodes to check for metastases.



MEDICATIONS

DRUG(S) OF CHOICE

Medical Treatment of Adrenal Disease

- Leuprolide acetate, a GnRH analog, is a potent inhibitor of gonadotropin secretion and acts to suppress LH and FSH and to downregulate their receptor sites. Administer Lupron 30-day depot, 100–250 µg/kg IM q4w until signs resolve, then q4–8w PRN,

lifelong. Larger ferrets often require the higher end of the dose range. This drug has no effect on adrenal tumor growth or metastasis. Anecdotal reports suggest that Lupron is more successful in alleviating clinical signs in patients with hyperplasia or adenomas; adenocarcinomas may be less likely to respond.

- Other GnRH agonists such as deslorelin acetate (Suprelorin, goserelin [Zoladex]) may be available in countries outside of the United States; 4.7 mg slow-release deslorelin implants have been reported to be as effective as leuprolide acetate depot injections, with alleviation of clinical signs lasting from 8 to 20 months.
- Melatonin implants (Ferretonin™ 5.4 mg implants, Melatek, LLC) can alleviate clinical signs of alopecia, pruritus, aggressive behavior, vulvar swelling, and prostatomegaly. Implants are repeated every 4 months as needed, lifelong. Other than lethargy at high doses, very few side effects have been reported; however, long-term use has not been adequately studied. Alleviation of clinical signs may be more likely in patients with adrenal hyperplasia or adenoma; adenocarcinomas may be less likely to respond. Melatonin has no demonstrated effect on adrenal tumor growth or metastasis. Melatonin can be used simultaneously with Lupron in treatment of refractory cases. Oral administration of Melatonin (0.5–1.0 mg/animal q24h PRN, administered 7–9 hours after sunrise) has also been used to temporarily control clinical signs, but loses effectiveness after 12 months of continuous use.

If surgical treatment is opted:

- In ferrets with concurrent insulinoma, or if a combination of left and subtotal right adrenalectomy is performed, administer prednisone 0.25–0.5 mg/kg PO q12h for 1 week, then gradually tapering the dose over 1–2 weeks.
- If subtotal or total bilateral adrenalectomy is performed, long-term treatment with glucocorticoids is often necessary. The dosage is titrated to the individual patient, and tapered to the lowest dosage interval necessary to prevent clinical signs of hypoadrenocorticism. Many ferrets have accessory adrenal tissue, and some may be

weaned from exogenous steroids completely if carefully monitored. However, some ferrets do become critically ill due to hypoadrenocorticism even with prednisone supplementation, and treatment with mineralocorticoid may also be required. Treatment is initiated based on clinical signs and electrolyte status (signs typically occur within days to week postoperatively). Dosages have been extrapolated from feline dose; Florinef (fludrocortisone acetate) 0.05–0.1 mg/kg PO q24h or divided q12h or Deoxycorticosterone pivalate (DOCP) 2 mg/kg IM q21d. Carefully monitor electrolyte status.

CONTRAINDICATIONS

N/A

ALTERNATIVE DRUGS

- Flutamide (10 mg/kg PO q12–24h) inhibits androgen uptake and binding in target tissues, and is used in the treatment of androgen-responsive prostatic tumors in humans. It has been used to reduce the size of prostatic tissue and treat alopecia in ferrets with adrenal disease. This drug has no effect on adrenal tumor growth or metastasis. Side effects may include gynomastia and hepatic injury; monitor liver enzyme concentrations during therapy. Therapy is expensive and may be cost-prohibitive for some clients.
- Anastrozole (0.1 mg/kg PO q24h until signs resolved, then on a week on–week off basis PRN) is an aromatase inhibitor, used to inhibit the production of estrogens.
- Bicalutamide (5 mg/kg PO q24h until signs resolved, then on a week on–week off basis PRN) inhibits testosterone at receptor sites.
- Ketoconazole is not effective in the treatment of ferret adrenal disease.

PRECAUTIONS

- The use of mitotane (o,p9,DDD) has been reported as a potential treatment for ferret adrenal disease, with limited or no efficacy. The use of mitotane may cause iatrogenic hypoadrenocorticism and hypoglycemia if an undetected insulinoma is present. Use with extreme caution, if at all.
- Pregnant women should avoid handling anastrozole or bicalutamide.

(CONTINUED)

ADRENAL DISEASE (HYPERADRENOCORTICISM)



FOLLOW-UP

PATIENT MONITORING

- Response to therapy is evident by remission of clinical signs, particularly hair regrowth, regression of vulvar swelling, and reduction in the size of urogenital cysts or prostatic tissue. Urogenital signs usually resolve within days of surgery.
- Monitor serum glucose concentrations before, during, and following surgery, since many ferrets have concurrent insulinomas and develop postoperative hypoglycemia.
- Following unilateral adrenalectomy or subtotal adrenalectomy, monitor for return of clinical signs since tumor recurrence is common. Clinical signs typically develop 1 year or more postoperatively.
- In ferrets with bilateral adrenalectomy, monitor for the development of Addison's disease (lethargy, weakness, anorexia, periodic evaluation of serum electrolytes).

PREVENTION/AVOIDANCE

There is some evidence suggesting that neutering after 6 months of age may decrease the incidence of disease.

POSSIBLE COMPLICATIONS

- Recurrence of tumor or development of tumor in the remaining gland in patients with unilateral or subtotal bilateral adrenalectomy
- Metastasis in patients with carcinomas
- Invasion of right adrenal tumors into the vena cava or liver
- Cachexia due to the catabolic effects of neoplasia
- Development of postoperative hypoglycemia in patients with concurrent undiagnosed insulinoma
- Addison's disease or death in ferrets with bilateral adrenalectomy

EXPECTED COURSE/PROGNOSIS

- Following surgical removal of the affected gland(s), a reduction in vulvar swelling is seen within 2 days to 2 weeks, and the haircoat returns to normal within 2–4 months. A reduction in size of paraurethral cysts or prostatomegaly may occur as soon as 1–2 days postoperatively.
- Response to medical therapy may vary with tumor type; anecdotal reports suggest a range

of days to months for alleviation of signs. Insufficient data exist to predict the outcome of long-term therapy.

- Prognosis is variable and depends on tumor type, age of animal, presence of concurrent disease, and mode of treatment.
- Ferrets with adrenal hyperplasia or adenomas often live 2 or more years, even with no treatment.
- Dermal and/or urogenital signs will worsen without treatment.
- Carcinomas rarely metastasize. If metastasis occurs, the prognosis is fair to poor.



MISCELLANEOUS

ASSOCIATED CONDITIONS

Insulinomas, lymphoma, cardiomyopathy, and/or nonspecific splenomegaly are often concurrently found in ferrets with adrenal disease.

AGE-RELATED FACTORS

Older animals are more likely to have concurrent heart disease, renal disease, or other neoplasia.

ZOO NOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

N/A

SYNONYMS

Hyperadrenocorticism

SEE ALSO

Insulinoma
Lower urinary tract infection
Prostatomegaly
Pyometra
Urogenital cystic disease

ABBREVIATIONS

FSH = follicular-stimulating hormone
GnRH = gonadotropic-releasing hormone
hCG = human chorionic gonadotropin
LH = luteinizing hormone

Suggested Reading

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