

Exotic Pet

P R A C T I C E

VOLUME 4 • ISSUE 12 • DECEMBER 1999

SCIENTIFIC ARTICLE

Dermatologic Conditions in Rabbits

Cathy A. Johnson-Delaney, DVM

Pet rabbits are frequently brought in to veterinary practitioners because of skin problems. A systematic approach to the diagnosis should include information about the rabbit's diet, bedding, environment, general husbandry, exposure to household chemicals, and interactions with other members of the household (human and other pets). Several long-haired breeds require daily grooming to keep the fur from becoming matted. A complete physical examination should include inspection of the nails, ear canals, and skin folds around the genitals and face. Diagnostic tests such as skin scrapings for parasites, fungal examination with 10% potassium hydroxide (KOH), and bacterial or fungal cultures can be performed, as they are with other species. Biopsies may be useful in cases of chronic or recurring conditions. Because several skin conditions are associated with systemic conditions, a CBC and chemistries panel, urinalysis, and fecal flotation test will provide useful information on the rabbit's overall health.

Parasitic Diseases

Cheyletiella parasitovorax is the rabbit fur mite. It is potentially contagious to humans and to other animals, including dogs and cats. Clinical signs include a white, scaly dermatosis particularly over the dorsum and dorsal cervical area, and spreading along the back to the rump. The owner's complaint is usually about the rabbit's dry skin or "dandruff." The mites are easily collected by superficial skin scraping or cellophane tape collection and examination under the microscope. The life cycle of this kind of mite is approximately 5 weeks long. The mites are readily killed with ivermectin (Ivomec, Merck AgVet Div, Rahway, NJ), with 3 treatments of 400 µg/kg given subcutaneously every 2 weeks.¹ Because the mite eggs attach to hair shafts that may have fallen into the environment, the environment should be treated with flea-killing products.

Psoroptes cuniculi is the rabbit ear mite.² It causes inflammation and crusting of the external ear canal. Affected rabbits will shake their heads, scratch at their ears, and further traumatize the skin. The crust can build up and occlude the external canal. The infection can become generalized in debilitated rabbits, involving skin of the legs, feet, and perineum. Identification of the mite and diagnosis is made by magnified otoscopic examination or by examination of some of the crust under the microscope. Subcutaneous injections of ivermectin (400 µg/kg) should be given every 2 weeks for 2 to 3 treatments; this is usually sufficient to clear up the infection.^{1,3} In most cases the ears should not be cleaned out, because the ears will be sensitive and will tend to bleed. The skin lesions usually resolve without adjunctive topical therapy. Occasionally residual debris may need to be cleaned out of the external ear canals after infestation. Cleaning of the environment is again important to prevent reinfestation.

Pet rabbits may be infested with fleas (*Ctenocephalides felis*), particularly if they share a home with dogs or cats. If an infestation occurs, all pets in the household should be treated. Preparations used on cats for fleas, such as the newer topical medications (Imidaclopramide, Advantage, Bayer, Shawnee Mission, Kan; Lufenuron, Program, Ciba Animal Health, Greensboro, NC; Fipronil, Top Spot/Frontline, Rhône-Merieux, Athens, Ga), have been used on pet rabbits, using reduced dosages of the cat formulations based on body weight. There have been anecdotal reports of problems with some of the topical preparations in young or dwarf rabbit breeds. It is not known at this time whether the reactions are caused by the chemicals themselves or by the base solutions they are in.

Traditional pyrethrin-based flea

continues on page 90

ISSUE HIGHLIGHTS:

Common Parasites of Rabbits and Ferrets

ROUNDTABLE
page 91

Frostbite Management in a Volverine Guinea Fowl

CASE REPORT
page 93

VOLUME 4 SUBJECT INDEX
page 94

Editor in Chief

Shawn Messonnier, DVM
Paws and Claws Animal Hospital
Plano, Texas

Editorial Board

Terry W. Campbell, DVM, PhD
Department of Clinical Science
Colorado State University
Fort Collins, Colorado

Cathy A. Johnson-Delaney, DVM
Senior Veterinarian, Primate Medicine
Washington Regional Primate Research
Center
University of Washington
Seattle, Washington

James K. Morrissey, DVM,
Diplomate ABVP—Avian Specialist
Avian and Exotic Animal Medicine and
Surgery Service
Animal Medical Center
New York, New York

Wm. Kirk Suedmeyer, DVM
Senior Staff Veterinarian
Kansas City Zoological Gardens
Adjunct Assistant Professor of
Zoological Medicine
UMC College of Veterinary Medicine
Kansas City, Missouri

Amy Beth Worell, BS, DVM,
Diplomate ABVP—Avian Specialist
All Pets Medical Centre
West Hills, California

Advisory Board

Michael A. Dutton, DVM,
Diplomate ABVP—Companion
Animal Practice
Weare Animal Hospital
Weare, New Hampshire

Gregory Rich, DVM
West Esplande Veterinary Clinic & Bird
Hospital
Metairie, Louisiana

ISSN 1086-4288 © December 1999 by Mosby, Inc. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher.

Vol. 4, No. 12, December 1999. *Exotic Pet Practice* (ISSN 1086-4288) is published monthly by Mosby, Inc., 11830 Westline Industrial Drive, St. Louis, MO 63146-3318. POSTMASTER send address changes to *Exotic Pet Practice*, 11830 Westline Industrial Drive, St. Louis, MO 63146-3318. Annual subscription rates for 2000: individual \$52.00, resident \$31.00, institutional \$79.00.

For multiple-copy pricing, contact Periodical Subscription Services, Mosby, Inc., 11830 Westline Industrial Drive, St. Louis, MO 63146; (800) 453-4351.
periodical.service@mosby.com

Editorial address: Susan Sibiski, 526 Cole Ln, Baltimore, MD 21220; E-mail: ssibiski@home.com.

Dermatologic Conditions in Rabbits

continues from page 89

products that are safe for cats and kittens have been used topically and in the environment.

Myiasis, or *fly strike*, caused by the larvae of *Cuterebra* species, is not uncommon in some parts of the country among rabbits housed outdoors.^{1,2} The larvae pupate in the subcutis, usually in the ventral cervical, axillary, or inguinal areas, and occasionally on the back or rump. A single larva is typically found within each subcutaneous swelling. The affected rabbit may show no signs other than the swellings, but some rabbits may show progressive weight loss secondary to lameness, debilitation, chronic infection, or even toxic shock. The area around each swelling should be prepared for surgery: enlarge the air hole with hemostats and carefully pull out the larvae. All necrotic tissue should be debrided or, in some cases, the entire swelling should be excised. Antibiotic therapy to prevent secondary infection is recommended.

Fungal and Bacterial Infections

Dermatophytosis is occasionally seen in pet rabbits. *Trichophyton mentagrophytes* is the most common organism found.³ Lesions may occur on the head, legs, and feet. As with other species, young animals are most commonly affected, and environmental stresses including malnutrition, overcrowding, and poor sanitation are predisposing factors to infection. The condition is usually self-limiting; however, because of the zoonotic potential, most house rabbits are treated. Diagnosis is made by identification of fungal elements by culture or with a skin scraping, using 10% potassium hydroxide. Treatment is based on dog and cat protocols and depends on the extent of the lesions. For small, solitary lesions, remove the hair, and apply a topical antifungal medication such as miconazole cream (Conofite, Mallinckrodt Veterinary, Inc, Mundelein, Ill) daily, usually 2 weeks past lesion resolution.¹ It is advisable to instruct the owner about zoonoses prevention, and dispense gloves along with the medication so the lesions are not touched directly. The owner should also clean and disinfect the rabbit's environment, using a 1:10 bleach solution. If lesions are multiple or widespread, the entire rabbit may need to be clipped. Oral griseofulvin can be given to nonpregnant rabbits at 25 mg/kg by mouth every 24 hours, or at a dose divided in half every 12 hours. Treatment is continued for 2 weeks beyond the resolution of clinical signs.^{1,3}

Ulcerative pododermatitis is often called *sore hock* and is usually associated with heavy-set rabbits housed on wire and kept with poor sanitation.^{2,3} The lesion consists of an ulcerated, circumscribed area of the skin covered by a scab on the ventral metatarsal region of the foot. Abscesses, caused by various organisms including *Staphylococcus aureus*, form under the scab.³ Affected rabbits will lose weight, be reluctant to move, and sit in a hunched position to shift weight off the sore feet. Treatment consists of providing soft, clean, dry bedding on a solid surface, bandaging the affected foot after topical antimicrobial therapy, and, if abscessed, providing systemic broad-spectrum antibiotic therapy. The bandage helps to protect the lesion from further trauma. Nonsteroidal anti-inflammatory medications or analgesics can be used if the rabbit is uncomfortable. Prevention is accomplished by providing rabbits some solid flooring in their home cages and maintaining good sanitation practices.²

Subcutaneous abscesses can develop anywhere on the rabbits' bodies, although they seem to occur more frequently on the head or limbs.¹⁻³ They may be secondary to bacteremia or trauma, and those occurring on the head are usually associated with tooth root abscesses, oral foreign bodies, and dental disease. A number of different bacterial agents have been associated, including *S aureus*, *Pasteurella multocida*, and *Pseudomonas aeruginosa*.

continues on page 92

ROUNDTABLE

Common Parasites of Rabbits and Ferrets

Q. What are some common external parasites found in rabbits and ferrets?

Dr Johnson-Delaney: In rabbits, consider fur mites, ear mites, and fleas. In warmer climates, Cuterebra larvae may be seen, as well as maggots from smaller dipterous flies. In ferrets, flea and ear mites can be seen, and also sarcoptic mange.

Dr Morrisey: Common external parasites in ferrets include ear mites (*Otodectes cynotis*), mange (*Sarcoptes scabiei*) and fleas. Rabbits can get ear mites (*Psoroptes cuniculi*), walking dandruff (*Cheyletiella parasitovorax*), fleas (*Ctenocephalides felis* or *canis*), and myiasis (aka, fly strike).

Q. What are some common internal parasites?

Dr Johnson-Delaney: Rabbits are often infected with various species of coccidia (intestinal and hepatic forms). I have diagnosed pinworms; tapeworms are also reported. Encephalitozoon cuniculi infections are also seen in rabbits. Ferrets can be afflicted with dirofilariasis. Coccidia may be seen, usually in young ferrets. Tapeworms and roundworms are also a possibility.

Dr Morrisey: The most common internal parasite of ferrets is coccidium, usually in younger ferrets. Other internal parasitic infections include heartworm disease (*Dirofilaria immitis*) and cryptosporidiosis. Rabbits most commonly get pinworms (*Passalurus ambiguus*) and coccidiosis. Encephalitozoonosis is also found commonly in pet rabbits.

Q. Discuss your treatment of ear mites in ferrets and rabbits.

Dr Johnson-Delaney: I use ivermectin in both species at a dose of 400 µg/kg (SC) and

repeated in 7 to 14 days (rabbits) or 10 to 14 days (ferrets). For ferrets, you can also give half the dose in each ear rather than subcutaneously. I try to clean the ears, although this can be painful for rabbits if the infection is severe (analgesia with aspirin at 100 mg/kg q4-6h PO or ibuprofen at 10-20 mg/kg q4h PO). Topical ear medication (triple antibiotic with corticosteroid) can also be given as well for pets with severe otitis and inflammation.

Dr Morrisey: Ivermectin works well in both species, although the dose differs slightly. In ferrets, I use 0.2 mg/kg (SC) while in rabbits I use 0.3-0.4 mg/kg (SC). It's important to give the drug subcutaneously because blood levels of ivermectin after oral administration have been found to be subtherapeutic. Topical ear mite preparations work well in ferrets but not as well in rabbits. Cleaning the ear is also beneficial in ferrets, but I do not do this in rabbits because bleeding and other problems may occur. I allow the debris to fall out or be removed by the rabbit while grooming, even in cases of severe infestations.

Q. Which products (and dosages) do you use for flea control?

Dr Johnson-Delaney: I currently use the feline product imidacloprid (Advantage, Bayer). For adult female ferrets, I use 2 drops; I use 3 drops for adult male ferrets. I make owners aware of the extra-label use and usually apply the product in the clinic for the first dose. Reactions have been reported with rabbits when using fipronil (Frontline and Topspot, Merial, Iselin, NJ); current thinking is that the reaction is due to the base or carrier. I

have also used the feline Program (Novartis) on ferrets, scaling the dosage to the ferret's weight. I have not had any problems with pyrethrin products labeled for kittens. I still use 15% carbaryl on ill animals.

Dr Morrisey: Pyrethrin-based flea powders have worked well for me in both species. Additionally, some of the newer flea products such as fipronil (Frontline, Merial) or imidacloprid (Advantage, Bayer) have been used safely and effectively in ferrets by using approximately 1/4 of the cat dose. Imidacloprid has also been used safely in rabbits, but fipronil should not be used in rabbits because it has caused neurologic disease.

Q. What are your treatments for common internal parasites (coccidia, etc)?

Dr Johnson-Delaney: For rabbits with intestinal coccidiosis, I use a trimethoprim-sulfa combination (30 mg/kg q12h PO for 10-14 days) or sulfadimethoxine (15 mg/kg q12h PO for 10-14 days). It is difficult to eliminate the hepatic form. For pinworms, I use fenbendazole (10 mg/kg PO, repeat in 2 weeks) or piperazine (200 mg/kg PO, repeat in 2-3 weeks). Praziquantel can be tried for tapeworms (5-10 mg/kg PO, SC, or IM, repeat in 10 days). To control heartworms in ferrets, I recommend 1/4 of the small canine Heartgard (Merial) monthly. (Editor's note: the manufacturer recommends against doing this for dogs since the ivermectin is not evenly distributed throughout the tablet.) One could also give ivermectin orally (0.3 mL of 1% ivermectin in 28 mL of propylene glycol which makes a 0.1 mg/mL suspension, given at 0.2 mL/kg PO monthly). For ferret coccidiosis I use sulfadimethoxine (30-50 mg/kg q12-24h PO for 10 days). Remove feces from the living

continues on page 92

Dermatologic Conditions in Rabbits

continues from page 90

Depending on the location of the infection, rabbits may exhibit lameness, lethargy, reluctance to eat, and localized swellings. Treatment is usually prolonged and difficult. Radiographs are useful to determine whether osteomyelitis is involved. Fine-needle aspiration of the abscess will provide samples for cytology, Gram's stain, and bacterial culture. A CBC, serum chemistries, and urinalysis will help assess the rabbit's overall condition. The lesions should be opened surgically and drained if possible. Systemic antibiotic therapy is needed and may continue for several weeks, particularly if there is osteomyelitis. Enrofloxacin (Baytril, Bayer, Shawnee Mission, Kan) has been used at 5 to 15 mg/kg by mouth every 12 hours or subcutaneously for the initial 2 to 4 weeks then tapered to 2.5 to 5 mg/kg by mouth every 24 hours for up to several months.¹ Abscesses frequently reoccur at the surgical site if any infected tissue is left. This may require amputation of a limb if a joint is involved or if the abscess is too extensive to excise. Abscesses involving the jaws and tooth roots

need aggressive cleaning and removal of abscessed teeth. Attention has to be paid to malocclusion, which may occur. The abscess cavity can be filled with calcium hydroxide paste (left in place for 1 week) or antibiotic-impregnated polymethylmethacrylate beads. Serial débridements and repacking may be necessary.⁴ Drainage should be established to the exterior, because intraoral fistulas do not heal well. Prognosis is guarded for any abscess resolution involving teeth or bone.

Moist dermatitis in rabbits tends to occur in two places: on the perineum, and under the chin, involving the neck and bib area. Chin dermatitis is often called *slobbers* and is secondary to dental disease.¹ This has to be differentiated from cases of young rabbits that suck on their bibs. Chin dermatitis will resolve with dental treatment. Occasionally, a *P aeruginosa* infection will develop in the dewlap of a rabbit that drinks from a bowl because the dewlap is continuously wet. The fur may take on a bluish coloration.² Treatment consists of replacement of the water bowl with a sipper tube. Perineal dermatitis is usually caused by urine scalding. The constant exposure to urine occurs because of excessive urina-

tion, urinary tract calculi, urinary incontinence associated with renal disease or cystitis, or a lack of mobility due to obesity, pododermatitis, or posterior paresis. Treatment is focused on medical management of the underlying condition and topical treatment of the affected area. The hair should be clipped, then the affected skin should be cleaned with a mild astringent such as Domeboro (Miles Inc, Consumer Healthcare Products, Elkhart, Ind) followed by drying and placement on dry bedding.¹ The area may need to be cleaned twice daily for several days.

References

1. Hillyer EV: Dermatologic diseases, in Hillyer EV, Quesenberry KE (eds): *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*. Philadelphia, WB Saunders, 1997, pp 212-219.
2. Stein S, Walshaw S: Rabbits, in Laber-Laird K, Swindle MM, Flecknell P (eds): *Handbook of Rodent and Rabbit Medicine*. Tarrytown, NY, Pergamon Press, 1996, pp 183-217.
3. Hrapkiewicz K, Medina L, Holmes DD: *Clinical Laboratory Animal Medicine: An Introduction*, ed 2. Ames, Iowa, Iowa State University Press, 1998, pp 135-172.
4. Bennett RA: Management of abscesses of the head in rabbits, in *Proc N Am Vet Conference*, vol 13, Small Animal edition, Orlando, Fla. Gainesville, Fla, Eastern States Veterinary Association, 1999, pp 821-823.

Common Parasites of Rabbits and Ferrets

continues from page 91

area often! Nematodes can be treated with ivermectin (200-400 µg/kg PO or SC, repeat in 10-14 days). Tapeworms can be treated with praziquantel (5-10 mg/kg SC, repeat in 2 weeks) and use flea control!

Dr Morrissey: *Ivermectin works well for most nematode infections in both rabbits and ferrets, and it can be used monthly as a heartworm preventative in ferrets. Coccidiosis is controlled using sulfa drugs such as*

trimethoprim-sulfa (30 mg/kg PO q24h for 5 days).

Encephalitozoonosis is difficult to treat, although albendazole has been used anecdotally.

Availability of Back Issues

As a service to our subscribers, copies of back issues of *Exotic Pet Practice* are maintained and are available for purchase from Mosby, until inventory is depleted, at a cost of \$12.00 per issue. Please write to Mosby, Inc. Subscription Services, 11830 Westline Industrial Drive, St. Louis, MO 63146-3318, or call (800) 453-4351 or (314) 453-4351 for information on availability of particular issues.

CASE REPORT

Frostbite Management in a Vulturine Guinea Fowl

Wm. Kirk Suedmeyer, DVM

An adult female 2.27-kg vulturine guinea fowl (*Acryllium vulturinum*) was presented with a limp of a few days' duration. Physical examination revealed no abnormalities. The bird was housed with four additional conspecifics in an indoor enclosure with a cement floor partially bedded with straw. A single heat lamp provided secondary heat, but the cement floor was in direct access to outside temperatures that approached -20°C . Fresh water and a commercial pelleted feed were provided on a daily basis.

A blood sample was obtained from the medial metatarsal vein for a CBC and select serum chemistries. Radiographs of the affected leg were within normal limits. The CBC revealed a leukocytosis of $28,000\text{ mm}^3$ (normal, $10,000\text{--}15,000\text{ mm}^3$) with a mature heterophilia of $21,520\text{ mm}^3$ (normal, $5000\text{--}9000\text{ mm}^3$). A mild elevation of creatinine phosphokinase was noted in the serum chemistries. Over the next 10 days, the distal extent of digits 2 through 4 demonstrated edema and a loss of pigment. A tentative diagnosis of frostbite was made.

Despite therapy with warm water soaks and moving to a warmer environment, the digits proceeded to demonstrate an avascular necrosis with a circumferential line of demarcation between viable and necrotic tissue. The bird was immobilized with isoflurane (Aerrane, Fort Dodge Animal Health, Fort Dodge, Iowa) using a non-rebreathing system, increasing

the concentration of isoflurane in 0.5% increments until a surgical plane of anesthesia was achieved. The necrotic areas of the affected digits were surgically removed at the distal extent of viable tissue. A dorsoventral V-flap incision was performed, and the affected bone was removed by disarticulating the proximal viable joint. The surgical opening was closed in two layers with 4-0 polyglactin absorbable suture (Vicryl, Ethicon, Somerville, NJ) and 4-0 monofilament nylon (Ethilon, Ethicon) in a simple interrupted pattern. The remaining digit was bandaged, and antibiotics were initiated with ceftiofur (Naxcel, UpJohn) at 50 mg/kg 4 times a day.¹ The affected digit was fixed in 10% neutral buffered formalin and submitted for histopathologic evaluation.

Histopathologic evaluation of the submitted digit demonstrated a coagulative necrosis. No viable cells were evident in the distal portions of the bone examined. At the junction of viable and nonviable tissue, a moderate-to-severe heterophil infiltration of the dermis was noted. These lesions were compatible with frostbite. Three additional birds housed in the same enclosure also demonstrated evidence of frostbite, and each had various lengths of digits removed. All birds recovered uneventfully and began to ambulate well. None of the birds had total digits removed.

Frostbite is not uncommon in birds.²⁻⁴ A group of Helmeted guinea fowl (*Numida meleagris*) in

our zoo are exposed to similar temperatures and have had no incidences of frostbite. This may represent species susceptibility, differences in management or social order, differences in substrate utilization, etc. Ergot poisoning can be present with similar clinical and histologic findings, although anorexia and central nervous system signs generally accompany necrosis of the digits.² In the cases presented here, the birds had no access to moldy feed and demonstrated no additional clinical signs.

Rapid warming of the affected tissues without rubbing is the preferred method of treatment. It is important not to allow re-exposure of frostbitten tissue to cold temperatures. Intravenous dextran solutions (Ceva Laboratories, Overland Park, Kan) have been used in frostbite treatment of dogs and people, but the benefits are controversial. Dextran is thought to provide colloidal homeostasis in frozen tissue preventing coagulation. Preventing frostbite is relatively simple. Providing a warm environment, especially for those species that do not have adaptive mechanisms for tolerating extreme weather conditions, should be part of any management plan. Animal species may vary in their susceptibility to weather extremes.

References

1. Altman RB, Clubb SL, Dorrestein GM, et al: *Avian Medicine and Surgery*. Philadelphia, WB Saunders, 1997, p 677.
2. Wallach JD, Boever WJ: *Diseases of Exotic Animals*. Philadelphia, WB Saunders, 1983, pp 837, 871, 874.
3. Ritchie BW, Harrison GJ, Harrison LR (eds): *Avian Medicine: Principles and Application*. Lake Worth, Fla, Wingers, 1994, pp 413-414.
4. Humphreys PN: Noninfectious diseases, in Fowler ME (ed): *Zoo and Wild Animal Medicine*. Philadelphia, WB Saunders, 1986, pp 355.

Readers: We welcome your questions, practice tips, and case reports. Please submit any materials to Susan Sibiski, 526 Cole Ln, Baltimore, MD 21220; ssibiski@home.com.

VOLUME 4 SUBJECT INDEX

- A**
- Abdominal enlargement, in guinea pig, 75, 76
 - Acariasis, in hedgehog, 7
 - Aeromonas salmonicida* infection, in goldfish and koi, 49-50
 - African bullfrog, prolapsed cloaca in, 27, 29
 - African hedgehog, uterine neoplasia in, 31
 - Air sac mites, in birds, 70
 - Airway access, in pigs, 67
 - Allergic alveolitis, in birds, 57
 - Alopecia, in rodents, 69
 - Aluminum hydroxide, for urolythiasis in green iguana, 55
 - Alveolitis, allergic, in birds, 57
 - Amoxicillin in ferret for lymphoma, 5 for renal failure, 12
 - Amphibians, examining, 51
 - Amphotericin B, for aspergillosis in birds, 4
 - Anatomy, avian reproductive, 9
 - Anesthesia in rabbits, 45 fasting before, 16
 - Anesthetic cream, 11
 - Anoles, green, care sheet on, 62
 - Anorexia, in rabbits, 3-4
 - Antibiotics
 - for *Aeromonas salmonicida* infection in goldfish and koi, 49-50
 - for renal disease in reptiles, 12
 - for renal failure in ferret, 12
 - systemic, for digit necrosis in estrildids, 18
 - Aquarium, pH crash in, 71
 - Aquatic turtles, wound management in, 3
 - Aspergillosis, in birds, 3-4
 - Atherosclerosis, in macaw, 13
 - Avian (see Birds)
- B**
- Bacterial infections, dermatologic, in rabbits, 90, 92
 - Balantidium* infections, doxycycline for, in primates, 68
 - Baths, dust, in chinchillas, 8
 - Bedding substrates, 81-82
 - Behavioral changes, in birds, 78
 - Biopsies, liver, in ferrets, 77
 - Birds
 - annual examination and diagnostic testing in, 40
 - aspergillosis in, 3-4
 - behavioral changes in, 78
 - cytodiagnosis in, 1-2, 5
 - egg binding in, 9-10, 13
 - erythroplastids on blood film in, 72
 - foreign body in, ventricular, removal, 76
 - mites in
 - air sac, 70
 - leg, scaly, 42
 - Newcastle disease in, 57
 - ophthalmic examination of, dilation of eye for, 56
 - poisonings in, common, 35-36
 - reproductive anatomy in, 9
 - steroid treatment of, 42
 - surgical procedures in, 75-76
 - transfusion medicine in, 65-66
 - tuberculosis in, 57
 - zoonotic diseases in, 57
 - Bites, prey, in snakes, 5
 - Bladder obstructions, in ferrets, 45, 47
 - Blood film, erythroplastids on, in birds, 72
 - Budgerigars, unilateral leg paralysis in, 34
 - Bullfrog, African, prolapsed cloaca in, 27, 29
 - Butorphanol, in renal failure in chinchilla, 53
- C**
- Calcium
 - EDTA for poisonings in birds, 36
 - gluconate solution for egg binding in birds, 10
 - oral, for paralysis in iguanas, 21
 - California kingsnake, care sheet for, 38
 - Campylobacter* infection, in estrildid finches, 18
 - Cardiovascular disease, in gray short-tailed opossum, 74
 - Catheter, indwelling urinary, placement in ferret, 85
 - Ceftiofur, for frostbite in vulture guinea fowl, 93
 - Chelating agents, for poisonings in birds, 36
 - Cheyletiella* infection, in rabbits, 58
 - Chinchillas
 - diagnostic quiz, 51, 53
 - skin and coat of, 8
 - Chinese hamsters, diabetes mellitus in, 27
 - Chlamydia, in birds, 57
 - Chordoma, on tail of ferret, 60
 - Chorionic gonadotropin, human, for wing web dermatitis in psittacines, 25
 - Chromium picolinate supplement, in diabetes mellitus in rodents, 28
 - Cisapride, in anorexic rabbit, 4
 - Clavulanate potassium, for lymphoma, in ferret, 5
 - Cloaca
 - mass in sun conure, 35, 37
 - prolapse
 - in African bullfrog, 27, 29
 - surgical correction, in birds, 75-76
 - Coat, of chinchillas, 8
 - Coccidia oocysts, in wallaby, 87
 - Cockatiels, care sheet for, 14
 - Cockatoo, sulfur-crested, histiocytic lymphosarcoma in, 37, 39
 - Conure, sun, cloacal mass in, 35, 37
 - Corticosteroids in birds, 42 for paralysis in iguanas, 21
 - Costovertebral flank glands, in male hamsters, 24
 - Cranial mediastinal mass, large, in Netherland Dwarf rabbit, 83, 84
 - Cryosurgery, for cloacal mass in sun conure, 37
 - Cryptosporidiosis, in primates, 68
 - Cutaneous ulcerative disease, septicemic, in turtles, 64
 - Cysts
 - feather, in estrildids, 17
 - white, in opossum, 13
 - Cytodiagnosis, avian and reptilian, 1-2, 5
- D**
- Death assessment, in reptiles, 77
 - Dermatitis, wing web, in psittacines, 25-26
 - Dermatologic conditions, in rabbits, 89-90, 92
 - Dermatology, estrildid finch, 17-18, 19
 - Dermatomycosis, in rabbits, 58
 - Dermatophyte infections, powder for, 75
 - Dermatophytosis in guinea pigs, 60 in hedgehogs, 58
 - Diabetes mellitus in cockatiels, 14 in guinea pig, 21, 23 in rodents, 27-28 after steroids, in birds, 42
 - Diarrhea, in wallaby, 84, 87
 - Diet
 - sugar glider, 54
 - wallaby, 46, 84, 87
 - Digestive system problems, in gray short-tailed opossum, 74
 - Digit necrosis, in estrildids, 18
 - Dimercaprol, for poisonings in birds, 36
 - Dimercaptosuccinic acid, for poisonings in birds, 36
 - Doxycycline, for *Balantidium* infections in primates, 68
 - Drug use, extra-label, for exotic pets, 43-44, 45
 - Dust baths, in chinchillas, 8
 - Dyspnea, in prairie dog, 67, 68
- E**
- EDTA, calcium, for poisonings in birds, 36
 - Educating staff, 59
 - Effusions, cytodiagnosis, in birds and reptiles, 5
 - Egg binding, in birds, 9-10, 13
 - Encephalitozoonosis, in Netherland Dwarf rabbit, 84
 - Enema, tap water, in anorexic rabbit, 4
 - Enrofloxacin
 - in anorexic rabbit, 4
 - after cloacal amputation in African bullfrog, 29
 - in liver disease in sulfur-crested cockatoo, 39
 - in renal failure in chinchilla, 53
 - Enzyme activities, tissue and plasma, in green iguana, 69
 - Erythromycin, for *Campylobacter* infection in estrildids, 18
 - Erythroplastids, on avian blood film, 72
 - Estrildid finch dermatology, 17-18, 19
 - Ethics, veterinary, in treating exotic pets, 19
 - Examination, of amphibians, 51
 - Eye, of bird, dilation for ophthalmic examination, 56
- F**
- Fasting, of rabbits before anesthesia, 16
 - Feather disorders, in estrildids, 17-18
 - Feeding, of fireflies to herps, caution against, 85
 - Feet, excessive scales on, in estrildids, 18
 - Fenbendazole in primates for *Trichospirura leptosoma* infections, 67 for *Trichuris* infection, 68
 - Ferrets
 - adult, immunization of, 83
 - bladder obstructions in, 45, 47
 - bump on tail of, 59, 60
 - catheter placement in, indwelling urinary, 85
 - female, as seasonally polyestrous, induced ovulator, 32
 - gastroenteritis in, 22
 - insulinomas in, mitotane in, 35
 - lethargy in, 11-12
 - liver biopsies in, 77
 - lymphoma in, 5
 - neural tube defects, 84, 87
 - parasites in, 91-92
 - transfusions in, 33-34
 - zoonotic diseases in, 58, 60
 - Finches
 - estrildid, dermatology, 17-18, 19
 - society, care sheet for, 86
 - Fireflies, caution against feeding to herps, 85
 - Flank glands, costovertebral, in male hamsters, 24
 - Fluconazole, for aspergillosis in birds, 4
 - Fluid therapy
 - for renal disease in reptiles, 12
 - for renal failure in ferret, 12
 - for *Salmonella typhimurium* infection in savannah monitor, 79
 - Flunixin meglumine in anorexic rabbit, 4 for *Salmonella typhimurium* infection in savannah monitor, 79
 - Fluoroquinolones, for *Aeromonas salmonicida* infection in goldfish and koi, 50
 - Foreign body, ventricular, removal, in birds, 76
 - Frostbite management, in vulture guinea fowl, 93
 - Fungal infections, dermatologic, in rabbits, 90, 92
 - Furazolidone, for *Campylobacter* infection in estrildids, 18
- G**
- Gastroenteritis, in ferret, 22
 - Gerbils, diabetes mellitus in, 27
 - Goldfish, *Aeromonas salmonicida* infection in, 49-50
 - Gonad, in female scarlet macaw, 88
 - Gonadotropin, human chorionic, for wing web dermatitis, in psittacines, 25
 - Gray short-tailed opossum, 73-74
 - Green anole, care sheet on, 62
 - Green iguanas (see Iguanas, green)
 - Guinea fowl, vulture, frostbite management in, 93
 - Guinea pigs
 - abdominal enlargement in, 75, 76

continues from page 94

- diabetes mellitus in, 21, 23, 27
leiomyosarcoma in, uterine, 76
lymphosarcoma in, multicentric, 15
nephritis in, severe chronic tubulointerstitial, 20
zoonotic diseases in, 60
- H**
Hamsters
Chinese, diabetes mellitus in, 27
male, costovertebral flank glands in, 24
Heart failure, in macaw, 13
Hedgehogs
African, uterine neoplasia in, 31
quill loss in, 7
zoonotic diseases in, 58
Hemochromatosis, in toucans, 6
Hepatic lipidosis, due to anorexia, in rabbits, 4
Herps, caution against feeding fireflies to, 85
Histiocytic lymphosarcoma, in sulfur-crested cockatoo, 37, 39
Housing of exotic animals, bedding substrates for, 81-82
Hyperplasia
parathyroid, in guinea pig, 20
tissue, cytodagnosis in birds and reptiles, 2
Hypersensitivity pneumonitis, in birds, 57
Hypertrophic osteopathy, in rabbit, 21
- I**
Iguanas
green
enzyme activities in, tissue and plasma, 69
urolythiasis in, 53, 55
paralysis in, 21
Ileus, physiologic, in rabbit, 4
Inflammation, in birds and reptiles, 1-2
Influenza virus, human, in ferrets, 58
Insulin in diabetes mellitus in guinea pigs, 23
in rodents, 28
Insulinomas, mitotane in ferrets with, 35
Iron storage disease, in toucans, 6
Isotretinoin, for lymphoma in ferret, 5
Itching, in rodents, 69
Itraconazole, for aspergillosis in birds, 4
Ivermectin
for maggot infestation in rabbits, 21
for mites
air sac, in birds, 70
on feet of estrilids, 18
in hedgehog, 7
in primates, 68
in rodents, 69
scaly leg, 42
for nematodes, in primates, 68
- K**
Keratitis, mycobacterial, in Maximilian's parrot, 29
Ketoconazole, for aspergillosis in birds, 4
Kidney
disease in reptiles, 11-12
failure
in chinchilla, 53
in ferrets, 12
Kingsnake, California, care sheet for, 38
Koi, *Aeromonas salmonicida* infection in, 49-50
- L**
Laboratory
sampling of reptiles, 61
tests for lethargy in ferrets, 12
Lagomorphs, red urine in, 61
Leg
mites, scaly, 42
paralysis, unilateral, in budgerigars, 34
Leiomyoma, uterine, in African hedgehog, 31
Leiomyosarcoma, uterine in guinea pig, 76
in hedgehog, African, 31
Lethargy, in ferrets, 11-12
Lipidosis, hepatic, due to anorexia, in rabbits, 4
Liver biopsies, in ferrets, 77
Lymphoma, in ferret, 5
Lymphosarcoma
histiocytic, in sulfur-crested cockatoo, 37, 39
multicentric, in guinea pig, 15
- M**
Macaw
atherosclerosis and heart failure in, 13
scarlet, female, gonad in, 88
Maggot infestation, in rabbits, 21
Malignant neoplasia, cytodagnosis, in birds and reptiles, 2, 5
Mange
demodectic, in rodents, 69
sarcoptic
in hedgehogs, 58
in potbellied pigs, 60
Maximilian's parrot, mycobacterial keratitis in, 29
Mediastinal mass, large cranial, in Netherland Dwarf rabbit, 83, 84
Medications, tablet or powdered, administering to rats, 83
Melanism, induced, in estrilids, 18
Metastatic soft tissue mineralization, disseminated, in guinea pig, 20
Methylprednisolone injection, in liver disease in sulfur-crested cockatoo, 39
Metronidazole
paste to discourage suture removal, 27
for protozoal infections in primates, 68
Microsporium, causing dermatomycosis in rabbits, 58
Mineralization, disseminated metastatic soft tissue, in guinea pig, 20
Mites
air sac, in birds, 70
in hedgehogs, 7
leg, scaly, 42
in primates, ivermectin for, 68
in rodents, 69
scales on feet of estrilids due to, 18
Mitotane, in ferrets with insulinomas, 35
Molting, delayed, in estrilids, 18
Monitor, savannah, *Salmonella typhimurium* in, 79
Monkeys, immunization of, 83
Mycobacterial keratitis, in Maximilian's parrot, 29
- N**
Necropsy techniques, 51-52
Necrosis, digit, in estrilids, 18
Nematodes, ivermectin for, in primates, 68
Neoplasia
malignant, cytodagnosis in birds and reptiles, 2, 5
uterine, in African hedgehogs, 31
Nephritis, tubulointerstitial, severe chronic, in guinea pig, 20
Netherland Dwarf rabbit, neurologic problems in, 83, 84
Neural tube defects, in ferrets, 84, 87
Neurologic problems, in Netherland Dwarf rabbit, 83, 84
Newcastle disease, in birds, 57
- O**
Obesity, in prairie dog, 61, 63
Obstructions, gastrointestinal, in rabbits, 4
Ocular injuries, in gray short-tailed opossum, 74
Odontoma, oral, in prairie dog, 68
Oocysts, coccidia, in wallaby, 87
Ophthalmic examination, dilation of eye of bird for, 56
Opossums
cysts in, white, 13
gray short-tailed, 73-74
Oral odontoma, in prairie dog, 68
Osteopathy, hypertrophic, in rabbit, 21
Ovary, in scarlet macaw, 88
Ovoid mass, hard, in sugar glider, 80
Oxytocin, for egg binding in birds, 10
Oxyurids, in primates, 68
- P**
Paralysis
in iguanas, 21
leg, unilateral, in budgerigars, 34
Parasites
dermatologic conditions due to, in rabbits, 89-90
in primates, 67-68
in rabbits, 91-92
Parathyroid hyperplasia, in guinea pig, 20
Parrot, Maximilian's, mycobacterial keratitis in, 29
D-Penicillamine, for poisonings in birds, 36
pH crash, in aquarium, 71
Phosphate binders, for renal disease in reptiles, 12
Pigs
airway access in, 67
guinea (see Guinea pigs)
potbellied
airway access in, 67
zoonotic infections in, 60
Pinworms, in primates, 68
Piperacillin
for *Salmonella typhimurium* infection in savannah monitor, 79
for urolythiasis in green iguana, 55
Plasma enzyme activities, in green iguana, 69
Pneumonitis, hypersensitivity, in birds, 57
Pocket pets, zoonotic diseases in, 60
Poisonings, common, in birds, 35-36
Polyomavirus infections, in psittacines, 30
Potbellied pigs
airway access in, 67
zoonotic infections in, 60
Powder, for dermatophyte infections, 75
Powdered medications, administering to rats, 83
Prairie dog
dyspnea in, 67, 68
obesity in, 61, 63
odontoma in, oral, 68
Prednisolone, for lymphoma in ferret, 5
Prey bites, in snakes, 5
Primates, parasites in, 67-68
Prostate enlargement, benign, in ferrets, 47
Protozoal infections, metronidazole for, in primates, 68
Psittacines
dermatitis in, wing web, 25-26
polyomavirus infections in, 30
Pyrantel in primates
for oxyurids, 68
for pinworms, 68
for *Strongyloides* infections, 68
- Q**
Quill loss, in hedgehog, 7
- R**
Rabbits
anorexia in, 3-4
dermatologic conditions in, 89-90, 92
fasting before anesthesia in, 16
fungal infections in, 90, 92
maggot infestation in, 21
Netherland Dwarf, neurologic problems in, 83, 84
obstructions in, gastrointestinal, 4
osteopathy in, hypertrophic, 21
parasites in, 91-92
rabies in, 37
scrotal swelling in, 43, 45
thyroma in, 52
urine in, red, 61
zoonotic diseases in, 58
Rabies
in ferrets, 60
in rabbits, 37
Rats
administering tablet or powdered medications to, 83
pet, life span of, 48
Reproductive anatomy, avian, 9
Reptiles
annual examination and diagnostic testing in, 40
cytodagnosis in, 1-2, 5
death in, assessing, 77
laboratory sampling of, 61
renal disease in, 11-12
watering methods for, 41-42
zoonotic diseases in, 57-58
Ringer's solution, lactated in anorexic rabbit, 4
for liver disease in sulfur-crested cockatoo, 39

continues on page 96

Volume 4 Subject Index

continues from page 95

- Rodents
alopecia in, 69
diabetes mellitus in, 27-28
itching in, 69
surgical procedures in, 59-60
- S**
- Salmonella*
infection in reptiles, 57-58
typhimurium
infection in savannah monitor, 79
septicemic cutaneous ulcerative disease due to, in turtles, 64
Savannah monitor,
Salmonella typhimurium infection in, 79
Scabies, in guinea pigs, 60
Scales, excessive, on feet of estrildids, 18
Scaly leg mites, in birds, 42
Scrotal swelling, in rabbits, 43, 45
Septicemic cutaneous ulcerative disease, in turtles, 64
- Skin, of chinchillas, 8
Snakes
California kingsnake, care sheet for, 38
prey bites in, 5
removing retained spectacles from, 51
Society finches, care sheet for, 86
Soft tissue mineralization, disseminated metastatic, in guinea pig, 20
Spectacles, retained, removal from snakes, 51
Staff, educating, 59
Steroids (see Corticosteroids)
Strongyloides infections, pyrantel for, in primates, 68
Sugar glider diet, 54
ovoid mass in, hard, 80
Sun conure, cloacal mass in, 35, 37
Surgical procedures in birds, 75-76
in rodents, 59-60
Suture removal, metronidazole paste to discourage, 27
- T**
- Tablet medications, administering to rats, 83
Testicular tumor, interstitial cell, in rabbit, 45
Tetracycline, for *Campylobacter* infection in estrildids, 18
Thymoma in rabbit, 52
Netherland Dwarf, 84
Ticks, removal of, 51
Tissue
enzyme activities in green iguana, 69
hyperplasia, cytodiagnosis in birds and reptiles, 2
soft, disseminated metastatic mineralization, in guinea pig, 20
Toucans, care sheet for, 6
Transfusion in ferrets, 33-34
medicine, avian, 65-66
Trichuris infection, fenbendazole for, in primates, 68
Tuberculosis, avian, 57
Tubulointerstitial nephritis, severe chronic, in guinea pig, 20
Tumor, testicular interstitial cell, in rabbit, 45
- Turtles
aquatic, wound management in, 3
ulcerative disease in, septicemic cutaneous, 64
- U**
- Ulcerative disease, septicemic cutaneous, in turtles, 64
Urinary catheter, indwelling, placement in ferret, 85
Urine, red, in lagomorphs, 61
Urogenital system problems, in gray short-tailed opossum, 74
Urolith removal, in ferrets, 47
Urolythiasis, in green iguana, 53, 55
Uterine neoplasia, in African hedgehogs, 31
- V**
- Vaccinations, 83
Ventricular foreign body removal, in birds, 76
Veterinary ethics, in treating exotic pets, 19
Vitamin B complex in anorexic rabbit, 4
C supplementation in diabetic rodents, 28
injection for egg binding in birds, 10
Vulterine guinea fowl, frostbite management in, 93
- W**
- Waiting room environment, 43
Wallaby diarrhea in, 84, 87
diets, 46
Watering methods, for reptiles, 41-42
Wing web dermatitis, in psittacines, 25-26
Wound management, in aquatic turtles, 3
- Z**
- Zoonotic diseases, 57-58, 60



11830 Westline Industrial Drive
St. Louis, MO 63146-9988

Bulk Rate
U.S. Postage
PAID
Permit #21
St. Joseph, MI