

PEER-REVIEWED

# How to handle respiratory, ophthalmic, neurologic, and dermatologic problems in rabbits

The same medical and surgical principles used in treating these problems in dogs and cats generally apply to rabbits as well. But to ensure that you "do no harm," familiarize yourself with the specifics discussed in this article.

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THE PRECEDING ARTICLE discussed gastrointestinal, reproductive, and musculoskeletal problems in rabbits. This article describes some of the most common respiratory, ophthalmic, neurologic, and dermatologic problems seen in pet rabbits, as well as their diagnosis and treatment.

## Respiratory conditions

### Snuffles

Snuffles, a disease of the upper respiratory tract, is common in rabbits. It is primarily caused by a local overgrowth of *Pasteurella multocida*, a gram-negative bacillus, in the nasal epithelium.<sup>1</sup> Studies indicate that cultures of the nasal epithelium are positive for *P. multocida* in 40 to 72% of clinically normal adult rab-

bbits housed in institutional colonies.<sup>2,3</sup> The transmission of pasteurellosis is either airborne or through direct contact. Its incubation period is about two weeks. Laboratory studies using vaccines of live attenuated *P. multocida* have found some protective benefit against pasteurellosis, but field studies have not been as successful.<sup>4,5</sup> Therefore, vaccination is not yet an option.

Treating snuffles may be challenging for two reasons: 1) in vitro sensitivities often do not correlate well with the in vivo ability of a drug to totally eradicate *P. multocida*, resulting in a relapse of the disease; and 2) fatal enteropathies, such as clostridial colitis, can result from treating snuffles with some antibiotic regimens. (See the first symposium article "Caring for rabbits: An overview and formulary" for an in-depth discussion of antibiotic usage in rabbits.) Recent studies suggest that enrofloxacin given at 5 mg/kg subcutaneously or orally twice daily for 14 days is the safest and most effective treatment regimen for respiratory pasteurellosis in rabbits.<sup>6,7</sup> However, sterile ab-

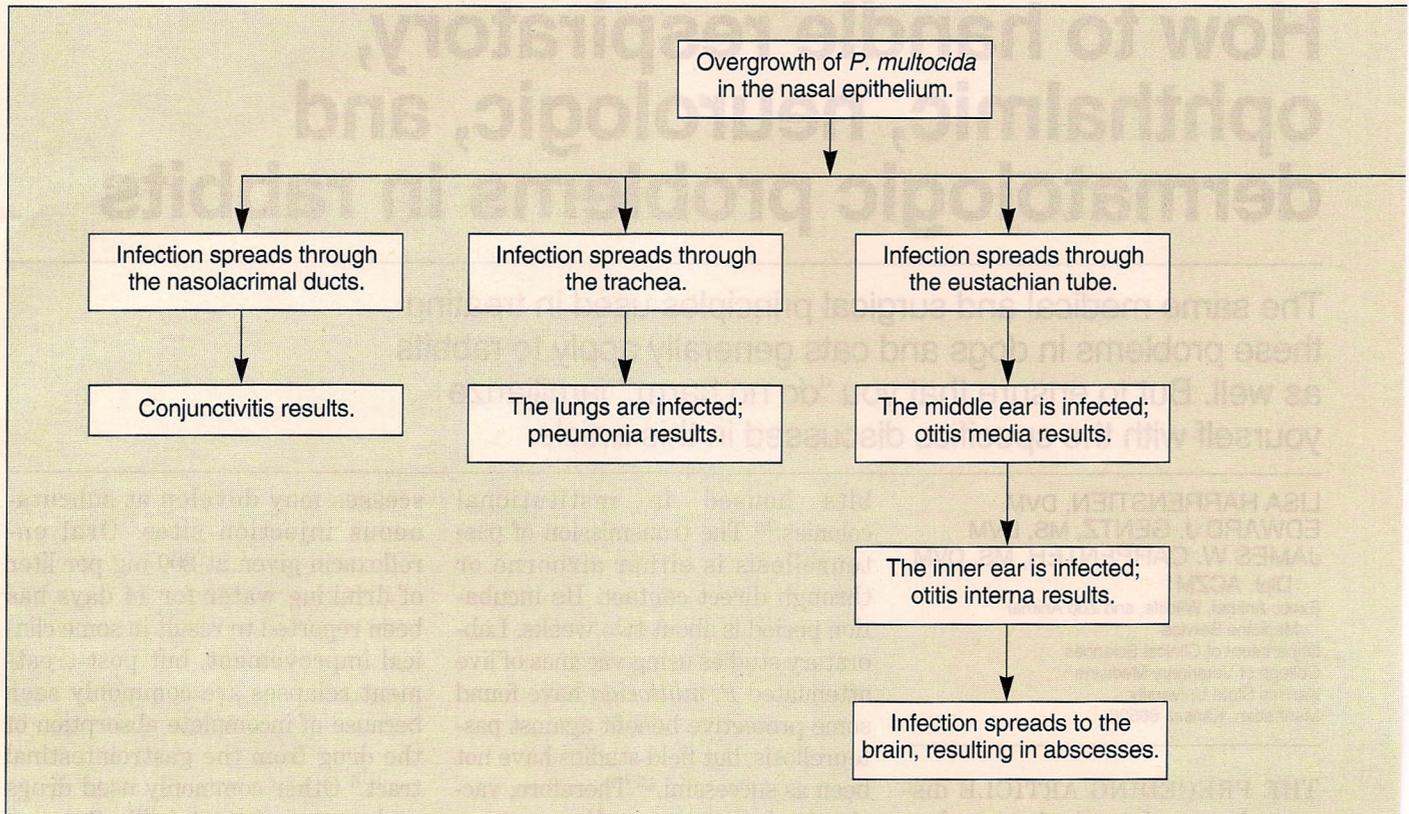
cesses may develop at subcutaneous injection sites. Oral enrofloxacin given at 200 mg per liter of drinking water for 14 days has been reported to result in some clinical improvement, but post-treatment relapses are commonly seen because of incomplete absorption of the drug from the gastrointestinal tract.<sup>6</sup> Other commonly used drugs such as procaine penicillin G, tetracycline, or chloramphenicol have also showed only partial efficacy when used as recommended.<sup>8</sup> Irrespective of the specific drug chosen, antibiotics should be discontinued and supportive therapy begun if diarrhea develops during therapy. Some rabbits may continue to have mild clinical disease after clearance of *P. multocida* because of secondary infection with *Bordetella bronchiseptica*, which interferes with mucociliary cell function.<sup>9</sup>

### Pneumonic pasteurellosis

Pasteurellosis can extend via the trachea or bloodstream to infect other organs (Figure 1).<sup>1,10</sup> Fibrinopurulent pneumonia and pleuritis result if the lungs are affected. Pul-

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1. Potential forms of pasteurellosis in rabbits.

monary abscesses develop cranioventrally, and sudden death may be the only sign of their presence.

Diagnosis may be aided by thoracic auscultation and radiographic examination, and is further supported by CBC findings. When radiographing the thorax, keep in mind that the thymus remains large in adult rabbits, extending from the base of the heart to the thoracic inlet. The bi-lobed left lung is normally two-thirds the size of the four-lobed right lung (Figures 2A & 2B).

As with pasteurellosis of the upper respiratory tract, enrofloxacin (5 mg/kg given subcutaneously or orally b.i.d. for 14 days) is

the current treatment of choice for pneumonic pasteurellosis in rabbits. Furosemide (1 to 4 mg/kg intravenously or intramuscularly every four to six hours) may also be indicated if wheezes are auscultated or if there is radiographic evidence of pulmonary edema.

### Ophthalmic conditions

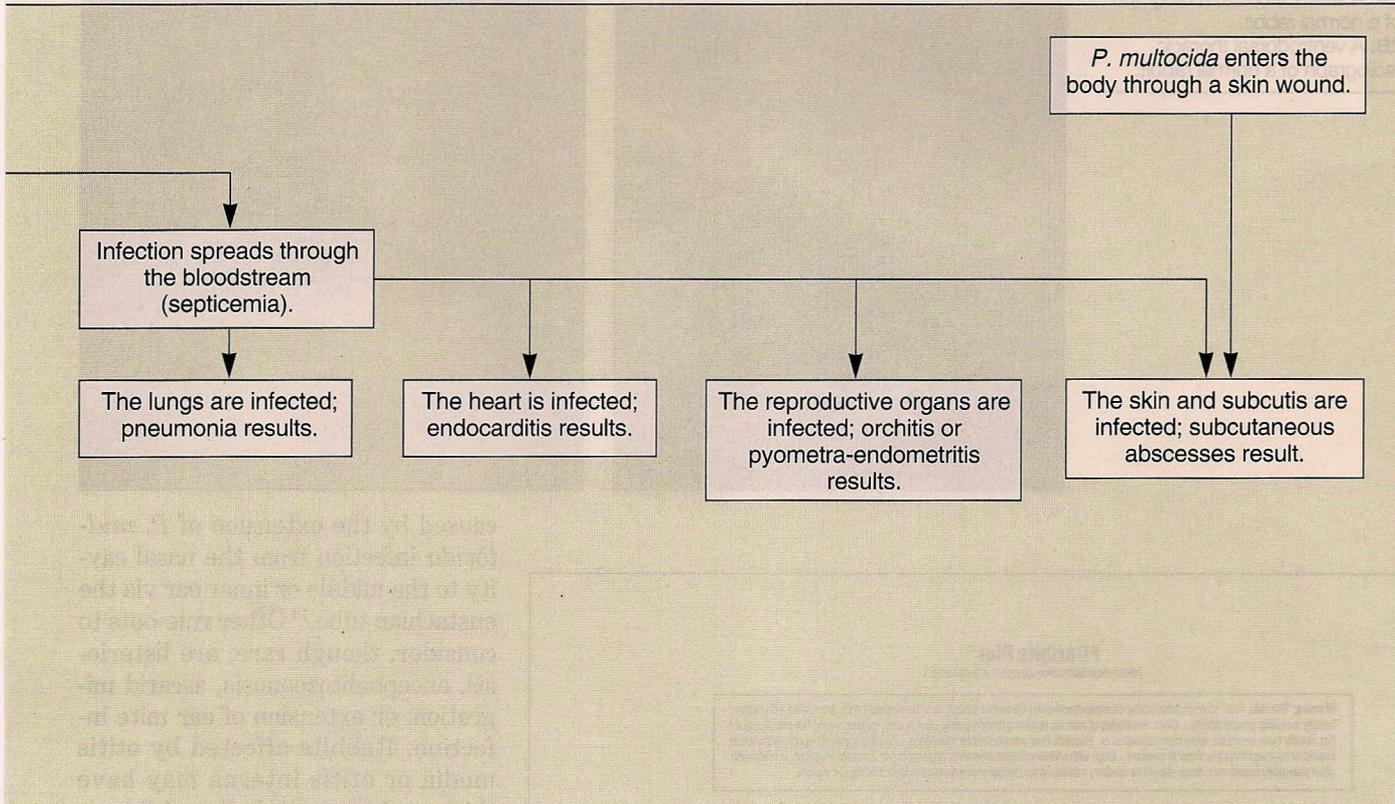
Corneal or intraocular disease may be diagnosed in rabbits using techniques similar to those used in dogs and cats. Useful diagnostic procedures include Schirmer tear testing, fluorescein dye examination, conjunctival scraping for cytology or culture, topical anesthetic application, tonometry, mydriatic therapy (tropicamide or a 1:1 combination of

atropine 1% and phenylephrine 10%), and indirect ophthalmoscopy (using a 28D, 30D, or 2.2 panretinal lens). To avoid systemic toxicity, use the smallest amounts possible of topical anesthetic or mydriatic agents.<sup>11</sup>

### Conjunctivitis, hypopyon, and retrobulbar abscesses

Ophthalmic involvement (conjunctivitis [Figure 3], hypopyon, or retrobulbar abscesses) is sometimes seen in conjunction with pasteurellosis.<sup>1</sup> Culture and sensitivity testing are recommended when these conditions are present because organisms other than *Pasteurella* species are occasionally isolated. Pending the culture results, the fol-

Figure 1



lowing combination of systemic and topical antibiotics should be given to treat ophthalmic conditions likely caused by pasteurellosis: enrofloxacin (5 mg/kg given subcutaneously or orally b.i.d. for 14 days) or procaine penicillin G (40,000 to 60,000 IU/kg given intramuscularly or subcutaneously s.i.d. or b.i.d. for 14 days), plus chloramphenicol ophthalmic solution or ointment applied topically four times a day.

Noninfectious causes of conjunctivitis include trauma from dust or bedding, fight wounds, or primary or secondary entropion. Conjunctivitis caused by trauma should be treated with topical antibiotics, wound management, and improved husbandry. Primary entropion, dis-

tichiasis, or trichiasis requires surgical correction for resolution.

Retrobulbar abscesses are difficult to treat.<sup>9,12</sup> Enucleation should be considered if aggressive antibiotic therapy and corneal lubrication have not been successful. The surgical technique for enucleation is similar to that used in dogs and cats, but the presence of a relatively large orbital venous sinus in rabbits makes careful surgical dissection (close to the globe) important. Penrose drain placement in the orbit is needed to allow for postoperative drainage.

#### Epiphora

Epiphora without conjunctivitis or other ocular signs is likely due to nasolacrimal duct obstruction, often

secondary to conjunctivitis or rhinitis. Rabbits have a single slitlike punctum, located at the inferior portion of the medial canthus. The nasolacrimal duct narrows and changes direction at two points along its length. Duct obstruction is relieved by flushing through the punctum, using a 23-ga. nasolacrimal cannula or intravenous catheter sleeve (Figure 4). Long-term cannulation of the duct is difficult to impossible.<sup>12</sup> Repeated irritation of the duct may result in permanent stenosis or obstruction.

#### Neurologic conditions

##### Torticollis

Torticollis, or head-tilt, is usually

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**2A.** A lateral thoracic radiograph of a normal rabbit.  
**2B.** A ventrodorsal thoracic radiograph of a normal rabbit.



Figure 2A

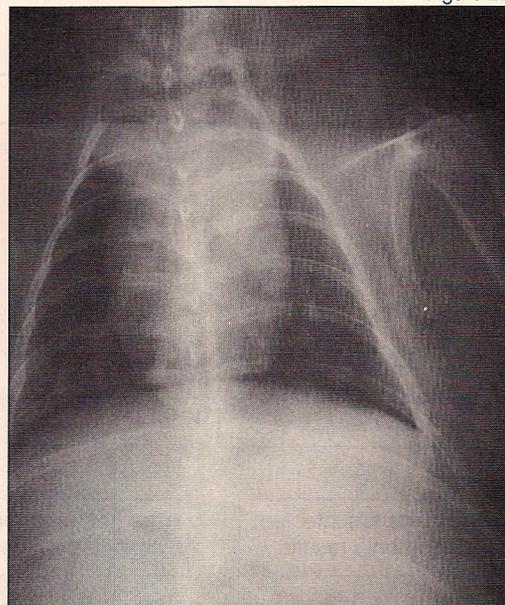


Figure 2B

## Filaribits Plus® (diethylcarbamazine citrate/oxibendazole)

**Warning:** Filaribits Plus® (diethylcarbamazine citrate/oxibendazole) Chewable Tablets have been occasionally associated with hepatic toxicity including several fatalities. Close monitoring of animals receiving this drug may identify early hepatic injury. The hepatic injury has usually been reversible upon discontinuation of Filaribits Plus administration; thus dogs exhibiting signs of hepatic dysfunction should be removed from treatment immediately. Dogs with a history of liver disease or dogs receiving Filaribits Plus concurrently with other potentially hepatotoxic drugs should be carefully monitored for clinical or biochemical evidence of hepatic disease.

**Composition:** Each 60 mg/45 mg Filaribits Plus tablet contains 60 mg diethylcarbamazine citrate and 45 mg oxibendazole. Each 120 mg/91 mg Filaribits Plus tablet contains 120 mg diethylcarbamazine citrate and 91 mg oxibendazole. Each 180 mg/136 mg Filaribits Plus tablet contains 180 mg diethylcarbamazine citrate and 136 mg oxibendazole.

**Indications:** Filaribits Plus are indicated for use in the prevention of infection with *Dirofilaria immitis* (heartworm disease) and *Ancylostoma caninum* (hookworm infection) in dogs. Filaribits Plus are also indicated for removal and control of *Trichuris vulpis* (whipworm infection) and mature and immature stages of intestinal *Toxocara canis* (ascariid infection) in dogs. Filaribits Plus may be given to dogs of all ages, including bitches, throughout the reproductive period and following whelping.

**Warning:** See Warning box regarding hepatic toxicity.

Dogs with established heartworm and/or hookworm infection should not receive Filaribits Plus until they have been converted to a negative status by the use of appropriate adulticidal and microfilaricidal heartworm therapy and/or hookworm therapy. A dog on prophylactic therapy should be examined for the presence of heartworm microfilaria every six months.

**Precautions and Side Effects:** Occasionally in dogs, hepatic dysfunction, sometimes fatal, has been reported with the use of Filaribits Plus.

Clients should be instructed to report any signs and symptoms which may suggest hepatic dysfunction so that appropriate biochemical testing can be done. Signs and symptoms reported as accompanying hepatic dysfunction include anorexia, vomiting, lethargy, jaundice, weight loss, polydipsia, polyuria, ataxia and dark urine.

The use of diethylcarbamazine citrate is not recommended in dogs with active *Dirofilaria immitis* infections. Inadvertent administration to heartworm infected dogs may cause adverse reactions due to pulmonary occlusion. Overdosage may cause emesis.

**Dosage and Administration:** Filaribits Plus are chewable tablets that are palatable to most dogs. Tablets may be fed free choice or placed on food. Filaribits Plus are scored for convenient adjustment of dosage.

### For the Prevention of Heartworm Disease, Hookworm Infection and for the Removal and Control of Whipworms and Mature and Immature Stages of Intestinal Ascariids in Dogs

Filaribits Plus are given orally (once a day) at a dosage rate of 3 mg diethylcarbamazine citrate and 2.27 mg oxibendazole per pound of body weight. Young dogs may be started on the preventive program at two months of age. Administration of Filaribits Plus in heartworm or hookworm endemic areas should start prior to hookworm exposure and at least one month before the beginning of the mosquito season. Filaribits Plus administration should continue daily throughout the entire period of exposure to hookworms and two months past the mosquito season since there is little residual effect of the drugs. Continuous low level administration effectively prevents maturation of hookworms (*A. caninum*), recently inoculated heartworm larvae (*D. immitis*) into adults and provides for the removal and control of whipworms (*T. vulpis*) and mature and immature stages of intestinal ascariids (*T. canis*). If Filaribits Plus are discontinued because of seasonal heartworm problem, hookworm prevention or therapy and whipworm and ascariid removal and control should be continued.

Body Weight (lbs.)	Recommended Dosage Schedule		Body Weight (lbs.)	Filaribits Plus® 180 mg/136 mg Tablets
	Filaribits Plus® 60 mg/45 mg Tablets	Filaribits Plus® 120 mg/91 mg Tablets		
1-5	¼ Tablet	¼ Tablet	21-30	¼ Tablet
6-10	½ Tablet	½ Tablet	31-40	½ Tablet
11-15	¾ Tablet	¾ Tablet	41-50	¾ Tablet
16-20	1 Tablet	1 Tablet	51-60	1 Tablet
21-25	1 ¼ Tablets	1 ¼ Tablets	61-70	1 ¼ Tablets
26-30	1 ½ Tablets	1 ½ Tablets	71-80	1 ½ Tablets
31-35	1 ¾ Tablets	1 ¾ Tablets	81-90	1 ¾ Tablets
36-40	2 Tablets	2 Tablets	91-100	2 Tablets
41-45	2 ¼ Tablets	2 ¼ Tablets	106-120	2 ¼ Tablets
46-50	2 ½ Tablets	2 ½ Tablets	121-135	2 ½ Tablets
			136-150	2 ½ Tablets

**CAUTION:** U.S. Federal law restricts this drug to use by or on the order of a licensed veterinarian.

Do not use in dogs that may be harboring adult heartworms.

KEEP OUT OF REACH OF CHILDREN

#### SUPPLIED:

Filaribits Plus® 60 mg/45 mg - Bottles of 100 and 200 tablets  
Filaribits Plus® 120 mg/91 mg - Bottles of 100 tablets  
Filaribits Plus® 180 mg/136 mg - Bottles of 50, 100 and 200 tablets

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caused by the extension of *P. multocida* infection from the nasal cavity to the middle or inner ear via the eustachian tube.<sup>13</sup> Other rule-outs to consider, though rare, are listeriosis, encephalitozoonosis, ascarid migration, or extension of ear mite infection. Rabbits affected by otitis media or otitis interna may have thickened tympanic bullae visible on radiographs, and pus in the tympanic cavity. If unilateral, the rabbit's head will tilt down on the affected side (Figure 5). As with other cases of pasteurellosis, treatment involves appropriate antibiotic therapy and possibly tympanic bulla osteotomy. Successful recovery relies on nutritional and fluid support until the rabbit can resume eating and drinking on its own.

### Acute paraplegia

This condition is usually the result of vertebral fracture (with spinal trauma) at the L<sub>6</sub>-L<sub>7</sub> vertebral space. This space is the fulcrum point between the major cranial and caudal muscle groups of the rabbit.<sup>14</sup> Rabbits are especially prone to ver-

Figure 3



Figure 3



Figure 4

3. Ocular discharge associated with conjunctivitis.
4. Nasolacrimal cannulation using a 23-ga. cannula, saline eyewash solution, and a head loupe.
5. Torticollis associated with *Pasteurella multocida*-induced otitis media (unilateral).
6. Typical thick consistency of pus in rabbits.

Figure 5



Figure 6



tebral luxation or fracture during restraint. Rabbits may be safely held and restrained by wrapping them in a towel or by scruffing with one hand and supporting the hindquarters with the other hand.

Prognosis for recovery from paraplegia depends on whether urinary and fecal continence are affected. The many secondary problems involved with adequate nursing care of an incontinent rabbit make euthanasia an appropriate option to consider. If hindlimb paralysis is the

only sign noted and if vertebrae are not malaligned on radiographs, cage rest for several weeks may be successful. In addition to cage rest, prednisolone (0.25 mg/kg given orally b.i.d. for five days, then tapered over two to three weeks) may be useful.

#### Dermatologic conditions

##### Abscesses

Subcutaneous abscessation is another expression of pasteurellosis.

Pruritus or redness may be noted by the owner, but usually the only sign is the presence of one or more firm nodules full of thick pus (Figure 6). Aspiration of the nodule is usually difficult and unsuccessful.<sup>15</sup>

The ideal treatment plan includes surgical excision of the entire nodule and administration of antibiotics for 10 to 14 days. If the abscess is in skin that cannot be excised, lancing and flushing the abscess twice daily with dilute povidone-iodine solution along with antibiotic therapy for 10

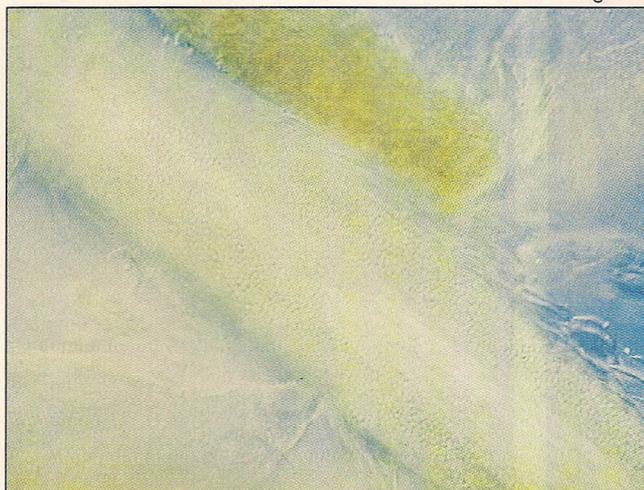
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Respiratory, ophthalmic, neurologic, and dermatologic problems (cont'd)

Figure 8



Figure 7



7. A light photomicrograph of a hair shaft with thousands of dermatophyte spores along its surface (Courtesy of Dr. Wayne Bailie).

8. Otitis externa and crusting due to *Psoroptes cuniculi* infection.

9. *Psoroptes cuniculi* (Figures 9-12 courtesy of Dr. Robert Ridley).

10. *Sarcoptes scabiei*.

Figure 9

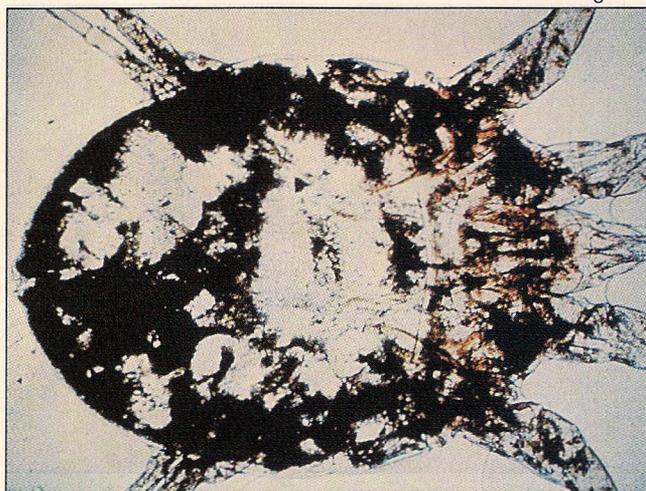
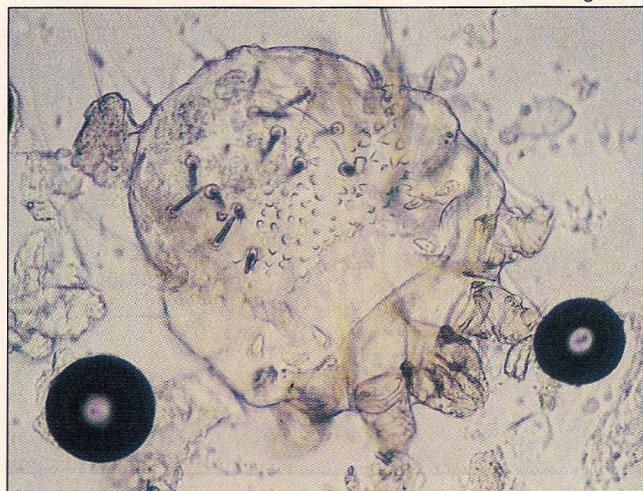


Figure 10



to 14 days may be curative. Aerobic and anaerobic culture and sensitivity testing are appropriate because *P. multocida* is not the only cause of rabbit abscesses. Other organisms reported to cause abscessation as well as dermatitis and skin ulceration include *Staphylococcus aureus* (sore hocks), *Pseudomonas aeruginosa* (blue fur disease), and *Fusobacterium necrophorum* (necrobacillosis, Schmorl's disease).<sup>15</sup>

### Open wounds

Puncture wounds in rabbits rapidly become contaminated, and wetness of the feet, dewlap (secondary to malocclusion), or muzzle easily leads to dermatitis. In addition, obese rabbits are predisposed to pressure necrosis and ulcerative pododermatitis, especially if kept on rough cage flooring. A rabbit that has recently been sedated by intramuscular injection of ketamine may show self-mutilation of its foot sec-

ondary to sciatic nerve irritation. Wound cleansing, antibiotic therapy, and Elizabethan collar placement are integral components of wound care.

As with other species, preventing skin disease depends heavily on maintaining good cage hygiene and eliminating underlying causes of trauma or skin irritation. Sometimes a specific cause of skin disease cannot be determined. Although temporary palliative wound man-

Figure 11

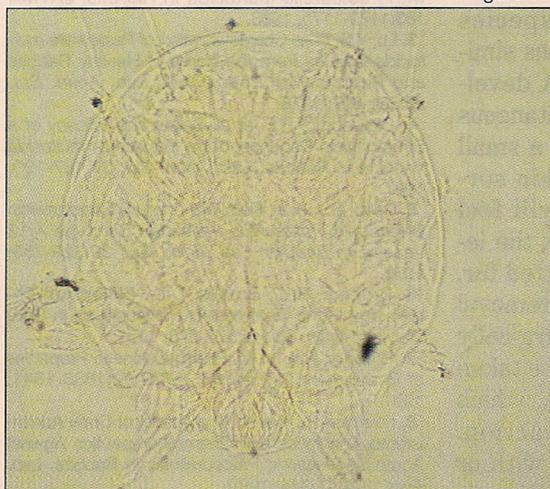
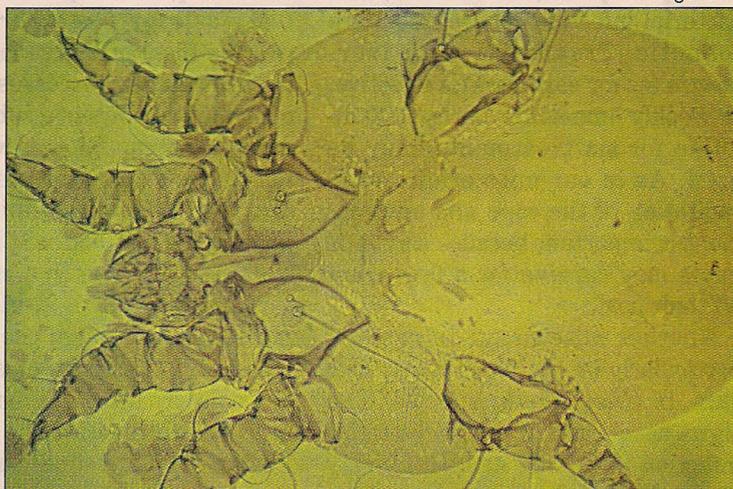


Figure 12



agement is of benefit, the owner should be warned of a high probability of relapse. If similar types of skin disease recur in the same patient, consider environmental factors. Remember also to consider the possibility of hematogenous spread of bacterial infection from other sites.

### Ringworm

Alopecia in the rabbit may be normal (at the withers or while nesting), secondary to underlying abscessation, or caused by infection with fungal organisms or ectoparasites.<sup>15</sup> Dermatophytosis (ringworm) is most often caused by *Trichophyton mentagrophytes* (in outdoor pets) or *Microsporum canis* (in indoor pets).<sup>16</sup> Ringworm in rabbits is usually dry, scaly, and pruritic and is seen as patchy alopecia on the head or feet.<sup>17</sup> Diagnosis requires a KOH preparation of a skin scraping or fungal culture (Figure 9) because *T. mentagrophytes* does not fluoresce under a Woods lamp and *M. canis* does not fluoresce consistently. Treatment includes a

program of topical povidone-iodine cleansing or lime-sulfur dips weekly, along with thorough disinfection of the environment. In serious cases, griseofulvin microsize (Grifulvin V<sup>®</sup> — Ortho-McNeil; 25 mg/kg orally b.i.d. for 30 days) may be administered.<sup>16</sup>

### Ectoparasitism

Ectoparasites are commonly found on rabbits, especially around the face and ears. Ear mite (*Psoroptes cuniculi*) infections may cause severe inflammation, but are readily treated once diagnosed. *Psoroptes* mites are whitish-yellow. They may be observed with the unaided eye or with an otoscope in the external ear canal, surrounded by grayish-tan crusty exudate (Figure 8). When viewed microscopically, a swab of the exudate, prepared in mineral oil, usually reveals many life cycle stages of the mite (Figure 9). The treatment plan for otoacariasis generally involves administering 1% ivermectin solution at 300 to 400 µg/kg subcutaneously or 0.5 ml instilled into each ear, repeating ei-

11. *Notoedres cati*. 12. *Cheyletiella parasitovorax*.

ther dose in 14 days. An alternative is to soften the exudate and clean the external ear canal(s) once daily for three weeks (the mites' life cycle) using mineral oil. Follow this by administering a thiabendazole-dexamethasone-neomycin sulfate solution into the ear canal(s). Rabbit aural epithelium is extremely delicate and sensitive, so initial cleaning may be best accomplished while the patient is anesthetized. The subsequent application of a topical steroid is recommended for its anti-inflammatory benefit. Either treatment option should also include thorough cleaning of the cage and environment.

Sarcoptic or notoedric mange (caused by *Sarcoptes scabiei* or *Notoedres cati*, respectively) is most commonly diagnosed from skin scrapings of tan, crusty lesions on the rabbit's face or outer pinnae (Figures 10 & 11). As in other hosts, sarcoptic mites burrow deeply into the skin, causing pruritus, sec-

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ondary alopecia, dermatitis, and bacterial infection. These mites are zoonotic. Treatment with ivermectin (as for ear mites) is effective, or weekly lime-sulfur baths (1:40 dilution for six treatments) may be used. As in ear mite eradication, sanitation of the cage and environment is important because sarcoptic mites may survive for a few hours off their host.

Another mite found on rabbits, particularly on the fur or superficial skin, is *Cheyletiella* species. The signs associated with *Cheyletiella* infection ("walking dandruff") may range from inflammation, scaling, and pruritus to no signs at all. One author notes that *Cheyletiella* mites are seen on 15 to 20% of rabbits brought to his clinic.<sup>16</sup> Rabbits with these mites typically have mild lesions.<sup>16</sup> A diagnosis of cheyletiellosis is based on the results of microscopic examination of a transparent tape preparation of the site, a mineral oil preparation of dander brushed from the fur, or a standard skin scraping (Figure 12). Adult *Cheyletiella* mites are saddle-shaped. In contrast, sarcoptic and *Psoroptes* mites are larger and round or oval. Protocols for treating fur mites include the following:

1. Weekly lime-sulfur dips for four to six weeks;<sup>15,16,18</sup>
2. 1% ivermectin solution (300-400 µg/kg subcutaneously, repeated in 21 to 35 days);<sup>19</sup>
3. Cat flea powder or flea spray, applied daily.

Environmental sanitation (e.g. the application of carbaryl 5% powder) is important for fur mite control because *Cheyletiella* mites, which can cause dermatitis in people, may sur-

vive for up to 10 days off the host.

Myiasis by *Cuterebra* species (warble flies) produces lesions similar to draining abscesses. A developing larva grows in a subcutaneous pocket and can be seen via a small fistula that opens to the skin surface. An affected rabbit will feel pain at the site and will lick the lesion, creating a patch of matted fur. Treatment involves sterile removal of the larva through the surgically widened fistula. Care must be taken to avoid crushing the larva, which may incite an immune reaction. Postoperative wound care, with or without short-term antibiotics, is necessary. Prevention of myiasis is achieved by housing rabbits in screened enclosures that adult flies cannot penetrate.

Rabbits can also be infested with fleas. The treatment and control of fleas on rabbits generally follows the same principles applied in cats, with environmental clearance as the most important factor. In rabbits, water-based flea products are better tolerated than alcohol-based ones.

## Conclusion

Rabbits are commonly affected by diseases of the respiratory tract, eyes, neurologic system, and skin. Diagnosing and curing these diseases is usually not difficult, except in chronic or recurring cases. The same principles of medicine and surgery used in dogs and cats also apply to rabbits, but a knowledge of drugs and techniques that are safe in rabbits is necessary.

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