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Outbreak of Sarcoptic Mange and Malasseziasis in Rabbits (*Oryctolagus cuniculus*)

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An outbreak of combined *Sarcoptes* and *Malassezia* spp. infection was diagnosed in a rabbitry. About 20 (4%) of 500 rabbits were affected. Two 6- to 8-month-old female Holland Lops rabbits were submitted to the Tifton Diagnostic & Investigational Laboratory at The University of Georgia for complete necropsy. Gross lesions consisted of marked multifocal areas of alopecia, crusting, and dermatitis around the eye and on ears, nose, lips, neck, abdomen, feet, and external genitalia. Histologic examination of the skin revealed epidermal acanthosis with marked parakeratotic hyperkeratosis and cross sections of embedded mites consistent with *Sarcoptes* sp. and budding yeasts consistent with *Malassezia* sp. To the best of the author's knowledge, this is the first case report of combined *Sarcoptes* and *Malassezia* spp. infection in rabbits.

Sarcoptes scabiei is a burrowing mite that inhabits the epidermis of skin and causes sarcoptic mange in a wide range of laboratory animals, including rabbits (25). Fertilized female mites penetrate the skin surface, form tunnels in the outer skin layers, and lay eggs in these tunnels. The eggs hatch, and larvae and, later, nymphs emerge. The feeding activities of the larvae and nymphs cause irritation, hypersensitivity reaction, and inflammation, with subsequent hyperkeratosis, seborrhea, and hair loss (7). Morbidity and mortality may be high (7).

Malasseziasis is caused by the budding yeast *Malassezia* sp., which has been commonly associated with otitis externa in dogs and cats (20). To the author's knowledge, malasseziasis has not been reported in rabbits. Herein is described an outbreak of combined sarcoptic mange and malasseziasis in rabbits.

Case Report

Two 6- to 8-month-old, female Holland Lops rabbits (*Oryctolagus cuniculus*) were submitted to The Veterinary Diagnostic and Investigational Laboratory at The University of Georgia for complete necropsy. The owner stated that the rabbits were weak and lethargic, and had multiple skin lesions. The total number of affected rabbits was 20 (4%) of approximately 500 rabbits; only breeding rabbits were affected. The rabbits were housed in single pens. Treatment was not given to any of the affected rabbits. The rabbits were necropsied, and gross lesions were recorded. For histologic examination, multiple tissue specimens, including skin, were taken and fixed in neutral-buffered 10% formalin, embedded in paraffin, sectioned at 5-μ thickness, and stained with hematoxylin and eosin (H&E), periodic acid-Schiff (PAS), and Gomori's methenamine silver (GMS).

Pathologic examination. The submitted rabbits were in poor body condition; they were dehydrated and emaciated. Multifocal variably sized areas of alopecia and crusting were present around the eyes and on ears, lips, nose, neck, abdomen, feet, and external genitalia (Fig. 1). The affected skin areas were covered with tannish yellow, scaly crusts. Other abnormalities were not seen on gross examination. Histologic examination of the skin revealed the epidermis diffusely and irregularly thickened by hyperplasia of the stratum spinosum (acanthosis), with formation of rete ridges. There was marked multifocal thickening of the stratum corneum (parakeratotic hyperkeratosis), with serocellular crust formation and cross sections of embedded mites. Within the epidermis were moderate infiltrates of viable and degenerate neutrophils and cellular debris. Multifocally, within the stratum corneum were multiple cross sections of oval to irregular arthropod parasites characterized by a chitinous cuticle, striated muscle, and a body cavity (*Sarcoptes* sp.; Fig. 2 and 3). In addition, there were moderate numbers of round to oval and budding yeasts (*Malassezia* sp.; Fig. 4). Yeast elements were best detected by use of the GMS and PAS stains (Fig. 5 and 6). Multifocally, some hair follicles were ectatic. The superficial part of the dermis was moderately expanded diffusely by edema and mixed infiltrates of lymphocytes, plasma cells, neutrophils, and eosinophils.

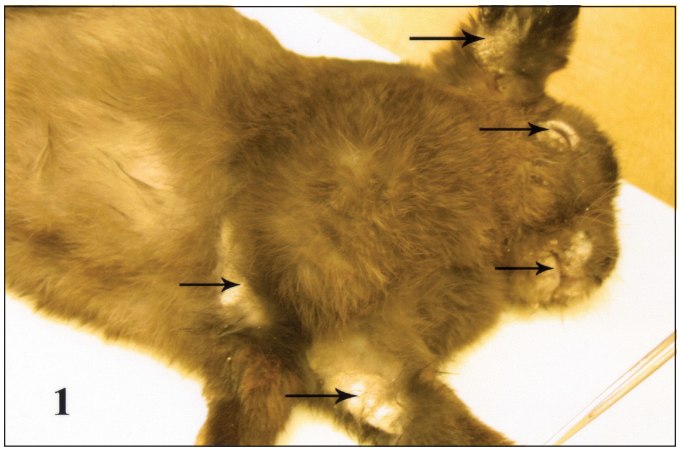

Figure 1. Sarcoptic mange in a rabbit. Notice multifocal areas of alopecia and hyperkeratotic dermatitis around the eye and on lips, ear, and feet (arrows).

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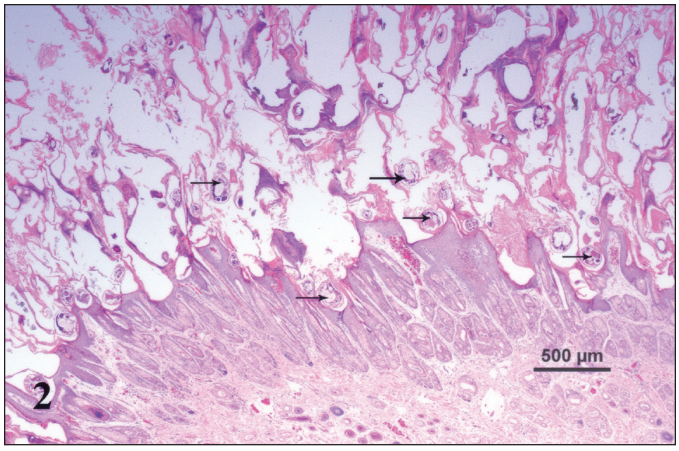

Figure 2. Photomicrograph of a section of skin from an infected rabbit. Notice marked parakeratotic hyperkeratosis with cross sections of embedded mites (arrows). Hematoxylin and eosin stain.

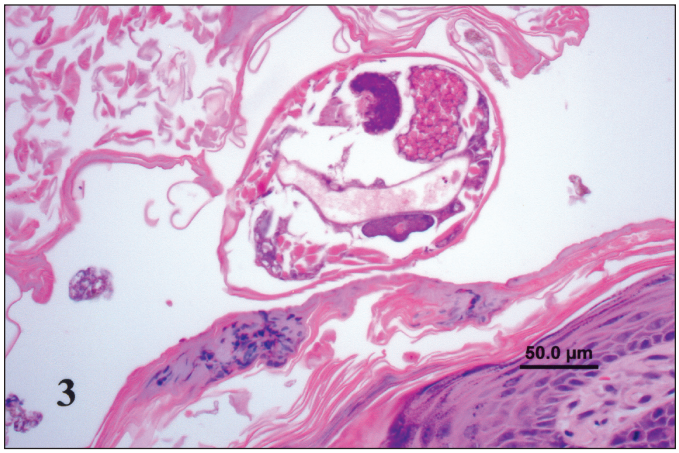

Figure 3. Photomicrograph of a section of skin from an infected rabbit. Notice section of the oval to irregular arthropod parasite characterized by a chitinous cuticle, striated muscle, and a body cavity (*Sarcoptes* sp.) within the stratum corneum. Hematoxylin and eosin stain.

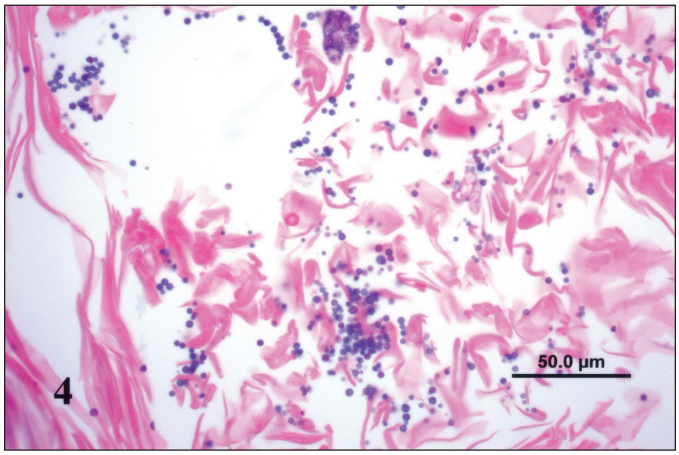

Figure 4. Photomicrograph of a section of skin from an infected rabbit. Notice many round to oval, budding yeasts (*Malassezia* sp.). Hematoxylin and eosin stain.

Discussion

On the basis of the gross pathologic, histopathologic, and histochemical findings, a diagnosis of combined sarcoptic mange and malasseziasis was made. The differential diagnosis for hyperkeratotic dermatitis and alopecia in rabbits includes: psoroptic mange (*Psoroptes cuniculi*), notoedric mange (*Notoedres cati*), *Cheyletiella* sp. dermatitis, dermatophytosis, and sarcoptic mange (*Sarcoptes scabiei*). Psoroptic mange is usually limited to the inner surface (also called ear mange or ear canker) of the pinna, and the causative agent is a non-burrowing mite (25). Morphology and physical characteristics of the mites can be used to differentiate sarcoptic mites from other mites that are found in rabbits. Psoroptic mange mites are larger than sarcoptic mange mites and are oval-shaped, with well-developed legs that project beyond the body margin (25). Adult psoroptic male mites measure 431 to 547 µm × 322 to 462 µm; females are large, round, and brownish white, and measure 403 to 749 µm × 351 to 499 µm (16, 25). All legs are long, and consist of five free segments (16).

Adult notoedric mange mites have a dorsally situated anus, whereas sarcoptic mange mites adults have a terminal, longitudinal anus. The dorsal spines of sarcoptic mange mites are larger than those of notoedric mange mites (16). *Cheyletiella* sp. dermatitis is usually present on the area over the scapulae; the causative agent is a non-burrowing mite, and skin lesions are usually mild (25). The female measures 450 × 200 µm, and the

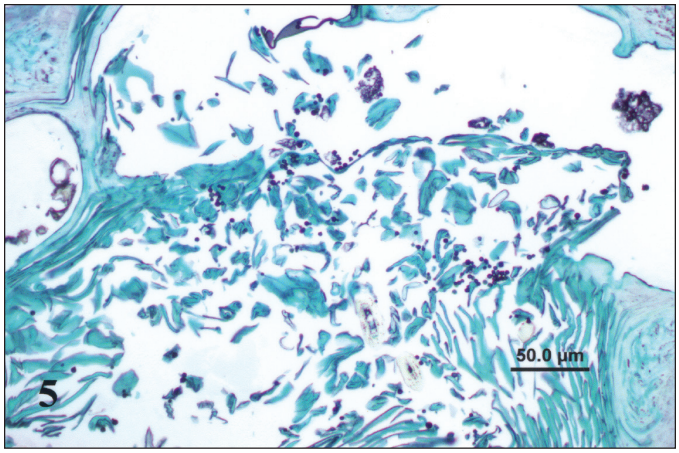

Figure 5. Photomicrograph of a section of skin from an infected rabbit. Notice many round to oval, budding yeasts (*Malassezia* sp.) that are Gomori methenamine silver stain positive.

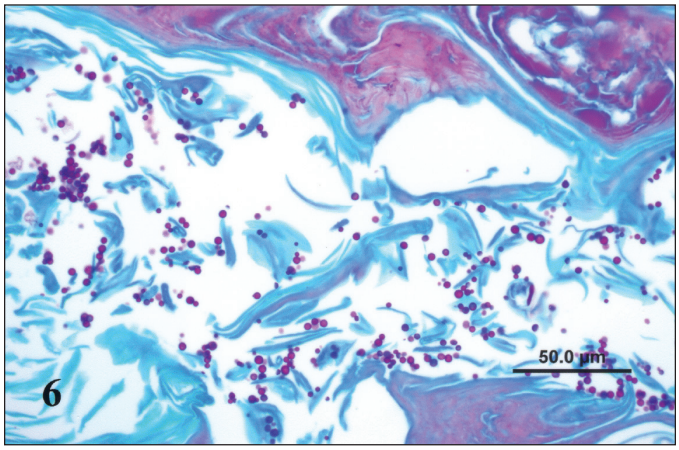

Figure 6. Photomicrograph of a section of skin from an infected rabbit. Notice many round to oval, budding yeasts (*Malassezia* sp.) that are periodic acid-Schiff stain positive.

male measures 320 × 160 μm (25). *Cheyletiella* sp. mites have a large, distinctive, curved claw on the palpi (25). Fungal elements were not found in histologic sections of affected skin.

Sarcoptic mange mites have a thick, chitinous body wall, with large spines on the dorsal surface (12). *Sarcoptes scabiei* mites have the following characteristics: the body shape is round, the legs are short, with a long, unjointed stalk with a sucker on front pairs of legs, vertical setae, terminal anus, dorsum with scales, cones, and bladelike setae; female mites are white, covered with fine parallel striae, and measure 303 to 450 μm × 250 to 350 μm (16, 25).

Sarcoptic mange affects a wide range of animal species and humans. It is well documented in foxes (19, 24). In lagomorphs such as rabbits, *S. scabiei* (also known as itch or scab mite) is not common and the mange it causes affects the face, nose, lips, and external genitalia (22). It is a highly contagious disease of the skin. The mite burrows into the stratum corneum. All stages of the mite are found on the host. The life cycle of female and male *S. scabiei* consists of an egg, larva, protonymph, and tritonymph that give rise to an adult (1). Transmission of *S. scabiei* occurs by direct and indirect contact (4). Although transmission to humans is equivocal, it has been reported that humans can be occasionally infected with *S. scabiei* of animal origin (4, 6, 8, 9, 11, 15, 21).

In rabbits, infection with *S. scabiei* induces relative protection against subsequent infections (3). Clinical signs of sarcoptic mange include intense pruritus, seborrhea, and alopecia in acute cases due to a hypersensitivity reaction (13), and crusting and hyperkeratosis in chronic cases (26). Amyloidosis, anemia, and leukopenia have been reported in rabbits with sarcoptic mange (2, 5). In the rabbits of this report, evidence for amyloidosis was not evident. Diagnosis of sarcoptic mange can be made by identification of the mite by examination of skin scrapings (25).

Ivermectin, at a dosage of 0.2-0.4 mg/kg of body weight administered subcutaneously once every 2 weeks for 2-3 treatments is usually a simple, safe, effective treatment (28). Moxidectin given orally at a dosage of 0.2 mg/kg twice, 10 days apart has been documented to be an effective treatment (27). Weekly dips in 2% lime/sulfur diluted 1:40 for 4-6 weeks can also be used as a treatment option (18). However, disadvantages of lime/sulfur dips are discoloration of the fur and the strong odor. Other treatment options may include: 0.05% solution of lindane, 10% DDT in talc, benzyl benzoate, and 25% proprietary solution of tetraethylthiuram monosulfate (16). All affected animals should be treated. In this instance, the owner reported that all affected rabbits were treated with a single dose of ivermectin administered subcutaneously and this treatment eliminated the mite infestation completely. Prognosis is good as ivermectin is usually effective at eliminating infestation (25). General control measures include supportive nutrition and bathing with a non-irritating soap, along with medication of all affected animals (16). In addition, thorough cleaning of cages and environment is important because sarcoptic mange mites may survive for a few hours off their host (18).

Malassezia sp. is a lipophilic yeast that lives on the skin of humans and animals, and belongs to the normal cutaneous microflora of warm-blooded vertebrates (17). The cells are round, oval, or cylindrical, display monopolar budding, and can be identified in histologic sections by use of PAS stain (14). Disruption of the normal cutaneous microenvironment plays a substantial role in disease genesis (17). *Malassezia* yeasts have been associated with various skin diseases (e.g., seborrheic dermatitis) in humans (14). *Malassezia pachydermatitis* has been implicated as a zoonotic agent when it was introduced into the intensive care nursery on health care workers' hands after being colonized from family pets (10). In animals, *Malassezia* sp. has been reported to play a role as a secondary pathogen on the skin of dogs affected with many dermatitides that result in seborrheic or atopic dermatitis (20). Type-1 hypersensitivity reactions to *Malassezia* sp. in atopic dogs have been reported (20). Dermatitis associated with *Malassezia* overgrowth is typically intensely pruritic (20). In the rabbits of this report, the heavy infestation with sarcoptic mange mites and alteration in the cutaneous microclimate played a role in disease severity. A low-dose (5 mg/kg administered orally every 24 h for 10 days) of ketoconazole, followed by 5 mg/kg administered every 48 h for 10 doses has been reported to be successful in most dermatitis cases (20). *Malassezia pachydermatis* has been associated with sarcoptic mange in red foxes, porcupines, and coyotes (23). A review of literature did not reveal reports of malasseziasis or its association with mange in rabbits. To the author's knowledge, this is the first report of combined sarcoptic mange and malasseziasis in rabbits.

Acknowledgments

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