

Sheep Scab

Psoroptes ovis Infestation

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Importance

Sheep scab is a contagious, highly pruritic disease caused by the mite *Psoroptes ovis*. Affected sheep develop large, yellowish, scaly, crusted lesions, accompanied by damage to the wool and hide. Emaciation and secondary bacterial infections can occur in untreated animals, pregnant sheep give birth to smaller lambs, and lambs that become infested may lose condition rapidly and die. Sheep scab is an animal welfare concern due to the pain and irritation caused by the mites.

Etiology

Sheep scab is caused by *Psoroptes ovis*, a mite (arthropod) in the family Psoroptidae (Order Astigmata). *Psoroptes* mites have traditionally been separated into species based on their host and body site preferences, and the morphology of the male mites. Mites on the bodies of sheep, cattle and other ungulates were named *P. ovis*, mites in the ears of sheep and on rabbits were called *P. cuniculi*, and mites on horses were *P. equi*. Based on genetic analysis, all *Psoroptes* spp. mites have now been reclassified into a single species, *Psoroptes ovis*.

The relationships between the *P. ovis* mites found on different species and their host specificities, particularly in sheep and cattle, are unclear. There seem to be variants with different host and site preferences, and a varying ability to cause severe disease. There has also been some speculation that the mites adapt to changes in the environment of the skin, and the proportion of highly pathogenic and relatively nonpathogenic variants is altered during this process. The patterns of adaptation to host species or sites in the body are still poorly understood, and experimental studies on cross-species transfer are contradictory. The *P. ovis* variant that causes sheep scab, a severe disease, is reportable in many countries.

Species Affected

Sheep scab is a disease of domesticated sheep (*Ovis aries*). Bighorn sheep (*Ovis canadensis*) are also susceptible.

Before species distinctions were abandoned, *P. ovis* had also been reported on some other species including cattle, horses, giraffes, goats and camelids. The relationships between these mites are uncertain; however, the *P. ovis* mites found on hosts other than sheep do not seem to be able to cause sheep scab. Although *Psoroptes* spp. mites have been successfully transferred between hosts in some experimental studies, other studies suggest that *P. ovis* from cattle does not survive on sheep, and *P. ovis* from sheep does not survive on cattle. Many countries have reported these mites on only one species and not the other. In the U.K., where sheep scab is endemic, neither the disease nor the mites appear to be transmitted from sheep to cattle or goats.

Geographic Distribution

Sheep scab has been eradicated from Australia, New Zealand, Scandinavia, the U.S. and Canada, but it can still be found in many other countries. The species *Psoroptes ovis* occurs worldwide, even in countries where sheep scab does not occur.

In the U.S., severe psoroptic mange of the body was reported in one wild bighorn sheep population in 1978, but it seems to have disappeared by 1997.

Transmission and Life Cycle

In sheep, *Psoroptes ovis* mites live at the base of the fleece and feed on skin exudates. This organism spends its entire life cycle on one host; all stages – larvae, nymphs, and adults – feed on the host. The life cycle is approximately 11 to 19 days from egg to egg under optimal conditions, and adult mites can live for 40 days. *P. ovis* is highly contagious, and a single gravid female mite can establish an infestation. This mite is usually transmitted by direct contact between animals, but it can also be spread on fomites such as fences, chutes and trucks. Estimates of its survival in the environment vary from 5 days to 7 weeks under various conditions. One source suggests that while the mites may survive off the host for up to 31 to 38 days, they can infest animals only during the first 15 to 16 days. Survival appears to vary with

the temperature (the mites survive longer when it is cooler) and possibly with the variant/strain of the mite.

All infested animals do not necessarily develop symptoms; asymptomatic sheep can spread the infestation to other animals. After an infestation, the mites die out on some animals. In other cases, they can persist for up to two years on an apparently normal host, in crevices such as the inguinal and infraorbital fossae. Mites also persist in the ears of recovered sheep, but these mites produce little or no disease when they are transferred to the bodies of naive sheep, and previously, were said to have become *P. cuniculi* rather than *P. ovis*.

Incubation Period

The incubation period varies from a few weeks to several months in naturally infected sheep. Experimental infestations usually become apparent in 10 to 35 days, and are followed by the rapid expansion of lesions.

Clinical Signs

Mild cases and the early stages of more severe disease are characterized by serous exudates and small erythematous macules, with yellow/orange staining of the wool near the skin. These macules occur mainly on the shoulders and neck at first. As the disease progresses, large, yellowish, scaly, crusted lesions develop, primarily on the wooly areas of the body. The crusts are loosely adhered to the skin with a viscous fluid. The wool becomes loose and falls out in tufts, and extensive alopecia can develop. In areas of alopecia, the skin may be thickened and hyperkeratotic, with many small (5-20 mm diameter) abscesses. Colonies of deep brown mites may be visible in some cases. Sheep scab lesions can spread quickly to affect large areas of the body. The lesions are intensely pruritic, and secondary damage from scratching, rubbing and biting is common. Some affected sheep display a 'nibble' reflex without any external stimulation, and most affected sheep have this reflex when the scabs are touched. When they are touched, some animals may fall into recumbency, with opisthotonos and chewing fits that can last up to 10 minutes. Untreated animals usually have a decreased appetite and lose weight. They can become anemic and emaciated, and milk yield may be reduced. Pregnant animals tend to give birth to lambs that are smaller than usual, and perinatal mortality in these lambs can be high. Secondary bacterial infections also occur. In severe cases, animals may die from dehydration and secondary bacterial pneumonia or septicemia caused by general debilitation. Rapid weight loss and death may be seen in infested lambs.

Most adult animals eventually recover and the wool regrows. In some but not all animals, mites may persist in the ears, and subclinically in the inguinal and infraorbital fossae. In chronically infested flocks, mites in the ears can cause head shaking, rubbing and scratching, with a high incidence of aural hematomas and abscesses.

Occasionally, the mites continue to cause exuberant crusts and scales in an individual animal. This condition may be the result of a weak immune response to the mites; very active mite populations can be found under the crusts in these sheep.

Post Mortem Lesions

The diagnostic lesions are identical to those in live animals. Secondary bacterial infections may be the cause of death.

Morbidity and Mortality

Most outbreaks are seen in the autumn, when the mites become more active; mite populations tend to be small in the spring and summer. The morbidity rate is usually high. In some cases, the entire flock may be affected. However, susceptibility varies, and some individual sheep are highly resistant. Deaths occur mainly in lambs.

Severe psoroptic mange has been implicated as one factor in the near extermination of at least one population of bighorn sheep.

Diagnosis

Clinical

Sheep scab should be suspected in sheep with intensely pruritic, alopecic, crusted yellowish lesions. Early stages may be characterized by erythematous macules and staining of the wool. The first lesions usually occur on the shoulders, back and neck, but they can spread to involve much of the body.

Differential diagnosis

The differential diagnosis includes dermatophilosis (mycotic dermatitis), pediculosis (lice), ringworm, other forms of mange caused by *Chorioptes*, *Demodex*, *Psorergates ovis*, *Sarcoptes scabiei* or other mites, infestation with sheep keds, photosensitization from various causes, and fleece rot/canary stain caused by plunge-dipping in *Pseudomonas aeruginosa*-contaminated solutions. High tick burdens may also cause irritation and anemia. Other diseases such as sheep pox can also resemble sheep scab.

Laboratory tests

P. ovis infestations are diagnosed by microscopic examination of superficial skin scrapings. These scrapings should be taken from more than one area. A magnifying glass can be helpful for detecting areas of the lesions where mites occur. Scrapings are made with a sharp curette or scalpel, and should be taken from the edges of active lesions. The specimens are placed in closed glass tubes. Mites may be visible with a magnifying glass or the naked eye when the tube is warmed between the hands. Liquid paraffin can also be applied to the skin and the scrapings collected directly onto microscope slides. Diagnosis is more difficult when the mites are in low

numbers, such as during the incubation period, when animals are recovering, when the mites have been suppressed by acaricides, and when sheep are shorn.

Scrapings are usually enriched for mites by adding a 10% solution of potassium hydroxide (KOH); the sediment is placed on a slide and examined microscopically at 10x magnification. Adult *P. ovis* mites are identified by a three-segmented pedicle and funnel-shaped suckers on the first and second pair of legs. The mouthparts are pointed. For definitive identification, mites should be sent to a laboratory that specializes in the identification of arthropods. Genetic analysis may help determine the variant present.

Infested sheep develop antibodies to *P. ovis*. Serological tests such as ELISAs have been published and may eventually be developed for commercial use.

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease.

Although preliminary identification can be done in the field, mites should also be collected into 70% ethanol for examination by an entomologist. Photographs of the gross lesions submitted with the specimens are helpful.

Recommended actions if sheep scab is suspected

Notification of authorities

Sheep scab should be reported immediately upon diagnosis or suspicion of the disease. *P. ovis* in other species may or may not be reportable. In the U.S., psoroptic mange is a reportable disease in cattle.

Federal: Area Veterinarians in Charge (AVIC):

http://www.aphis.usda.gov/vs/area_offices.htm

State Veterinarians:

<http://www.aphis.usda.gov/vs/sregs/official.html>

Control

Sheep scab can be treated with injections of ivermectin, doramectin or moxidectin, or with acaricides administered as dips or sprays. Animals must be quarantined to prevent the spread of the mites. Transmission to wildlife must also be prevented.

In endemic areas, all sheep entering a farm that is free of sheep scab should be treated and isolated.

Public Health

Psoroptes ovis does not infest humans.

Internet Resources

The Merck Veterinary Manual

<http://www.merckvetmanual.com/mvm/index.jsp>

United States Animal Health Association.

Foreign Animal Diseases

<http://www.usaha.org/pubs/fad.pdf>

World Organization for Animal Health (OIE)

<http://www.oie.int>

OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals

http://www.oie.int/eng/normes/mmanual/a_summry.htm

OIE Terrestrial Animal Health Code

http://www.oie.int/eng/normes/mcode/A_summry.htm

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*Link defunct as of 2009