

Managing Ectoparasites on Sheep

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Sheep are an important component in Montana's agriculture. Proper identification of pests in addition to selecting and applying the correct insecticide will protect sheep from the negative effects of pest attacks. The information in this guide will assist in correctly determining the type of ectoparasite found on sheep and the appropriate method for control.

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SHEEP ARE AN IMPORTANT COMPONENT IN

Montana's agriculture. In 2010 Montana ranked fifth in the U.S. for lamb crop with 235,000 head, seventh for all sheep and lamb inventory and seventh for wool production with 2.2 million pounds. Several species of insects and related pests attack sheep and compromise their production and health. Proper identification of pests in addition to selecting and applying the correct insecticide will protect sheep from the negative effects of pest attacks. The information in this guide will assist in correctly determining the type of ectoparasite found on sheep and the appropriate method for control.

Sheep Ked

Identification and Field Biology

Sheep keds, *Melophagus ovinus*, are wingless flies that are often called sheep ticks by producers because of their resemblance to ticks. All species in this family are parasitic on birds or mammals and both sexes are blood feeders. The sheep ked is wingless throughout its entire life. Some species retain functional wings throughout their lives (pigeon louse fly) while others lose their wings once a suitable host has been located (deer ked). After mating, the female sheep ked produces a single egg that develops as a larva within the fly's uterus. When fully grown (seven to eight days), the larva is deposited and cemented to the wool and a red pupal case is formed around the larva. An adult ked will emerge in three to four weeks depending on temperature. An adult female ked can live for four to six months and produce up to 20 larvae.

Sheep keds spend their entire life on domestic sheep. They are transferred from animal to animal by direct contact. Ked populations fluctuate seasonally with highest numbers occurring in winter and spring and lowest in summer. Summer decline is attributed to an immune response by the sheep which interferes with blood feeding.

Damage and Economic Losses

Sheep keds have been reported to cause an 8 percent reduction in weight gains, 15 percent reduction in wool production and 30 percent reduction in value of sheep skins. The feeding by sheep keds causes dense, hard nodules to develop in the skin – a condition known as cockle. These nodules are not easily penetrated by dyes; they weaken and discolor the hide resulting in a downgrade in the leather. The quality of wool is also negatively affected due to sheep ked debris. There is no confirmed evidence that keds are vectors of any important diseases of sheep.

Management Strategies

Shearing Sheep ked populations can be reduced by approximately 75 percent by shearing prior to lambing. If ewes are not shorn prior to lambing, keds will move from the ewes and infest their lambs. The infested lambs, which will not be shorn until the following spring, can serve as a reservoir for reinfesting the flock.

Chemical Insecticides are available as a body spray, pour-on or dust for sheep ked control (Table 1). Treating sheep after shearing will give optimum ked control. Replacement animals and newly purchased breeding rams should be treated before they are brought into the flock. If possible after treatment, they should be isolated from the rest of the flock for a period of seven to 10 days to allow the insecticide to kill the adult keds. Field studies in Montana and Wyoming have demonstrated that water soluble insecticides such as Goat Lice Remover (Table 1) are superior to oil based insecticides for ked control because they travel more freely through the fleece.

Sheep Lice

Identification and Field Biology

Three species of lice can occur on sheep and goats: the African blue louse, *Linognathus africanus*, the sheep foot louse, *L. pedalis*, and the sheep biting louse, *Bovicola ovis*.

The sheep biting louse, while considered the number one louse problem on domestic sheep worldwide, is uncommon, if not absent, in the Rocky Mountain States.

The sheep foot louse is widely distributed in North America. Light infestations of this species occur as small colonies of lice between and around the accessory digits. In heavy infestations not only the legs support heavy numbers of lice but also the scrotum of rams. This louse is not considered very injurious since feeding occurs on the hairier parts of the sheep's body and the animal exhibits little discomfort.

The African blue louse is established in the southwestern and western U.S. where it has become a major pest of sheep. This is the only louse species of economic importance in Montana and Wyoming. Female lice are one-tenth inch in length and males are slightly smaller. Infestations in the winter can be found on the rib and shoulder areas of sheep. Lambs and yearlings are most susceptible to lice, with heaviest infestations occurring in these animals when they are under stress from poor nutrition or disease.

Damage and Economic Losses

Lice infestations are primarily responsible for downgrading wool quality. Biting lice feed on skin scurf, are very irritating and cause sheep to bite, pull their wool and rub against available objects. The wool becomes ragged, torn and may be completely removed in large patches. Sheep heavily infested with the African blue louse can have large patches of blood stained wool on the rib and shoulder areas.

Management Strategies

Sheep susceptibility to lice can vary among individuals within a flock, so only a few animals may appear to be infested. Because other animals may be carrying low levels of lice, it is recommended that all animals in a flock be treated. It is also important to treat replacement animals to prevent a new infestation from being introduced. For optimum lice control with spray and pour-on products, manufacturers recommend a second application 10 to 14 days after the first treatment. The pour-on insecticides listed in Table 1 are oil-based and may leave an oily residue on the wool. Insecticide dust can be applied by shaker can, dusting glove or mechanical dusting applicator.

Sheep Nose Bot

Identification and Field Biology

The sheep nose bot, *Oestrus ovis*, is a large, grayish fly (one-half inch in length) that deposits live larvae in the nostrils of sheep during the summer. Sheep react to the larva-laying by running or walking with their noses close to the ground or huddling in groups. Once deposited, the larvae migrate to the sinuses where they live on mucous of the nasal passages and sinuses. Larval development takes six to eight months to complete. In the spring, larvae migrate back down the

nasal passages, drop to the ground and pupate with the adult fly emerging from the pupa several weeks later. An external sign of a nose bot infestation is the appearance of a slightly to moderate runny nose which increases in severity as the infestation develops.

Damage and Economic Losses

Membranes of the nasal passages and sinuses are irritated by the presence and feeding of bot larvae. This may result in bacterial infections which can lead to pneumonia and death in severe cases. Lamb weight gain performance can be reduced by as much as 4 percent from nose bot infestations.

Management Strategies

Ivermectin is the only registered insecticide for control of the nose bot (Table 1). It can be applied with standard animal health drenching equipment.

Ticks

Identification and Field Biology

Although ticks are commonly thought of as insects, they are actually arachnids; a group which includes spiders, mites and scorpions. They can easily be distinguished from adult insects. All adult ticks have four pairs of legs, no antennae and two fused body parts (head and cephalothorax). Adult insects have three pairs of legs, one pair of antennae and three distinct body parts (head, thorax and abdomen). *Note: larval or seed ticks have three pairs of legs.*

Ticks that infest sheep are typically reddish-brown in color and have four distinct life stages: egg, larva, nymph and adult. A larval, or "seed tick", feeds on a small vertebrate host (e.g., mice, ground squirrels), then drops off the host and molts to the nymph. The eight-legged nymph attaches and feeds on a similarly sized host after which it drops to the ground and molts to the adult. The adult attaches to a third, larger host (e.g., dog, human, sheep), drops to the ground when feeding is complete, lays a batch of 1,000 to 5,000 eggs and then dies. When feeding occurs on a different host in each life stage, as in the example above, the pattern is termed a three-host life cycle. This is characteristic of more than 90 percent of the hard ticks. The time to complete an entire life cycle by a three-host tick is usually three years. Examples of three-host ticks in Montana include the Rocky Mountain wood tick, *Dermacentor andersoni*, and the American dog tick, *D. variabilis*. The winter tick, *D. albipictus*, completes development on one host and is categorized as a one-host tick.

Damage and Economic Losses

Tick feeding on sheep can damage the skin, resulting in buyers downgrading quality and market price of sheepskins. Feeding by the Rocky Mountain wood tick can cause paralysis in sheep when neurotoxins found in the tick's saliva are injected into the bloodstream while the tick is feeding.

The toxins produce paralytic symptoms within two to seven days following attachment, beginning with weakness in the hind legs and ending with total paralysis. These symptoms can be produced by as few as one female tick. Removal of the embedded tick usually results in resolution of symptoms within several hours to days. If the tick is not removed, the toxins can be fatal. The Rocky Mountain wood tick and American dog tick can transmit tularemia a bacterial pathogen that circulates between rabbits and sheep. The spinose ear tick, *Otobius megnini*, will attach and feed in the ears of sheep; secondary bacterial infections may occur at the tick feeding sites.

Management Strategies

Insecticides registered for use on sheep to control ticks are listed in Table 1. High pressure insecticidal sprays provide the best results. The spinose tick can be controlled by applying an insecticide directly into the ears.

Biting Midges (Culicoides)

Identification and Field Biology

Biting midges (Family: Ceratopogonidae) are usually less than 3 mm in length (they can fly through window screens). They are often referred to as “no-see-ums” because of their size. The primary species of importance in Montana is *Culicoides sonorensis*. After taking a blood meal, female midges develop a batch of eggs (up to 400 depending on the

size of the blood meal) that are deposited along the margin of a variety of aquatic environments including stock ponds, marshes, swamps, overflowing water tanks, etc. Three to four weeks are required for development from egg to adult. Adult midges are most abundant in close proximity to the production sites. When host-seeking, *Culicoides* adults are most active for a couple of hours after dusk and again prior to dawn. In Montana, this species overwinters as larvae in the moist substrate in aquatic environments.

Damage and Economic Losses

There are no economic loss data showing the impact biting midges have on sheep production. However, *C. sonorensis* is a vector of bluetongue and epizootic hemorrhagic disease. In a 2007 bluetongue epizootic in Wyoming and Montana, woolgrowers suffered substantial economic losses due to morbidity and mortality and from the resulting quarantine that prevented movement of sheep at the time lambs were usually sent to market (Miller et al. 2010. JAVMA. 237:955-959).

Management Approaches

One cultural approach is to find *Culicoides* production sites and drain them. However, in many instances this would be difficult if not impossible to achieve because of the abundance of these sites and environmental and economical consequences of draining aquatic habitats. Insecticides used as animal sprays for biting fly control may provide some reduction in biting midges (Table 1).

TABLE 1. Insecticides registered for controlling ectoparasites on sheep.

Insecticide	Application Method	Pest(s) Controlled	Restrictions and comments
Atroban 11% EC (11% permethrin)	Animal spray	Keds, lice, ticks, biting flies ²	Spray to thoroughly wet animal.
GardStar 40% EC (40% permethrin)	Animal spray	Keds, lice ticks, biting flies	Spray midline to tailhead until wet. Do not let runoff occur.
Goat Lice Remover/Barn and Premise Spray (8.5% permethrin + 4.25% PBO ¹)	Animal spray pour-on	Keds, lice ticks, biting flies	Apply as pour-on down midline of back.
Ivomec, Privermectin (0.08% ivermectin)	Oral drench	Nasal bots	Product formulated specifically for use in sheep only.
Permethrin 1% (1% permethrin)	Pour-on	Keds	Apply as pour-on down midline of back.
Permethrin CDS (7.4% permethrin + 7.4% PBO ¹)	Pour-on	Keds, lice	Apply as pour-on down midline of back.
Prozap Insectrin X (10% permethrin)	Animal spray	Lice, ticks, biting flies	Spray to thoroughly wet animal.
Python Dust (0.075% zeta-cypermethrin + 0.15% PBO ¹)	Dust	Keds, lice ticks, biting flies	Apply by hand or shaker can evenly over the back.

¹ Piperonyl butoxide

² Biting flies include midges, black flies, mosquitoes

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Black Flies

Identification and Field Biology

Black flies (Family: Simuliidae) are small (one-quarter inch in length), black to yellowish flies with an arched or “humpbacked” thorax (back). Because of the pronounced thorax, they are frequently called buffalo gnats. About two-thirds of the black fly species feed on mammal blood and the other third feed on birds. Black flies are associated with moving water in streams, creeks, irrigation ditches, and rivers. Eggs are deposited in layers or irregular strings on the surface of objects (stones, logs, submerged vegetation) that are kept wet by moving water or they are deposited directly in

the water. Larvae attach to stones, branches, grass or other debris in swift-flowing water. Larval and pupal development can take from several weeks to a couple of years depending on the species, water temperature, larval nutrition, etc. Prior to emergence, the newly formed adult splits the pupal case and rises to the surface in an air bubble. Adult flies generally live three to four weeks. They are daytime feeders and usually attack thinly haired regions on the animal (around the eyes, in the ears, on the muzzle or belly). Black flies are exophilic (i.e., they will not enter buildings to feed or rest).

Damage and Economic Losses

Swarms of black flies can cause sheep to bunch up and refuse to feed or move to water. Annoyance of livestock under attack is evident, particularly by those that fly around the head attempting to land and feed. Their bites are irritating and can result in lesions that can persist for days to months. When feeding is intense, scabbing can occur. Black flies are not known to transmit any diseases to sheep. Severe infestations have resulted in death due to resulting toxemia and anaphylactic shock.

Management Approaches

In certain situations, housing sheep inside barns or stables may reduce black fly attacks because they are exophilic. Insecticides used as animal sprays for biting fly control may provide some control of black flies (Table 1).

Mosquitoes

Identification and Field Biology

Approximately 50 species of mosquitoes occur in Montana. Adult females of these species feed on blood from a variety of birds and mammals, while the males feed on plant nectar. Adult mosquitoes are slender, with thin legs and narrow, elongate wings. Their wings and body are covered with scales forming characteristic patterns and colors that are used for identification. The long, slender proboscis which houses the mouthparts is also distinctive.

Mosquitoes can be categorized as floodwater or standing water species. Floodwater species deposit their eggs singly in depressions on moist soil that will eventually be flooded by rainfall or snowmelt. Species in this group overwinter in the egg stage. Standing water species deposit eggs on the surface of permanent or temporary pools of water. The eggs adhere to one another and collectively form a “raft” of eggs that floats on the surface until they hatch. Mosquitoes have four larval stages, collectively known as wigglers, and a pupal stage, often called a tumbler. Larvae feed on microorganisms in the water and usually require seven to 14 days to complete larval development. The pupal stage is non-feeding and requires several days to complete. Newly emerged adults are ready for mating and a blood meal shortly after emergence.

Damage and Economic Losses

Large swarms of mosquitoes can cause livestock to bunch together which disrupts grazing, pasture utilization and creates heat stress among the animals. Behavior modifications such as these often result in decreased weight gains and lower milk production, which results in lower weaning weights. Among the many pathogens mosquitoes transmit to their hosts, they are particularly efficient vectors of encephalitic viruses. The pathogens transmitted by mosquitoes in Montana are usually asymptomatic in sheep.

Management Approaches

Eliminating or modifying the water sources that produce mosquitoes is a very effective, sustainable control tactic. In some instances, water can be drained from sites that produce mosquito larvae. Low areas that collect rainwater or snow melt can be filled. Other sites such as unused water tanks, discarded tires and containers that are filled or collect water (e.g., bird baths, wading pools) can be periodically dumped to interrupt the mosquito life cycle. However, this is not always feasible, nor desirable, especially in wetlands. Moving sheep away from mosquito infested areas or placing them in shelters in the evening when most mosquito species are active has been suggested. Insecticides used as animal sprays for biting fly control may provide some control of mosquitoes (Table 1).



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