

External Parasites of Goats

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Introduction

Arthropod pests limit production in the goat industry in many ways. External parasites feed on body tissue such as blood, skin, and hair. The wounds and skin irritation produced by these parasites result in discomfort and irritation to the animal. Parasites can transmit diseases from sick to healthy animals. They can reduce weight gains and milk production. In general, infested livestock cannot be efficiently managed.

Lice

Lice (Order: *Phthiraptera*) are wingless, flattened, permanent ectoparasites of birds and mammals. The development of lice is slightly different when compared to other external parasites. Lice go through incomplete development where the immatures are known as nymphs and look similar to adults (Figure 1). Over 3,000 species of lice have been described, mainly parasites of birds. Lice infest a wide range of domestic livestock, including pigs, cattle, goats, and sheep, and cause a chronic dermatitis (pediculosis), characterized by constant irritation, itching, rubbing, and biting of the hair or fleece. Goat lice

are host specific and only attack goats and their close relatives such as sheep.

Lice are divided into two main groups: the Anoplura (sucking lice) and Mallophaga (chewing or biting lice). Biting lice have chewing mouthparts and feed on particles of hair, scab, and skin exudations. Sucking lice pierce the host's skin and draw blood. Louse-infested animals may be recognized by their dull, matted coat or excessive scratching and grooming behavior. The irritation from louse feeding causes animals to rub and scratch, causing raw areas on the skin or loss of hair. Weight loss may occur as a result of nervousness and decreased nutrition status in the animal. Milk production is reduced up to 25%. Also, the host is often listless and in severe cases, loss of blood to sucking lice can lead to anemia.

Lice are most often introduced to herds by bringing in infested animals and spread from one animal to another by contact. Transmission from herd to herd is usually accomplished by transportation of infested animals, although some lice may move from place to place by clinging to flies.

Goat lice can be controlled by both production practices and chemical intervention. Providing a high-energy diet can be an effective louse control strategy. If possible, it is important to keep animals in uncrowded conditions and to spot treat or quarantine any infested individuals until they have been successfully deloused. Most louse populations on animals vary seasonally, depending on the condition of the host. Louse populations on livestock are typically greater during the winter months and reach peak activity in late winter and early spring. Animals under stress will usually support larger louse populations than found under normal conditions. Insecticides are usually best applied in late fall. Control of louse infestations is needed whenever an animal scratches and rubs to excess. Louse control is difficult with just a single insecticide application since the drug will not kill the louse eggs. A second application is needed 2 weeks after the initial treatment to allow the eggs to hatch.

There are three principle species of biting lice and sucking lice that can attack goats.

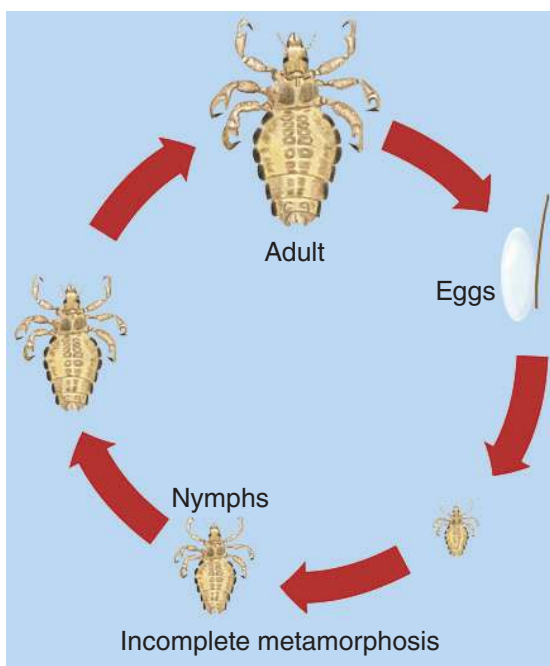


Figure 1. Illustration of an incomplete lice life cycle.
Illustration by K. Williams.



Figure 2. Goat biting louse, *Bovicola caprae* (left), Angora goat biting louse, *B. crassipes* (center), and *B. limbata* (right).

Credits: K.C. Emerson Entomology Museum, Stillwater, Oklahoma and <http://www.ento.csiro.au>.

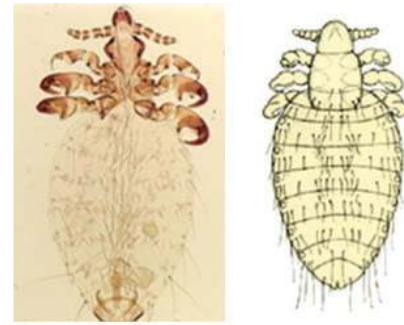


Figure 3. Goat sucking louse, *Linognathus stenopsis* (left), African goat louse, *L. africanus* (center), and sheep foot louse, *L. pedalis* (right).

Credits: K.C. Emerson Entomology Museum, Stillwater, Oklahoma and <http://www.ento.csiro.au>.

Biting lice

The goat biting louse (*Bovicola caprae*), Angora goat biting louse (*B. crassipes*), and *B. limbata* are the three main species that can be found on goats (Figure 2). All three species live on the skin surface and feed on hair, skin, and detritus. Eggs hatch in 9 to 12 days and, on average, the entire life cycle is completed in 1 month. Biting lice of goats are distributed worldwide with winter populations being the most severe. Optimal control can be achieved with a residual insecticide spray with retreatment 2 weeks after the initial treatment.

Sucking lice

Three species of blood-sucking lice are found on goats: the goat sucking louse (*Linognathus stenopsis*), African goat louse (*L. africanus*), and sheep foot louse (*L. pedalis*) (Figure 3). The goat sucking louse can be dispersed over the entire body of goats and the African goat louse is usually dispersed around the head, body, and neck regions. Both the goat sucking louse and the African goat louse are bluish-gray in appearance. The sheep foot louse is an occasional pest of goats and can be found on the feet or legs of the animal. These blood-feeding lice species cause the most severe damage. Excessive feeding causes scabby, bleeding areas that may lead to bacterial infection. Mohair on Angora goats may be damaged to the extent of reduction in value of 10 to 25%. Control can be obtained utilizing the same methods described for biting lice.

Nose Bot Fly

The nose bot fly exhibits a unique quality by depositing live larvae (maggots) (Figure 4), not eggs as in the case of other fly species, in the nostrils of goats. Larvae migrate to the head sinuses and, after development, migrate back down the nasal passages, dropping to the ground where they complete development. Migration of the bot larvae to and from the head sinuses causes nasal membranes to become irritated and secondary infections can occur at the irritation sites.

Infested animals exhibit symptoms such as discharge from nostrils, extensive shaking of the head, loss of appetite, and grating of teeth. Another sign of a nose bot infestation is the presence of blood flecks in the nasal discharge. The behavior of goats in the presence of adult

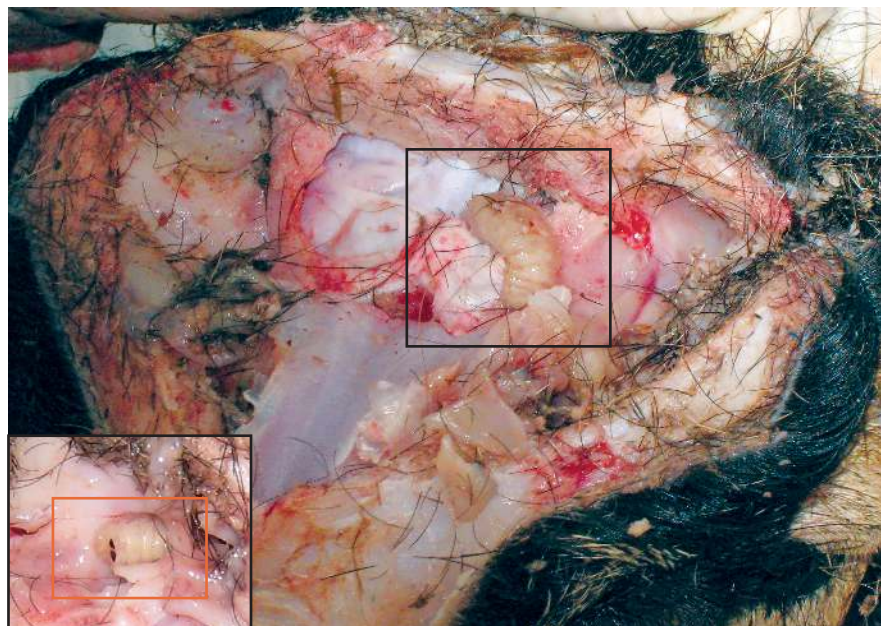


Figure 4. Nose bot (inset and outlined with square) inside the nasal passage of a goat.

Credit: Langston University.

bot flies is very excitatory and usually animals will snort with their noses towards the ground.

Ivermectin is highly effective against all stages of the larvae. Other drugs reported to be effective include eprinomectin and doramectin. In the U.S., these drugs or recommended routes of administration may constitute extra-label use, requiring a valid veterinary-client-patient relationship and an appropriate withdrawal period for slaughter purposes. Nose bots are usually a winter problem so treatment should be administered after the first hard frost, which kills the larvae internally and reduces the risk of adult flies from laying eggs for later reinfestations.

Keds

Keds, more often called sheep ticks, are actually a wingless fly (Figure 5). They spend their entire life cycle on sheep or goats, transferring between animals by contact. Sheep keds, *Melophagus ovinus*, are primarily a pest of sheep, but occasionally are found on goats. Adults are grayish-brown, 6-legged, and ¼-inch long with a broad, leathery, somewhat flattened, unsegmented, saclike abdomen covered with short spiny hairs. Sheep keds can live up to 6 months, during which time the female produces around 10 to 15 young at the rate of 1 every 8 days. Reproduction is continuous, though slow during the winter, producing several generations per year.

Unlike most insects, the female sheep ked gives birth to living maggots which are nourished within her body until they are fully grown. The maggots are ¼-inch long, whitish, oval, and without legs. The skin turns brown within a few hours after birth and forms a hard puparium (case) around the larva. These cases are often called eggs, nits, or keds. Adult keds emerge from the pupal cases in 2 to 5 weeks, depending on temperature. They crawl over the skin and feed by inserting their sharp mouthparts into capillaries and sucking blood, much like a mosquito. This feeding results in considerable irritation causing the animal to rub, bite, and scratch. Another effect observed from animals infested with keds is the condition known as “cockle.” Hide buyers downgrade skins with cockle because it weakens the hide and discolors them.

Keds usually do not cause great damage if the animal is fed a highly nutritious diet, but goats grazed throughout the year on pasture or range may acquire heavy burdens of keds during winter months and early spring. In addition, keds in large numbers



Figure 5. Adult sheep ked, *Melophagus ovis*.

Credit: Ken Gray, Oregon State University

can cause anemia, which can weaken the animal and make it more susceptible to other diseases.

Sprays, dips, and hand-dusting with insecticides are all effective methods for controlling sheep ked.

Mites

Goats can be infested by several species of mites, but the species more commonly found on goats are goat follicle mite (*Demodex caprae*), scabies mite (*Sarcoptes scabiei*), psoroptic ear mite (*Psoroptes cuniculi*), and chorioptic scab mite (*Chorioptes bovis*) (Figure 6).

The goat follicle mite causes dermal papules and nodules and this resulting condition is known as demodectic mange in goats. These papules or nodules are caused by hair follicles or gland ducts becoming obstructed and swelling, trapping the mites within these lesions. These continue to enlarge as the mites multiply, sometimes reaching several thousand mites per lesion. Cases of demodectic mange occur most commonly in young animals, pregnant does, and dairy goats. Papules usually appear on the face, neck, axillary region (armpit region), or udder and these papules can enlarge to 4 cm in diameter as mites multiply. Nodules can rupture and exude the mites, resulting in transmission of the mite to other animals. Transmission of the goat follicle mite

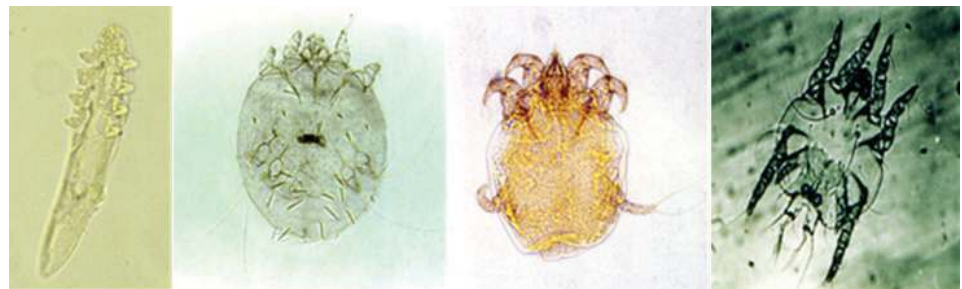


Figure 6. Left to right, goat follicle mite, (*Demodex caprae*), scabies mite (*Sarcoptes scabiei*), psoroptic ear mite (*Psoroptes cuniculi*), and chorioptic scab mite (*Chorioptes bovis*).

Credits: S.J. Upton, Kansas State University and Thomas Nolan, University of Pennsylvania.

to newborn goats typically occurs within the first day following birth. Other possible means of transfer are licking and close contact during mingling or mating. Certain breeds of goat (e.g., Saanen) tend to be much more sensitive to demodectic mange than others.

The scabies mite burrows into the skin of its host causing varying degrees of dermatitis, a condition known as sarcoptic mange. Although cases of sarcoptic mange in goats often resolve themselves without developing severe signs, heavily infested goats may exhibit crusty lesions and extensive hair loss around the muzzle, eyes, and ears; lesions on the inner thighs extending to the hocks, brisket, underside, and axillary region; dermal thickening and wrinkling on the scrotum and ears; and dry, scaly skin on all parts of the body, especially in areas of hair loss.

The psoroptic ear mite or ear mange mite causes lesions on or in the ear of the host animal. These lesions cause crust formation, foul odor discharges in the external ear canal, and behavioral responses such as scratching the ears, head shaking, loss of equilibrium, and spasmodic contractions of neck muscles. The psoroptic ear mite lives its entire life under the margins of scabs formed at infested sites. There the eggs are deposited and hatch in 4 days. The complete life cycle takes about 3 weeks. All stages of this nonburrowing mite pierce the outer skin layer. Transmission of this mite occurs between animals by direct contact. Prevalence rates as high as 90% have been reported in dairy goats, including both kids and adults, in the U.S. Young goats, usually less than 1 year old, generally exhibit higher infestation rates than do older animals. Signs of the psoroptic ear mite in kids are often observed as early as 3 weeks after birth, reflecting transfer of mites from mother to young. By 6 weeks of age most kids in infested goat herds are likely to harbor these mites. Chronic infestations have led to anemia and weight loss in goats.

The chorioptic scab mite causes chorioptic mange in domestic animals, especially in cattle, sheep, goats, and horses. This mite occurs primarily on the legs and feet of its hosts, where all of the developmental stages are likely to be found. Eggs are deposited singly at the rate of one egg per day and are attached with a sticky substance to the host's skin. Adult females usually live for 2 weeks or more, producing about 14 to 20 eggs during this time. Eggs hatch in 4 days and are often clustered as multiple females lay their eggs in common sites. The immature stages last anywhere from 11 to 14 days and the entire life cycle is completed in 3 weeks. Infestations of chorioptic scab mite tend to be higher in goats than in sheep, with up to 80 to 90% of goats in individual herds being parasitized. The mites occur most commonly on the forefeet of goats, where the largest numbers of mites

and lesions are usually associated with the accessory claws. However, they also can occur higher on the foot. Lesions are generally mild and seldom draw attention.

Treatment and control of mites should focus on all animals in a herd to achieve control. Delayed egg hatch requires retreatment at 10 to 12 days. To reduce the risk of introducing mites into herds, check new animals for signs of mange during their quarantine period.

Fleas

Adult fleas are small (1 to 8 mm), wingless insects that are narrow and are compressed on the sides with spines (combs) directed backwards. Most species move a great deal and remain on the host only part of the time to obtain a blood meal. The legs are well developed and are utilized to jump great distances (7 to 8 inches).

Fleas develop through a complete life cycle with four stages: egg, larva, pupa, and adult. Under ideal conditions, a generation can be completed in as little as 2 weeks. Mating takes place and eggs are laid on the host. Eggs then drop off the host to the ground or bedding material



Figure 7. Cat flea, *Ctenocephalides felis*, (left) and sticktight flea, *Echidnophaga gallinacea*, (right).

Credits: Domingo Zungri Courtesy of Bugguide.net and Pest and Diseases Image Library, Bugwood.org, courtesy of University of Georgia.

and hatch in 2 days but can delay hatching up to several weeks. Development of the larval and pupal stages occurs in the host's bedding material. Larvae are very small, worm-like, legless insects with chewing mouthparts. In several weeks they go through three larval stages, feeding on organic material. The pupal stage lasts approximately 1 week and then the newly emerged adult flea is ready to feed on blood within 24 hours.

There are two flea species that commonly infest goats: the cat flea (*Ctenocephalides felis*) and the sticktight flea (*Echidnophaga gallinacea*) (Figure 7). Female cat fleas can lay up to 25 eggs per day for a month, contributing to very high densities of fleas in a relatively short time. Cases of severe anemia associated with high numbers of cat flea bites have been reported in domestic animals. The sticktight flea attaches firmly to its host usually around the face and ears. This species remains attached to its host for as long as 2 to 3 weeks. Large populations



Figure 8. Female (left) and male (right) American Dog tick, *Dermacentor variabilis*.

Credit: R. Grantham; Oklahoma State University.



Figure 10. Female (left) and male (right) Gulf Coast tick, *Amblyomma maculatum*.

Credit: R. Grantham; Oklahoma State University.

of this flea may cause ulcers on the head and ears. Both of these flea species can easily spread to other animals so special considerations of monitoring herd dogs should be implemented if fleas become a problem in a goat herd.

Ticks

Ticks bite their hosts causing injuries that result in blood loss and transmission of disease pathogens. Ticks can be classified in three groups: one-host, two-host, and three-host ticks. Ticks that commonly parasitize goats mainly belong to the three-host group. As the name implies, three-host ticks infest three different hosts throughout their life cycle, which can make control difficult.

While ticks are not commonly found on goats, there are four species of ticks that have been documented to parasitize goats: Rocky Mountain Wood tick (*Dermacentor andersoni*), American Dog tick (*Dermacentor variabilis*), Gulf Coast tick (*Amblyomma maculatum*), and Lone Star tick (*Amblyomma americanum*).

The adult American Dog tick can be identified by its reddish-brown color with silver-white markings on the back and upper body regions (Figure 8). The silver-white markings are on the scutum (u-shaped area behind the

mouthparts) in females and on the male they extend over the whole back. Females increase in size dramatically when fully engorged (from $\frac{1}{4}$ to $\frac{1}{2}$ inch), resembling a gray bean.

The Rocky Mountain Wood tick (Figure 9) is an important pest of goats because it can cause tick paralysis and transmit pathogens. Adult ticks feed primarily on large mammals. Larvae and nymphs feed on small rodents. This tick is primarily located in the Rocky Mountain states and is usually found in elevations above 5,000 feet. This tick is similar in appearance to the American Dog tick and is generally brown or reddish-brown in color with the females having a distinct dorsal silver-gray decoration.

The Gulf Coast tick is most commonly found on goats with horns and more specifically at the base of the horns. Occasionally, some Gulf Coast ticks are found in the ears of the animals. The Gulf Coast tick is reddish-brown with pale reticulations (Figure 10) and appears very similar to, but slightly smaller than, the American Dog tick. The Gulf Coast tick has longer mouthparts than the American Dog tick. The Gulf Coast tick is considered a presumed vector of *Ehrlichia ruminantium*, the rickettsial causative agent of heartwater, an African disease of ruminants that could enter the U.S. from the Caribbean.

Lone Star ticks are more commonly found along the withers and neck areas of goats. Occasionally, they can be found on the head and armpit regions. Adult females can be easily identified by the single lone spot on their back (Figure 11). Adult males have non-connecting white markings



Figure 9. Female (left) and male (right) adult Rocky Mountain Wood tick, *Dermacentor andersoni*.

Credit: James Gathany, CDC.



Figure 11. Female (left) and male (right) Lone Star tick, *Amblyomma americanum*.
Credit: R. Grantham; Oklahoma State University.

along the posterior margin. This tick has much longer mouthparts when compared to the previously mentioned ticks. Research has shown that goats can serve as reservoirs of *Ehrlichia chaffeensis*, which is the bacterial agent responsible for human monocytic ehrlichiosis and the primary vector is the Lone Star tick. Care should be taken when handling goats that are heavily infested with Lone Star ticks.

All of the tick species previously described can be found on goats and utilize multiple hosts which can complicate control since each life stage can parasitize different animals. A seasonal cycle of these ticks indicates that Gulf Coast ticks begin to parasitize goats in early spring with the latest occurrence observed in mid-summer. The American Dog tick and Lone Star tick are observed on goats throughout summer months. Targeted insecticide applications should control all of these tick species, but reapplication may be warranted 3 weeks later. Currently, there are very few insecticides registered for goats so extreme vigilance should be taken when selecting products to treat your goats. Consult your veterinarian for appropriate products and instructions for potential off-label use.

Flies

Flies go through complete metamorphosis comprising eggs, larvae, pupae, and adults (Figure 12) with each life stage occupying different habitats. Flies that are particularly troublesome to goats include horn fly, stable fly, horse fly, house fly, blow fly, mosquitoes, and black fly. These flies can be severely annoying and may affect the performance of goats. They hinder grazing and cause goats to bunch or run to get relief from the annoyance of these flies. Biting or blood-sucking flies can cause painful bites and significant irritation to goats.

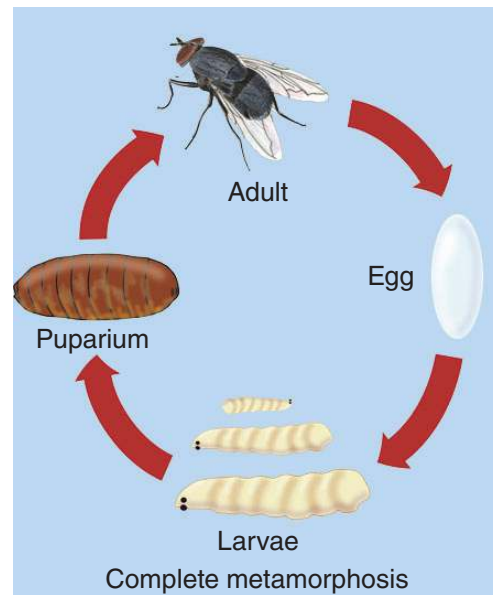


Figure 12. Illustration of a fly life cycle.
Illustration by K. Williams.

Biting flies Horn flies

Horn flies (Figure 13) are primarily a pest of cattle but are occasionally seen on goats especially when goats are co-grazing a pasture with cattle. Both male and female horn flies take blood from the host and feed from 20 to 30 times a day. Horn flies continually stay on the animal and only leave the animal for short periods to lay eggs. Typical feeding areas on goats include the back, side, belly, and legs. Horn fly populations begin building up in the spring and last until the first frost.

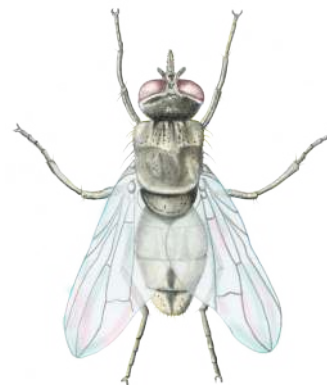


Figure 13. Adult horn fly, *Haematobia irritans*, approximately 4 mm in length.
Illustration by K. Williams.

Stable flies

Stable flies (Figure 14) are medium-sized flies that resemble house flies. Stable flies feed on goats with their head up, and prefer to stay on the feet and legs of goats. Both male and female stable flies take blood from the host



Figure 14. Adult stable fly, *Stomoxys calcitrans*.

Credit: Dan Brown, Kansas State University.

and have a very painful bite. Large populations of stable flies on pastured goats often cause goats to bunch and mill around. Stable fly larvae develop in moist decaying organic matter associated with spilled feed, soiled hay, or straw bedding. They particularly like areas where hay bales were fed and the hay is trampled into the ground by feeding goats. Stable flies are more of a problem around barns or loafing sheds where there is an abundant resource of decaying organic matter for them to develop as well as vertical resting sites such as the sunny sides of barns or sheds.

Horse flies and deer flies

There are many species of horse and deer flies in the U.S. (Figure 15). Seven or eight species can be considered significant pests depending on the location. Horse flies vary in size from ½ to 1½ inches or longer. Female horse flies are vicious biters, and peak populations of

one species or another occur throughout the summer months. Male horse flies do not bite. Horse and deer flies generally only complete one generation per year. Many horse flies lay their eggs around the edges of ponds and their larvae develop in the moist mud along the perimeter of the pond, making control in the larval stage impossible. Some of the most important species lay their eggs in the soil under thick layers of leaves in heavily timbered areas. Larvae develop in the soil. Adult horse and deer flies prefer feeding on the legs and backs of animals. Heavy populations of adult horse flies can cause economic losses, but generally controlling them in a cost-effective manner is not possible. Because the female horse fly is only on the animal for a few minutes while taking a blood meal, it is difficult to get enough pesticide on the animal to deter the fly from feeding. The flies may receive enough pesticide to kill them after they leave the animal, but this is difficult to determine. Because horse flies are continually emerging throughout the summer and many species have an extensive flight range there will be flies on goats regardless of whether or not a pesticide treatment has eliminated some of the population. Horse flies are repelled by some pesticides just after spraying the animal, but this is not a practical method of protection. Recently, traps have been promoted to trap out populations of horse flies, but these traps are expensive and numerous traps are required in order to reduce horse flies in a relatively small area.

Mosquitoes and black flies

Certain species of mosquitoes and black fly species will feed on goats, but are normally not present in high enough populations for a long enough period to cause significant damage. Both of these groups of insects are most prevalent in the spring. Black fly immature stages develop only in running water in streams or rivers. Large populations sometimes occur in late spring and into early summer. Mosquito larvae develop in standing water and pest populations on goats are most often associated with water that results from flooding or heavy rainfall and that remains for 7 to 10 days. Large populations sometimes occur in pasture areas that hold temporary pools of water. The primary threat from mosquitoes is their ability to transmit disease.

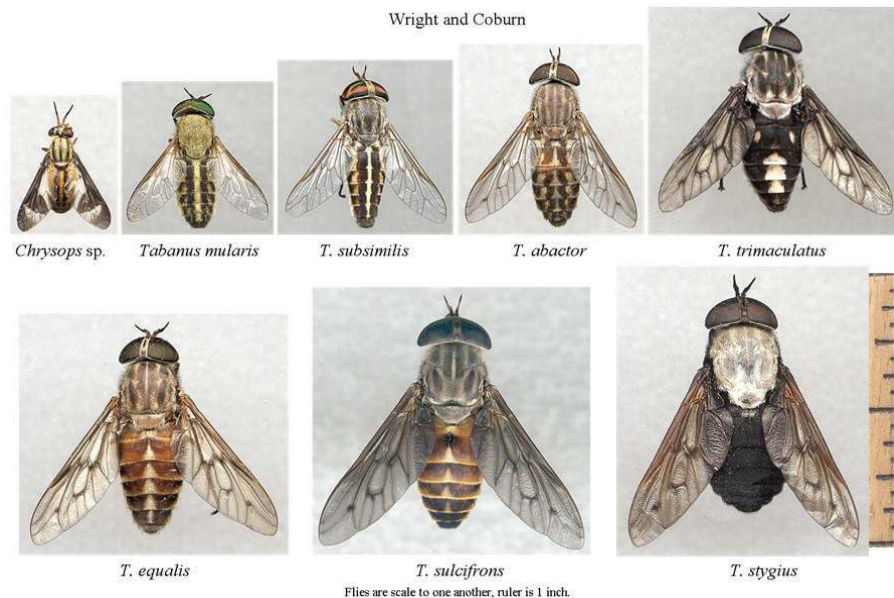


Figure 15. Common horse and deer flies found around livestock.
Credit: R. Wright, L. Coburn and R. Grantham, Oklahoma State University.

Nuisance flies

House flies

House flies (Figure 16) do not bite goats, as they only possess sponging mouthparts. However, they may cause extreme annoyance to animals when present in large numbers. House flies tend to aggregate on specific areas of the animal and can be severe nuisance pests of confined animals, especially goat kids. They often aggregate around the eyes and mouth because of the moisture secreted by the animal. House fly larvae develop in moist decaying



Figure 16. Adult house fly, *Musca domestica*.

Credit: Jim Kalisch, University of Nebraska-Lincoln.

organic matter, especially accumulated manure, rotting feed, and garbage. House flies will utilize areas associated with spilled feed and hay to lay eggs similar to the life cycle of stable flies. House flies are not often

pests of pastured goats unless such goats frequent loafing sheds. Good sanitation around barns is the best method of house fly control. Sprays inside buildings, referred to as premises sprays, can also be utilized to control adult house flies. Premises sprays can be sprayed on the surface areas inside of barns and the flies will contact the insecticide residue when they rest on these surfaces. Automated mist blowers can be used in barns to apply space sprays which will kill adult flies. Commercial baits can also be used to attract house flies to bait containing a pesticide. Baits typically attract only house flies and do not provide control for other fly species.

Blow flies

Blow flies are similar to house flies and do not bite goats but cause significant annoyance to the animals and animal operators. They tend to aggregate on animals with wounds or skin infections. Blow fly larvae develop in decaying organic matter and in decomposing dead animals. The primary source of blow fly attraction to animals is bacterial activity on the animal. Sanitation around barns is the best method of preventing a blow fly population from becoming significant. Special care should be taken during kidding season to clean up afterbirth since this is highly attractive to blow fly populations.

Fly control

A significant portion of fly problems around livestock buildings can be alleviated through sanitation and proper manure management leading to the elimination of larval habitat or modifying it in such a way as to make it

unsuitable for fly production. Regular removal of bedding material and spilled feed is a good measure to prevent fly populations from becoming significant.

In combination with a good sanitation program is the utilization of fly parasitoids sometimes known as 'fly predators.' Several companies produce and market these to livestock operators and they can be cost-effective when used properly. These parasitoids are small wasps that target fly pupae and kill the fly by laying their eggs inside the fly pupae. Proper dissemination of these fly predators is critical to preventing a fly outbreak and the best practice is releasing them before fly populations become noteworthy. Also, if fly parasitoids are utilized then limited insecticides should be used since these are insects just like the flies they are killing.

Insecticide-based control may be necessary when flies become extensive around goat operations. The only products approved for on-animal application to goats are permethrin or pyrethroid based products with best results from synergized pyrethroid products containing piperonyl butoxide (PBO).

For treating barns and surfaces, goat operators have more options using products sometimes referred to as premises sprays. The best option for a premises spray is to use a residual spray that will remain effective for some length of time as compared to a non-residual product such as pyrethrum. When applying residual sprays be sure to treat vertical fly resting sites such as barn walls and make sure the surface is not wet or greasy when applying the product. Recently, more livestock operators that house animals in barns for the majority of the time are utilizing automated mist systems. These systems can be effective but care should be taken not to over-apply products, especially when animal feed or hay is present. Also, the overuse of these systems can lead to insecticide resistance and goat operators using these systems should set them to be active when the flies are active.

Summary

A comprehensive management plan for external parasites on goats will be variable and unique to individual goat operations. The key to a successful parasite management program is continual monitoring of the herd. A summary (Table 1) of recommended practices for each pest complex is given with peak seasonality for each pest on goats. The combined approach of an integrated pest management program is the most economical and environmentally sound tactic. The overall goal of a sound external parasite program is to manage the pests in a manner that reduces stress to the animals as well as reducing the risk of pathogen transmission from the parasites.

Table 1. Recommended practices for external parasite control

Pest	Season	Herd Management	Sanitation Practice	Insecticide Practice
Lice	Late-fall through late-spring.	Isolate new animals away from the herd for at least 2 weeks.	None.	Apply approved product and re-apply after 10 days.
Nose Bot Fly	Adults: spring and summer. Bots: fall through spring.	Look for unthrifty animals with blood flecks within the nasal discharge.	None.	Consult with your veterinarian for proper application of products.
Keds	Fall and winter.	Isolate new animals away from the herd until a thorough examination of the animals can be conducted.	None.	Apply approved products with at least 50 psi and only treat 5 -10 animals at a time.
Mites	Late fall through late-spring.	Isolate new animals away from the herd for at least 2 weeks.	None.	Apply approved product and re-apply after 10 days.
Fleas	Spring and summer.	Isolate new animals away from the herd for at least 2 weeks and monitor herd dogs.	None.	Apply approved products and only treat 5 -10 animals at a time; apply spot-on products to the herd dogs.
Ticks	Spring and summer but occasionally certain ticks will be present during the winter.	Isolate new animals away from the herd until a thorough examination of the animals can be conducted; monitor herds in wooded areas with tall grass more frequently.	Keep vegetation cut short around barn areas.	Apply approved products and only treat 5 -10 animals at a time.
Flies	Spring through fall.	Monitor animals for fly activity especially mid-morning during the late-spring and summer months.	Clean out bedding regularly, keep weeds cut down, drain standing water, and maintain a manure management program.	Apply approved products and only treat 5 -10 animals at a time. Do not treat animals if significant moisture is present (i.e., heavy dew). Apply approved premise sprays to barn walls, fencing, and other fly resting places.

