Category B: Agricultural Animal Pest Control

Agricultural Animal Pest Control Learning Objectives

THIS CATEGORY IS PART OF THE GENERAL KNOWLEDGE REQUIRED FOR THE GENERAL EXAM FOR PRIVATE CERTIFIED APPLICATORS. NON-PRIVATE CERTIFIED APPLICATORS MAY BE CERTIFIED IN THIS CATEGORY BY TAKING A SEPARATE CATEGORY EXAM.

After studying this section, you should be able to:

- ✓ **Describe Integrated Pest Management (IPM) as it applies to agricultural pest control on animals.**
- ✓ **Describe pesticide safety around animals.**
- ✓ **Explain the difference between ectoparasites and endoparasites.**
- ✓ **Describe some of the most common insect pests of livestock and the different measures that can be used for control.**
- ✓ **Describe the use of contraceptives in wild and feral horses and burros.**

Category B, Agricultural Animal Pest Control

Category B, Agricultural Animal Pest Control, is the category that covers pest control of both internal and external parasites in livestock. Livestock includes cattle, sheep, goats, swine and poultry. Livestock production concentrates groups of animals close together. This can provide ideal conditions for the development and expansion of insect parasites.

Livestock production is a business. Pesticides cost money and time, and their use can reduce profits. Pesticides can have serious consequences if applied improperly. They can harm non-target insects, beneficial insects, wildlife, pets, livestock and humans. Pest management in livestock production is further complicated by the end use of the animals. The products the animals

Category B, Agricultural Animal Pest Control covers the pest control of both internal and external parasites in livestock.

Principles of IPM:

- **Identify the pest.**
- **Monitor the pest population.**
- **Establish an action threshold.**
- **Evaluate control options.**
- **Implement control tactics.**
- **Monitor results.**

If chemical controls are required, rotate pesticides. Use products with different modes of action to reduce the risk of developing pesticide resistance.

produce, such as milk, eggs and fiber, will be used or consumed by humans, as will the animals themselves. Thoughtful planning and implementation are required to minimize unintended damage, reduce costs and maximize profit.

Additionally, this category provides the certification required for those wishing to use contraceptives on wild and feral horses and burros. The exam for this category will include reading a contraceptive label and answering questions on the label.

2021 changes to the certification categories require all PRIVATE Certified Applicators to be tested on both Category A, Agricultural Plant Pest Control and Category B, Agricultural Animal Pest Control as part of the general knowledge exam. For NON-PRIVATE Certified Applicators, Category A, Agricultural Plant Pest Control and Category B, Agricultural Animal Pest Control remain certification categories, with each requiring a separate category exam.

Integrated Pest Management (IPM)

The principles of Integrated Pest Management can be applied to controlling insect pests in livestock production.

- **Pests, their hosts and beneficial organisms must be positively identified.** The pest must be correctly identified. If you can't identify the pest, collect samples and submit them to the University of Nevada, Reno Extension, or the Nevada Department of Agriculture for identification. Once the pest is identified, determine the pest's life cycle, growth cycle and reproductive habits.
- **Establish monitoring guidelines for each pest species.** Routine monitoring of both pests and natural enemies (beneficial species) is a critical part of IPM. Methods of monitoring include visual inspection and pest counts. Document and track both pest and beneficial organism population numbers. The ratio of natural enemies, usually insects, to pests should be considered before a pesticide is applied.
- **Establish an action threshold for the pest**. A fundamental concept of IPM is that a certain number of individual pests can and should be tolerated. Will the pest cause unacceptable damage to the value of the animal? **What will happen if no action is taken?** The action threshold in livestock production is generally based on economics. The **economic threshold** is defined as the pest population level that produces damage equal to the cost of preventing damage by controlling the pest. The threshold is the pest density, or population level, at which a control application should be made. The threshold is different for each pest.

- **Evaluate and implement control tactics.** Select tactics that will be most effective, most economical and have least impact on non-target species and the environment. Select controls that are least likely to harm beneficial organisms but are effective at suppressing the pest. If chemical controls are required, rotate pesticides. Use products with different modes of action to reduce the risk of developing pesticide resistance.
- **Monitor, evaluate and document the results.** This allows you to make adjustments to your pest control plan to improve the effectiveness of future pest control strategies.

Pesticide Safety Around Animals

Pests of domestic animals can be serious threats to an animal's health and the owner's bottom line. Pesticide products are often needed to control the pests. Pesticides are formulated to kill pests and should be used with caution, as livestock are consumed by humans or produce products, such as milk and eggs, that are consumed by humans.

When selecting a pesticide, make sure:

- The label lists the pest you are trying to control.
- The label lists the animal or site on which you want to apply the pesticide.
- The formulation is correct for the application site and conditions.
- The right application equipment is available.
- The right safety equipment is available.

Never use more pesticide than is stated on the label. Young animals are very susceptible to overdoses of pesticides. Overdoses of pesticides may be fatal or may weaken or injure animals. Weakened animals are more susceptible to diseases and predators.

Remember that most pesticides are applied according to the body weight of the animal. Check that there are no minimum weight or age requirements for application of the pesticide.

You must also know the withdrawal times for animal harvest or use of animal products. Keep careful records and make sure previous applications of pesticides or medications will not interfere with the pesticide application or cause undesirable effects.

Use caution when applying the pesticides. Mix only the amount of pesticide needed for that day. Cover all animal feed and water. Use the correct Personal Protection Equipment (PPE) specified by the label. Apply the pesticide under the best conditions to reduce drift or contamination of

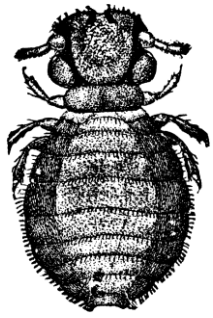
Never use more pesticide than is stated on the label. Overdoses of pesticides may be fatal or may weaken or injure animals.

Remember that most pesticides are applied according to the body weight of the animal. Check that there are no minimum weight or age requirements for application of the pesticide.

Insect pests are the biggest pest problem affecting livestock production.

Endoparasites are those that spend their entire lives inside the animals.

Ectoparasites spend all or a portion of their lives living on the outside of the animal.



Chewing Lice

adjacent sites, animals or humans. Clean application equipment properly, and dispose of any excess pesticide appropriately.

Insect Pests

Insect pests are the biggest pest problem affecting livestock production. The insects that affect livestock are generally parasitic and feed on livestock at some stage in their lives. These pests can cause loss of gain and undue agitation and stress in infected animals. The damage these pests inflict may also damage the carcass, hide or fleece of the infected animals. The effects of an infestation can be devastating, and occasionally life-threatening, to very young livestock. Basic insect identification information can be found in General Knowledge: General Pest Problems section of this manual.

Insect pests of livestock can be divided into two basic categories: endoparasites and ectoparasites.

Endoparasites are those pests that spend their lives inside the animal's organs or organ systems, such as the gut, heart, lungs, etc. Examples are flukes, roundworms, heartworms, etc. Grubs are not endoparasites, but horse bots are. It is imperative to properly identify these pests. This may require collecting feces, blood or other samples and having subsequent microscopic examination. Consult with professionals, and select an appropriate method of control for these pests.

Ectoparasites are the most common and damaging pests of livestock. They attach themselves to the outside of the animal and spend all or a portion of their lives there. Examples are flies, ticks, mites and lice. Not all life stages of these pests are harmful to livestock. Control of these pests may be better accomplished at certain life stages of the pest.

Specific Insect Pests of Livestock

Lice: Lice are parasites that must reside on an animal to survive. Lice are species-specific. Each species of lice attacks only one species of livestock. There are many different types of lice. Lice can have either chewing mouthparts (Mallophaga insect order) or sucking mouthparts (Anaplura insect order). Chewing or biting lice bite the animal, feeding on feathers, fur, skin or blood, and then move on to the next meal. Sucking lice attach themselves to the livestock and continuously feed on the animal's blood. Sucking lice can be a vector of disease. Both types of lice are wingless. Both can cause stress and loss of gain in livestock. Lice can cause skin irritation when they feed, which causes the animal to scratch or rub the site. This can cause skin abrasions that can lead to secondary infections. It can also

damage hides and fleece. The animal may spend so much time and energy trying to rid itself of the pest infestation that it may eat less and drop its rate of gain. A heavy infestation of lice can be debilitating, causing anemia, dermatitis, hair loss, low weight gain and low milk yield.

Lice are transferred between hosts by direct contact: They crawl from one host to another. Some lice can survive a few days without a host and may transfer to a new host via shared areas, such as bedding, feeding or scratching areas. Lice infestations are generally highest in the winter.

Some animals are more susceptible to lice than others. These carrier animals can infect the whole herd. Checking for a lice infestation can be done during preventative vaccine administration. Look for lice in the hair or fleece around the head, neck, ears and dewlap. Lice are about the size of a flea and will be observed moving around.

The threshold for initiating control measures is the presence of lice. No numeric threshold need be reached. Feeding animals a high-energy diet and maintaining uncrowded conditions will reduce the incidence of a lice infestation. Quarantine of infected animals helps to reduce spread.

There are several ways to treat lice. Dipping, spray-applied insecticides, pour-on insecticides, dusting, dust bags, spot-on insecticides and insecticide ear tags are all methods of chemical control for lice. Systemic injectable insecticides work well on sucking lice but may not control biting lice. Most of the surface treatments only control the adults or nymphs; eggs will not be affected. For this reason, certain treatment methods must be repeated in two weeks to eliminate the hatching eggs.

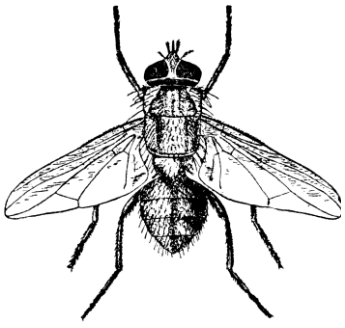
Horn Fly: Horn flies are small (3-4 mm) gray-black flies. When feeding on livestock, they are usually in a head-down position. Horn flies have piercing sucking-type mouth parts and they feed on livestock blood. They are the number one pest of cattle in the world. The fly spends all its adult life on livestock, leaving only for short intervals to lay eggs in fresh manure. Each female can lay 500 eggs. The fly progresses from egg to adult in only 10 to 14 days, so a new generation can be produced every two weeks. They congregate on body areas of livestock where they cannot be disturbed or easily dislodged. Severe infestation can cause weight loss, reduced milk production and reduced vitality. Animals may become very agitated when trying to dislodge the flies and may injure themselves in the process. The economic threshold is generally 200 flies per animal or 100 flies per side of animal.

For small operations, breaking up manure by dragging pastures and corrals every 48 hours can reduce fly populations by 50 percent. This cultural control

Lice are about the size of a flea and will be observed moving around.

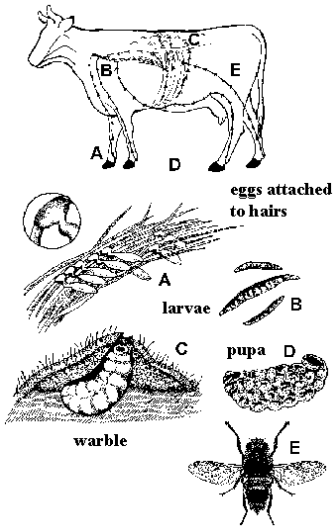
Lice are the most common ectoparasite of swine.

Two of the most common ectoparasite pests of beef cattle are the horn fly and lice.



Horn Fly

Because horn flies lay their eggs in fresh manure, manure management is not as viable a cultural control option as it is in house fly and stable fly control.



Life cycle of Heel or Grub Fly
http://edis.ifas.ufl.edu/in146

method is not viable for large operations. Because horn flies lay their eggs in fresh manure, manure management is not as viable a cultural control option as it is in house fly and stable fly control.

Biological controls are limited to organisms that naturally occur in the field, such as predaceous mites, predaceous beetles and parasitic wasps. There are no biological controls commercially available to augment these naturally occurring biological controls, like there are for stable flies and house flies. The parasitic wasps developed as a biological control for house flies and stable flies are ineffective against horn flies. Dung beetles can reduce horn fly numbers by removing and burying manure before the fly completes its development, but the dung beetle population has not kept pace with increases in livestock production.

Mechanical control consists of a walk-through fly trap. The trap is based on the inverted cone principle, where insects are funneled in through a large opening and subsequently can't find an escape route through a small opening. The traps are placed in an area in the pen or pasture that all the cattle must walk through on a regular basis, such as water source or salt lick. The trap stirs up the flies and funnels them into an enclosure that has an opening too small for them to exit. Research indicates the use of these types of traps can reduce horn fly populations by 50 percent or more. An explanation and diagrams of this type of trap can be found at the Extension Beef Cattle Resource Committee, Beef Council Handbook, Non-chemical Horn Fly Traps, http://www.iowabeefcenter.org/bch/HornFlyTraps.pdf.

Chemical controls include pesticide sprays, dips or injections. Pesticide-impregnated ear tags will control horn flies and several other pests of livestock. The tags spread pesticide when the animals rub themselves and rub against each other. The tags are removed when the pest season is over to reduce the potential for developing pesticide resistance. There are several different ear tags available that contain pesticides with different modes of action. See http://livestockvetento.tamu.edu/files/2010/10/Insecticide-Impregnated-Ear-Tags-for-Cattle3.pdf. Rotating the use of ear tags with different modes of action will also reduce the potential for pesticide resistance to develop in horn flies and other pests.

Heel or Grub (Bomb) Fly: Heel flies and grub or bomb flies are significant pests of cattle and may also be found on goats, sheep and horses. On rare occasions, they have been found on humans. The life cycle of these pests takes an entire year to complete. The adult flies are large and resemble bumblebees. They do not bite or feed on the host animals. The adults lay their eggs on the host animal's hair or hide, generally in the leg areas. The eggs hatch, and the larvae or grubs crawl down the hair to the skin and

burrow into the host animal. The fly larvae migrate through the animal. Heel fly larvae may cluster together around the esophagus, diaphragm, small intestine or heart. After a few months, the grub or bomb fly larvae migrate to connective tissues on the back, near the spine. The larvae cut small holes through the hide for breathing. In response to the injury, cysts form around the larvae in the host animal. When the larvae are mature, they emerge from the cysts, fall to the ground and pupate.

The adult flies are nuisances and may cause animals to expend a lot of energy running from them or standing in deep shade or water. Once infected with the grubs, the host animal's skin can become irritated, and the grubs can cause injury to organs and hides. All these factors can contribute to a reduction in weight gain and milk production. At slaughter, damaged areas of the carcass cause a reduction in useable meat.

Since the adults do not feed, treatment and control are focused on the larvae. Larval treatment for heel or grub flies must be properly timed. Treating infected animals when the larvae are clustered near the esophagus or spine can cause stress, injury and even death. If the larvae die inside the animal at these sites, it can cause inflammation that may also cause chronic bloat or suffocation when the larvae die near the throat (heel fly) or paralysis of the hind quarters when the larvae die near the spine (grub or bomb fly). Treatment should be done before the grubs migrate to esophagus or spine. In general, in Nevada, do not treat for these pests in November and December; wait to treat until January or February. Treatment may be done with sprays, dips or injections.

House Fly: House flies are the number one pest of dairy operations. They are difficult to control, as they lay eggs in any kind of decaying organic matter. They do not bite livestock, but they can be a nuisance, feeding on nasal and ocular (eye) secretions and causing livestock to expend energy in avoiding them rather than feeding. They may also be vectors of certain diseases and parasitic worms.

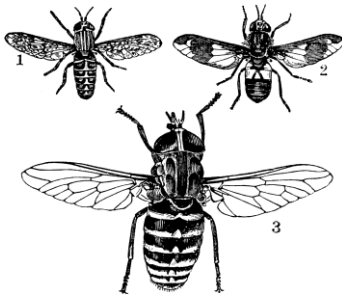
House flies are about 6 mm in length and dull gray in color, with four stripes running the length of the thorax. Their eyes are reddish. House flies have sponging mouth parts and do not bite. They breed quite rapidly, going from egg to adult in six to 10 days. The adults can live up to 30 days, with the females laying eggs continuously. This rapid rate of development and large egg population can cause large populations to build rapidly.

Sanitation is the best control method for house flies. Clean up manure, spilled feed and grain, and soiled hay to limit breeding sites. Dust bags placed in dairy operations as the cattle leave the milking parlor can aid in control. Dust bags should contain an insecticide that leaves little or no

Since adult heel or grub (bomb) flies do not feed, treatment and control are focused on the larvae.

House Fly

Stable Fly



Horse Flies

residue at the next milking. Parasitic wasps as biological controls have shown some success but require repeated releases of the wasps. Insecticidal baits and traps may help reduce numbers. Residual sprays on buildings, corrals, and other fly resting places may aid in control.

Stable Fly: Stable flies are biting flies, gray in color and approximately 7 mm to 8 mm long. They have a checkerboard pattern on the abdomen. Stable flies look very similar to house flies but have a bayonet-like mouth part for sucking blood. Both males and females consume blood. The stable fly bite is quite painful, and they will also attack humans. When feeding, they are usually in a head-up position. Unlike horn flies, they do not live on the animal, but only reside on the animals when feeding.

Stable flies can fly 70 miles or more from their breeding site, so new populations may re-infest operations periodically throughout the season. Breeding sites for these flies are similar to house flies: decaying vegetation and old manure. They will not lay eggs in dried materials. They cause economic losses when their numbers are great enough to cause weight loss due to blood loss and disturbance of feeding.

The best control of stable flies is sanitation. Clean up manure, spilled feed and grain, and soiled hay to limit breeding sites. Dust bags placed in dairy operations as the cattle leave the milking parlor can aid in control but are not as effective as for house flies. Parasitic wasps as biological controls have shown some success, but they are not as effective for stable flies as for house flies. Insecticidal baits and traps may help reduce numbers. Residual sprays on buildings, corrals and other fly resting places may aid in control.

Horse Fly or Deer Fly: These are large, dark brown to dark gray flies. Horse flies are 25 mm in length and deer flies are 6 mm to 10 mm long. Females bite livestock using their cutting and sponging mouthparts. The females feed intermittently but frequently, generally feeding on the back, neck and sides of livestock. They lay their eggs on vegetation near water sources. Both horse flies and deer flies can cause agitation and loss of gain in livestock. They may also be vectors of disease.

Control is difficult. Since they lay eggs on vegetation, removing breeding sites is not possible. Larval stage control is impossible, as it requires removing water sources. Control at the adult stage is nearly impossible as the flies only feed intermittently and can fly long distances from their breeding sites. Back rubbers and dust bags may provide some control.

Face Flies: Face flies are dark gray flies approximately 6 mm to 8 mm in length. They resemble house flies but are slightly larger and darker in color. These pests congregate around the eyes and nostrils of cattle. They feed on

nasal and ocular (eye) secretions. Face flies only spend five to 10 minutes per day actually feeding on the cattle. They are a nuisance, causing agitation and loss of gain in cattle. They can also be a vector of *Moraxella bovis*, more commonly known as pink eye.

Control is difficult because the flies spend such a limited amount of time on the cattle. Ear tags can aid in control, but ear tags for both ears are required for adequate control. Dust bags and back rubbers can be effective if they are placed low enough to contact the face.

Ticks: Ticks are small arthropods with eight legs and no antennae. Ticks can be subdivided into hard, or ixodid, ticks and soft ticks. All life stages of ticks are visible with the naked eye. Each life stage of a tick requires a blood meal. Some hard ticks live on one host their whole lives, but most are three-host ticks, living on three different hosts for larva, nymph and adult stages. Most soft ticks are multi-host animals, feeding from many different animals. Soft ticks generally reside in bedding or nesting areas of animals, feeding on multiple hosts and laying eggs after each meal.

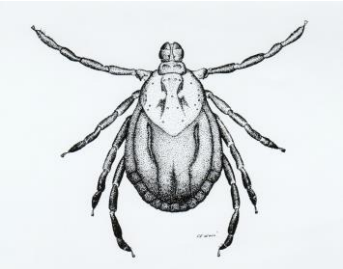
Hard ticks include the American dog tick, the brown dog tick, Rocky Mountain wood tick, the deer tick, also known as the black-legged tick, and the winter tick, also known as the moose tick. Ticks acquire their host animals by a behavior called "questing." The tick climbs onto vegetation, such as a grass blade or the end of a shrub branch, and extends its legs. When an animal brushes against the vegetation, the tick pulls itself onto the animal. The tick attaches to the animal and begins to feed. Severe infestations can cause anemia from blood loss, worry, agitation and irritation in animals, weight loss or reduced rate of gain, and injury to hides and fleece. The wound made by the tick may provide an entry point for other insect pests or disease. Ticks can be the vectors of several diseases that can affect both animals and humans, including Rocky Mountain spotted fever (*Ricksettsia rickettsia*), Lyme disease (*Borrelia burgdorferi* and *Borrelia mayonii*), Colorado tick fever (CTF virus) and tularemia (*Francisella tularensis*). It is important to identify the type of tick to determine if further testing for disease is warranted. The following websites have pictures of the individual ticks mentioned at several life stages:

The Centers for Disease Control and Prevention, Tick Website, https://www.cdc.gov/ticks/index.html

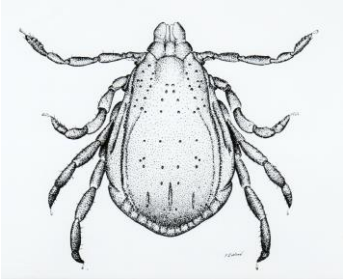
The University of Rhode Island Tick Encounter website, https://web.uri.edu/tickencounter/fieldguide/

The American dog tick (*Dermacantor similis*) is found west of the Rocky Mountains. These ticks most commonly feed on dogs but will also feed on

Face flies can be a vector of *Moraxella bovis*, more commonly known as pink eye.



American dog tick. Drawing by F. E. Wood, umd.edu.



Brown dog tick. Drawing by F. E. Wood, umd.edu.

Western black legged tick. by F. E. Wood, umd.edu.

rodents, livestock and humans. Adult females are most likely to bite humans. American dog ticks can transmit tulameria and, Rocky Mountain spotted fever.

The brown dog tick (*Rhipicephalus sanguineus*) feed mainly on dogs, but will feed on livestock, wildlife and humans. It can transmit Rocky Mountain spotted fever and is considered the primary vector of the disease in the southwestern United States. It also transmits other diseases to dogs only. Unlike other ticks, the brown dog tick can complete its entire life cycle indoors. Severe infestations will require good sanitation and several treatments over several months to eradicate.

The Rocky Mountain wood tick (*Dermacentor andersoni*) feeds on small rodents in the larval and nymph stages and on large mammals, including humans, as adults. These ticks transmit Rocky Mountain spotted fever and tularemia to humans, cats and dogs. They can transmit Colorado tick fever virus to humans. They also can transmit *Anaplasma marginale* to cattle.

The deer tick, also known as the western black legged tick (*Ixodes pacificus*), feeds on lizards, birds and rodents in the larval and nymph stages. As adults, they feed on deer and other large mammals, including livestock. The nymphs and adult females have been reported to feed on humans. These ticks transmit Lyme disease and very likely *Borrelia miyamotoi* disease, a form of relapsing fever.

The winter tick, also known as the moose tick (*Dermacentor albipictus*), feeds on large-hooved mammals, both wildlife and livestock. These ticks do not feed on humans. Deer and most other mammals can remove the ticks during grooming, but moose cannot remove them during grooming and can die from a severe infestation.

Treatment for hard ticks consists of managing vegetation around animal enclosures to limit questing sites. Good sanitation of bedding or crowded animal areas may help limit the infestation. Treatment of the entire range is not practical or affordable. Treatment of individual animals may be done by hand-picking the pests from the host animals.

For multiple animal infestations, chemical sprays or dips may be warranted. Ear tags, similar to flea and tick collars for dogs and cats, may aid in controlling tick infestations in livestock. The tags spread pesticide when the animals rub themselves and rub against each other. The tags need to be removed when the pest season is over to reduce the potential for pesticide resistance to develop. There are several different ear tags available that contain pesticides with different modes of action. Rotating ear tags with different modes of action will also reduce the potential for developing

pesticide resistance.

Soft ticks of importance to the livestock industry include fowl ticks, also called blue ticks, and Spinose ear ticks (see below). **Fowl ticks** live in bedding or nesting areas, moving onto the animals to feed, mainly at night, and then moving back off the animals. Severe infestation causes anemia, loss of feathers and reduced egg production. Since these ticks do not live full-time on the host animals, control is best achieved by good sanitation in the living and nesting areas. Remove soiled bedding and nesting materials. Severe infestations may require chemical treatment of living and nesting areas.

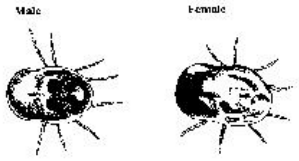
Spinose Ear Ticks: These pests are soft ticks that infest cattle, horses, dogs and humans. They spend their larval and nymph stages feeding in the ear canal. Affected animals will shake their heads and rub their ears, trying to dislodge the pests. Animals with severe infestations will appear dull and listless and may begin to lose weight. Place new herd animals in quarantine to help avoid infestation. This may not be feasible, since the larva and nymphs can live in the ear for four months or more.

Chemical control is the most commonly used control method. Insecticidal ear tags are used, as are insecticides applied into the ear canal during other routine preventive medication applications. Remove the tags when the pest season is over to reduce the potential for developing pesticide resistance. There are several different ear tags available that contain pesticides with different mechanisms of action. Rotating use of ear tags with different mechanisms of action will also reduce development of pesticide resistance.

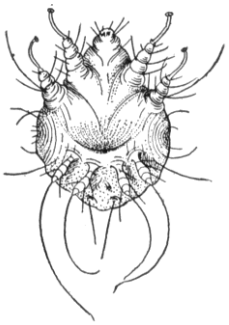
Psoroptic Mange Mites: Psoroptic mange mites are non-burrowing mites that live on the skin surface of infected animals. These mites puncture the skin and feed on lymph fluids (clear body fluids, not blood) or feed on skin scales. Feeding causes intense itching and scabs. These mites tend to affect the hairiest portions of the animal's body, particularly the back, shoulders and sides. Skin scrapings and microscopic identification is required to diagnose the presence of these pests.

Management of non-burrowing mange mites is difficult. A single infected animal should be quarantined and treated. The whole herd may require quarantine treatment. Control is generally limited to chemical methods, such as dips, sprays or injectable pesticides.

Sarcoptic Mange Mites: Sarcoptic mange mites are burrowing mites that live under the skin of affected animals. These mites can infest horses, cattle, sheep, goats, swine and dogs. They do not affect cats, rabbits or fowl. These burrowing arachnids cause intense itching and skin irritation. Infested animals may scratch themselves so much that they develop weeping sore



Spinose Ear Ticks
ianrpubs.unl.edu



Sarcoptic Mange Mite

Incidence of sarcoptic mange should be reported to the Nevada State Veterinarian.

ZonaStat-H is a porcine zona pellucida (PZP) immuno-contraceptive vaccine for use in limiting the populations of wild and feral horses and burros.

spots on their skin, which may be a site for secondary infections or insect infestations. Generally, the mites target the least hairy portion of the animal's body, which differs for each species of animal. Females burrow into the skin, feed on lymph fluid and lay eggs. The eggs hatch, leave the burrow and wander on the animals to a new site, finally reaching adult stage. Then, they mate; the females dig a burrow and lay more eggs. Generally, a microscope is required for accurate diagnosis.

Similar to non-burrowing mites, management of burrowing mange mites is difficult. A single infected animal should be quarantined and treated. The whole herd may require quarantine treatment. Incidence of sarcoptic mange should be reported to the Nevada State Veterinarian.

Wild and Feral Horse and Burro Contraception

Wild and feral horses and burros may become pests in some situations. Wild horse and burro herd populations have significantly increased in some areas, exceeding the appropriate population levels on those public lands. Uncontrolled populations may lead to adverse environmental effects, such as degradation of wildlife and native vegetation habitat. Additionally, these populations may lead to conflicts with other rangeland uses, such as cattle grazing and recreation. To help control these populations, wild and feral horses and burros may be removed and transferred to private ownership. They may be maintained in holding facilities, which can be very expensive. Another option being tested in several areas of the United States is ZonaStat-H, a porcine zona pellucida (PZP) immunocontraceptive vaccine for use in limiting the populations of wild and feral horses and burros. This product is a restricted-use pesticide in Nevada. The product may only be used on wild and feral horses and burros. Individuals must be certified pesticide applicators and must follow label instructions for application of this product. **Reading a label from this product and answering a few questions based on the label will be part of the general test for PRIVATE certified applicators and part of the category exam for NON-PRIVATE certified applicators.**

Conclusion

Livestock production concentrates groups of animals close together. This can provide ideal conditions for the development and expansion of insect parasites.

Livestock production is a business. Pesticides cost money and time, and their use can reduce profits. Pesticides can have serious consequences if applied improperly. They can harm non-target insects, beneficial insects, wildlife,

pets, livestock and humans. Pest management in livestock production is further complicated by the end use of the animals. The products the animals produce, such as milk, eggs and fiber, will be used or consumed by humans, as will the animals themselves. Thoughtful planning and implementation are required to minimize unintended damage, reduce costs and maximize profit.

The first step to pest control is to correctly identify the pest. Consider all control options for managing the pest. Keep records of your management efforts and their success.

The first step to pest control is to correctly identify the pest.

Unless otherwise noted, all line drawings are from Clipart ETC, Florida's Educational Technology Clearinghouse, University of Southern Florida, http://etc.usf.edu/clipart/index.htm

Originally published in 1987 as Category 1B – Agricultural Pest Control, Animals, Nevada Pesticide Applicator's Certification Workbook, SP-87-07, by W. Johnson, J. Knight, C. Moses, J. Carpenter, and R. Wilson.
Updated in 2018 by M. Hefner, University of Nevada Cooperative Extension, and B. Allen and C. Moses, Nevada Department of Agriculture.
Updated in 2023 by M. Hefner, University of Nevada, Reno Extension and B. Allen, D. Farris and R. Saliga, Nevada Department of Agriculture.

This page intentionally left blank