TEXAS A&M AGRILIFE EXTENSION

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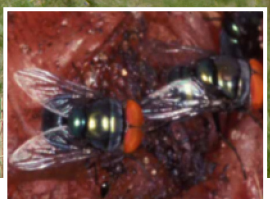
Managing External Parasites of Texas Cattle



Sonja L Swiger

Assistant Professor and Extension Entomologist,
The Texas A&M System

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The Texas dairy and beef cattle industry is a $12 billion industry and controlling external parasites is an important part of avoiding financial losses.

External parasites, commonly called ectoparasites, cost livestock owners billions of dollars each year. Untreated, these parasites make animals suffer and lose weight. Parasites also lower the quality of animal products by:

- feeding on their hides and hair
- reducing meat and milk production by sucking their blood
- transmitting diseases
- causing cattle to lose energy

Integrated pest management

Efficient pest management requires that cattle operators understand the three components of integrated pest management (IPM) and how they work together. IPM uses cultural, biological, and chemical control methods to more effectively suppress insect pests.

Cultural control

Cultural control focuses on preventing new infestations by minimizing conditions that support insect breeding.

The best way to prevent initial infestations is to check and treat new cattle for lice, ticks, or mites before adding them to existing herds.

Poor sanitary conditions in and around barns/operations encourage insect reproduction. The most effective way to control insect and mite populations, minimize breeding conditions:

- Remove and dispose of carcasses quickly.
- Clean up and dispose of manure and spilled feed—especially if they are wet.
- Keep drainage ditches clear by cleaning out weeds.
- Remove straw or hay that has been defecated and urinated on.
- Clean and dress all wounds on cattle to exclude blowflies and prevent infection.

One pound of moist manure or wasted feed can support the production of up to 1,000 house flies—but larvae cannot survive on manure with less than 30 percent moisture. Remove manure from barns at least twice a week and spread it thin on pastures. Do not pile manure or leave it in clumps. Rotate the pastures to allow manure to dry out and decompose.

Biological control

You must identify insect populations accurately to make pest control decisions and avoid overusing pesticides. Some insects are harmless to humans and animals and can be used to control pest insects through predation:

- Fire ants prey on any available larvae.
- Black dump fly larvae feed on house fly larvae developing in the same manure.
- Small fish and immature dragonflies, damselflies, and mayflies feed on mosquito larvae.

Beneficial insects can also control pest populations through competition:

- Soldier fly maggots eat more manure than horn fly or house fly maggots, leaving competitors short of food and unable to complete development.
- Dung beetles remove manure to house their larvae. This causes the pats to dry faster and become unsuitable for fly development.
- Parasitic wasps lay eggs inside immature horn flies, house flies, and stable flies. The wasp larva then eats the immature flies.

Though wasps can be used to supplement sanitation, parasitic wasps probably will not control pests adequately in an environment that promotes breeding.

For more information, see *http://www.ca.uky.edu/entomology/entfacts/ef502.asp.*

Chemical control

Pesticides should be used only when preventive methods are not effective or available. Use chemical control methods only when pest activity is at its highest.

Safety tips for using pesticides

- Follow all directions and safety precautions precisely. Never deviate from pesticide label recommendations.
- Record every pesticide application; include the common name, trade name, formulation, dilution, application rate, and date of treatment.
- Use a facemask or respirator and protective clothing during spraying. Avoid breathing spray mist or dust. Follow label recommendations regarding personal protective equipment.

- If you spill pesticides on your skin or clothes, wash them thoroughly with soap and water, and change clothes. Wash contaminated clothing separately from household laundry.
- Do not eat, drink, or smoke when handling pesticides.
- Provide adequate ventilation when applying pesticides.
- Follow label application rates to avoid illegal meat and milk residues and possible harm to the animal.
- Never apply pesticides closer to slaughter dates than the number of days listed on the label.
- Avoid wind drift; pesticides can kill fish, wildlife, and crops.
- Do not treat animals that are sick, overheated, or stressed from shipping, dehorning, castration, recent weaning, etc.
- Do not contaminate mangers, feed, water, milk, or milking equipment.
- Do not spread treated manure on pastures or cropland against label recommendations.
- Store pesticides in the original, labeled containers, safely locked away from children, pets, and livestock.
- Dispose of empty pesticide containers promptly and according to specified recommendations.
- If you suspect poisoning, call a doctor immediately. Symptoms include blurred vision, abdominal cramps, diarrhea, excessive salivating, vomiting, tremors, and tightness in the chest.

Livestock pests

Horn fly

Horn flies (*Haematobia irritans*) bite cattle and feed on their blood; they weaken the animal and make it lose weight.

Adult horn flies have piercing mouthparts and each fly feeds 30–40 times per day. The bites are painful and will form a wound that mars animal hides.

Horn fly populations increase from late spring to early fall; they peak in midsummer. They rest on the withers, back, and sides of the cattle, moving to the belly when temperatures exceed 90 degrees F. Cattle react by licking their backs, twitching their flanks, switching their tails, and kicking at their bellies with their hind legs. When flies exceed 250 per side, cattle will lose 15 to 50 percent of their weight.

Horn flies are the same color as house flies and stable flies but are slightly smaller (3⁄16 in.). The females can lay several hundred eggs in their 3-week lifespan. They lay their eggs under the edges of fresh dung pats where they develop in 10–20 days, depending on the temperature.

To control and prevent horn fly infestations:

- Kill adult flies before they harm the cattle or produce offspring.
- Exclude adult flies with screens or other barriers.
- Drag pastures and spread manure in a thin layer to limit breeding grounds.
- Rotate pastures to prevent manure buildup.

Beneficial organisms such as predators, parasitoids and natural competitors will help control insect populations. Predatory mites, beetles and the larvae of certain flies such as *Hydrotaea* spp. or *Muscina* spp. feed on horn fly larvae. Parasitoid wasps such as *Muscidifurax* spp. and *Spalangia* spp. feed on pupae. Dung beetles and the black soldier flies compete with horn flies for cattle dung.

The point at which chemical control measures are economically justified is called the threshold. For horn flies, the threshold is 250 flies per side. Use chemical control once the threshold is reached. Control options include:

- ear tags
- sprays
- pour-on liquids
- back rubs
- injections
- insect growth regulator
- mineral feed products
- boluses
- dust bags

Place self-treatment devices at bottlenecks near water, feed, or mineral sources. It may take 2 –3 weeks before cattle adopt self-treatment devices. Forcing cattle to use these devices can help control lice and will control horn flies more rapidly.

Insecticide-impregnated ear tags can also give excellent control if they are properly attached and the insect is not insecticide resistant. The tag applies a small amount of insecticide to the animal's body over

a 2½- to 5-month period. Replace the tag when the insecticide is depleted and no longer controls the flies. Ear tags are an economical way to control horn flies, Gulf Cost ticks, and spinose ear ticks.

Managing pyrethroid- and organophosphate-resistant horn flies

Alternate the type of active ingredients to avoid or minimize insecticide resistance. Treating successive generations of flies with the same types of insecticides promotes insecticide resistance; insects that are susceptible to the active ingredient are quickly killed; those that are not pass on their genes and increase the number of resistant insects.

Horn fly resistance to organophosphates was first recorded in the 1970s; resistance to pyrethroids was confirmed in 1984.

Flies that resist one pyrethroid will resist all other pyrethroid insecticides currently labeled for use in Texas. To reduce resistance, delay treatment until flies reach threshold levels and susceptible flies mate with resistant ones. Periodic application methods (sprays, self-treatment devices, etc.) tend to delay development of resistance more than do continuous release methods such as ear tags.

Treatment options

- Use sprays, dusts, or other formulations with a different mode of action than the ear tag, and treat only when horn fly populations exceed 250 per head.
- Alternate the type of ear tag insecticide each year. Organophosphate (OP) ear tags such as Terminator II, OPtimizer, Patriot, Warrior, or Dominator can be used after a pyrethroid ear tag. Do not use organophosphate ear tags for more than 2 successive years. Organochlorine (Avenger) or macrocyclic lactone (XP 820) ear tags are effective alternatives to pyrethroid or organophosphate ear tags.
- Remove the ear tags when calves are weaned or when the cows are worked in the fall. If there are more than 200 to 250 horn flies per head when the tags are removed, use a spray or dust with a different mode of action to reduce overwintering flies.

Combination ear tags are not recommended because they combine modes of action and can promote resistance to both classes of insecticides at the same time.

House fly

The house fly (*Musca domestica*) is the most abundant insect of confined cattle. This fly breeds continuously in manure and rotting vegetation. Adult house flies are about ¼ in. long and are gray and black with four black stripes on the thorax. The sides of the abdomen are creamy yellow, and distinctly noticeable.

House flies do not bite; they feed on blood, sweat, tears, saliva, and other bodily fluids. Cattle respond by flapping their ears, shaking their heads, and avoiding infested areas. House flies can infest cattle wounds with maggots and spread pathogens (disease-causing organisms) such as *E. coli*.

Sprays, baits, light traps, and adhesive strips can control adult flies in livestock barns. Although, insecticides can keep maggots from developing on manure piles, chemicals alone will not solve the problem. Do not contaminate feed, utensils, or drinking water with insecticides.

Spread manure so heat and drying can kill eggs and larvae. Remove waste and spilled feed regularly.

Stable fly

Stable flies (*Stomoxys calcitrans*) are the US cattle industry's most costly pest. They look like house flies but are smaller (3⁄16 in.) and inflict a painful bite. Unlike horn flies that remain on the animal, stable flies rest on nearby surfaces after feeding.

Although stable flies suck blood only once a day, their irritation inhibits weight gain and milk production. They attack the legs, sides, back, and belly; cattle will stamp, and kick, and switch their tails. They will also bunch in a group, which keeps them from dissipating excess heat when it is hot and humid.

Stable flies congregate near confined animals indoors or out and breed in mixtures of urine, manure and decaying litter. Larvae (maggots) develop in straw bedding, wet hay, and manure accumulations. Eggs develop into adult flies in 3 to 4 weeks; adults can live for 3 weeks.

Stable flies begin to cause economic losses and must be controlled when concentrations reach two to four flies per leg.

Dispose of manure and litter as outlined for house flies to help reduce populations. Discard trampled hay bales and place new ones in another location to reduce larvae development. Predators, parasites, and pathogens that attack horn flies will also help in managing stable flies. Spraying animals and resting areas with approved insecticides will control flies immediately.

Screwworm fly

The primary screwworm fly larvae feed on living tissue but have been eradicated from Texas. The secondary screwworm fly larvae, *Cochliomyia macellaria,* feed on dead tissue and are found throughout the continental United States. The female lays eggs only rarely in wounds on living cattle but often in the natural openings of fresh carcasses. The larvae begin to develop within 10 to 20 hours.

There is always a danger that screwworm-infested animals could be reintroduced into uninfested areas. Inspect livestock for screwworms and report any suspected screwworm cases to your county Extension agent or local veterinarian. Submit any suspect larvae found in animals for identification.

For identification, collect 10 larvae from deep within the wound and place them in alcohol. Send the samples to:

USDA–ARS–KBUSLIRL
Screwworm Research Unit
2700 Fredericksburg Road
Kerrville, TX 78028.

Or

National Veterinary Services Laboratory
Attn: Sample Processing Department
920 Dayton Ave
Ames, IA 50010
(515) 337-7266.

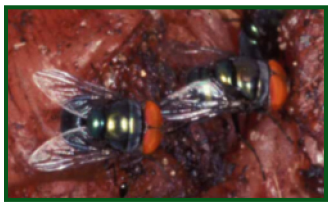
The US Department of Agriculture, Animal and Plant Health Inspection Service international services office at (301) 734-8892 also can provide assistance.

Myiasis

Myiasis is the invasion of a living vertebrate animal by fly larvae. Myiasis can be classified as accidental, facultative, or obligatory:

- Accidental myiasis occurs when an animal ingests food contaminated with fly eggs or larvae; the larvae typically are not parasitic but cause discomfort as they pass through.
- Facultative myiasis is not essential to the life cycle of the parasite, but occurs, for example, when the maggots of blow flies that normally feed on carrion invade an open sore on living cattle.
- Obligatory myiasis is the infestation by a fly species that requires a living host for development. Examples are the primary screwworm and bot flies.

Blow fly



Blow flies are big and metallic green and blue. They seek carrion for their larvae, though maggots are sometimes also found in cattle wounds. Black blow fly larvae often infest dehorning wounds during winter and occasionally infest the navels of newborn animals. Heavy infestations are occasionally fatal.

Blow flies breed and reproduce in decaying animal and bird carcasses, dog manure, and wet garbage. Remove dead animals to prevent heavy blow fly infestations. Clean infested wounds and treat them immediately with a topical pesticide until the larvae are gone.

Cattle grub (Heel fly)

Heel fly larvae are called cattle grubs; they reduce feed efficiency and lower milk production, weight gain, and hide value. They make cattle run wildly with their tails in the air (gadding) or stand in water to protect themselves. Affected animals have poorer carcass trim and lower meat quality.

Female flies lay eggs on the legs and lower body of cattle. Eggs attached to the hairs hatch into tiny larvae that penetrate the skin and migrate through the animal's body. Larvae congregate in the tissues of the esophagus or spinal column, but eventually move to the back in later summer, fall, or winter. Grubs develop a "cyst" or "warble" in the animal just under the skin on the back. After 6 to 8 weeks, grubs cut holes in the hide, fall to the ground, and pupate. Adult heel flies emerge in late winter, spring, or summer.

Cattle grubs can be controlled once they reach the animal's back; but by then, most of the damage is done. Prevention is preferable.

Systemic insecticide sprays, dips, pour-ons, boluses, and injectables are distributed through the animal's body and destroy cattle grubs by contact. To avoid a host/parasite reaction, use systemic insecticides when heel fly activity ceases between May 1 and July 4 but not within six to 7 weeks before grubs appear on the back. Typical host/parasite reaction symptoms include:

- swollen esophagus
- bloat
- profuse salivation
- discomfort
- in extreme cases, death

Organophosphate poisoning symptoms are similar to host–parasite reactions. However, do not use the antidote for OP poisoning, atropine, because it may make the problem worse.

Other biting flies

Horse fly and deer fly

Female horse flies and deer flies are vicious biters and make livestock lose weight. They also can transmit anaplasmosis, anthrax, and other diseases. Horse flies are a serious nuisance to livestock and even a few can significantly reduce production. Most of these flies are found in damp, brushy, or low-lying areas near creeks, streams, or tanks.

The horse fly measures ½–1½ in. long: the deer fly is generally ¼ –⅓ in. long, and readily bites humans.

A female horse fly can lay up to 800 eggs at a time. Though most species lay eggs on vegetation near a water source, some lay their eggs in dry soil or leaf litter.

Female horse flies are not easily deterred or dislodged. Heavy attacks can reduce weight gain, milk yield, and feed utilization, and damage the hide.

Controlling these flies is difficult because one location can have several species that feed at different times. Spraying these flies while on the animal is ineffective because each fly generally feeds for only 4 minutes. No insecticides kill the larvae or pupae.

Moving livestock from infested areas may provide some relief, but shelter or barriers offer the most effective protection. Box traps and canopy traps can limit the number of adult flies in an area.

Biological controls such as ladybird beetles feed on the eggs; wading birds and dragonflies feed on the larvae. Some large solitary wasps attack the adults, and parasitoid wasps rear their young on various stages of horse flies and deer flies.

Mosquito

Photo by Bart Drees

Mosquitoes multiply in water and attack mostly at dusk. Large populations can hinder production and, in some cases, even kill livestock and wildlife by sucking their blood and transmitting diseases.

Mosquito larvae develop in tidal pools, rain pools, or floodwater; in permanent surface water like pools, streams, swamps, and lakes; and in water-holding containers like tree holes, drinking water troughs, and discarded tires.

Female mosquitoes will lay eggs on water or on a surface where water will accumulate. Eggs generally take 2 to 3 days to become larvae but can take up to a week. Most mosquito larvae take 6 days to become a pupa, then 2 days to become an adult.

To control mosquitoes, eliminate standing water to prevent egg laying and larval development.

Natural controls do not significantly reduce mosquito populations. Birds, bats, dragonflies, and fish eat mosquitoes but do not reduce their numbers significantly.

Chemical control is necessary for heavy infestations. Sprays reduce the number of biting females and some products treat standing water. Topical sprays repel biting mosquitoes. Ear tags, back rubbers, or dust bags will protect cattle against mosquito adults without further intervention, but you should monitor water sources for larvae.

Products containing *Bacillus thuringiensis israelensis* (*Bti*) and *B. sphaericus* kill larvae effectively.

Black fly

The black fly is a small humpbacked fly that can irritate and even kill livestock. Black flies depend on flowing water for their larvae and are found along fast-moving rivers, particularly in northeast Texas.

The female black fly lays eggs near a riverbed. The larvae attach themselves to vegetation and filter food from the water. Black fly adults can emerge from their pupal cases in such large numbers that they can suffocate cattle.

Photo by J.V. Robinson

Black flies have a painful bite and can transmit diseases. Black fly swarms can make cattle crash into structures, stampede, and even trample calves.

These flies are best managed at the larval stage by treating the water where they grow. Treating cattle with dusts, ear tags, back rubbers, pour-ons and sprays will limit the number of black fly attacks. For additional protection, use shelter, smoldering fire, permethrin-based repellents and white petroleum jelly on the ears.

Lice

Photo by Bart Drees

A single cow can harbor more than a million lice. Symptoms include: lameness, dermatitis, hair loss, allergic responses, and skin crusting or scabbing. Lice cause anemia, lower milk production and inhibit feed efficiency and weight gain. They also lower the animal's resistance and increase secondary diseases and mortality.

The cattle biting louse (*Bovicola bovis*) feeds on hair and scales and prefers the top line of the animal's back, especially the withers. It can spread to other parts in heavy infestations.

Four species of lice suck blood from cattle:

- The shortnosed cattle louse (*Haematopinus eurysternus*)
- The longnosed cattle louse (*Linognathus vituli*), which occurs in greater numbers on calves than mature cattle; it can be found all over the body but prefers the shoulders, back, neck, and dewlap.
- The little blue cattle louse (*Solenoptes capillatus*), is the smallest of the lice and gets its name from its color at maturity. It is a common species on cattle and clusters on the face. These lice also infest the top of the neck, the dewlap, and the brisket. During heavy infestations, they can be found from the horns to the tail.
- The cattle tail louse (*Haematopinus quadripertusus*), populations peak during the summer. The adults are typically confined to the tail region; the nymphs will be found on the face, neck, vulva, and anus.

Lice spread in cattle by direct contact and can heavily infest animals that are sick, very young, or very old. Heavy infestations can be debilitating and cause restlessness and anemia. Sucking lice can also spread bovine anaplasmosis.

In temperate regions, lice are typically more abundant during winter and spring, so treat cattle in the late fall and early winter. Control methods include:

- spot treatments
- quarantine of infested individuals
- dust
- powders
- sprays
- dips
- ear tags
- boluses
- pour-ons
- lotions and
- injectables

Systemic pour-ons, injectables, and oral products are effective and popular treatments. Do not use systemic products on grub-infested animals in winter because reactions can be lethal.

Heavily infested cattle are a major source of reinfestation for a herd. Cull these animals to protect the rest of the herd.

Mites

Mange mites tunnel into the skin and deposit their eggs inside. Scab mites deposit their eggs at the bases of hairs or in the skin. They initially irritate the skin and cause scabs that enlarge as feeding continues. Left untreated, they will fully occupy the skin or hair follicles. Problems include:

- persistent dermatitis
- mite-induced allergies
- transmission of microbes and metazoan parasites
- intermediate parasites (tapeworms)
- invasion of respiratory passages, ear canals, and internal organs

On stressed, pregnant or lactating cows, the cattle follicle mite (*Demodex bovis*) causes nodules under the skin that can be felt but not easily seen. Heavy infestations can cause lesions on the neck, shoulders, and udder and between the forelegs and body.

Nodules will form over a 1-month period, and then gradually disappear and be replaced by other nodules. The smallest sores are the size of a pinhead, the largest as big as a chicken egg. The nodules eventually rupture and exude a pus-like substance full of mites causing defects to the hides.

Scabies, psoroptic, and chorioptic mites (*Sarcoptes scabiei, Psoroptes bovis, Chorioptes bovis*) must be reported under state law. If you suspect these mites, contact the Texas Animal Health Commission, Box 12966, Austin, Texas 78711, 1 (800) 550-8242.

Scabies mites are spread by direct contact. The adult females burrow in the upper skin layers, where the mites live. Cattle react to fecal deposits in the burrows 3 weeks after scabies mites first infest. Lesions occur first in areas with thin hair (such as on the head) but quickly spread over the entire body and cause generalized mange. Progressive infestations make the skin thicken and crust; scratching and rubbing will cause secondary infections. Because mites are difficult to collect, infestations are usually diagnosed by clinical signs and positive responses to acaricide treatments.

The psoroptic scab mite causes mange that spreads rapidly by contact with another animal or indirectly from an infested object such as a fencepost or stall. These mites are more prevalent in the winter and feed by abrading the skin. The host responds by developing swelling and dermatitis around the blood vessels.

The chorioptic scab mite causes mange that is irritating and develops crusty lesions. Chorioptic scab mites feed primarily on the legs and feet and generally go unnoticed as cattle spread them. Cattle typically react to them only when infestation reaches into the thousands and mange develops. Chorioptic mange is also referred to as foot mange, leg mange, or itchy heel.

Reportable Diseases

Report any suspected foreign or emerging animal disease to the Texas Animal Health Commission immediately. Texas law requires that specific livestock and fowl diseases (a complete list can be found at *http://info.sos.state.tx.us/fids/200904288-1.html*) be reported to the TAHC within 24 hours of diagnosis. This requirement applies to veterinarians, veterinary diagnostic laboratories, and people who manage animals.

Ticks

Photo by Bart Drees

Several tick species attack livestock. Ticks can spread protozoan, viral, bacterial, and fungal pathogens and also injure cattle by feeding on their blood. Tick damage to cow hides reduces their value.

Ticks are classified as hard or soft. A hard tick has a prominent plate on its back known as a scutum. This plate is hard and its color varies according to species. The mouthparts of hard ticks extend from the front of the head, and they feed only once between each stage of development. Female hard ticks also lay eggs only once.

Hard ticks differ according to the number of hosts they use during their lifecycle:

- A one-host tick stays on a single host from egg through adult; after the female's final feeding, it drops from the host, lays eggs, and dies.
- A two-host tick completes the larval and nymphal stages on a smaller host such as a rabbit, then moves to a larger host such as a cow for the adult stages. After the adult female feeds, it drops from the host, lays eggs, and dies.
- The three-host tick begins as a larva on a small host such as a squirrel, where it takes a blood meal, and then moves to an intermediate host such as a rabbit. The nymph feeds once on the intermediate host and then detaches. The adult attaches to a large host such as a deer or a cow, where it feeds once, detaches, lays its eggs, and dies.

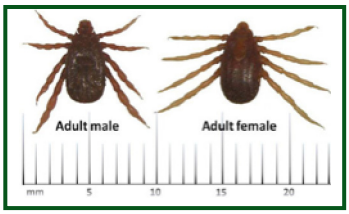
Soft ticks have no scutum and appear more rounded. The mouthparts are located beneath the body. Soft tick females can take multiple blood meals as adults and lay multiple batches of eggs.

Common Texas ticks

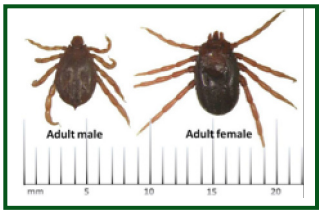
The following tick images were contributed by O.F. Strey and P.D. Teel, http://tickapp.tamu.edu , Tick Research Laboratory, Texas AgriLife Research, College Station, TX 77843.

Texas cattle fever disease was eradicated in the US in the early 1900s. However, since 2009, *Boophilus* tick populations have reentered South Texas.

Two species of this tick, *B. annulatus* and *B. microplus,* spread the protozoans that cause Texas cattle fever. This disease causes animals to develop a high temperature, stop feeding, and become anemic. The animal will eventually become lethargic, lapse into a coma, and possibly die. Heavily infested cattle that do not develop cattle fever disease will still gain less weight and produce less milk.



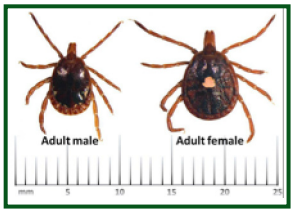
Boophilus annulatus



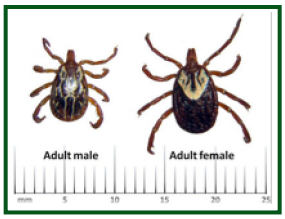
Boophilus microplus

The Texas Animal Health Commission and the USDA are working together to prevent Boophilus ticks from spreading beyond South Texas and the quarantine zone.

The Lone Star tick (*Amblyomma americanum*), is aggressive, will attach to many types of hosts, and transmits several pathogens. This tick prefers wooded or brushy areas during spring and summer. It is most abundant in Central Texas and has killed white-tailed deer.

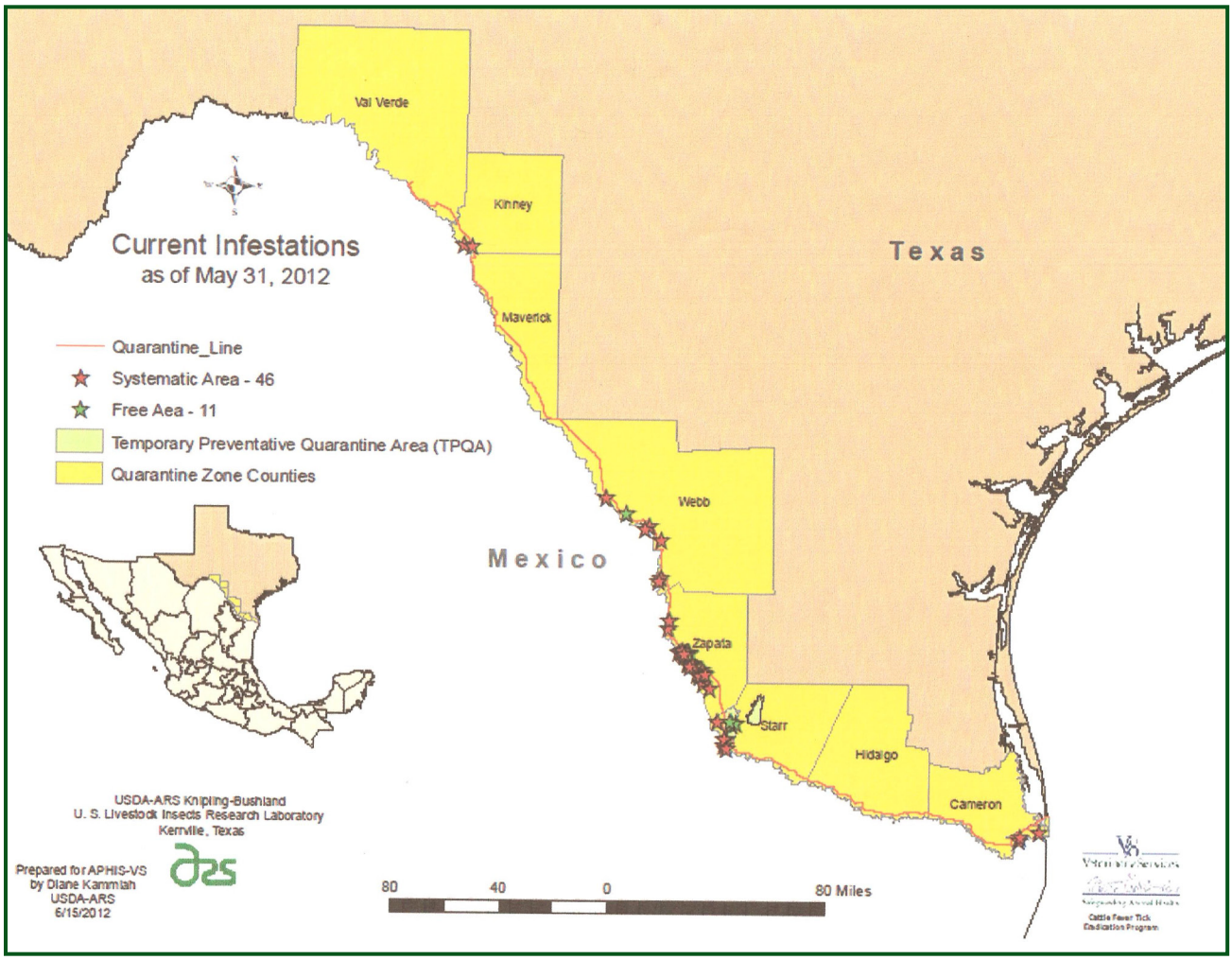


Amblyomma americanum



Amblyomma maculatum

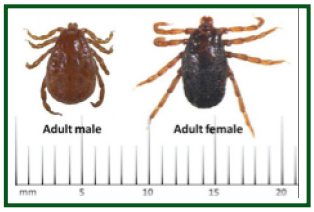
The Gulf Coast tick (*Amblyomma macula-*



Fever Tick Quarantine Zone, USDA-APHIS

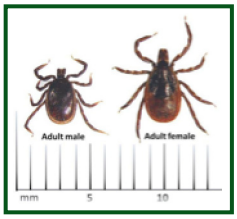
tum) ranges from the Texas Gulf Coast to central Oklahoma. In Texas, populations peak in late summer and early fall. Adults attack cattle mainly around the ears, eyes, and poll. Heavy infestations can injure the skin and often render the hides useless.

The winter tick (*Dermacentor albipictus*), is a one-host tick that attacks during the winter and late fall. Heavy infestations of this tick cause blood loss that can lead to anemia or even death.



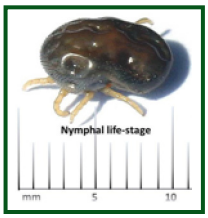
Dermacentor albipictus

The black-legged tick (*Ixodes scapularis*), is prevalent in the eastern half of Texas during spring and winter. It is most commonly found on white-tailed deer and is the primary carrier of Lyme disease. The winter tick readily feeds on humans.



Ixodes scapularis

The spinose ear tick (*Otobius megnini*), though limited in Texas, often infest livestock and domestic and wild ruminants. The larvae and nymph stages feed on blood; the adult does not. These ticks attach deep within the ears and cause intense irritation, wax accumulation, and excretions that can lead to ear infections.



Otobius megnini

Pesticides known as acaricides are used commonly to prevent and control mite and tick infestations. Clearing or burning dense vegetation will also help reduce tick populations.

Insecticide application methods

Sprays

Prepare only enough solution for the number of animals you plan to treat. Do not store mixed insecticides. Emulsifiable concentrates or soluble formulations are well suited for use in small sprayers. For wettable powders, sprayers should have a high-volume piston pump with a suitable agitator. Apply sprays at a pressure of 250 to 350 pounds per square inch.

For ticks, lice, and mites, use enough water to cover the animal thoroughly. When spraying systemic insecticides to control cattle grubs, be sure to wet the animals to the skin.

Dips

Dip vats are effective and, when properly maintained, can be used several times a year. The initial cost is high, but many animals can be dipped during the season with little additional expense. Vat treatments ensure good coverage by wetting the animal thoroughly. Vats are the most effective way to treat for *Boophilus* ticks.

Follow label directions when filling or recharging a dipping vat; use only products labeled for dipping animals. Do not mix different products unless specified on their labels. Stir the vat thoroughly before dipping animals.

Pour-ons

Apply pour-on insecticides directly to the center of the backlines of animals. The chemical is absorbed and then circulates through the animal's system. Backline pour-on treatments control horn flies for up to 30 days.

Spot-ons

This method uses specially designed applicators to apply a small amount of pesticide to a single spot on the animal's backline. Spot-on pesticides are best used for cattle grubs and lice.

Dusts

Dusts are applied with hand shakers or self-treatment dust bags. They are most valuable against horn flies and lice on large animals.

Injectables

Avermectin and milbemycin treatments for beef cattle are formulated for subcutaneous injection and are also labeled for internal parasite control.

Feed and mineral insecticide additives

Some insecticides may be administered as feed or mineral additives. These control specific fly species whose maggot stages develop in animal manure.

Insecticide-impregnated ear tags

Ear tags are plastic devices that dispense insecticide to control ear ticks and horn flies. They control ear ticks for 4 to 5 months and horn flies for 2½ to 5 months. Ear tags also help control most biting insects, such as stable flies, mosquitoes, and lice.

Baits

Baits help control house flies that congregate around feedlots, dairies, and livestock barns. Baits are made of dry sugar, syrup, or other substances that attract house flies. A small amount of insecticide is added to kill flies that eat the bait.

Boluses

Boluses are administered orally and slowly release chemicals in the animal's second stomach. These chemicals pass out into the manure and disrupt the development of maggots.

Read and follow label directions

The Environmental Protection Agency establishes tolerances for pesticide residues in agricultural commodities intended for human consumption. Follow the manufacturer's label recommendations label concerning safety restrictions, dosage, and application. Observe all label-specified withdrawal intervals to avoid illegal residues in meat or milk.

Dilution Chart for Mixing Sprays or Dips

Amount of insecticide concentrate in 100 gallons and 5 gallons of total mixture												
	1% mix		0.5% mix		0.25% mix		0.60% mix		0.03% mix		0.01% mix	
Insecticide concentrate	**100 gal**	**5 gal**	**100 gal**	**5 gal**	**100 gal**	**5 gal**	**100 gal**	**5 gal**	**100 gal**	**5 gal**	**100 gal**	**5 gal**
5.7% EC	1.75 gal	7.0 pt	8.8 gal	3.5 pt	4.4 gal	28.0 oz	1.0 gal	6.7 oz	4.2 pt	3.4 oz	1.4 pt	1.1 oz
10% EC	10.0 gal	2.0 qt	5.0 gal	1.0 qt	2.5 gal	1.0 pt	4.8 pt	3.8 oz	2.4 pt	1.9 oz	0.8 pt	0.63 oz
11% EC	9.0 gal	3.6 pt	4.5 gal	1.8 pt	2.3 gal	14.5 oz	4.4 pt	3.5 oz	2.2 pt	1.7 oz	0.73 pt	0.57 oz
11.6 ELI	8.6 gal	3.4 pt	4.3 gal	1.7 pt	2.2 gal	13.8 oz	4.1 pt	3.3 oz	2.1 pt	1.6 oz	0.70 pt	0.55 oz
25% WP	33.4 lb	1.6 lb	16.7 lb	13.3 oz	8.3 lb	6.7 oz	2.0 lb	1.6 oz	1.0 lb	0.8 oz	0.33 lb	0.27 oz
25% EC	4.0 gal	25.6 oz	8.0 qt	12.8 oz	1.0 gal	6.4 oz	1.9 pt	1.5 oz	1.0 pt	0.8 oz	0.33 pt	0.26 oz
40% WP	20.8 lb	1.0 lb	10.4 lb	8.3 oz	5.2 lb	4.1 oz	1.3 lb	1.0 oz	10.0 oz	0.5 oz	3.34 oz	0.17 oz
40% WP	2.5 gal	1.0 lb	5.0 qt	0.5 pt	2.5 qt	4.0 oz	19.2 oz	1.0 oz	9.6 oz	0.5 oz	3.20 oz	0.17 oz
50% WP	16.7 lb	13.3 oz	8.3 lb	6.7 oz	4.2 lb	3.4 oz	1.0 lb	0.8 oz	0.5 pt	0.3 oz	0.17 oz	0.10 oz
57% EC	7.0 qt	11.2 oz	3.5 qt	5.6 oz	3.6 pt	2.8 oz	13.4 oz	6.7 oz	6.7 oz	0.3 oz	2.20 oz	0.11 oz

WP = Wettable powder
EC = Emulsifiable concentrate
ELI = Emulsifiable liquid insecticide
WDL = Water dispersible liquid

Fluid conversion for EC only:
1 gallon (gal) = 4 quarts (qt)
1 gallon = 128 fluid ounces (oz)
1 quart (qt) = 2 pints (pt)
1 fluid ounce (oz) = 2 tablespoons (tbsp)
1 tablespoon = 3 teaspoons (tsp)

Formulas and Examples

For wettable powders (WP), use the following late formula to determine the number of ounces of powder to mix in the spray tank.

$$\frac{A \times S \times 8.345}{WP} \times \frac{A \times S}{16 \text{ oz} = \text{amount of WP in ounces}}$$

Where: A = amount finished spray (gallons)
S = % spray mix desired
WP = % wettable powder

Example: To make 5 gallons of a 0.06% spray mix from a 25% WP:

$$\frac{5 \text{ gal} \times 0.06\ \%\ \text{spray} \times 8.345}{25\%\ WP} \times 16 \text{ oz} =$$

$$\frac{2.5}{25} \times 16 \text{ oz} = 0.1 \times 16 = 1.6 \text{ oz}$$

For EC, ELI, or WDL, use the following formula to calcu- the number of liquid ounces to mix in the spray tank.

$C \times 128$ oz = quantity of liquid in ounces

Where: A = amount finished spray (gallons)
S = % spray mix desired
C = % concentration liquid product

Example: To make 100 gallons of a 0.06% spray mix from a 12% EC:

$$\frac{100 \times 0.6}{12} \times 128 = 0.5 \times 128 = 64 \text{ oz or 4 pints}$$

Pesticide suggestions

The following tables are snapshot guide to insecticides for specific pests. Manufacturer's label directions for each product will contain complete instructions and recommendations. Read the product labels carefully to determine whether the product is appropriate for your situation. Follow directions, restrictions and precautions precisely. Active chemical ingredients and corresponding insecticide trade names are listed on page 22.

Beef cattle and non-lactating dairy cattle

Note: Under certain conditions, some pour-ons may cause minor skin irritation and scurfing. Treat show animals at least several weeks before show time to allow any unsightliness to disappear. In addition to restrictions below, follow all precautions and restrictions listed on the product label.

Horn flies

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Abamectin				
	XP 820™	8.0% ear tag	0	1–2 tags per head
Beta-cyfluthrin				
	CyGuard™	15% ear tag	0	1–2 tags per head
Coumaphos				
	Coumaphos	1% dust	0	Apply to any age; direct application requires 10 days before next dusting. Suspend dust bags in frequented areas; hand dose at 2 oz per animal
	Co-Ral®	6.15% EC	0	Treat no more than 6 times per year; apply once every 10 days
		11.6% ELI	0	2½ fl oz in 4 gal of water; apply until runoff
		42% flowable	0	1 qt in 200 gal of water; apply until runoff every 10 days apart; apply only 6 times per year
Coumaphos + Diazinon				
	Corathon™	15% + 35% ear tag	0	1–2 tags per head
Cyfluthrin				
	CyLence®	1% pour-on	0	Use on all ages
Deltamethrin				
	Coopers™ Spot On	1% spot-on	17	Expected control for 4–8 weeks; do not repeat within 4 weeks
Diazinon				
	OPtimizer™	21% ear tag	0	2 tags per head
	Patriot™	40% ear tag	0	1–2 tags per head
	Terminator II™	20% ear tag	0	1–2 tags per head
	Warrior™	30% ear tag	0	1–2 tags per head

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Dichlorvos				
	Vapona®	43.2% EC	1	1–2 fl oz per animal daily as a fine mist spray; do not use on calves >6 months old
Diflubenzuron				
	ClariFly®	0.67% feed through	0	Begin in spring; safe for beneficial insects; all cattle must consume 0.10 mg per kg of body weight each day
Doramectin				
	Dectomax®	0.5% pour-on	45	1 ml per 22 lb of body weight; safe for any age beef cattle; weatherproof
Eprinomectin				
	Eprinex®	0.5% pour-on	0	1 ml per 22 lb of body weight; up to 28 days of control
Gamma-cyhalothrin				
	StandGuard®	0.5% pour-on	0	Follow application recommendations; repeat as needed every 2 weeks; do not use more than 4 times in 6 months
Ivermectin				
	Iver-On™	0.5% pour-on	48	1 ml per 22 lb of body weight; up to 28 days of control
	Ivomec®	0.5% pour-on	48	1 ml per 22 lb of body weight; up to 28 days of control
	Noromectin®	0.5% pour-on	28	Controls horn flies for up to 35 days; external use only; 1 ml per 10 kg body weight
Lambdacyhalothrin				
	Saber™	1% pour-on	0	Do not apply more than once every 2 weeks; do not apply more than 4 times in 6 month period
	Saber™Extra	10% ear tag	0	2 tags per head
	Ultra Saber™	1% Pour-on	0	Do not apply more than once every 2 weeks; do not apply more than 4 times in 6 months
Lambdacyhalothrin + pirimiphos methyl				
	Double Barrel™	6.8% + 14% ear tag	0	1–2 tags per head
Methoprene				
	Altosid®	10.5% feed-through	0	Ensure adequate supply of supplement is available to cattle; no effects on beneficial insects

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Moxidectin				
	Cydectin®	0.5% pour-on	0	Protects from horn flies for 7 days; no impact on dung beetles
Permethrin				
	Atroban®	1% pour-on	0	½ fl oz per 100 lb; pour along back and down face
		11% EC	0	For self- or spray application
		42.5% EC	0	Do not treat more than once every 2 weeks
	Boss®	5% pour-on	0	3 ml per 100 lb
	Brute®	10% pour-on	0	Apply down midline or back over shoulders; highly concentrated formulation
	Catron® IV	0.5% EC	0	Spray for 3 seconds per side
	GardStar®	40% EC	0	1–2 qt coarse spray per animal
	GardStar® Plus	10% ear tag	0	2 tags per head
	Hi-Yield®	0.25% dust	0	Broad use; suspend in frequented region
	Permectrin™	0.25% dust	0	Suspend dust bags in frequented areas
		1% pour-on	0	½ fl oz per 100 lb; pour along back line and down face
	Permectrin™ CDS	7.4% pour-on	0	1.5–2.0 ml per 100 lb; pour along back and down face; also use as a spray or backrubber
	Permectrin™II	10% EC	0	Use as a backrubber, spray, or spot application
	Permethrin	1% pour-on	0	½ fl oz per 100 lb; do not repeat more than once every 2 weeks
	Pest Rid®	10% EC	0	Effective to up 28 days
	Screwworm Aerosol	0.5% EC	0	Spray about 3 seconds per side
	Synergized Delice®	1% EC	0	Use on all ages of cattle; requires many applications
	Synergized Permethrin	1% pour-on	0	Multiple application methods
	Tengard® SFR	36.8% EC	0	1–2 qt per animal
	Ultra Boss®	5% pour-on	0	3 ml per 100 lb
Phosmet				
	Prolate/Lintox-HD™	11.75% EC	3	Repeat as necessary every 7–10 days; do not use when grubs are in gullet or spinal canal

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Pirimiphos methyl				
	Dominator®	20% ear tag	0	1–2 tags per head
Pyrethrins + dichlorvos				
	Super II Dairy & Farm Spray	0.05% + 0.49% ready-to-use	0	Quick knockdown; spray cattle directly
Spinosad				
	Elector®	2.46% EC	0	**Pour-on:** 4 ml per 110 lb; repeat as needed every 14 days **Spray:** 1–2 qt per animal; repeat as needed every 7 days; do not make more than 5 consecutive treatments
Tetrachlorvinphos				
	Rabon®	3% dust	0	Suspend dust bags in frequented areas; hand-dose at 2 oz per animal
		50% WP	0	½–1 gal spray per animal
		97.3% oral	0	Feed through larvicide
Tetrachlorvinphos + Dichlorvos				
	Ravap®	23.0% + 5.3% EC	0	½–1 gal spray per animal; do not treat more often than every 10 days; not for use on calves <6 months old
Zeta-cypermethrin				
	PYthon™	0.075% dust	0	Apply to any age
		10% ear tag	0	1–2 tags per head
	PYthon MAGNUM™	10% ear tag	0	1 tag per head
Cattle grubs				
Note: Systemic pesticides for cattle grub control may be administered as dips, sprays, pour-ons, injectables, or spot-ons. Administer treatments between May and September 1, preferably soon after May 1 for best results. Consult your veterinarian.				
Coumaphos				
	Co-Ral®	6.15% EC	0	Apply specified dosage for complete wetting to run off; treat no more than 6 times per year; do not make applications less than 10 days apart
		11.6% ELI	0	Apply specified dosage in 4 gal water for complete wetting to run off

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Coumaphos *continued*		42% flowable	0	**Dip treatment:** Charge dip vats with accurate concentration by using exact quantity of Co-Ral® and volume of water specified; mix suspension thoroughly before each use; passage of animals through the vat does not change concentration of remaining suspension; replace water lost to evaporation. If water is added to the vat due to rainfall or replenishment, add an appropriate amount of pesticide; continue to use vat until accumulation of debris makes it unsuitable for further use
Doramectin				
	Dectomax®	1% Injectable	45	Subcutaneous or intramuscular injection; 1 ml per 110 lb of body weight; do not use on dairy cattle over 20 months old
		0.5% pour-on	45	1 ml per 22 lb of body weight; safe for any age beef cattle; weatherproof
Eprinomectin				
	Eprinex®	0.5% pour-on	0	1 ml per 22 lb of body weight
Ivermectin				
	Iver-On™	0.5% pour-on	48	1 ml per 22 lb of body weight
	Ivomec®	1% injectable	48	Use subcutaneous injection only; not for intravenous or intramuscular use; do not exceed 200 mcg of avermectin per 2.2 lb of animal weight; use no more than 10 ml of Ivomec® on animals over 1,000 lb
		0.5% pour-on	48	1 ml per 22 lb of body weight
	Ivomec® Plus – ivermectin + clorsulon	1% + 10% injectable	48	Subcutaneous injections only; do not exceed 200 mcg of avermectin and 2 mcg of clorsulon per 2.2 lb of animal weight.
	Noromectin®	0.5% pour-on	28	1 ml per 22 lb of body weight: external use only
	Noromectin® Plus	0.5% injectable	49	1 ml per 110 lb of body weight; give subcutaneously

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Moxidectin				
	Cydectin®	0.5% pour-on	0	Ready-to-use topical; apply to all cattle in herd; 1 ml per 22 lb of body weight
		0.5% injectable	0	Administered subcutaneously; give to all cattle in herd; 1 ml per 110 lb of body weight
Tetrachlorvinphos				
	Rabon®	3% dust	0	After the grubs have encysted (formed warbles), apply 3–4 oz down the backline and rub in thoroughly
Ticks				
Abamectin				
	XP 820™	8.0% ear tag	0	1–2 tags per head
Amitraz				
	Taktic®	12.5% EC	0	Mix 1 can (760 ml) in 100 gal water; use within 6 hours of mixing; use up to 2 gal on full grown animal.
Beta-cyfluthrin				
	CyGuard™	15% ear tag	0	1–2 tags per head
Coumaphos				
	Coumaphos	1% dust	0	Apply to any age; direct application requires 10 days before next dusting
	Co-Ral®	6.15% EC	0	Apply specified dosage for complete wetting to run-off; treat no more than 6 times per year; do not make applications less than 10 days apart
		11.6% EC	0	Apply specified dosage in 4 gal of water for complete wetting to run off
		42% flowable	0	**Dip treatment:** add specified quantity in 200 gallons of water; agitate dip thoroughly before each use to ensure uniform treatment; do not dip more than twice per year or treat less than 10 days apart Spray treatment: Add specified amount to 200 gal water and mix thoroughly; apply for complete wetting to run off; do not spray more than 6 times per year or treat less than 10 days apart

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Coumaphos + diazinon				
	Corathon™	15% + 35% ear tag	0	1–2 tags per head
Deltamethrin				
	Coopers™ Spot On	1% spot-on	17	Expected control for 4–8 weeks; do not repeat within 4 weeks
Diazinon				
	OPtimizer™	21% ear tag	0	2 tags per head
	Patriot™	40% ear tag	0	1–2 tags per head
	Terminator II™	20% ear tag	0	1–2 tags per head
	Warrior™	30% ear tag	0	1–2 tags per head
Lambdacyhalothrin				
	Saber™Extra	10% ear tag	0	1–2 tags per head
Lambdacyhalothrin + pirimiphos methyl				
	Double Barrel™	6.8% + 14% ear tag	0	1–2 tags per head
Permethrin				
	Atroban®	1% pour-on	0	½ fl oz per 100 lb body weight up to 5 fl oz
		11% EC	0	1 pt–25 gal water or 1 qt–50 gal water; 1 to 2 qt per animal; repeat every 10–14 days
		42.5% EC	0	1 pt–100 gal; apply 1 qt per animal; repeat as needed but not more than every 10–14 days
	Boss®	5% pour-on	0	3 ml per 100 lb body weight, maximum of 30 ml
	Brute®	10% pour-on	0	High concentrated; follow dosing instructions
	Catron® IV	0.50% EC	0	**Ear ticks:** Spray directly into ear
	Fly-Rid® Plus	0.5% EC	0	Ready-to-use
	GardStar®	40% EC	0	1–2 qt spray per animal wet thoroughly; repeat application 10–14 days **Ear ticks:** Spray ½ fl oz into ear
	GardStar® Plus	10% ear tag	0	2 tags per head
	Permectrin™ II	10% EC	0	Spray animal thoroughly; use ½–1 gal of spray per head; spray at 14 to 21 day intervals

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Permethrin *continued*	Permethrin	1% pour-on	0	Apply ½ fl oz per 100 lb, maximum of 5 fl oz; treat every 2 weeks as needed
	Tengard® SFR	36.8% EC	0	1–2 qt of spray per animal over whole body; wet thoroughly; 1 per 2 fl oz directly in ear for ear tick control
	Ultra Boss®	5% pour-on	0	Apply 3 ml per 100 lb body weight, maximum of 30 ml; repeat as needed every 2 weeks
Phosmet				
	Prolate/Lintox-HD™	11.75% EC	3	Do not treat non-lactating dairy cattle within 28 days of freshening; follow dosing instructions; repeat every 7–10 days as needed
Pirimiphos methyl				
	Dominator®	20% ear tag	0	1–2 tags per head
Tetrachlorvinphos				
	Rabon®	50% WP	0	Lone star ticks: Use ½–1 gal of spray per animal
Tetrachlorvinphos + dichlorvos				
	Ravap®	23.0% + 5.3% EC	0	1 gal in 200 gal; use ½–1 gal spray per animal; do not treat more often than every 10 days; do not use on calves <6 months old; for severe infestations dilute 1 gal in 50 gal of water
Zeta-cypermethrin				
	PYthon™	0.075% dust	0	Apply to any age; apply up to 2 oz per animal; for ear ticks apply 1 to 3 oz inside each ear; repeat as needed every 3 days
		10% ear tag	0	1–2 tags per head
	PYthon MAGNUM™	10% ear tag	0	1 tag per head
Lice				
Amitraz				
	Taktic®	12.5% EC	0	Mix 1 can (760 ml) in 100 gal water; use within 6 hours of mixing; use up to 2 gal on fully grown animal; pay particular attention to the legs, axilla and groin area, udder, tail regions, and head, including the ears; administer second treatment 10–14 days later

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Abamectin				
	XP 820™	8.0% ear tag	0	1–2 tags per head
Beta-cyfluthrin				
	CyGuard™	15% ear tag	0	1–2 tags per head
Coumaphos				
	Coumaphos	1% dust	0	Apply to any age; direct application requires 10 days before next dusting
	Co-Ral®	6.15% EC	0	Apply specified dosage for complete wetting to run off; treat no more than 6 times per year; do not make applications less than 10 days apart
		11.6% ELI	0	Apply specified dosage in 4 gal water for complete wetting to run off
		42% flowable	0	**Dip treatment:** add specified quantity in 200 gal of water; agitate dip thoroughly prior to each use to assure uniform treatment; do not dip more than twice per year or treat less than 10 days apart **Spray treatment:** Add specified amount to 200 gal water and mix thoroughly; apply for complete wetting to run off; do not spray more than 6 times per year or treat less than 10 days apart
Coumaphos + diazinon				
	Corathon™	15% + 35% ear tag	0	1–2 tags per head
Cyfluthrin				
	CyLence®	1% pour-on	0	Use on all ages; ready-to-use; follow dosage instructions
Diazinon				
	OPtimizer™	21% ear tag	0	2 tags per head
	Patriot™	40% ear tag	0	1–2 tags per head
	Terminator II™	20% ear tag	0	1–2 tags per head
	Warrior™	30% ear tag	0	1–2 tags per head
Deltamethrin				
	Coopers™ Spot On	1% spot-on	17	Expect control for 4–8 weeks; do not repeat within 4 weeks

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Diflubenzuron + Permethrin				
	Clean-up™	5% + 5% pour-on	0	3 ml per 100 lb body weight, maximum of 30 ml; repeat every 2 weeks as needed
Doramectin				
	Dectomax®	1% Injectable	45	Subcutaneous or intramuscular injection; 1 ml per 110 lb body weight; do not use on dairy cattle over 20 months old
		0.5% pour-on	45	Apply 1 ml per 22 lb body weight; safe for any age beef cattle; weatherproof
Eprinomectin				
	Eprinex®	0.5% pour-on	0	1 ml per 22 lb body weight
Gamma-cyhalothrin				
	StandGuard®	0.5% pour-on	0	Follow dosage instructions; do not apply to face of cattle
Ivermectin				
	Iver-On™	0.5% pour-on	48	Apply 1 ml per 22 lb of body weight
	Ivomec®	1% injectable	48	Use subcutaneous injection only; not for intravenous or intramuscular use; do not exceed 200 mcg of avermectin per 2.2 lb animal weight; do not use more than 10 ml of Ivomec® on animals over 1,000 lb
		0.5% pour-on	48	1 ml per 22 lb body weight
	Ivomec® Plus – ivermectin + clorsulon	1% + 10% injectable	48	Subcutaneous injection only; do not exceed 200 mcg of avermectin and 2 mcg of clorsulon per 2.2 lb animal weight
	Noromectin®	0.5% pour-on	28	1 ml per 22 lb body weight; external use only
	Noromectin® Plus	0.5% injectable	49	1 ml per 110 lb body weight; give subcutaneously
Lambdacyhalothrin				
	Saber™	1% pour-on	0	Apply as instructed; repeat every 2 weeks as needed; do not apply more than 4 times within any 6 month period
	Saber™Extra	10% ear tag	0	Use 2 tags per head

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Lambdacyhalothrin *continued*	Ultra Saber™	1% pour-on	0	Apply as instructed; repeat every 2 weeks as needed; do not apply more than 4 times within any 6-month period
Lambdacyhalothrin + pirimiphos methyl				
	Double Barrel™	6.8% + 14% ear tag	0	1–2 tags per head
Moxidectin				
	Cydectin®	0.5% pour-on	0	Ready-to-use topical; apply to all cattle in herd; 1 ml per 22 lb of body weight
		0.5% injectable	0	Administered subcutaneously; give to all cattle in herd; 1 ml per 110 lb body weight
Permethrin				
	Atroban®	1% pour-on	0	½ fl oz per 100 lb body weight, maximum of 5 fl oz
		11% EC	0	1–2 qt spray per animal; wet thoroughly; repeat every10–24 days as needed
		42.5%	0	2 qt per animal or dip to thoroughly wet animal; repeat as needed every 2 weeks
	Boss®	5% pour-on	0	3 ml per 100 lb body weight, maximum of 30 ml
	Brute®	10% pour-on	0	High concentrated; follow dosing instructions
	Catron® IV	0.50% EC	0	Apply to the infested areas of the animal using a stiff brush to get the spray to the base of the hair; repeat every 3 weeks.
	GardStar®	40% EC	0	1–2 qt spray per animal, wet thoroughly; repeat application 10–14 days
	GardStar® Plus	10% ear tag	0	2 tags per head
	Hi-Yield®	0.25% dust	0	Broad use; suspend applicator in frequented region
	Permectrin™	1% pour-on	0	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Permectrin™ CDS	7.4% pour-on	0	2 ml per 100 lb body weight, maximum of 20 ml; apply 2 treatments at 14-day interval

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Permethrin *continued*	Permectrin ™ II	10% EC	0	Mix 1 qt in 200 gal water, 8 oz in 50 gal of water; apply ½–1 gal per head; second treatment 14–21 days later
	Permethrin	1% pour-on	0	½ fl oz per 100 lb body weight, maximum of 5 fl oz; repeat treatment at 14-day intervals
		10% EC	0	Follow label
	Pest Rid®	10% EC	0	Follow label
	Synergized Delice®	1% EC	0	Use on all ages; ½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Synergized Permethrin®	1% pour-on	0	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Tengard® SFR	36.8% EC	0	1–2 qt spray per animal; wet thoroughly; repeat application 10–14 days
	Ultra Boss®	5% pour-on	0	3 ml per 100 lb body weight, maximum of 30 ml
Phosmet				
	Prolate/Lintox-HD™	11.75% EC	3	Do not treat non-lactating dairy cattle within 28 days of freshening; follow dosing instructions; repeat every 7–10 days as needed
Pirimiphos methyl				
	Dominator®	20% ear tag	0	1–2 tags per head
Spinosad				
	Elector®	2.46% EC	0	**Pour-on:** 4 ml per 110 lb body weight **Spray:** 1–2 qt of spray per animal; treat 45–60 days after initial treatment for optimal control
Tetrachlorvinphos				
	Rabon®	3% dust	0	Hand-dose 2 oz per animal
		50 WP	0	½–1 gal per animal
Tetrachlorvinphos + dichlorvos				
	Ravap®	23% + 5.3% EC	0	Follow dilution instructions; use ½–1 gal per animal; treat every 10 days as needed

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Zeta-cypermethrin				
	Python™	0.075% dust	0	Apply to any age; apply up to 2 oz per animal; repeat as needed every 3 days
		10% ear tag	0	1–2 tags per head
	PYthon MAGNUM™	10% ear tag	0	1 tag per head
Screwworm and other blow fly larvae				
Note: Treat wounds and surrounding area thoroughly, but do not use excessive amounts. Treat twice the first week and weekly thereafter until healed.				
Coumaphos				
	Co-Ral®	42% flowable	0	**Spray treatment:** Mix specified amount in 200 gal water and mix thoroughly as a high-pressure spray to wet the skin, not just the hair; do not spray more the 6 times per year; do not make applications less than 10 days apart
Permethrin				
	Catron® IV	0.5% EC	0	**In and around superficial wounds:** Spray wounds thoroughly allowing spray to penetrate into pockets made by maggots; apply over discharge around wound to prevent re-infestation; treat at 5–7 day intervals until wound is healed
	Screwworm Aerosol Spray	0.5% EC	0	Spray about 3 seconds on each side, being careful to spray back, withers, and forelegs thoroughly; repeat treatment when flies are troublesome
Mange and Scab Mite				
Amitraz				
	Taktic®	12.5% EC	0	Mix 1 can (760 ml) in 100 gal water. **Spray:** Use within 6 hours of mixing; use up to 2 gal on full- grown animal; wet animal thoroughly and penetrate to skin until run off. **Spray dip machine:** to control cattle scabies, applications should be made as instructed by USDA, APHIS, VS bulletins; 2 treatments 1–10 days apart are required

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Doramectin				
	Dectomax®	1% Injectable	45	Subcutaneous or intramuscular injection; 1 ml per 110 lb body weight; do not use on dairy cattle over 20 months old
		0.5% pour-on	45	1 ml per 22 lb body weight; safe for any age beef cattle; weatherproof
Eprinomectin				
	Eprinex®	0.5% pour-on	0	1 ml per 22 lb body weight
Ivermectin				
	Iver-On™	0.5% pour-on	48	Apply 1 ml per 22 lb of body weight
	Ivomec®	1% injectable	48	Use subcutaneous injection only; not for intravenous or intramuscular use; do not exceed 200 mcg of avermectin per 2.2 lb animal weight; do not use more than 10 ml of Ivomec® on animals over 1,000 lb
		0.5% pour-on	48	1 ml per 22 lb body weight
	Ivomec® Plus – ivermectin + clorsulon	1% + 10% injectable	48	Subcutaneous injection only; do not exceed 200 mcg of avermectin and 2 mcg of clorsulon per 2.2 lb of animal weight
	Noromectin®	0.5% pour-on	28	1 ml per 22 lb body weight; external use only
	Noromectin® Plus	0.5% injectable	49	1 ml per 110 lb body weight; give subcutaneously
Moxidectin				
	Cydectin®	0.5% pour-on	0	Ready-to-use topical: Apply to all cattle in herd; 1 ml for each 22 lb body weight
		0.5% injectable	0	Administered subcutaneously; give to all cattle in herd; 1 ml for each 110 lb body weight
Permethrin				
	Atroban®	11% EC	0	1–2 qt of spray per animal; wet thoroughly; apply again in 10–14 days
		42.5% EC	0	Apply 1 qt per animal or dip to thoroughly wet animals to ensure coverage; repeat as needed every 10–14 days.

Active ingredient	Brand name	Formulation	Withdrawal days to slaughter	Remarks
Permethrin *continued*	GardStar®	40% EC	0	1–2 qt per animal; wet thoroughly; reapply in 10–14 days
	Permectrin™ II	10% EC	0	½–1 gal spray per head; thoroughly cover; second treatment recommended 14–21 days later
	Permethrin	10% EC	0	Follow label
	Pest Rid®	10% EC	0	Follow label
Phosmet				
	Prolate/Lintox-HD™	11.75% EC	3	Do not treat non-lactating dairy cattle within 28 days of freshening; follow dosing instructions; repeat every 7–10 days as needed

Lactating dairy cattle

Note: Use good judgment when selecting and applying pesticides. Some materials may be used safely if they are applied correctly; others may contaminate the milk. Milk entering interstate commerce can be confiscated by the Environmental Protection Agency (EPA) if it contains illegal pesticide residues. Consequently, careless use of pesticides may be very costly to the milk producer.
One important source of milk contamination with pesticides is the hay or forage that the animal consumes. When buying baled hay or similar feed material, be sure that pesticide residues do not exceed established tolerances.
All pesticides listed below have a 0 day wait for slaughter or milk.

Horn flies			
Active ingredient	**Brand name**	**Formulation**	**Remarks**
Beta-cyfluthrin			
	CyGuard™	15% ear tag	1–2 tags per head
Coumaphos			
	Coumaphos	1% dust	2.0 oz per animal by shaker; hang bags in milking parlor exits
	Co-Ral®	1% dust	**Dust bag, shaker can:** Apply 2 oz per animal; treat no more than 12 times per year; do not make applications less than 10 days apart
		6.15% EC	**Spray treatment:** Apply specified dosage for a complete wetting to run off; treat no more than 6 times per year; do not make applications less than 10 days apart
		11.6% ELI	**Cattle Backrubbers:** Mix specified dosage in 1 gal No. 2 fuel oil or No. 2 diesel fuel; saturate the fiber portion of the backrubber with this mixture; place the backrubber where animals congregate or travel regularly; for dairy cattle, suspend at a height that will prevent straddling; re-saturate backrubber as needed
		42% flowable	**Spray treatment:** Add specified amount to 200 gal water and mix thoroughly; apply for complete wetting to runoff; do not spray more than six times per year; do not make applications less than 10 days apart

Active ingredient	Brand name	Formulation	Remarks
Cyfluthrin			
	CyLence®	1% pour-on	Can use on all ages and sizes; ready-to-use solution
Deltamethrin			
	Coopers™ Spot On	1% EC	Control can be expected for 4 to 8 weeks. Treatment should not be repeated within four weeks.
Dichlorvos			
	Vapona®	40.2% EC	Apply 1–2 fl oz (do not exceed) per animal daily as a fine mist spray. Be sure to cover all parts of the animal. Do not apply in combination with other dermal organophosphate pesticides. Do not wet the hide. Do not apply to calves under 6 months of age.
Eprinomectin			
	Eprinex®	0.5% pour-on	1 ml for each 22 lb body weight; controls horn flies for up to 28 days
Moxidectin			
	Cydectin®	0.5% pour-on	1 ml for each 22 lb body weight; due to the angular topline of most dairy breeds, apply slowly to all in the herd; provides 7 days persistent activity
Permethrin			
	Atroban®	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
		11% EC	1–2 qt per animal; backrubber
		42.5% EC	1–2 qt or dip thoroughly to ensure complete coverage; repeat as needed every 2 weeks
	Boss®	5% pour-on	3 ml per 100 lb body weight, maximum of 30 ml
	Brute®	10% pour-on	Use as a pour-on or backrubber; controls up to 6 weeks
	Catron® IV	0.5% EC	Spray about 3 seconds on each side, being careful to spray the back, withers, and forelegs thoroughly; repeat treatment when flies are troublesome
	Fly-Rid® Plus	0.5% EC	Multi-purpose
	GardStar	40% EC	1–2 qt of coarse spray per animal over whole body surface
	GardStar® Plus	10% ear tag	2 tags per head
	Hi-Yield- Garden, Pet & Livestock Dust	0.25% dust	Bag application or direct application of 2 oz per animal; for dairy cows, dust bags may be suspended in the exit from the milking barn
	Permectrin™	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Permectrin™ II	10% EC	Mix 1 qt in 200 gal water; 8 oz in 50 gal water; apply ½ to 1 gal thoroughly
	Permectrin™ CDS	7.4% pour-on	1.5–2.0 ml per 100 lb body weight, maximum of 15–20 ml; repeat as needed every 2 weeks; controls up to 6 weeks
	Permethrin	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz; repeat as needed every 2 weeks

Active ingredient	Brand name	Formulation	Remarks
Permethrin *continued*		10% EC	Broad-spectrum control; residual activity up to 28 days
	Pest Rid®	10% EC	Broad-spectrum control; residual activity up to 28 days
	Screwworm Aerosol	0.5% EC	Spray about 3 seconds on each side being careful to spray back, withers and forelegs thoroughly; repeat when flies are troublesome
	Synergized Delice®	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Synergized Permethrin®	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Tengard® SFR	36.8% EC	1–2 qt coarse spray per animal over whole body surface
	Ultra Boss®	5% pour-on	3 ml per 100 lb body weight, maximum of 30 ml; repeat as needed every 2 weeks
Spinosad			
	Elector®	2.46% EC	For horn fly control, repeat applications as needed, but no more often than every 14 days; do not make more than 5 consecutive treatments of this product.
Tetrachlorvinphos			
	Rabon®	3% dust	Hand dose at 2 oz per animal; dust bag; safe, broad-spectrum insecticide
		97.3% oral larvicide	Feed 1 block per 10-15 head of cattle or horses. This allows all animals' equal access to blocks. Feed blocks at the rate of 0.88 oz. per 100 lb. of bodyweight per day.
Tetrachlorvinphos + dichlorvos			
	Ravap®	23% + 5.3%	1 gal in 200 gal water or 2 oz in 3 gal water; apply ½ gal per animal; repeat as necessary; not for calves under 6 months; prevent contact with cow's teats unless they are washed before milking; apply at least 20 minutes before milking or after milking is complete
Zeta-cypermethrin			
	PYthon™	0.075% dust	Use in dust bag, shaker can, dusting glove, or mechanical dust application; apply 2 oz dust per animal; repeat once every 3 days
		10% ear tag	1–2 tags per head
	PYthon™ MAGNUM	10% ear tag	1 tag per head
Cattle grubs			
Eprinomectin			
	Eprinex®	0.5% pour-on	1 ml for each 22 lb body weight
Moxidectin			
	Cydectin®	0.5% pour-on	1 ml for each 22 lb body weight; due to the angular topline of most dairy breeds, apply slowly to all in the herd

Active ingredient	Brand name	Formulation	Remarks
Tetrachlorvinphos			
	Rabon®	3% dust	Hand dose at 2 oz per animal; dust bag; safe, broad-spectrum insecticide
Stable fly and house fly			
Coumaphos			
	Coumaphos	1% dust	2.0 oz per animal by shaker; hang bags in milking parlor exits
Dichlorvos			
	Vapona®	40.2% EC	1–2 fl oz (do not exceed) per animal daily as a fine mist spray; be sure to cover all parts of the animal; do not apply in combination with other dermal organophosphate pesticides; do not wet the hide; do not apply to calves under 6 months old
Permethrin			
	Atroban®	11% EC	1–2 qt per animal; backrubber
		42.5% EC	2 qt or dip thoroughly to ensure complete coverage; repeat as needed every 2 weeks
	Catron® IV	0.5% EC	Spray about 3 seconds on each side, being careful to spray back, withers, and forelegs thoroughly; repeat treatment when flies are troublesome
	Fly-Rid® Plus	0.5% EC	Follow label
	GardStar	40% EC	1–2 qt coarse spray per animal over whole body surface
	Permectrin™ II	10% EC	Mix 1 qt in 200 gal water; 8 oz in 50 gal of water; apply ½–1 gal thoroughly
	Permethrin	10% EC	Broad-spectrum control; residual activity up to 28 days
	Pest Rid®	10% EC	Broad-spectrum control; residual activity up to 28 days
	Screwworm Aerosol	0.5% EC	Spray about 3 seconds on each side, being careful to spray back, withers, and forelegs thoroughly; repeat when flies are troublesome
	Tengard® SFR	36.8% EC	1–2 qt coarse spray per animal over whole body surface
Tetrachlorvinphos			
	Rabon®	97.3% oral larvicide	Feed 1 block per 10-15 head of cattle or horses. This allows all animals' equal access to blocks. Feed blocks at the rate of 0.88 oz per 100 lb of bodyweight per day.
Zeta-cypermethrin			
	PYthon™	0.075% dust	Use in dust bag, shaker can, dusting glove, or mechanical dust application; apply 2 oz of dust per animal; repeat once every 3 days

Active ingredient	Brand name	Formulation	Remarks
Lice			
Amitraz			
	Taktic®	12.5% EC	Mix 1 can (760 ml) in 100 gal water. **Spray & spray dip machine:** Use within 6 hours of mixing; use up to 2 gal of spray for a full-grown animal, wet animal thoroughly and penetrate skin until run off. Pay particular attention to the legs, axilla, groin area, udder, tail regions and head, including the ears; a second treatment 10–14 days later is recommended to kill lice hatching from eggs
Beta-cyfluthrin			
	CyGuard™	15% ear tag	1–2 tags per head
Coumaphos			
	Coumaphos	1% dust	2.0 oz per animal by shaker; hang bags in milking parlor exits
	Co-Ral®	1% dust	**Dust bag, shaker can:** Apply 2 oz per animal; treat no more than 12 times per year; do not make applications less than 10 days apart
		6.15% EC	**Spray treatment:** Apply specified dosage for a complete wetting to run off; treat no more than 6 times per year; do not make applications less than 10 days apart
		11.6% ELI	**Spray treatments:** Apply specified dosage in 4 gal water for a complete wetting to run off; repeat as necessary
		42% flowable	**Spray treatment:** Add specified amount to 200 gallons water and mix thoroughly; apply for complete wetting to run off; do not spray more than 6 times per year; do not make applications less than 10 days apart
Cyfluthrin			
	CyLence®	1% pour-on	Can use on all ages and sizes; ready-to-use solution; controls lice for up to 3 weeks
Deltamethrin			
	Coopers™ Spot On	1% EC	Complete clearance of all lice may take 4–5 weeks, during which time lice hatch from the eggs and are killed; re-treat an animal 6–8 weeks later if necessary
Diflubenzuron			
	Clean-up™	5% pour-on	Apply 3 ml per 100 lb body weight, maximum of 30 ml; repeat treatment as needed every 2 weeks
Eprinomectin			
	Eprinex®	0.5% pour-on	1 ml for each 22 lb body weight
Moxidectin			
	Cydectin®	0.5% pour-on	1 ml for each 22 lb body weight; due to the angular topline of most dairy breeds, apply slowly to all in the herd

Active ingredient	Brand name	Formulation	Remarks
Permethrin			
	Atroban®	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
		11% EC	1–2 qt coarse spray per animal; wet thoroughly
		42.5%	2 qt of spray or dip to thoroughly wet to ensure complete coverage; repeat as needed every 2 weeks
	Boss®	5% pour-on	3 ml per 100 lb body weight, maximum of 30 ml
	Brute®	10% pour-on	Use as a pour-on or backrubber
	Catron® IV	0.5% EC	Apply to the infested areas of the animal using a stiff brush to get the spray to the base of the hair. Repeat every 3 weeks if required.
	GardStar®	40% EC	1 to 2 qt of coarse spray per animal over whole body surface, wet thoroughly; repeat application 10–14 days
	GardStar® Plus	10% ear tag	2 tags per head
	Hi-Yield- Garden, Pet & Livestock Dust	0.25% dust	Bag application or direct application of 2 oz per animal; for dairy cows, dust bags may be suspended in the exit from the milking barn.
	Permectrin™	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Permectrin™ II	10% EC	1 qt in 200 gal water; 8 oz in 50 gal of water; apply ½–1 gal thoroughly; retreat 14–21 days later
	Permectrin™ CDS	7.4% pour-on	2.0 ml per 100 lb body weight, maximum of 20 ml; two treatments at 14-day intervals recommended
	Permethrin	1% pour-on	Apply ½ fl oz per 100 lb body weight, maximum of 5 fl oz; apply 2 treatments 14 days apart
	Synergized Delice®	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Synergized Permethrin®	1% pour-on	½ fl oz per 100 lb body weight, maximum of 5 fl oz
	Ultra Boss®	5% pour-on	3 ml per 100 lb body weight, maximum of 30 ml; repeat as needed every 2 weeks
	Tengard® SFR	36.8% EC	1–2 qt of coarse spray per animal over wh.ole body surface
Spinosad			
	Elector®	2.46% EC	For optimal lice control, an initial application followed by a second treatment 45–60 days later is recommended
Tetrachlorvinphos			
	Rabon®	3% dust	Hand-dose 2 oz per animal; dust bag
Tetrachlorvinphos + dichlorvos			
	Ravap®	23% + 5.3%	1 gal in 200 gal of water or 2 oz in 3 gal water; apply ½ gal per animal; repeat as necessary; not for calves under 6 months; prevent contact with cow's teats unless they are washed before milking; apply at least 20 minutes before milking or after milking is complete

Active ingredient	Brand name	Formulation	Remarks
Zeta-cypermethrin			
	PYthon™	0.075% dust	Use in dust bag, shaker can, dusting glove, or mechanical dust application; apply 2 oz of dust per animal; repeat once every 3 days
		10% ear tag	1–2 tags per head
	PYthon™ MAGNUM	10% ear tag	1 tag per head
Screwworm & other blow fly larvae			
Coumaphos			
	Co-Ral®	42% flowable	**Spray treatment:** Mix specified amount in 200 gal water and mix thoroughly as a high pressure spray to wet the skin, not just the hair; do not spray more than 6 times per year; do not make applications less than 10 days apart
Permethrin			
	Catron® IV	0.5% EC	**In and around superficial wounds:** Spray wounds thoroughly allowing spray to penetrate into pockets made by maggots; apply over discharge around wound to prevent re-infestation; treat at 5–7 day intervals until wound is healed
	Screwworm aerosol	0.5% EC	Spray about 3 seconds on each side, being careful to spray back, withers, and forelegs thoroughly; repeat when flies are troublesome

Premises (Inside or outside of animal quarters)

Note: Do not spray animals directly with premise concentrations. Do not contaminate water, feed, foodstuffs, milk or milking utensils.

Active ingredient	Brand name	Formulation	Location	Remarks
House flies and stable flies				
Beta-cyfluthrin				
	Tempo® SC Ultra Premise Spray	11.8% EC	Livestock facilities	8 ml–16 ml per 1000 sq ft; apply as a general surface and/or a crack and crevice spray; do not make applications where animals are present
Chlorpyrifos				
	Durashield® CS	20% EC	Livestock housing and holding areas (dairy areas, milk rooms, calf hutches, calving pens and parlors)	2–5 fl oz per gal water, 1 gal per 1000 sq ft; apply as coarse wet spray; treat normal fly resting areas and surfaces known to attract flies
Cyfluthrin				
	Tempo®	20% WP	Livestock buildings, including dairy barns, milking parlors, hospital pens, clinics, and chutes	10–20 g per gal water; apply to surfaces where pests collect or rest
Deltamethrin				
	Annihilator™	0.02% EC	Livestock facilities (indoors)	Apply thoroughly to surfaces until wet; repeat once a week as necessary
			Outdoors	Spray outside surfaces of windows and door frames and other areas where pests may enter; spray resting areas (eaves, porches, around light fixtures and cords, railing)
Dichlorvos				
	Vapona®	43.2% EC	Dairy barns and other building (indoors)	Apply as a space spray mist to open air at the rate of 1 qt per 8,000 cu ft or as coarse wet spray to indoor surfaces at the rate of 1 qt per 1000 sq ft
			Cattle feedlots, stockyards, holding pens, and corrals (outdoors)	Apply at an overall application rate of about 5 gal per acre; fog or mist when insects are most active

Active ingredient	Brand name	Formulation	Location	Remarks
Difluroethane				
	Country Vet®-Instant Knock Down CV – 80D	55–56% EC	Livestock facilities	—
Dinotefuran				
	QuikStrike® Fly Scatter Bait	0.5% bait	**Scatter bait:** Outside milking parlors and meat processing plants **Bait stations:** In and outside milking parlors, meat processing plants and feed lots	**Scatter bait:** Scatter granules at desired locations; apply ¼ lb per 500 sq ft; reapply to maintain control **Bait stations:** secure 4 ft above the ground; 1 station every 250 sq ft with 3 oz of bait per station
Esfenvalerate				
	Clear Zone® Farm Residual Concentrate	9.36% EC	In and around livestock housing	1 gal per 1000 sq ft of surface area
Gamma-cyhalothrin				
	StandGuard® Premise	5.9% EC	Livestock facilities, railcars, trucks, and trailers	Apply directly to walls, ceiling, window screens, and other insect resting areas as a residual surface treatment; may be used in and around equipment storage sheds
Imidacloprid				
	QuickBayt® Fly Bait	0.50% bait	Livestock facilities	1.5 oz per 250 sq ft; for use around the outside as a scatter bait or inside within a bait station; also can be used inside and outside as a paint-on application
	QuickBayt® Spot Spray	10% EC	Livestock facilities	16 oz in 1 gal for 2000 sq ft; mix in water and spray or paint on surfaces; apply as coarse fan or cone spray; repeat as needed every 7 days
Lambdacyhalothrin				
	Grenade® ER	9.7% EC	Animal housing	Apply a directed application to horizontal surfaces and overhead areas; allow drying before reintroducing animals

Active ingredient	Brand name	Formulation	Location	Remarks
Methomyl				
	Golden Malrin®	1.0% bait	**Scatter bait:** Outside feedlots, livestock barns, and meat processing plants **Bait stations:** Outside milking parlors	**Scatter bait:** Distribute at ¼ lb per 500 sq ft; reapply daily when population is high otherwise every 2–3 days **Bait stations:** Secure 4 ft above the ground; add 1 oz of product and space equally within 500 sq ft
Permethrin				
	Atroban®	42.5%	Premises of beef and dairy; outside meat processing	Apply spray to surfaces where flies rest at 1 gal per 750–1000 sq ft; do not allow run off; do not spray more often than every 2 weeks
	Brute®	10% pour-on	Livestock facilities	Apply undiluted as coarse spray or wipe directly onto surfaces where pests crawl and alight; 1 fl oz will treat 560 sq. ft; 1 pint will treat 8.900 sq ft; 1 gallon will treat 71,200 sq ft
	Fly-Rid® Plus	0.5% EC	Barns	Multi-purpose
	GardStar®	40% EC	Beef and dairy premises and outside meat processing premises	**Surface spray:** Apply until surface is wet but do not let runoff occur (1 gal per 750–1,000 sq. ft); do not use in milk rooms **Space spray:** Apply as a fog or fine mist until area is filled with mist using 2 fl oz (60 ml) per 1,000 cu ft; can be used in milk rooms **Overhead space spray system:** 4 fl oz (118 ml) spray per 1,000 cu ft of air space; do not use in milk rooms **Outdoor space spray:** Fill area with mist. Apply while the air is still and avoid wetting foliage
	Manna Pro®-Livestock and Premises Insecticide Concentrate	2.5% EC	Livestock facilities	Controls pests up to 4 weeks

Active ingredient	Brand name	Formulation	Location	Remarks
Permethrin *continued*	Permectrin™ II	10% EC	Barns, dairies, loafing sheds, milking parlors, feedlots, and livestock housing	1 qt in 25 gal water; spray all surfaces to run off using 1 gal per 750 sq ft; mist or fog 4 oz per 1000 sq ft
	Permethrin	10% EC	Dairies, cattle barns, and milking parlors	Broad-spectrum control
	Pest Rid®	10% EC	Dairies, cattle barns, and milking parlors	Broad-spectrum control
	Screwworm Aerosol Multi Purpose Insecticide Spray	0.5% EC	Animal quarters, and milk rooms	Remove protective cap; hold container upright, and spray from a distance of 12–15 in
	Synergized Delice®	1% pour-on	In and around beef and dairy premises	For use as a ready-to-use spot spray or premise spray, use undiluted in a mist sprayer. Apply directly to surface, 1 gal per 7,300 sq ft
	Synergized Permethrin®	1% pour-on	Beef and dairy premises and outside meat processing premises	1 gal per 7,300 sq ft; for use as a ready-to-use premise spray, use undiluted in a mist sprayer; apply directly to the surface to leave a residual insecticidal coating; pay particular attention to areas where insects crawl or alight
	Tengard® SFR	36.8% EC	Dairies, barns, feedlots, livestock houses & outside meat processing premises	**Spray:** 4 fl oz to 12.5 gal water; spray surfaces until wet or 1 gal per 750 sq ft; do not use in milk rooms **Fog or Mist:** 1.5–2.0 fl oz to 1 gal water; apply until area is filled with mist, using 2 fl oz per 1000 cu ft of space; can be used in milk rooms **Overhead space spray:** 4 fl oz to 10 gal mineral oil; 4 fl oz spray per 1,000 cu ft of air space; do not use in milk rooms
Pyrethrin + Permethrin				
	Clear Zone® Double Impact Farm Fly Spray	0.25% + 0.25% EC	**Dairy farms:** Space treatment of milking parlor and milk room **Beef cattle operations:** Space treatment	Cover equipment; direct fog upward at a rate of 1 to 3 sec per 1000 cu ft; in barns, close all windows and doors and spray at the rate of 1–2 sec per 1,000 cu ft; if can't close area, double the dosage

Active ingredient	Brand name	Formulation	Location	Remarks
Pyrethrin				
	Clear Zone® Metered Pyrethrins Spray III	1.0% EC	In and around dairies, farms, and milk handling areas	Controls flying insects; designed for use in battery-operated time-release units
	Clear Zone® Metered Pyrethrum Spray	0.975%	In barns, dairies, and milk handling areas	Controls flying insects; designed for use in battery-operated time-release units
	Clear Zone® Farm Fly Spray	0.5% EC	Dairy farm use	**Milking parlor and milk room:** Close all windows and doors; direct fog upward and in all directions at 1–3 sec per 1,000 cu ft; keep room closed for 15 min after treatment; open and ventilate before reoccupying; cover milking utensils and milk to prevent contamination by spray and dead falling insects
			Beef cattle operations	In barns, close all windows and doors. Spray 1–2 sec per 1,000 cu ft; keep area closed for 15 min following application; ventilate area after treatment is complete; if area cannot be closed, double the dosage; repeat application daily or as necessary
	Country Vet®-Farm and Home Fly Spray	0.3% EC	Dairy farm	**Milking parlor and milk room:** Close all windows and doors; direct spray upwards, spraying for 5 seconds for 1,000 cu ft of space; do not remain in treated areas; ventilate after treatment; after spraying, milking utensils must be washed with an effective cleaning compound followed by a potable water rinse
			Beef cattle operations	In barns, close all windows and doors; spray 5 seconds per 1,000 cu ft of space; do not remain in treated area; ventilate after treatment; repeat application as necessary

Active ingredient	Brand name	Formulation	Location	Remarks
Pyrethrin *continued*	Dairy Bomb 50Z	0.50% EC	Beef cattle operations, dairy farms (including milk houses and milk parlors), barns, animal quarters and milk rooms	Provides even fog and ideal particle suspension throughout the life of the aerosol
	Dairy Bomb 55	0.5% EC	Dairies, milk houses, cattle operations, and food processing plants	Provides even fog and ideal particle suspension throughout the life of the aerosol.
	Dairy Bomb 55Z	0.5% EC	Dairies, milk houses, cattle operations and food processing plants	Provides even fog and ideal particle suspension throughout the life of the aerosol
Pyrethrins + Dichlorvos				
	Super II Dairy & Farm Spray	0.05% + 0.49% EC	Livestock facilities	Can be used as a fogging spray; 1 oz per 100 cu ft
Spinosad				
	Elector®	2.46% EC	In and around beef and dairy premises	Spray fly-inhabiting surfaces in animal premises to the point of runoff; base timing and frequency of application on flies reaching nuisance levels but not more often than once a week; apply to vertical and overhead surfaces where flies congregate.
	Elector® PSP	44.2% EC	Livestock facilities	Apply to vertical and overhead surface where flies congregate; repeat every 7 to 10 days as needed or when populations reach nuisance levels
Tetrachlorvinphos				
	Rabon®	50% WP	Livestock facilities and dairy barns	**For dry and unpainted, whitewashed wood/concrete block surfaces:** 1 gal per 500 sq ft; for masonite/galvanized sheet metal surfaces: ½ gal per 500 sq ft
Tetrachlorvinphos + dichlorvos				
	Ravap®	23% + 5.3% EC	Livestock facilities	1 gal of dilution per 500–1000 sq ft **Larvicide:** Apply1 gal dilution per 100 sq ft; repeat at 7–10 day intervals

Acknowledgments

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