Ticks That Affect Domestic Animals and Poultry

Allen McIntosh and William C. McDuffie

Ticks are among our commonest parasites. They are blood feeders and transmit disease-producing organisms to man and domestic animals. In man, several tickborne diseases are known in the United States, including Rocky Mountain spotted fever, tularemia, relapsing fever, Colorado tick fever, and tick paralysis. In domestic animals, babesiosis, anaplasmosis, tularemia, and avian spirochetosis are tickborne.

An appraisal in 1954 of the estimated annual losses by ticks to cattle was nearly 14 million dollars. The estimate was made after the eradication of tick fever in the United States; previously cattle fever caused estimated losses of 40 million dollars each year.

Not all ticks are known to transmit disease-producing organisms. They may cause injury by secondary infections of the wounds produced during feeding, by injection of toxic substances, and by extraction of blood. Death may occur in both domestic and wild animals when the ticks are numerous. Sir Arnold Theiler, in the Union of South Africa, in 1909 reported a case in which a horse died from acute anemia, caused by the blue ticks, Boophilus decoloratus. Fourteen pounds of engorged ticks were collected from the horse in 3 days—and that was only about half the ticks present.

In range animals and certain wild mammals, especially moose and elk, death may result from heavy infestations of the winter tick, Dermacentor albipictus. They are particularly bad in late winter and early spring when feed is short.

Ticks are parasitic arthropods of the class Arachnida, order Acarina, superfamily Ixodoidea. There are two families, Argasidae and Ixodidae. They are usually larger than mites, to which they are related.Ticks range in body length from 1.2 millimeters (unengorged females of Ixodes scoticus) to 28 millimeters (engorged females of Amblyomma varium, the largest tick known). Ticks occur on toads, lizards, snakes, turtles, birds, and mammals. Most of the species are not host specific, but are found on a large variety of animals. In number of valid species, ticks are less numerous than the insects or the mites. The total number of ticks probably does not exceed 450 species—but that does not mean that ticks are not abundant.

Some species are noted for their great fecundity. C. B. Phillip, of the Rocky Mountain Laboratory at Hamilton, Mont., has recorded more than 18,000 eggs laid in one batch by a single specimen of one of our common ticks, Amblyomma maculatum. Some species (argasids) lay only a few eggs but are able to survive long periods of fasting.

Ticks must have a meal of blood if they are to produce eggs, and some can wait 9 or 10 years for it. Ticks occur in all parts of the world, except in the extreme frigid zones.

Some species are restricted in their distribution by lack of suitable hosts; others, by climatic requirements. Two common species, the brown dog tick and the fowl tick, have become established in most of the tropical and temperate areas of the world.

Some species in their development may require three hosts. Some may require only one host. The three-host ticks drop from the animal to molt after each stage has become fully engorged; each metamorphosis, from larvae to
nymphs and from nymphs to adults, takes place off the host. The engorged larvae and nymphs of the one-host ticks do not drop but remain attached to the host; they spend their quiescent periods, or metamorphoses, on the same animal.

The life history of a tick involves four stages—egg, larva or “seed tick,” nymph, and adult.

Eggs are not deposited until the engorged tick has left the host. The pre-oviposition (pre-egg-laying) period in many instances is 5 to 14 days—perhaps shorter in warm weather and a month or more in cool weather. Some ticks (the fowl tick, for example) lay a few hundred eggs, return to the host for another blood meal, and then lay more eggs; they repeat the process for several feedings. Most ticks, however, lay but a single batch of eggs and die when oviposition is completed. Oviposition usually lasts 1 to 2 weeks if the weather is warm.

The incubation period for the eggs of several of the common ticks is about 10 days to 3 weeks, but some may take 3 months.

The six-legged larva, or “seed tick,” must find a suitable host when it hatches if the life cycle is to be continued. The period of larval engorgement may be 2 days for some species and 2 to 3 weeks for others. Thereafter they remain attached, if they are one-host species, or drop off, if they are of the three-host kind. After a quiescent period, which may last 10 days to several weeks, larval metamorphosis is completed.

The eight-legged nymph finds a new host, or at least a new place of attachment, if it is of the one-host variety. The engorgement period for nymphs is like that of the larvae, but the quiescent period is longer. The nymphs may vary in size. The smaller ones become males and the larger ones become females.

After the nymphs have engorged, a few days to several months may elapse before they transform into adults. The final molt having been completed, the adults search for new hosts or (in the case of the species that molt on the host) the female reattaches and the male goes searching for a mate. Most species mate on the host.

Many individuals in each of the developmental stages—larvae, nymphs, and adults—die without finding suitable hosts. Many of the species, however, can survive long periods of fasting. Larvae of the brown dog tick, an ixodid, has been known to live 253 days; the nymphs, 2 to 6 months; and adults, up to 596 days. This ability to survive without a blood meal makes the pest difficult to control.

Some argasids, or leather ticks, may have even longer periods of fasting. Gorden E. Davis, of the Rocky Mountain Laboratory, kept a specimen of Ornithodoros turicata for 9 years without a blood meal and for 3.5 years more after one feeding.

Taxonomically, ticks are divided into two family groups:

1. The scutate, or shield ticks, family Ixodidae. They are characterized by a dorsal scutum, which covers the anterior part of the body in the female and immature stages and completely covers the body in the adult males.

2. The nonscutate ticks, of the family Argasidae, which lack a scutum and have a leathery integument.

Sixteen species of argasids are known in the United States. Four, Ornithodoros talaje, O. turicata, O. hermsi, and O. parkeri, are known vectors of relapsing fever spirochetes.

The fowl tick, Argas persicus, is a vector of avian spirochetosis (rare in the United States) and also is believed to be the cause of fowl paralysis. It causes considerable losses. Heavy attacks may cause death. The hosts include most species of domestic fowls, particularly chickens, and several species of wild birds, including some game species, quails, turkeys, and doves. The fowl tick is most prevalent in Florida and the Southwestern States. And it occurs also in Mexico, Central
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America, South America, and many other countries.

The spinose ear tick, *Ornithodoros (Otobius) megnini*, is troublesome to livestock. It is not known to be a vector of any disease-producing organism, although the infectious agent of Q-fever has been reported from it. The immature stages are found deep in the ears of the host. Cattle, sheep, goats, and horses are the common hosts. It also attacks mules, asses, hogs, cats, dogs, and a number of wild mammals. Most records of this tick have come from animals in the Southwestern States and Mexico. It is found also in Central America and South America and in parts of South Africa.

The spinose ear tick is unique in that the adults never feed. The nymphs engorge until they reach adult size, drop to the ground, and seek a place to molt. After molting, the adults mate and the females lay their eggs.

Great losses are attributed to this tick. The annual loss in the United States for sheep alone has been estimated at 1.3 million dollars.

The pajaroello tick, *Ornithodoros coriaceus*, has been taken from cattle and deer. It attacks man, particularly cattlemen, readily. Its venomous "bite" is painful. It is not known to be a disease vector. It occurs in California and the Pacific coast region of Mexico.

Two additional species of argasids, *Ornithodoros turicata* and *O. talaje*, occasionally attack domestic animals. The former attacks pigs, cattle, and horses. The latter attacks dogs, cats, and chickens. Both species are vectors of spirochetes that cause relapsing fever. Both occur in Florida and several Southwestern States and Mexico.

The family Ixodidae is represented in the United States by 50 species comprising five genera: *Ixodes*, *Dermacentor*, *Amblyomma*, *Haemaphysalis*, and *Rhipicephalus*. Two additional species belonging to a sixth genus, *Boophilus*, *B. annulatus* and *B. microplus*, once were present in this country.

Many species of the genus *Ixodes* occur in America, but only three are common on domestic animals. The black-legged tick, *Ixodes scapularis*, and the California black-legged tick, *Ixodes pacificus*, are common on cattle and horses in the Southeastern States and on the Pacific coast, respectively. *Ixodes cookei* occurs on cattle, sheep, dogs, cats, and people in the Eastern States. Wild mammals are its chief hosts.

The *Ixodes* are not known to be disease vectors, but *I. pacificus* is a suspected vector of *Pasteurella tularensis*.

Experiments have indicated that *I. scapularis* may transmit anaplasmosis. *Ixodes* have long mouth parts, which often are broken off in the tissue of the host when the ticks are removed.

Nine species of the genus *Dermacentor* occur in the United States. Six are common parasites of domestic animals. Three of the species attack man. Two or more species are present in most States. In this group of ticks we find the vectors of the dreaded Rocky Mountain spotted fever, tularemia, and Colorado tick fever and the cause of tick paralysis.

Three species of the genus *Dermacentor*—*D. albipictus*, *D. nigrolineatus*, *D. nitens*—are one-host ticks. The immature stages remain attached to the host and molt on it. The others leave the host to molt, and the second host may be quite different from the first one.

The American dog tick, *Dermacentor variabilis*, is a pest of dogs and man. In the adult stage it also occurs on most domestic animals and many wild animals. Small mammals are the hosts of the immature stages. It transmits two diseases of man, spotted fever and tularemia. It also may produce tick paralysis and carry bovine anaplasmosis. The species is found in all of the States east of the Rocky Mountains and in California and Oregon.

The Rocky Mountain spotted fever tick, *Dermacentor venustus*, often referred to as *D. andersoni*, probably is the worst transmitter of disease. It is a vector of Rocky Mountain spotted fever, tulare-
mia, Colorado tick fever, American Q-fever, and (in experiments) encephalomyelitis and anaplasmosis. It also can produce tick paralysis in man and mammals. When it is abundant, it may produce anemia when its feeding causes rapid loss of blood. Most domestic animals, man, and numerous wild mammals are its hosts.

C. B. Phillip and William L. Jellison of Hamilton, Mont., and H. F. Wilkins of Helena, Mont., reported in 1935 an unusual case of an epizootic tickborne tularemia in a band of 1,320 sheep near Ringling, Mont. The epizootic occurred during April and May 1934. The sheep were heavily infested with adults of *Dermacentor venustus*. There were then more ground squirrels and jackrabbits there than in several previous years; the rodents had aided in the increase in the number of ticks that later attacked the sheep. Ground squirrels are hosts for the immature stages. Rabbits may serve as hosts for the immature and adult stages. About 40 percent of the sheep in the flock were affected, and 200 died before the disease subsided.

The Rocky Mountain tick occurs in Montana, Wyoming, Colorado, Utah, Nevada, and Idaho; parts of Washington, Oregon, and California; western North Dakota, South Dakota, and Nebraska; northern New Mexico; and northern Arizona.

The Pacific coast tick, *Dermacentor occidentalis*, which occurs in Oregon and California, has been taken from the cow, horse, sheep, dog, man, and many other mammals. We have evidence that it can transmit Rocky Mountain spotted fever, tularemia, and anaplasmosis.

The winter tick, *Dermacentor albipictus*, is found often on range stock in numbers sufficient to cause losses through weakened condition or death of the host. Cattle, horses, moose, and elk are the common hosts. Its greatest abundance is in Canada and our Northern States from Maine to Oregon. It also has been found in several Western States. The species is a one-host tick. It does its greatest damage to stock in the late winter and early spring, when the adult female becomes fully engorged. It is not a proved vector of disease, but it has been suspected of transmitting a disease of moose in Minnesota.

The brown winter tick, *Dermacentor nigrolineatus*, is a close relative of *D. albipictus*. Some authorities regard the two as variations of the same species. *D. nigrolineatus* has been found on deer in New York, and ticks typical of this species were taken from deer on Prudence Island, R. I., in late October of 1954. In the Southern States, the brown winter tick is commonly found on horses, mules, cattle, and deer. It does not occur as far north as *D. albipictus*; the two species, however, do overlap in certain areas, and probably interbreed, giving rise to hybrids that are difficult to place in either species.

The tropical horse tick, *Dermacentor nitens*, is principally a parasite of horses and related animals. Specimens have been collected from goats, sheep, and cattle. Deer may serve also as a host. This tick is usually confined to the ears, where it remains for its two molts. The inside of the ear is often inflamed and packed with various developmental stages of the tick, cast-off skins, and tick feces, which create a nauseating odor. Screwworm infestation may follow the inflammation. The tropical horse tick is limited in the United States to the southern tip of Texas. The species is abundant in the West Indies, the eastern coast of Mexico, and several Latin American countries.

The genus *Amblyomma* is represented in the United States by six species. Three of them are economically important, for they attack man and most of the domestic animals. Many wild mammals, reptiles, and birds are hosts for some of the species. These are three-host ticks. The long mouth parts usually are imbedded deeply in the host and often break off when the tick is removed. The three most common species can transmit disease.

The lone star tick, *Amblyomma americanum*, commonly occurs in the larval, nymph-
al, and adult stages on man, cattle, horses, dogs, goats, and hogs. Many wild mammals and several kinds of birds, including wild turkeys, are hosts for the immature stages. The distribution area includes the coastal States from New Jersey to Texas and several inland States, including Oklahoma, Arkansas, Missouri, Tennessee, and Kentucky, and the southern parts of several adjoining States. It also occurs in Central America and South America. The lone star tick is capable of transmitting the causative organisms of Rocky Mountain spotted fever, tularemia, and American Q-fever.

The cajenne tick, *Amblyomma cajennense*, is an annoying pest of man and most domestic animals. It is found also on a few wild animals. All stages, often in large numbers, attach themselves to the hosts. The range of distribution includes North America, Central America, and South America. In the United States it is believed to occur only in 12 southern counties of Texas. It has been reported to be a carrier of spotted fever in Brazil.

The gulf coast tick, *Amblyomma maculatum*, in the adult stage is most common on sheep, mules, horses, cattle, dogs, and goats. It also has been taken from man and a number of wild mammals. The immature stages have been reported from more than 20 species of birds. Huge numbers have been found on the meadow lark and other ground-frequenting birds. Its range includes North America, Central America, and South America. In the United States it is believed to occur only in 12 southern counties of Texas. It has been ranked second to the cattle fever tick, *Boophilus annulatus*, in losses it causes.

The favorite place of attachment is the inner surface of the outer ear, in which they cause swelling, scabbing, and cracking of the skin. The screw-worm fly, attracted to the wounds, deposits its eggs on the lesions. Serious complications occur as the fly larvae develop. The supporting cartilage of the ear is often destroyed, so that the ear droops, a common occurrence among mules. Severe cases may destroy the entire ear in just a few days. Death may occur if animals are left untreated.

R. R. Parker and coworkers of the Rocky Mountain Laboratory reported a pathogenic rickettsial organism from specimens of the gulf coast tick in Texas, Mississippi, and Georgia. The disease, as produced in guinea pigs, has been named “maculatum disease.” Some of the ticks sent to Dr. Parker in August 1938 were taken from a flock of sick sheep near Ludowici, Ga. The owner of the flock reported that some of the sheep had died.

The genus *Haemaphysalis* is represented in the United States by two species, a rabbit tick and a bird tick. Neither is found commonly on man or domestic mammals. The members of the genus are three-host ticks.

The bird tick, *Haemaphysalis chordeilis*, occasionally is reported as a parasite of game birds and other ground-inhabiting species. Young turkeys in Vermont have been reported as having been killed by it. The type host was a night hawk taken in Massachusetts. The bird tick has also been reported from several other States and British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario in Canada.

The rabbit tick, *Haemaphysalis leporispalustris*, is a parasite of rabbits and hares and several species of ground-frequenting birds. It may occur in enormous numbers. Several thousand have been found on a single animal. It seldom is found on man or domestic animals, but it is of considerable importance as a factor in the natural maintenance of two diseases, Rocky Mountain spotted fever and tularemia. The rabbit tick is found in the Western Hemisphere from southern Alaska to Brazil.

The genus *Rhipicephalus* has many species, most of which are confined to Africa. A single species, the brown dog tick, is found in the United States and several other countries.

The brown dog tick, *Rhipicephalus*
sanguineus, is found principally on dogs. It occasionally attacks people who are in close association with infested dogs. Numerous other animals, wild and domestic, have been reported as hosts in some other countries. The tick was first reported in the United States in 1907 in Texas. It was reported in Key West, in Florida, in 1913. It had been found in Texas, Florida, Louisiana, Mississippi, New York, Pennsylvania, and in Ohio by 1931—R. A. Cooley, of the Rocky Mountain Laboratory, in 1946 listed 34 States. He believes this tick is probably the most widely distributed species in the world, as it is present in nearly all countries between 40° N. and 40° S. This dog tick is a three-host tick, but the dog serves as host for each of the three stages. It breaks no records as an egg layer—it deposits an average of 2,500 eggs—but it can rapidly cover a dog.

The engorged female drops from the dog and then seeks a protected crack or crevice of the kennel or other quarters to deposit her batch of eggs. Hatching takes place in 20 to 30 days. If a dog is available, the six-legged larvae may complete their engorgement in 3 to 6 days. The engorged larvae drop from the dog and they, too, seek a protected place for a nap of 9 or 10 days. On awakening, the tick—now in the nymphal stage—has 8 legs and an appetite. If it finds a dog, the nymph can satisfy its appetite in 4 to 9 days, after which it drops and sleeps 11 to 15 days or up to 2 months if the weather is cool.

After completion of nymphal metamorphosis, the newly emerged male and female adults go searching for a dog. Mated females have been known to engorge fully in 6 days. Unmated females have been observed only partially engorged after having been attached 40 to 50 days.

The brown dog tick transmits several diseases. Babesia canis, the causative organism for malignant jaundice, common in dogs in France, Africa, and other places, has been reported from Florida. Hepatozoon canis, the cause of canine anemia, although not known to occur in America, is transmitted by this tick. Trypanosoma cruzi has been experimentally transmitted to dogs. The brown dog tick also is a potential vector of Rocky Mountain spotted fever and tularemia.

The genus Boophilus, which probably has only four valid species, occurs mostly on cattle in tropical and subtropical regions. The species are one-host ticks; the various stages do not drop to molt. Two species occur in North America. The members of this genus are notorious as vectors of cattle fevers.

The cattle fever tick, Boophilus annulatus, was found on deer in Florida in 1821. Cattle are the most common hosts. Other hosts include horses, mules, goats, sheep, deer, and buffalo. It is the vector of Texas cattle fever. The original area covered by the tick in the United States included all or parts of California, Oklahoma, Texas, Missouri, Arkansas, Louisiana, Kentucky, Tennessee, Mississippi, Alabama, Virginia, North Carolina, South Carolina, Georgia, and Florida.

The tropical cattle tick, Boophilus microplus, is a close relative of the cattle fever tick and may indeed be only a variety of that species. The host is similar, and both species are vectors of cattle fever and anaplasmosis. It occurs in North America, Central America, South America, Australia, parts of Africa and Asia, the East Indies, and the Philippine Islands. Before it was eradicated in the United States, it was known to occur in about 30 counties in central Florida and in at least 3 counties in the southern tip of Texas.

The Congress appropriated funds in 1906 to eradicate the cattle fever tick. That was the beginning of an extensive program, which did not cease until both species of cattle ticks were eradicated. In 1954, eradication had been completed in all 15 States, with the exception of a narrow zone along the Texas-Mexico border, where reinfection occurs from time to time because
the adjacent area in Mexico is heavily infested.

Ticks that affect livestock and poultry can be controlled with several of the new insecticides. Most widely used for the purpose are toxaphene, DDT, and lindane (the essentially pure gamma isomer of BHC). Chlordane is also effective but is not used extensively to combat ticks. These insecticides have largely supplanted rotenone, nicotine, arsenic, and other materials that were in general use until about 1945. The standard arsenical dip containing 0.19 percent arsenious oxide is still used, however, against the cattle fever tick.

Insecticides may be used in two ways to control ticks that affect livestock.

The most common procedure is to apply them directly to infested animals. Applications may be made as dusts or sprays or by dipping. Such treatments provide effective control of the ticks on animals and minimize reinfestation for 2 to 6 weeks, depending on the species.

The second way is to apply the insecticides to infested premises or natural habitats. Sprays or dusts may be used. Treatment of premises is essential to control the fowl tick and brown dog tick and is also useful against other species that may infest farm buildings. Thorough treatment of premises will control existing tick populations and minimize reinfestation for a month or more, depending on the species and the season of the year.

Treatment of natural habitats of ticks—pastures, brushy areas, and fence rows—is desirable to prevent the infestation of animals. Such treatments are practicable on small areas or if the ticks are confined to a particular environment. They are not practical for large areas of pasture or woodlands.

Toxaphene is the insecticide of choice to control ticks on livestock. It is available in emulsifiable concentrates and wettable powder, both of which are suitable for use in sprays or dipping vats. Sprays and dips should contain 0.5 percent of toxaphene. This concentration will kill all stages of flat or unfed ticks and all the engorged stages, except possibly a few adults. The residue of insecticide on animals will minimize reinfestation by three-host ticks for about 2 weeks and by the one-host ticks for a month or more.

DDT is highly effective against flat or unfed stages of ticks and also will keep down reinfestation for 2 weeks or a month. It is not effective against engorged ticks. Generally, therefore, it is used with lindane, which is highly effective against engorged ticks but has little residual effect. The combination sprays or dips containing 0.5 percent of DDT and 0.025 percent of lindane or the gamma isomer of BHC will provide the same immediate and residual effectiveness as those containing 0.5 percent of toxaphene. DDT and lindane are available as wettable powders and emulsifiable concentrates. Ready-mixed DDT-lindane or DDT-BHC wettable powders are made by several companies.

Spraying is the most widely used method of applying insecticides to livestock to control ticks. Hand-pressure sprayers, of a capacity of 2 or 3 gallons, may be used to treat small herds. For large groups it is best to use a power sprayer equipped with a mechanical agitator to maintain equal distribution of the insecticide in the spray. Power sprayers should be operated at a pressure of 100 to 400 pounds to the square inch. Treatment should be thorough so as to insure complete wetting of the hair and penetration of the spray to the skin. Treatments can be made at pressures lower than 100 pounds, but more time and care are required for thorough coverage.

The amount of spray to apply varies in different sections of the country and according to the size and type of animal. In the Southern States, for example, less than 1 gallon may be enough for a beef cow of average size, but in the Northern States, where cattle have thicker, longer hair, 2 gallons or more may be needed for thorough wetting.
In any event, the spray should be applied in whatever amount is necessary to wet thoroughly all parts of animals. This procedure should be followed in spraying for the control of all ticks that attach to the animal's skin, including the lone star tick, the gulf coast tick, and the winter tick. From a regulatory standpoint, however, spraying may not be adequate in eradication programs such as are conducted against the cattle fever tick.

Sprays for the spinose ear tick need be applied only to the head and neck and inside the ears. The sprays should be applied at low pressures inside the ear so as not to injure the ear and annoy the animal unduly. From 1 to 2 pints is enough for a cow of average size. Single treatments with any of the recommended sprays will eliminate existing infestation and minimize reinfection for a month or more.

Several special formulations have been developed as ear treatments to control the spinose ear tick. One of the most satisfactory and widely used formulations is a mixture of 5 percent of BHC (15 percent gamma isomer), 10 percent of xylene, and 85 percent of pure pine oil. It is applied inside the ears with a common spring-bottom oiler. Light applications kill existing infestations and prevent reinfestation for a month or longer under average conditions.

Tick treatments are most effective if applied when the animals are restrained. Individual animals may be held with a halter or tied to a post. Large groups, especially range animals, should be placed in chutes. Small crowding pens also may be used, but the proper treatment of animals under such conditions is more difficult than in chutes and more hazardous for the operator.

**DIPPING** is the most practical means of treating large herds of livestock to control ticks. The animals are forced through a chute into the vat and must swim through the dip to the opposite side. They are completely submerged momentarily and are in the dip long enough to assure complete wetting. The animals usually emerge into a small pen, where they are allowed to drain for several minutes. The pen is so built that the excess drip drains back into the vat. Several hundred goats or sheep and 50 to 100 head of cattle can be treated in an hour in a vat of average size—one that has a capacity of 2,000 gallons.

The vat should be thoroughly cleaned before it is used. A measured amount of water should then be run into it and the amount of concentrate added to give the recommended concentration of insecticide. The concentrate—wettable powder or emulsifiable—should be slowly and evenly distributed along the full length of the vat. Mixing should begin as soon as the concentrate is introduced and be continued for several minutes after all has been added. Mixing may be accomplished with large paddles or by dragging a bucket on a rope back and forth through the vat.

Dipping should begin as soon as mixing is complete. Because the dipping of animals gradually reduces the amount of dip, it is usually necessary to add water and insecticide after each dipping operation. The old and new material should be thoroughly mixed before dipping is started again.

The effectiveness and safety of dipping operations depends largely on the use of properly formulated insecticide concentrates. The material should disperse spontaneously and uniformly in any type of water and remain in perfect dispersion during dipping operations, and it should redisperse readily even after standing for several weeks. In short, stability should be such that the dip can be used throughout an entire season. All vats should be drained, thoroughly cleaned, and recharged after each season’s use, or at least twice a year if it is in more or less continuous use.

Toxaphene and DDT—BHC wettable powder and toxaphene emulsifiable concentrates that will fulfill the performance requirements for use in vats...
are available commercially. Instructions for their use are given on the containers. The user must see that the material is used as recommended and performs properly in his vat. He should take special care that the dip never contains more than 0.5 percent of toxaphene or 0.5 percent of DDT plus 0.03 percent of lindane. Higher concentrations may result in the death of livestock. He should take equal care to see that the amount of insecticide does not fall much below the recommended level because low concentrations will not kill engorged ticks.

How often to dip depends on the species of tick. Dipping is necessary every 2 or 3 weeks to control three-host species, especially during the season of greatest abundance, spring and summer. Usually it is only necessary to dip at monthly intervals to control one-host ticks.

The main exception to the 1-month interval involves the cattle fever tick. Because the cattle fever tick transmits a disease that can kill cattle in a short time, dipping programs in the United States used to be designed for eradication, rather than for immediate control. The cattle fever tick has been eradicated from the United States, and the only infestations are on animals shipped in from countries infested with it. The treatments are made at 14- to 18-day intervals to kill all engorged females and thereby end their chance to reproduce. This dipping schedule may have to be maintained for a year or more to achieve eradication. Localized infestations of the cattle fever tick can be eradicated by keeping livestock out of the area for about a year. Existing tick populations will usually starve and die within a year. As a rule, however, stockmen are unwilling or unable to lose the benefits of pastures for so long a time.

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congregate in cracks and crevices, behind loose boards, under the bark of trees, and in similar hiding places in or near poultry houses. They thrive best in loosely constructed poultry houses, but they may also abound in tight henhouses, particularly if proper sanitation is not maintained. The combination of proper construction and regular, thorough cleaning of litter from poultry houses therefore is essential in preventing or minimizing infestations.

Established fowl-tick infestations can be controlled by spraying the poultry houses and outdoor roosts with insecticides. The sprays should be applied to all roosts and throughout the interior of the houses. Applications should be made at a pressure to insure thorough coverage of outer surfaces and penetration of all hiding places. Small power sprayers are best, but satisfactory results can also be had with 2- or 3-gallon, compressed-air sprayers, operated by hand.

DDT, toxaphene, and lindane are approved for use in controlling fowl ticks in poultry houses. Toxaphene and lindane should be used at a concentration of 0.5 percent and DDT at 5 percent. Wettable-powder suspensions, emulsions, or oil solutions can be used, but emulsions are generally preferred because of the ease of preparation from emulsifiable concentrates. The individual applying the spray must judge for himself the amount needed, keeping in mind thorough coverage of exposed surfaces as well as complete penetration of all likely hiding places. Several treatments may be required to control heavy infestations. As a rule, however, a thorough treatment about every 6 months will maintain control of these pests in properly constructed poultry houses.

Control of the fowl tick is especially difficult in poorly constructed shelters and in trees, barns, and sheds or under houses where fowls roost indiscriminately. Then it is necessary to spray more thoroughly and more frequently than if the fowls are properly housed and confined to a limited area. It is therefore strongly recommended that growers provide well-constructed shelters and follow approved procedures.
for rearing and handling their fowls. This practice will greatly reduce the possibility of tick infestation and will make it easy to maintain control with a minimum of spraying.

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For further reading:


**Flies That Affect Livestock**

E. F. Knipling and William C. McDuffie

Flies affect livestock in two ways—by biting them and sucking their blood and by transmitting diseases.

The hornfly, stablefly, and a hundred or more kinds of horseflies and deerflies that flourish in the United States are a constant worry to cattle and to other livestock during the fly season. The horseflies and deerflies are doubly important because they also transmit certain diseases directly or by inoculation from one animal to another.

The common housefly, which occurs wherever livestock are raised, is a nonbiter, but it is capable of mechanically spreading filth and disease organisms, and it serves as an intermediate host of certain internal parasites.

We did not fully realize the losses caused by flies until control measures were developed. Then we could compare the productivity of the animals treated for hornfly control with that of untreated animals. Tests conducted by the Department of Agriculture in 1945 in cooperation with several Midwestern States showed that beef cattle subjected to heavy attacks of hornflies gained an average of 50 pounds less