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## EC89-1550 Nebraska Management Guide for Control of Arthropod Pests of Livestock and Horses

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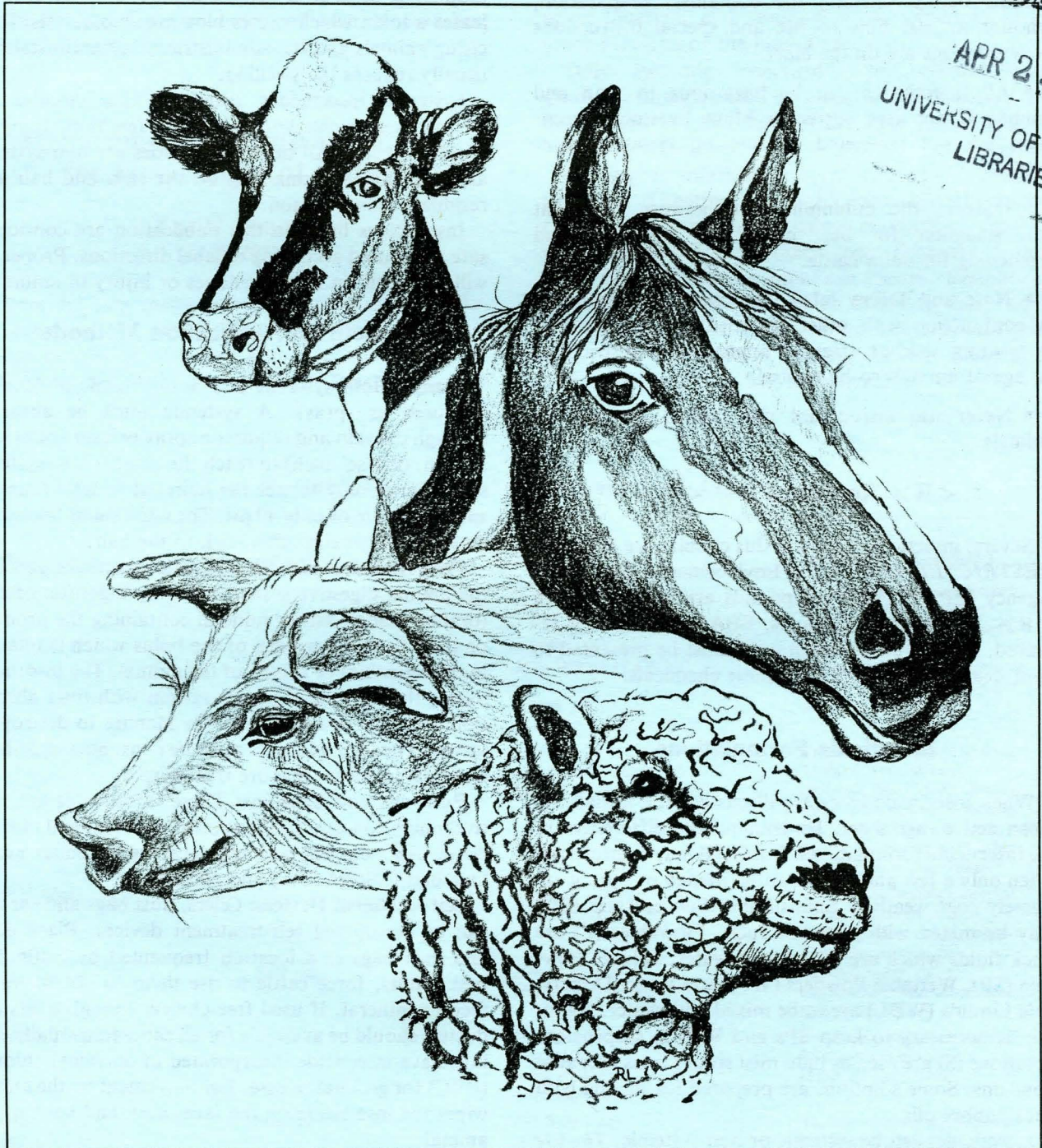
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# Nebraska Management Guide For Control of Arthropod Pests Of Livestock and Horses

John B. Campbell, Extension Entomology Specialist



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# Nebraska Management Guide

## For Control of Arthropod Pests Of Livestock and Horses

### Precautions

- Always read and understand label recommendations before opening the container; preparation, amount to use, how to use and special instructions or restrictions are on the label.
- All insecticides can be hazardous to man and animals if not used correctly. Many livestock insecticides are not registered for use on lactating dairy cattle.
- Observe the minimum time between treatment and slaughter for beef cattle and treatment and freshening for dairy cattle.
- Note and follow label restrictions for treatment in conjunction with other insecticides or medication in treating sick or stressed animals and restrictions on age of animals to be treated.
- Never use insecticides not labeled for use on animals.

### <R> Restricted Use <R>

Several insecticides listed in this circular are classified **RESTRICTED USE** by the Environmental Protection Agency (EPA). These compounds are marked with a <R>. To use these products, EPA certification is required. A valid certification card must be presented to your dealer when purchasing these chemicals.

### Insecticide Formulations

When insecticide rates are discussed, the initials AI mean active ingredient. Understand the differences in the insecticide formulations. Dusts (D) may be preferred when only a few animals are to be treated or during extremely cold weather. Emulsifiable Concentrates (EC) may be mixed with water or fuels. Flowables (F) are thick fluids which are mixed with water. Soluble Powders (SP), Wettable Powders (WP), and Water Dispersible Liquids (WDL) are to be mixed with water. Agitation is necessary to keep SPs and WPs in suspension. Solutions (S) are used as light mist sprays or as prepared pour-ons. Some solutions are prepared for mixing with back rubber oils.

Insecticides can be systemic or non-systemic. *The use of systemic insecticides are not recommended on cattle between Nov. 1 and Feb. 1 in Nebraska, because of the danger of a host-parasite reaction.* Systemic insecticides

are absorbed through the skin into the animal's blood stream and tissues. This reaction is the result of grubs being treated when they are migrating through the esophagus or central nerve canal. The dying grub releases a toxin which causes bloating or paralysis. Exercising animals and the administration of antihistamines usually reduces the swelling.

Systemic insecticides listed in this circular are coumaphos, trichlorfon, phosmet, fenthion, famphur and ivermectin. All other insecticides are non-systemic and function by remaining on the skin and hair as a residual contact poison.

Insecticides listed in this publication are considered safe when used according to label directions. Proper use will not result in illegal residues or injury to animals.

### Insecticide Application Methods

**Sprays:** Both systemic and non-systemic insecticides are used as sprays. A systemic must be absorbed through the skin and requires a spray pressure of at least 300 psi. (lbs/sq. inch) to reach the skin. A non-systemic spray needs only to wet the haircoat which requires a spray pressure of only 40 psi. The addition of household detergent helps the spray stick to the hair.

**Feed Additives and Boluses:** The insecticide gets into the animal digestive system either by ingestion of feed (oral larvicide), salt or mineral containing the product, or from the slow erosion of the bolus which is retained in the reticulum or rumen of the animal. The insecticide passes through the digestive system with little absorption and then is available in the manure to destroy fly larvae. The feed additives must be consumed at 24-hour intervals to assure manure treatment.

**Pour-ons and Spot-ons:** These insecticides are relatively high concentrations applied to the animal in small doses. All pour-ons and spot-ons are systemics except Dursban (chlorpyrifos) and permethrin.

**Self-treatment Devices:** Oilers, dust bags and ear tags can be considered self-treatment devices. Place oilers and dust bags at a location frequented by cattle. For best results, force cattle to use them to obtain water, feed or mineral. If used free-choice, enough oilers and dusters should be available for all cattle to use daily. Ear tags have insecticide incorporated in polyvinyl chloride (PVC) for gradual release. Ear movement by the animal wipes the insecticide on the face, neck and back of the animal.

**Area Sprays:** These are short residual, quick knockdown insecticide sprays applied to an area inhabited by house and stable flies via hydraulic spray-



ers, mist blowers, foggers or aircraft.

**Residual Sprays:** Long residual sprays are applied to surfaces which serve as house and stable fly resting places.

**Baits:** These insecticides are mixed with a house fly food source (sugar, molasses).

**Larvicides:** These insecticides are applied to house and stable fly breeding areas.

**Dips:** In Nebraska, dips generally used for grub and lice control on large numbers of cattle are systemic.

**Injections:** Ivomec (Ivermectin) is used as a subcutaneous injection for control of internal parasites, grubs, lice and scabies.

## Management Recommendations for Insect Pests of Cattle

### Cattle Grubs (G 78-409)

There are two species of cattle grubs in Nebraska, the common and the Northern. The life cycles are similar except the Northern grub is about four to six weeks later than the common grub. Practically, grub

treatments can be applied at fall weaning time. These grub treatments also will reduce cattle lice numbers, but cattle still may require another treatment for lice later in the winter. Treatment for grubs is not recommended on Nebraska cattle between Nov. 1 and Feb. 1 because of the chances of a host-parasite reaction. Cattle grubs migrate to the back through the esophagus (common) and spinal canal (Northern). Cattle grubs, killed by a systemic insecticide, release a toxin which causes a swelling in animal tissue. Severe swelling in the esophagus will cause bloating, and swelling in the spinal canal will cause paralysis of the hindquarters.

Only systemic insecticides will control cattle grubs. Treatments can be made at fall weaning time but should not be made earlier than late August or later than November.

Cattle grub infestations occur primarily in calves or yearlings. Therefore, a cattle grub control program can be successful only if calves or yearlings that will remain at the farm or ranch from February through April (grub emergence time) are treated. Systemic insecticides may not be used on lactating dairy cattle. Nebraska dairy cattle seldom are infested with grubs but, if an infestation occurs, calves, replacement heifers and dry cows can be treated.

### Insecticide Recommendations for Cattle Grub Control

Insecticide	Application method	Rate	Restrictions & Comments
<i>Coumaphos (Co-Ral)</i>	Pour-on	4% S @ 1/2 oz/ 100 lb body weight	Do not treat sick or stressed animals. Do not treat in conjunction with other medications or insecticides. Do not treat animals younger than 3 months. Do not treat lactating dairy cattle.
	Spray	0.375% AI 25% WP or 11.6% EC	
	Dip	0.25% AI 25% WP or 11.6% EC	
<i>Famphur (Warbex)</i>	Pour-on	12.5% S @ 1/2 oz/ 100 lb body weight Do not exceed 4 oz	Treatment-slaughter interval 35 days. Do not treat lactating dairy cattle, Brahma bulls, calves under 3 months of age, sick or stressed cattle, or in conjunction with other medication or insecticide.
<i>Fenthion (Teguvon)</i>	Pour-on	3% S @ 1/2 oz/ 100 lb body weight	Treatment-slaughter interval 45 days. Do not treat lactating dairy cattle, calves 3 months of age, sick or stressed cattle, or in conjunction with other medication or insecticide.
	Spot-on	20% S @ 4cc/ 300 lb body weight	
<i>Ivermectin (Ivomec)</i>	Injection	1% AI 1 cc/110 lb body weight Subcutaneous injection	Treatment-slaughter interval 35 days. Do not treat lactating dairy cattle.
<i>Phosmet (Imidan) (Prolate GX-118)</i>	Pour-on	4% S @ 1 oz/ 100 lb body weight Mix 1 gal 11.6% EC with 2 gal water Do not exceed 8 oz	Treatment-slaughter interval 45 days. Do not treat lactating dairy cattle, calves 3 months of age, sick or stressed cattle, or in conjunction with other medication or insecticide.



## Insecticide Recommendations for Cattle Grub Control (continued)

Insecticide	Application method	Rate	Restrictions & Comments
<i>Trichlorfon (Neguvon)</i>	Spray	0.25% AI, 11.6% EC	Treatment-slaughter interval 21 days. Do not use in conjunction with other medications. Do not treat lactating dairy cattle.
	Dip	0.15% AI, 11.6% EC	
	Pour-on	8% AI 1/2 oz/100 lb body wt.	

### Cattle Lice (G 74-86)

Four species of lice infest cattle in Nebraska. Three of these are blood-feeding and the fourth feeds on skin. The life cycles of all are basically the same. Eggs are deposited on the cattle hair (nits). Immature lice resemble adults except for size, and their feeding habits are the same. The cycle from egg to adult averages one month but accelerates during cold weather. Lice are spread by animal contact. Some animals are physiologically more susceptible to lice than others. These "chronic" or "carrier" animals should be culled from the herd. Grub treatments in the fall will reduce lice numbers but may not prevent the buildup of economic levels later in the winter. Methods of treating

for cattle lice are the same as those noted for cattle grubs. Treated animals should be examined 14 days post-treatment to determine if a second treatment is needed. Most insecticides do not destroy louse eggs.

The systemic insecticides listed for control of cattle grubs also may be used for lice control (see that section for products, rates and precautions). The biting or chewing louse is not controlled by the internal systemic insecticides unless the lice contacts the insecticide on the hair coat of the animal. Therefore, sprays may be more effective than pour-ons, spot-ons or injections for control of this species. It is not necessary to use systemic insecticides for lice control. Low pressure sprays (with a small amount of household detergent which aids in the insecticide sticking to the hair coat) are adequate for lice control.

### Insecticides Recommended for Control of Cattle Lice

Insecticide	Application method	Rate	Restrictions & Comments
<R> <i>Amitraz (Taktic)</i>	Spray	0.025% AI, 12.5% EC	Treatment-slaughter interval 14 days. Do not treat bulls over 8 months of age. Treat only dairy, Brahma, continental or exotic breed cattle crossed with British beef breeds. Do not treat sick or stressed animals or in conjunction with other medication or insecticide. Do not treat lactating dairy cows or veal calves.
<i>Chlorpyrifos (Dursban 44)</i>	Pour-on	43.2% S @ 2cc/100 lb body weight	
	(see label for application precautions)		
<i>Coumaphos (Co-Ral)</i>	Spray	0.03% AI 11.6% EC or 25% WP	Repeat as needed
<i>Crotoxyphos (Ciodrin)</i>	Spray	0.25% AI, 14.4% EC @ 1 gal/animal	Do not apply more often than 7 days.
<R> <i>Dioxathion (Delnav)</i>	Spray or Dip	0.15% AI, 30% EC	Do not apply more often than 14 days.
<i>Fenthion (Tiguvon) (Lysoff)</i>	Pour-on	1% AI 7.6% EC @ 1 oz/100 lb body weight	Do not treat lactating dairy cattle. Treatment-slaughter interval 21 days.
<i>Fenvalerate (Ectrin)</i>	Spray	0.05% AI, 10% EC	Do not spray more often than 7 days.
<i>Malathion</i>	Spray	0.5% AI 57% EC or 25% WP	Do not treat lactating dairy cattle.
<i>Methoxychlor</i>	Spray	0.5% AI 25% EC or 50% WP	Do not treat lactating dairy cattle.
<i>Permethrin (Atroban) (Ectiban) (De-Lice)</i>	Spray	0.01% AI, 5.7% EC, 10% EC or 11% EC	Treat lactating dairy cattle only after milking.
	Pour-on	1% S @ 1/2 oz/100 lb body weight Do not exceed 5 oz.	



## Horn Flies (G 76-299)

The horn fly is a small (1/2 size of house fly) blood-feeding fly. The flies remain on the animal most of the time. Eggs are deposited in manure and the life cycle from egg to adult requires only about 14 days in the summer. The fly overwinters in the pupal form under dung pats. Because of the short life cycle and high egg production rate, horn flies increase rapidly to high numbers (several hundred per animal) by late spring and early summer.

Control of the horn fly can be achieved by several methods of insecticide application. However, under range conditions, self-treatment devices, i.e. dust bags, oilers and ear tags, are the most practical. Widespread resistance to pyrethroid insecticides used in ear tags has developed in Nebraska and most of the U.S. Pyrethroids are being replaced with phosphate insecticides, but good management will be required to slow the development of resistance to these insecticides.

Dust bags and oilers are most efficient when cattle are forced to use them to obtain water, feed or salt and mineral. Bulls and older animals tend to dominate the use of these self-treatment devices, leaving some animals untreated unless a forced-use system is employed.

Other horn fly control methods include sprays, pour-ons, boluses and feed additives. Sprays and systemic pour-ons are not practical except for small herds that routinely come to the farmyard daily. Treatments of this nature need to be applied at two to three week intervals. Systemic insecticides re-

main active in the blood of treated animals for three to four days. The non-systemic sprays may be effective on the hair coat for seven to 10 days.

Boluses are administered at the beginning of the summer fly season. They remain in the reticulum of the animal, slowly eroding, thus releasing insecticide which passes through the digestive system and into the manure where it kills developing fly larvae. Feed additives do the same thing. The insecticide is incorporated into feed or mineral. The insecticide must be consumed at 24 hour or less intervals to be effective. The feed additive or bolus system is most effective under conditions where cattle are relatively isolated. Newly emerging horn flies migrate to cattle, usually downwind, and can travel a considerable distance, so migrating flies from a neighboring herd may mitigate the control effort made with a bolus or feed additive.

Ear tags containing cypermethrin, fenvalerate, flucythrinate, and permethrin are available but they are pyrethroids. Pyrethroid resistance is widespread in Nebraska horn fly populations. The insecticide resistance problem indicates a need for management of insecticide use. Ear tags should be applied just before cattle go to grass and removed immediately after the first heavy frost in the fall. Although the ear tag insecticides available for resistant flies are both phosphates, they still should be rotated yearly. We suggest additional fly control efforts in mid-August with the addition of dust bags or oilers containing insecticides different from those being used throughout the fly season. This will reduce the degree of resistance being carried by the overwintering population of horn flies.

### Insecticides Recommended for Horn Fly Control in Nebraska

Insecticide	Application method	Rate	Restrictions & Comments
<i>Chlorpyrifos</i> (Dursban 44)	Pour-on	See cattle lice section for rates and restrictions.	
<i>Coumaphos</i> (Co-Ral)	Pour-on	See cattle lice section for rates and restrictions.	
	Spray		
	Dust bag	1% AI Dust	
	Back rubber	1% AI (in oil) 11.6% EC	
<i>Crotoxyphos</i> (Ciodrin)	Spray	See cattle lice section for rates and restrictions.	
	Back rubber	1% AI (in oil) 14.4% EC	
	Dust bag	3% AI Dust	
(Ciovap)	Spray	0.5% AI 10% EC + 2.5% Vapona	Do not treat more often than every 7 days.
	Back rubber	1.0% AI (in oil) 10% EC + 2.5% Vapona	
<i>Diazinon</i>	Ear tag	20% AI, 15g/tag	Do not treat lactating dairy cattle.
<i>Diflubenzuron</i> (Dimilin) (Vigilante)	Bolus	9.7% AI 1/2 bolus/275 lb body weight Do not exceed 2 boluses.	



## Insecticides Recommended for Horn Fly Control in Nebraska (continued)

Insecticide	Application method	Rate	Restrictions & Comments
<R>Dioxathion (Delnav)	Spray	See cattle lice section for rates and restrictions.	
	Back rubber	1% AI (in oil) 30% EC	Do not treat lactating dairy cattle.
Fenvalerate (Ectrin)	Spray	See cattle lice section for rates and restrictions.	
Lindane	Spray	0.03-0.06% AI 25% EC	Treatment-slaughter interval 30 days. Treat calves at 0.03% rate.
	Back rubber	0.2% AI (in oil)	Treatment-slaughter interval 30 days. Do not treat calves under 6 months of age.
Malathion	Oiler	2% AI (in oil) 30% EC	
Methoprene (Altosid)	Feed additive	0.02% AI 4-8 oz/100 lb body weight/month	Registered only for horn fly control.
(Inhibitor)	Bolus	1/2 bolus/300-659 lb body weight 1 bolus/660-1400 lb body weight Administer orally with balling gun.	Do not administer bolus to suckling calves or cattle too small to swallow bolus.
Methoxychlor	Dust bag	10% AI dust	
Permethrin (Atroban)	Spray	See cattle lice section for rates and restrictions.	
(Ectiban) (DeLice)	Oiler	0.15% AI (in oil) 5.7% EC	Do not use in horn fly pyrethroid-resistant areas
Phenothiazine	Feed additive	0.26% AI, 0.25g/100 lb body weight	
Stirofos (Rabon)	Dust bag	3% AI dust	Do not treat lactating dairy cattle.
	Feed additive	7.76% or 97.3% AI 26.4 mg AI/lb ration 7.92 mg AI/animal/day	
	Spray	0.35% - 0.5% AI 50% WP	Do not treat lactating dairy cattle.
	Spray	0.45% AI 23% EC Rabon + 5.7% EC Vapona	Do not treat lactating dairy cattle.
(Ravap)	Back rubber	1.25% AI (in oil)	

### Face Fly (G 74-167)

The face fly resembles the house fly in size and appearance but is considerably different in behavior and life cycle. Like the horn fly, the face fly deposits eggs in the manure of range or pasture cattle. The life cycle takes about three weeks from egg to adult in the summer. This fly overwinters as an adult in sheltered areas which include houses, barns and sheds.

The face fly feeds on secretions around the eyes and nose of cattle and other animals. It also will feed on animal wounds and manure, and the male feeds on pollen. The face fly has modified mouth parts which serve as a rasp when the fly feeds on eye tissue. The rasping feeding action damages the tissue around the eye. This injury causes secretions (weeping eyes) which attract face flies.

The injury also provides an avenue for entrance of

eye pathogens such as *Moraxella bovis*, the causative agent of pinkeye and IBR virus (red nose). The face fly can transmit these pathogens mechanically from animal to animal. The face fly is, of course, only one of many factors that can cause injury to the eyes of cattle. Other factors such as sunburn, blowing sand, grass seed, pollen, etc., also predispose the animal to eye pathogens.

The habitat of the face fly is much more restricted than is true for the horn fly. The face fly is found mainly in areas of 30 or more inches of precipitation which provides lush vegetation. In the more arid range areas, the manure dries before the face fly can complete its life cycle. As a consequence, in the western two-thirds of Nebraska, the face fly is found only along waterways or in canyon pasture floors which have trees which shelter the manure from rapid drying.

Control of the face fly is difficult. The fly feeds primarily on the face of cattle, which is a difficult part of



the animal to treat. Only a portion of the face fly population feeds on cattle and these do not remain on the animal very long. The major portion of a face fly population that feeds on cattle are young females seeking a source of protein (animal tears and mucous) prior to egg deposition. **Systemic insecticides are ineffective for face fly control because they do not feed on the blood of animals.**

The dusts, sprays and dips, oiler mixed, feed additives, boluses and ear tags registered for control of horn flies also are registered for face fly control. The exception is methoprene feed additive and bolus. The pyrethroid insecticide ear tags also are registered for face fly control, but we do not recommend their use in Nebraska because of the horn fly resistance problem. Cattle may be infested with the horn fly and not face fly, but all cattle in Nebraska will be infested with horn flies. Horn fly control can be achieved without treating calves in a cow-calf herd. Face flies, however, are

attracted at least as much to calves as cows so the method of treatment selected should treat both cows and calves.

When face fly populations are high, one method of treatment may not be enough. The best face fly control can be achieved by forcing cattle to use dust bags or oilers to obtain water, feed or mineral. Dust bags should be hung high enough for cattle to see under them when first employed. As the fly season progresses, they should be lowered so they treat calves as well as cows.

Back rubbers can be equipped with treated flaps which rub across the face of the animal as it passes under the oiler. These devices should be managed so calves are treated as well as cows. The migration of flies which is detrimental to control of horn flies with feed additives and boluses is even more pronounced for face flies. The face fly may migrate to a different group of cattle every time it feeds.

### Insecticides Recommended for Face Fly Control in Nebraska

Insecticide	Application method	Rate	Restrictions & Comments
<i>Coumaphos (Co-Ral)</i>	Spray	See cattle lice section for formulations, rates and restrictions.	
	Dust bag	1% AI Dust	
	Back rubber	1% AI (in oil) 11.6% EC	
<i>Crotoxyphos (Ciodrin)</i>	Spray	See cattle lice section for formulations, rates and restrictions.	
	Back rubber	1% AI (in oil) 14.4% EC	
	Dust bag	3% AI Dust	
<i>(Ciovap)</i>	Spray	0.5% AI 10% Ciodrin EC + 2.5% Vapona	Do not treat more often than every 7 days.
<i>(Ciovap)</i>	Back rubber	10% Ciodrin EC + 2.5% Vapona	1.0% AI (in oil)
<i>Diazinon</i>	Ear tag	20% AI, 15g/tag	Do not treat lactating dairy cattle.
<i>Diiflubenzuron (Dimilin) (Vigilante)</i>	Bolus	9.7% AI 1/2 bolus/275 lb body weight Do not exceed 2 boluses.	
<R> <i>Dioxathion (Delnav)</i>	Spray	See cattle lice section for formulations, rates and restrictions.	
	Back rubber	1% AI (in oil) 30% EC	Do not treat lactating dairy cattle.
<i>Fenvalerate (Ectrin)</i>	Spray	See cattle lice section for formulations, rates and restrictions.	
<i>Lindane</i>	Spray	0.03-0.06% AI 25% EC	Treatment-slaughter interval 30 days. Treat calves at 0.03% rate.
	Back rubber	0.2% AI (in oil)	Treatment-slaughter interval 30 days. Do not treat calves under 6 months of age.
<i>Malathion</i>	Oiler	2% AI (in oil) 30% EC	
<i>Methoxychlor</i>	Dust bag	10% AI, dust	
<i>Permethrin (Ectiban)</i>	Spray	See cattle lice section for formulations, rates and restrictions.	
	Oiler	0.15% AI (in oil) 5.7% EC	Do not use in horn fly pyrethroid-resistant areas.



## Insecticide Recommendations for Face Fly Control (continued)

Insecticide	Application method	Rate	Restrictions & Comments
<i>Stirofos</i> ( <i>Rabon</i> )	Dust bag	3% AI dust	Do not treat lactating dairy cattle.
	Feed additive	7.76% or 97.3% AI 26.4 mg AI/lb ration 7.92 mg AI/animal/day	
	Spray	0.35% - 0.5% AI 50% WP	Do not treat lactating dairy cattle.
(Ravap)	Spray	0.45% AI 23% EC Rabon + 5.7% EC Vapona	Do not treat lactating dairy cattle.
	Back rubber	1.25% AI (in oil)	

### Cattle Mange (Scabies) (G 75-230)

The terms "scabies" and "mange" often are used interchangeably. There are three species of mites that cause the condition of mange. *Psoroptes ovis*, the causative agent for Sarcoptic scabies, is by far the most injurious form of cattle scabies. It requires immediate quarantine and federal and state approved control measures when it is detected. It is usually the only species present in Nebraska. The other two species are *Sarcoptes scabiei* and *Chorioptes bovis*. All three species are subject to federal and state regulations.

The common scabies mite may attack any part of the body, particularly areas of thick hair. Lesions most commonly occur on the withers, along the back and around the tail. Sarcoptic scabies is more likely to colonize body areas where the hair is thin and the skin tender. Chorioptes scabies mites live on the surface of the skin where it usually does not produce severe or conspicuous lesions.

Symptoms of scabies may not be evident until winter because the reproduction rate of the mites decreases during hot weather and increases during cold weather. The life cycle is as short as 10-12 days during the winter. Except for the numbers of pairs of legs, the immature mites (three pair) and the adult mites (four pair) are

similar in appearance and feeding habits.

*Psoroptes ovis* does not burrow into the skin but its feeding causes severe skin irritation and itching. Rubbing and scratching by the animal further irritates the infested area. Eventually a scab forms which provides a sheltered and optimum situation for the mite. Under these conditions, they increase rapidly. Infested animals fail to do well and loss of hair during the winter can bring about the death of the animal.

*Sarcoptes scabiei* var *bovis* burrows in the skin; otherwise its life cycle is similar to *P. ovis*. While not as severe, it tends to be more difficult to control. *Chorioptes bovis* lives in colonies on the skin but does not usually produce severe lesions. This species tends to be more of a pest on dairy cattle, particularly in the Northeast United States.

There is a fourth mite species, *Demodex bovis*, the cattle follicle mite. This mite is found in dermal pustules. It, too, is more of a pest of dairy cattle in the Northeast.

Mites spread from animal to animal by contact. That is why legislative control programs require not only the treatment of infested animals, but of any animals that may have come in contact with the infested animals, as well. There is only one insecticide approved for scabies control in Nebraska, and that is ivermectin.

### Insecticide Recommendation for Scabies Mite Control in Nebraska

Insecticide	Application method	Rate	Restrictions & Comments
<i>Ivermectin</i> ( <i>Ivomec</i> )	Injection	1% AI 1 ml/110 lb body weight Subcutaneous injection	Treatment-slaughter interval 35 days. *Do not treat lactating dairy cattle.

\*The FDA has not developed a permanent guideline on how long milk from treated lactating dairy cattle must be withheld from the market. A temporary ruling has been made in one case of 35 days, the same as the treatment slaughter interval for beef cattle.



## House and Stable Fly Control in and near Livestock Facilities (G 75-211, G 75-212)

House and stable flies commonly referred to as filth flies are pests around animal facilities. Both species breed in animal waste, mixed with decaying organic matter (feed stuffs), soil and moisture. The latter is critical in any consideration of sanitation practices. In addition, the house fly will breed in fresh manure.

The life cycles of the two species are similar, but in the summer the house fly is able to complete its life cycle in two weeks as opposed to three weeks for the stable fly. Both species probably overwinter in breeding areas below the frostline as slowly developing larvae. As temperatures increase, the larvae migrate upward and pupate. The flies that emerge are the overwintering population that give rise to the first generation in the spring.

The annoyance and stress to beef and dairy cattle caused by stable flies reduces weight gain performance, feed efficiency (0.48 lb/day and 11%, respectively, in Nebraska trials) and milk production (as much as 40 percent in Illinois trials). Losses from house flies are not as acute, but they are disease vectors. Both fly species may be the cause of lawsuits when urban areas infringe on agricultural production areas.

Management of animal wastes and of moisture (sanitation) is critical to any successful fly control program. The major fly breeding areas should be located and either cleaned or spread out thin enough to dry quickly. Leaky waterers or run-off drainage areas should be maintained to function properly, and spilled feed should not be allowed to accumulate longer than one week. Summer harvested haylage should be covered with black plastic where drainage occurs.

In confined units that use slatted floors and pits in waste management, care must be taken to provide agitation to prevent a crust from developing on the waste. House flies will breed just below the crust.

If air or water is not used for agitation, the pits should not be allowed to fill more than within one foot of the slatted floor so that dropping of the waste material will provide agitation.

Screening ventilation openings and air intake vents in confined animal or poultry facilities reduces the number of flies entering buildings for feeding or egg deposition. The use of high pressure water to clean out areas hard to reach with regular cleaning equipment will improve sanitation efforts.

**Area Spray:** Insecticide applications also should be considered as a part of the total strategy. The method of application most often employed is a mist blower (area spray). Diluted insecticide is dripped into a high velocity air stream. The insecticide droplets are dispensed by the air stream into space occupied by flies. The droplets kill flies they contact. Insecticides approved for application by this method have little residual value because they

break down very rapidly (two hrs) in the environment. The popularity of this system is more from the standpoint of labor and time requirements than from efficacy.

There are factors that will improve the efficacy of mist blower applications. These include: 1) Control of weeds and other vegetation around animal facilities. This practice removes a favorable habitat and forces flies to congregate in fewer areas. 2) Do not spray when temperatures are below 65°F or above 90°F. Insecticides are not very active at cool temperatures, and evaporation and inversion reduces the effectiveness of mist applications at high temperatures. 3) Spray what is mixed the day it is mixed. Insecticides deteriorate when mixed for more than a few hours. 4) If trees are used as a windbreak, flies rest in them during the hot part of the day. Application of the mist into the trees may be more efficient than spraying the pens. 5) Rotation of insecticides once or twice during the season or at least from one season to the next will reduce the build up of resistance in the fly populations.

Although mist blowers are the most popular method of applying area sprays, aircraft, hydraulic sprayers and foggers also may be used to dispense area sprays. Regardless of the equipment, it should be adjusted to deliver fine droplets of insecticide into the fly-infested area. The insecticide labels often give application rates in terms of amount of product per cubic foot of space. Practically, we recommend one to five gallons finished spray per acre.

**Residual Spray:** Insecticides used for this application method will kill flies that contact the material for about seven to 14 days. Direct sunlight (ultraviolet radiation, ULV) will break down the materials, and rainfall will wash it off treated surfaces.

Residual insecticides are most effective when applied to shaded fly resting surfaces. House flies will "roost" under eaves or inside buildings on the walls, rafters and ceilings at night. Stable flies generally do not enter buildings unless they are well-lighted. They rest on the shady sides of feed bunks, buildings and windbreaks, or on vegetation. Flies absorb enough insecticide when it is applied to the resting sites to kill them. Application of insecticides to resting areas requires more time and labor than application of area sprays.

Labels on residual insecticides usually give the amount of finished spray to apply to 1,000 sq ft of surface. In general, the insecticides can be applied to the point of run-off, and care should be taken not to contaminate feed and water. Some residual insecticides will require the removal of animals from buildings while the spray is being applied. Others will have restrictions on treating the inside of buildings, treating animals under a certain age, or treating dairy milking parlors.

If fly resting areas are not too intensive, residual and area sprays may be rotated. It takes both house and stable fly females about six days after emergence to reach the egg depositing stage. In a rotation, a good



mist blower application could be followed a week later with a residual application which should be effective for another week. This rotation could be followed throughout the fly season.

**Baits:** Baits may be used in dry form as purchased, or made into liquids by adding water, sugar, corn syrup or molasses. Baits should be replaced at two to four day intervals. Stable flies feed only on blood, so baits are not appropriate for them. Baits will not control a house fly population, but they can be used as an adjunct system for other control methods. They may be particularly useful around the office, feed storage areas, in the alleyways of confined units and other similar places. Baits can be mixed with water into a slurry and used as a residual treatment in swine, poultry and beef confined units. Bait stations should be cleaned and new bait used at weekly intervals.

**Feed additives or boluses:** Feed additives are not effective for stable fly control and are effective for house flies mainly in western dry regions where the only suitable breeding habitat for house flies is fresh manure.

The same considerations would hold true for boluses. Under some management conditions, feed additives may be useful in confined beef, swine or poultry units for house fly control.

**Animal treatments:** Spraying, dusting, pour-ons, spot-ons, dips, ear tags or any other methods of applying insecticides to animals for control of house flies or stable flies generally are ineffective. The possible exception is the application of insecticides to riding horses on a daily basis for protection from stable flies. This also might apply to show animals the day of showing.

**Larvicides:** We generally do not recommend applying insecticide to fly breeding areas because of the possibility of a rapid development of resistance in fly populations and because the pH of the breeding area generally breaks the insecticide down rapidly. In some cases, however, it may be too wet or otherwise difficult to clean up fly breeding areas which may be creating most of the fly problem. Under these conditions, we do recommend larvicides as a temporary solution.

#### Insecticides Recommended for Control of House and Stable Flies in and Around Livestock Facilities

Insecticide	Application method	Rate	Restrictions & Comments
<b>Mist Area Sprays</b>			
<i>Dichlorvos</i> (Vapona) (DDVP)		0.5% AI, 58% EC 1-5 gal finished spray per acre	
<i>Fenvalerate</i> (Ectrin)		0.05% AI, 10% EC 1-5 gal/acre	
<i>Malathion</i>		0.5% AI 57% EC or 25% WP 1-5 gal/acre	
	(Aircraft only)	97% ULV 8 oz/acre	
<i>Naled</i> (Dibrom)		0.5% AI, 58% EC 1-5 gal/acre	
	(Aircraft only)	93% ULV 4 oz/acre	
<i>Permethrin</i> (Atroban) (Ectiban)		0.05% AI 5.7%, 10% or 11% EC 1-5 gal/acre	
<b>Residual Sprays</b>			
<i>Diazinon</i>		2% AI 50% WP	Treat to point of runoff.
<i>Dimethoate</i> (Cygon)		1% AI 23.4% EC	Treat to point of runoff. Remove animals before treating in buildings.
<i>Fenthion</i> (Baytex)		1% AI, 45% WP	Treat to point of runoff.
<i>Methoxychlor</i>		2% AI, 50% WP	Treat to point of runoff. House flies may develop resistance. Rotate to another insecticide at least seasonally.
<i>Permethrin</i> (Atroban) (Ectiban)		0.1% AI 25% WP 5.7%, 10% or 11% EC	Treat to point of runoff. House flies may develop resistance. Rotate to another insecticide at least seasonally.
<i>Stirofos</i> (Rabon)		1% AI 24% EC 50% WP	Do not contaminate feed or water.
<i>Trichlorfon</i> (Dipterex) (Neguvon)		1% AI 45% EC	Do not contaminate feed or water. Treat to point of runoff.



## Insecticides Recommended for Control of House and Stable Flies in and around Livestock Facilities (continued)

Insecticide	Application method	Rate	Restrictions & Comments
	<b>Baits</b>		
<i>Dichlorvos</i>		0.5% AI, Ready-to-use	Do not place baits where animals, pets or children may contact them. Do not contaminate feed, water, milk or milk utensils.
<i>Malathion</i>		1% AI, Ready-to-use	
<i>Methome + Muscamone</i>		1% Methome + 0.025% Muscamone	Do not use inside buildings.
<i>Methoxychlor (Golden Malrin)</i>	1% AI		
<i>Trichlorfon</i>		1% AI	
	<b>Larvicides</b>		
<i>Dimethoate (Cygon)</i>		1% AI, 23.4% EC	
<i>Stiophos (Rabon)</i>		1% AI 24% EC 50% WP 1 gal/100 sq ft fly breeding area	
	<b>Feed Additives</b>		
<i>Cyromazine (Larvadex)</i>		1% AI 1 lb/ton finished ration (5 parts/million)	Poultry only.
<i>Phenothiazine</i>		0.25% AI 0.25 mg/100 lb body weight	Cattle only.
<i>Stiophos (Rabon)</i>		7.76% or 97.3% AI 26.4 mg AI/lb ration 7.92 mg AI/animal/day	Cattle and swine.

### External Insect and Mite Parasites of Swine

The hog louse and two species of mange mites (the common itch mite and the less common hog follicle mite) are the major external parasites of swine. House flies and stable flies also may be a nuisance and/or pests of swine. Control of the last two species is discussed in the section on cattle.

The hog louse and both mange mites are found on a high percentage of swine slaughtered at Midwest feedlots. Ear scrapings indicate 26 percent of Nebraska swine were infested with mange mites. Both mange mites and lice spread by animal contact. Breeding stock may be the principle reservoirs of these pests. The SPF (swine pathogen-free) swine health program used in several midwest states (primarily for breeding stock) requires all participating stock to be free of lice and mange. Purchase of SPF stock should reduce the spread of these parasites.

Hog lice are blood-feeding. The life cycle from egg to adult averages ca. 24 days. The immatures resemble the adults in appearance and feeding habits. The reproduction rate increases in the winter and declines in the summer. Although the hog louse is the biggest of the domestic livestock species of lice, it may be difficult to see because its coloration may blend with that of the animal. Louse-infested animals itch and the scratching causes the skin to become thickened and cracked, which results in sores. These signs are the main indicators of the presence of lice.

Any breeding stock being brought into the program should be isolated and treated for lice twice, 10-14 days apart. SPF swine will have been treated. Sows should be treated at least two weeks prior to farrowing. Pigs should be treated at weaning before being placed in a finishing program. Boars should be treated before breeding season.

### Insecticide Recommendations for Control of the Hog Louse

Insecticide	Application method	Rate	Restrictions & Comments
<R> <i>Amitraz (taktic)</i>	Spray or Dip	0.025% AI, 12.5% EC	10-day treatment interval. Use lower rate for dip. Do not dip overheated animals. Do not treat animals under 3 months of age.
<i>Coumaphos (Co-Ral)</i>	Spray or Dip	0.03-0.05% AI 11.6% EC or 25% WP	
<i>Crotoxyphos (Ciodrin) (Ciovap)</i>	Spray	0.25% AI, 14.4% EC	14-day treatment interval. Do not treat animals under 3 months of age.
<R> <i>Dioxathion (Delnav)</i>	Spray or Dip	0.15% AI, 30% EC	14-day treatment interval. Do not treat animals under 3 months of age.



### Insecticide Recommendations for Control of the Hog Louse (continued)

Insecticide	Application method	Rate	Restrictions & Comments
<i>Fenthion (Teguvon)</i>	Pour-on	3% AI 1/2 oz/100 lb body weight	
<i>Fenvalerate (Ectrin)</i>	Spray	0.05% AI, 10% EC	30-day treatment interval.
<i>Lindane</i>	Spray or Dip	0.03-0.06% AI 20% EC or 25% WP	Pre- and post-treatment farrowing interval 14 and 21 days, respectively. Treatment-slaughter interval 30 days.
<i>Malathion</i>	Spray or Dip	0.5% AI, 57% EC	
<i>Methoxychlor</i>	Spray or Dip	0.5% AI 25% EC or 50% WP	
<i>Permethrin (Ectiban)</i>	Spray	0.025% AI, 5.7% EC	
<i>Stirofos (Rabon)</i>	0.35-0.5% AI 50% WP		

Mange mites burrow into the skin of swine. The burrowing causes intense itching. Mange infested animals scratch primarily with their hind feet, which causes lesions. The lesions scab over and this creates an ideal environment for the mites, which increase rapidly. Infested skin areas become scruffy, inflamed, raw and cracked. A positive mange diagnosis can be made only by examining skin scrapings (deep enough to penetrate the mite burrows) under magnification. The mites are

spread by contact. Market hogs may be down-graded because of a rough, unkempt appearance, and infested animals may suffer decreased weight gain performance. They are more susceptible to stress-related diseases.

If pigs are sprayed, care should be taken to make sure some of the insecticide gets into the ears. The ear serves as a reservoir for later general infestation when winter arrives.

### Insecticides Registered for Control of Swine Mange Mites

Insecticide	Application method	Rate	Restrictions & Comments
<R> <i>Amitraz (Tactic)</i>	Spray or Dip	0.25% AI, 12.5% EC	
<i>Ivermectin (Ivomec)</i>	Injection	1 ml/75 lb body weight Subcutaneous in neck area	Treat sows 7-14 days prior to breeding. Treat boars twice yearly.
<i>Lindane</i>	Spray or Dip	0.03-0.06% AI 20% EC or 25% WP	Treatment-slaughter interval 30 days for spray, 60 days for dip.

### Insecticide Recommendations for Insect Pests of Sheep (G 74-119)

Sheep in Nebraska are subject to infestations of the sheep ked "tick", three species of sheep lice, wool maggots, sheep nose bot, spinose ear tick, the stable, house and face flies, and the aquatic complex of biting flies (mosquitoes, culicoides, black flies, tabanids and biting gnats).

The sheep ked is a wingless fly that resembles a tick. Keds spend the entire life cycle on sheep, transferring to lambs by contact. The female deposits a fully developed larva on a wool strand. A red puparium (case) forms around the larva. A fully developed sheep ked emerges from the puparium after about 21 days. Sheep keds feed on the blood of sheep.

A condition called "cockle" is thought to be the

result of the sheep ked puncturing the skin to feed. Hide buyers downgrade sheep skins with the "cockle." Several states are following the example of Wyoming and treating all animals in a flock in order to be able to market ked-free animals.

The best time to treat for sheep ked is right after shearing. If lambs are present and infested, they, too, should be treated. In addition, any sheep coming into the flock as replacement ewes or rams should be treated before they are allowed into the flock.

The sheep biting louse is a common pest of sheep. These lice feed on the skin scurf. The feeding causes irritation and sheep react by biting and rubbing the infested skin area. The fleece of infested animals becomes ragged, torn and reduced in value. The sheep biting louse and sheep foot louse, both blood-feeding lice, also occasionally may be found on sheep. Generally, if sheep are treated for the sheep ked, sheep lice also are controlled.



Wool maggots are the larvae of some species of blow flies (the black blow fly, in particular). The flies deposit eggs in dirty, wet wool, usually in the crotch area or at wound sites. Maggot infested sheep are restless, stamp their feet, try to bite at the irritated area and may leave the flock in search of a secluded place. Care and medication of wounds, early shearing or clipping or cleaning dirty areas before fly season will reduce the incidence of fly infestation.

The sheep nose bot (head grub) is the larvae of the sheep bot fly. The fly deposits live larvae in the nostrils of sheep. The larvae migrate to the head sinus and, after development, migrate back down the nasal passage. The fly "strike", when the fly deposits larvae, causes irritation to sheep as does the migration to and from the head sinus. Infested sheep bang their heads on the ground, feedbunks or fence posts. The bot fly may not be present in Nebraska, but feeder lambs shipped in from other states may be infested. No insecticide is registered for control of this pest.

The spinose ear tick is a pest of both cattle and sheep. It is found primarily on arid range areas, and infested cattle or sheep in Nebraska usually have been shipped into the state. There also may also be a few ticks of

other species present on sheep, but usually not enough to be economic.

The feeding area preferred by the spinose ear tick is the inner folds of the outer ear.

Stable, house and face flies feed on sheep primarily at the sites of shearing wounds. If sheep are not sheared prior to fly season, the animals should be treated with an insecticide to provide protection until the wounds heal. Recommendations for fly control around sheep pens and buildings are the same as recommended for feedlots and dairies.

The aquatic biting fly complex is difficult to control. *Culicoides* transmits blue tongue to sheep, primarily, but also to white tail deer and cattle.

Pasture sheep away from waterways that are breeding areas for these pests, if possible. Otherwise, treat sheep periodically with one of the insecticides listed for keds or lice to provide some relief from the biting fly annoyance.

Sheep scab mite is supposed to be eradicated from the United States. Like cattle scabies, it is treated as a disease and is subject to federal and state quarantines and treatment laws. Control is not included in this recommendation guide.

#### Insecticides Recommended for the Sheep Ked and Sheep Lice

Insecticide	Application method	Rate	Restrictions & Comments
<i>Coumaphos (Co-Ral)</i>	Spray or Dip	0.06% AI 11.6% EC or 25% WP	Do not treat lambs under 3 months of age. Treatment-slaughter interval 15 days.
<R> <i>Dioxathion (Delnav)</i> <i>Fenvalerate (Ectrin)</i>	Spray or Dip	0.15% AI, 30% EC	Treatment interval 14 days.
	Spray	0.025% AI, 10% WDL 1 qt spray/animal	Treatment interval 30 days. Treatment-slaughter interval 2 days.
	Pour-on	0.2% AI, 10% WDL 4 oz/animal	
	ULV Spray	0.25% AI, 10% WDL 1/3 oz per animal	
<i>Lindane</i>	Spray	0.05% AI, 20% EC	Do not treat lambs under 3 months of age. Treatment-slaughter interval 30 days.
<i>Malathion</i>	Spray	0.5% AI, 57% EC	Do not use on lambs under 3 months of age.
<i>Permethrin (Ectiban)</i>	Spray	0.05% AI, 5.7% EC	
	Pour-on	1% AI, S 1.2 oz/100 lb body weight. Do not exceed 2.5%.	

#### Insect Control Recommendations for Sheep Wool Maggot

Insecticide	Application method	Rate	Restrictions & Comments
<i>Coumaphos (Co-Ral)</i>	Spray animal or spot treat infestation site	0.125% AI, 25% WP	Treatment-slaughter interval 15 days.
<R> <i>Dioxathion (Delnav)</i>	Spray animal or spot treat infestation site	0.15% AI, 30% EC	Treatment interval 14 days.

Control of house and stable flies in and near livestock facilities holds true for sheep facilities as well. The animal sprays listed for control of sheep keds and lice will protect sheep from the biting fly complex (including the aquatic complex). These sprays need to be repeated at about 14 day intervals throughout the fly season.



## **Insecticide Recommendations for Insect Pests of Horses in Nebraska (G 78-411)**

Horses are subjected to many of the same insect pests as are cattle but, as with most animal species, there are a few insects that parasitize only horses. The major insect pests of horses in Nebraska are stable flies, black flies, biting gnats, horse and deer flies and horse bot flies.

Stable and house flies not only feed on horses but are intermediate hosts and, thus, vectors of internal parasites of horses. The nematodes, *Habronema microstoma* and *Habronema muscae*, are associated with the stable and house fly, respectively. The face fly feeds on the eye secretions of horses and is a vector of the eye worms of the genus *Thelazia*.

Control measures for horse insects that will fit the many conditions in which horses are kept are difficult to devise. These range from the one or two horse pleasure and 4-H horse owners to horse breeding farms, race horse facilities and ranch horses. Numbers vary from one to a hundred or more. However, sanitation measures discussed in the section on cattle insect control also are essential for house and stable fly control.

The same residual insecticides and area sprays recommended for feedlots and dairies can be used in and around horse facilities as well.

However, livestock sprays recommended for use on animals should not be used on horses unless the label specifically names horses. Horses have very sensitive skin, and sprays with petroleum carriers may burn the skin of a horse. As a consequence, insecticide formulations suitable for horses often are available only through companies (Franklin, Farnam) specializing in full lines of horse products that formulate the registered chemicals with carriers suitable for use on horses.

Application of insecticides to only a few horses for protection from biting flies may be more practically applied with a sponge as a wipe, rather than with a sprayer. Rubber gloves with long cuffs should be used by the applicator if the wipe method is the treatment of choice. The same insecticide may be sold under several trade names.

Black flies feed primarily in the ears of horses, and treatment in the ear with pressurized spray cans may be the most effective treatment method for those pests. Some species of mosquitoes transmit strains of encephalitis which affects both horses and man. Horses should be vaccinated yearly for protection against encephalitis.

Mosquito control best can be achieved by a concentrated effort to control the immature forms at the aquatic breeding site. Either develop a drainage system to prevent standing water or treat the water with biological insecticides such as *Bacillus thuringiensis* var. *israelensis*, a bacteria.

Horses perspire, which washes away the insecticide or repellent and probably causes a more rapid breakdown of the product. Horse protection with sprays requires

repeated applications at two to three day intervals.

Insecticide-impregnated plastic strips that can be attached to the halter or fastened around the throat both repel and control biting flies. These function in a way similar to a no-pest strip or an ear tag; the insecticide gradually releases through the plastic matrix and is rubbed on the hair coat.

In addition to the insects mentioned that regularly attack horses, horn flies and occasionally cattle grubs use horses as hosts. Horn flies may attack horses in the spring when adults first emerge from the overwintering phase of their life cycle if cattle are not yet in summer pastures and horses are present.

Cattle grubs cannot complete their development beyond the encysting stage in a horse, and cannot cut a breathing hole in the skin of horses as they do in cattle. The grub incidence in horses is too low to indicate the need for treatment with a systemic insecticide. The encysted grub is quite irritating to the horse and should be removed surgically, and the wound treated to prevent infection.

There are three species of horse bot flies (gad flies) that infest horses with bots. The female of the common bot fly deposits eggs on the hairs of the chest, legs, belly and flanks of horses. The eggs hatch immediately when the horse licks them, and they bore into the tongue. They migrate through the tongue to the stomach where they attach to the wall to complete the larval growth stage. When that stage is complete, they detach and are passed out with the manure where they pupate and, in time, emerge as a new generation of flies.

The life cycles of the other two species, the throat bot fly and the nose bot fly, are similar. The throat bot fly deposits eggs on hairs below the jaw. These eggs hatch without stimulation and migrate to the gum area of the cheek teeth before migrating to the stomach, pylorus or duodenum. The nose bot fly deposits eggs on the hairs of the horse's lips. The larvae of these species hatch on their own and penetrate the lip membranes in front of the incisors before migrating to the stomach wall.

Severe infestations of horse bots may cause gastrointestinal stress, block the stomach outlet (colic) or rupture the stomach, causing the death of the horse. Gum and tongue inflammation and even abscesses may result from the infestations in the mouth.

Treatment of horses for bots should be delayed until after the first hard freeze, unless bot symptoms are apparent, to prevent reinfestation. Sponging the areas where eggs are attached with warm water will cause them to hatch and the larvae can be killed before they enter the mouth.

As with most animals, horses are infested with both a biting and a blood-feeding species of louse. The biting louse feeds on sloughed skin, hair and skin secretions. The sucking lice feeds on blood. The life cycle of both takes a month or more. They may be located anywhere on the animal but are found most often on the head, neck, mane and tail.



Severe infestations bring about an unkempt hair coat and cause itching which the animal reacts to by excessive rubbing and scratching. Severe infestations of the blood-feeding louse may cause anemia. Lice are transmitted among horses by contact.

Ticks will attach to horses but are not an economic problem in Nebraska. One other insect, the blister beetle, may affect horses indirectly if they are ingested with

hay. Blister beetles contain cantharidin which is very toxic to horses. First-cutting alfalfa usually is harvested before blister beetles are present. Prairie hay is less infested with blister beetles than is alfalfa. Alfalfa intended for horse use can be treated if many blister beetles are present. (See EC 88-1511 for a listing of insecticides registered for use on alfalfa.)

#### Insecticides Recommended for Treatment for Flies on Horses

Insecticide	Application method	Rate	Restrictions & Comments
<i>Coumaphos (Co-Ral)</i>	Spray or Sponge	0.75% AI 11.6% EC or 25% WP	
<i>Dichlorvos (DDVP, Vapona)</i>	Spray or Sponge	0.48% AI + Synergist (piperonyl butoxide) + pyrethrin Ready to use 1-2 oz/animal	
<i>Fenvalerate (Ectrin)</i>	Plastic Strap	8% AI Attach one strap to halter	
<i>Malathion (Cythion)</i>	Spray or Sponge	0.5-1% AI, 57% EC	
<i>Methoxychlor</i>	Spray or Sponge	0.5% AI + 7.5% stabilene (a repellent)	
<i>Permethrin (Ectiban)</i>	Plastic Strap	10% AI Attach one strap to chin strap	
<i>Pyrethrin</i>	Roll-on or Rub-on Spray	1.4% AI Ready to use Mix with several insecticides including Dichlorvos, Methoxychlor and synergists	
<i>Stirophos (Rabon)</i>	Feed additive	7.76% or 97.3% AI 26.4 mg AI/lb ratio or 7.92 mg AI/animal/day	Horn and face fly control only

#### Insecticide Control Recommendations for Control of Horse Bots (Treat following first hard freeze)

Insecticide	Application method	Rate	Restrictions & Comments
<i>Dichlorvos (DDVP) (Vapona)</i>	Feed and Paste or Gel	Ready to Use	
<i>Ivermectin (Egvalon)</i>	Paste or Gel	1% AI 1 ml/110 lb body wt.	Treatment-slaughter interval 35 days.
<i>Trichlorfon (Neguvon) (Anthon)</i>	Bolus	4.5 g/250 lb body wt.	Treatment-slaughter interval 35 days
	Tube		
	Paste or Gel		

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