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HORSE PEST MANAGEMENT

Gene Burgess, Professor, Entomology and Plant Pathology

Insect and related parasites cause direct and indirect damage to horses. They feed on the horses; cause irritation; spread diseases; and cause digestive upsets, poor condition and retarded growth. Therefore, strong parasite control programs are needed.

Many different flies are pests of horses. Basically, they may be divided into three groups by their feeding habits. Sponging mouthparts, found on house flies and face flies, are used to sponge or sop up liquid foods. Stable flies, horn flies, horse flies and mosquitoes use piercing mouthparts to pierce the host animal's skin so that they may feed on blood. Some flies, such as bots and cattle grubs, have no mouthparts as adults.

HORSE BOTS

There are three bot flies that attack horses. The common bot fly, Gasterophilus intestinalis, lays his yellow-white eggs on the hairs of the horses' forelegs, chest, neck, belly and sometimes on the hind legs and flanks. These eggs incubate one to two weeks and hatch only if licked or eaten. The moisture, warmth and friction from the licking stimulates larval hatch. The young bot larvae then migrate to the mouth of the horse. They burrow into the front of the tongue and three to four weeks later emerge out the rear of the tongue before migrating and attaching to the stomach wall.

The female throat bot fly, Gasterophilus nasalis, lays her eggs on the hairs under the jaw and throat. Incubation takes four to six days and larvae hatch without stimulation. These larvae infest the gum margins around the cheek teeth for one month before migrating to the stomach, pylorus and duodenum. Large numbers of larvae in the gums may cause pus pockets and mouth irritation.

The female nose bot fly, Gasterophilus hemorrhoidalis, deposits black eggs on the hairs of the lips. The larvae hatch in two to four days. These larvae penetrate the inner lip membranes in front of the incisors and after five to six weeks also migrate and attach themselves to the stomach walls.

When the bot larvae are mature, they detach themselves, change into the non-feeding pre-pupal stage as they move through the intestines and pass out with the droppings. These pre-pupae burrow into the ground where they remain one to two months. Adult flies emerge during warm summer months. The life cycle from egg to adult fly takes one year.

Stomach bots cause gastrointestinal disturbances. Occasionally, they become so numerous that they mechanically block the stomach outlet, resulting in colic. The blockage may also cause rupture of the stomach wall and death. This seldom occurs.

Bots may be controlled by several methods. Larvae can be induced to hatch by sponging with warm (104 to 118° F) water. Sponging horses on cool days (below 60° F) will assure that larvae quickly die of exposure. Warm water may be applied with an insecticide if treatment is done on a warm day. Treating the body areas, where bot flies glue their eggs, with insecticide wipes or sprays should help control bots. This treatment should be done once a week for the common bot fly. Since the throat bot fly and nose bot fly have shorter incubation times, treatment should be done two to three times weekly.

There are medications available in the form of liquids and pastes to be mixed in feed rations or applied orally. Dosages of internal medication are based on weight. Treatments are best given in the colder months after the first killing frost, after bot larvae have started to accumulate on the stomach lining. Alternating classes of insecticides helps combat resistance.

HORSE FLIES AND DEER FLIES

Horse flies (Tabanus sp) and deer flies (Chrysops sp) are serious pests of horses. These heavy-bodied, brown or black flies are swift fliers and vicious biters. They have clear or striped wings and range from 1/3 to 1 inch in size.

These insects feed by piercing the skin of the horse and sucking the blood as it wells up in the wound. Only the adult females are blood feeders and they only feed during the daylight hours. Horse flies and deer flies are usually found feeding on the head, neck, shoulders and back. Horse flies and other blood-sucking insects have been implicated in the transmission of "swamp" fever (equine infectious anemia) in horses.

Most horse flies and deer flies have only one generation per year. The female lays her eggs on vegetation around moist, swampy places. The larvae burrow into the mud where they spend the next year feeding on small animals. They pupate in the spring and emerge as adults by early summer.

Control of horse flies and deer flies is very difficult. Some control can be achieved by draining wetlands or by using approved insecticides for larval control. Pyrethrin sprays, organophosphate and synthetic pyrethroid insecticide sprays give limited control of these pests. These flies do not normally enter structures. Providing pastured horses space and structures for sanctuary during heavy attacks helps alleviate the control problem.

STABLE FLIES

Stable flies, Stomoxys calcitrans, are the most injurious flies that attack horses. This insect is about the same size of the common house fly, but it is a blood feeder; both sexes feed on blood.

Stable flies are usually found feeding on the lower legs or flanks of the horse. Due to the painful bite, horses will stamp and kick trying to rid themselves of these pests. When present in large numbers, stable flies can cause considerable blood loss as well as severe irritation. The flies stay on the animal only while feeding, after which they seek a sheltered area to digest their meal. Females must have a blood meal each time they lay eggs. These flies may contribute to the transmission of swamp fever and are vectors of "summer sores," weeping wounds that are difficult to heal.

Stable flies breed in decaying organic matter. A fermenting mixture of straw, manure and urine is ideal. Although horse manure is usually too dry to support their development, it becomes an adequate breeding medium when allowed to accumulate in stalls or barns where it becomes moistened with urine or water. Decaying straw, grass clippings, hay or silage are also suitable breeding materials for stable flies.

The life cycle of stable flies from egg to adult takes 21 to 25 days. Females can lay up to 20 batches of eggs. High populations can build up under optimum conditions.

Control of stable flies off the animal (in and around buildings, etc.) will be discussed with house fly control. Insecticides may be applied to the animal especially to the legs of the horse. They should be reapplied when they appear to be losing their effectiveness. Under heavy populations, pasture horses away from wooded areas and treat with insecticides every day or two.

HOUSE FLIES

House flies, Musca domestica, are not serious pests of horses, but they are important disease carriers. These flies transmit stomach worms and have been incriminated in the transmission of over 60 vertebrate pathogens by body part contamination, regurgitation and defecation. The house fly can cause considerable irritation to the horse when feeding on secretions around the eyes. These flies are 1/4 inch long and dull black or dark gray. House flies feed on a broad range of food and filth including rotting organic matter, garbage, all types of excrement, wet and rotting hay, grass, straw, grain or silage but seem to prefer horse manure. They have a short life cycle of six to 14 days and build up to high populations around stables if not controlled.

CONTROL OF HOUSE FLIES AND STABLE FLIES

A good pest management program is important for stable fly and house fly control.

This includes:

1. elimination of breeding materials;
2. control of moisture;
3. judicious use of insecticides; and
4. mechanical control

Elimination of breeding materials -- Good sanitation is the key to any successful fly control program. Corrals, run-in sheds and barns should be designed to facilitate the rapid and efficient removal of manure and other fly-breeding materials. Feed mangers should be designed to minimize the accumulation of wasted feed beneath them. Fly-breeding materials should be removed and disposed of at least once a week to break the seven to 21-day life cycle of these flies. Make sure areas such as around fence posts, outside and under fences, outside and under feed troughs or hay racks, corners in barns or other buildings, stalls and sick pens, around silos or other feed storage areas, garbage cans and around waterers and water tanks are not missed.

Manure and other fly-breeding materials are most easily disposed of by spreading them thinly on cropland. This may be done by using a flail-type manure spreader.

Manure storage facilities should be used when it is impossible to spread the manure on fields. Manure stored in liquid manure pits or manure lagoons should be mixed with enough water to inhibit fly breeding. Agitation of the manure-water mixture will eliminate the accumulation of floating solids where fly breeding can occur.

Manure can be stockpiled in non-liquid type storage areas. However, flies can still develop in the outer few inches of stockpiled manure. These stockpiles should be well drained. These should be spread thinly on crop land as soon as possible. Large amounts of manure can be composted to reduce fly breeding problems, while creating a useful and valuable by-product.

Moisture Control -- Manure and other fly breeding materials should be kept dry. Corral areas should be designed to promote adequate drainage and eliminate wet spots. Good drainage away from manure stockpiles is also important. Automatic waterers should be maintained properly. All these practices promote drying and help reduce fly breeding.

Insecticides -- Insecticides are usually needed to round out a complete fly control program. However, they should never be the sole means of fly control. There are several ways to use insecticides for fly control.

1. Residual insecticides can be applied to the walls, ceilings and rafters of horse barns, run-in sheds or other farm buildings, as well as vegetation around the buildings will help control adult flies that use these areas as resting sites. Start residual sprays early in the spring where flies first appear. Stop spraying or change chemicals when control is no longer effective. Wettable powder formulations usually give longer residual protection than emulsifiable concentrates when they are applied to bare wood or concrete block walls.
2. Insecticide space sprays, fogs and mists control large numbers of adult flies, especially in enclosed areas such as barns. These chemicals have a short residual effect and must be applied on a daily basis.
3. Insecticide-impregnated strips containing DDVP are useful in controlling adult flies in enclosed areas such as tack rooms, feed storage rooms or box stalls.
4. Insecticide baits available in dry or wet formulations should be spread in areas where flies congregate. Baits should be used daily to maximize their fly control capabilities. Children and domestic animals should not have access to these baits.

5. Larvicides are insecticides that can be applied to areas of intense larval development to kill the larvae before they emerge as adults. These may be sprayed on manure stockpiles or mixed with the feed.

Always read and follow label directions. Observe proper safety precautions and avoid contaminating feed, water and equipment with insecticides.

Mechanical Control -- Screening is an excellent way to keep flies out of areas such as feed rooms, tack rooms and box stalls. Fans directing an air blast downward and outward above doors will help prevent flies from entering barns.

This integrated approach to house fly and stable fly will control flies and reduce the incidence of insecticide resistant flies. Studies have shown that insecticide resistant strains of house flies develop more rapidly on farms where sanitation is poor. If flies become resistant, intensify your non-insecticidal control measures, rotate insecticides (to another family), and use shorter residual insecticides for adult fly control.

FACE FLIES

Face flies, Musca autumnalis, are occasional pests of horses, especially when the horses are pastured with or near cattle. Both males and females, with sponging mouthparts, feed on mucous secretions of the eyes and nostrils as well as on blood oozing from wounds caused by horse flies or stable flies. Their feeding, especially around the eyes, is very annoying to horses.

Face flies are about the same size and coloration as house flies. The female lays eggs in fresh cattle manure. The entire life cycle takes from 15 to 25 days.

Face flies are difficult to control because of the difficulty of treating the head. Face flies only stay on the host a short time each day, spending the remainder of their time on vegetation, fence posts or other objects. The use of spray or wipe-on insecticides applied to the head or neck of the horse is the most effective way to control these pests. There are also insecticide impregnated strips and collars that are labeled for face fly control. Wounds should be protected with dressings or repellents. Fly shakers attached to the halter provide some protection for the eyes. The use of dustbags or face rubbers and insecticide impregnated ear tags are useful in controlling face flies on cattle and help reduce the overall population for horses and other animals.

HORN FLIES

Horn flies, Haematobia irritans, are blood sucking flies that attack cattle and horses if pastured near cattle. These flies are gray to black and resemble the house fly but are about half as large. They are commonly found upside down when feeding and are commonly found on the back and sides of cattle and horses. These flies remain on their host day and night, leaving only to transfer to other animals or to lay eggs.

Horn flies breed in freshly deposited cattle manure. Eggs hatch in 24 hours and require moisture for survival. The life cycle requires 10 days to one month depending on temperature.

The best way to control them on horses is to control them on cattle. This may be done by using insecticide impregnated ear tags, forced-use backrubbers or regular sprays. Sprays and wipes will provide control on horses as well.

MOSQUITOES AND BLACK FLIES

Several different species of mosquitoes feed on horses. They are slender-bodied, long-legged flies that can be as large as 1/2 inch long.

Mosquitoes breed in standing or slow-moving water. They also breed in tin cans, bird baths, old rubber tires or stopped-up gutters. Their life cycle is from 10 days to two weeks.

Bites from mosquitoes are irritating and large numbers can take large quantities of blood. Only the female feeds on blood. Mosquitoes are a vector of Eastern Equine Encephalomyelitis (EEE) and Western Equine Encephalomyelitis (WEE).

Black flies require moving water. They breed in streams, pond overflows, etc. Black flies bite horses on belly lines, between the back legs and in the ears.

Control mosquitoes by eliminating their breeding sites. Sprays and wipe-on insecticides may be applied to horses. Space sprays, fogs and insecticidal strips are useful for mosquito control in stables.

CATTLE GRUBS

Two species of cattle grub, bomb flies (*H. bovis*) and heel flies (*H. lineatum*), will parasitize horses if they are pastured near cattle. Bomb flies are banded with yellow and black stripes, while heel flies are smaller and more orange than yellow. Adults are prevalent during late May through June. Adults do not sting or bite but frighten cattle by their buzzing sound. Females usually lay eggs on the lower portions of the host's body. They hatch in less than a week, penetrate the skin and migrate in connective tissue. Eventually, larvae of both species migrate to the subcutaneous tissue of the back where they cut breathing holes in the hide. When the larvae mature, they escape through the breathing holes, fall to the ground and pupate. Flies emerge during the first warm days of spring. There is one generation per year.

Cattle grubs cannot complete their development in horses. They make aberrant migrations to the head, neck, withers and rib cage areas. They remain just under the skin and form hard nodules that may become sores if the horse or the saddle rubs the affected part.

These are generally not a problem on horses, However, control of grubs in horses is best achieved by controlling them on cattle. Treatments may be made with an injectable or with organophosphorus insecticides applied as a pour-on, spot-on or spray. Control measures must be applied soon after the fly season is over, which is from late July until November 1.

LICE

Lice can be found on all parts of the horse but are usually first noticed on the head, neck, mane and tail. There are two different species of lice which are occasionally a problem on horses. Signs of lice include scurfy skin, unkempt coat and excessive rubbing and scratching. Lice reproduce all year but are more of a problem during winter. Their entire life cycle is spent on the horse.

The horse-biting louse, Bovicola equi, is about 1/10 inch long and very flat. It has chewing mouthparts and feeds on dry skin, skin secretions and hair. Biting lice lay their eggs around the angle of the jaw and on the flanks. The eggs hatch in five to 10 days. Nymphs begin feeding immediately, reaching maturity in three to four weeks.

The blood-sucking louse, Haematopinus asini, is about 1/8 inch long and a dirty gray color. Sucking lice are more common, as well as more irritating, than biting lice. They have piercing, sucking mouthparts and with large infestations cause the host to become severely anemic. The horse rubs off patches of hair. Louse infestations are more commonly seen on horses on inadequate diets. Weight loss, stunted growth and susceptibility to diseases are associated with heavy infestations. Lice are not considered important in the transmission of equine pathogenic agents.

Eggs are glued to the hairs and hatch in 11 to 20 days. The nymphs suck blood and complete development in two to four weeks.

Some animals are particularly susceptible to louse infestation and are known as "carriers". These animals should be routinely inspected and treated, if needed.

Control is achieved by proper grooming, feeding and chemical treatment. Owners usually spot the problem quicker when grooming. Proper nutrition allows the animal to better withstand the blood loss or irritation of a severe louse infestation.

When using insecticides, wettable powder (WP) formulations are generally preferred over emulsifiable concentrates (EC) because some horses are more sensitive to skin burns from solvents in EC formulations. However, problems should not occur if the insecticide is labeled for use on horses for lice and used according to the label directions.

TICKS

In the spring, the American dog tick, Dermacentor variabilis, may infest horses and cattle. Ticks are blood-sucking arthropods closely related to insects. Large numbers of ticks can withdraw a great deal of blood and cause anemia in the host. Ticks cause irritation, restlessness and spread of disease on horses. They can be vectors of sleeping sickness, piroplasmiasis and E.I.A. (equine infectious anemia or swamp fever). Ticks may be removed by swabbing them with cotton soaked in alcohol or chloroform. Ticks are suffocated by the alcohol or chloroform. Ticks can also be controlled on horses using the same insecticides used for lice control.

MANGE OR ITCH MITES

Mange or itch mites tunnel in the upper skin layers, suck blood and secondary infections often result. Heavy infestations result in severe dermatitis.

Control is achieved by treating the area and surrounding areas on the horse. This treatment should be repeated in seven to 10 days. See materials in table for mange and residual sprays.

CONCLUSION

Adopt a good pest management program, taking into consideration all methods of pest control available. Plan ahead your pest management strategy. Consult with county agents and specialists in the field.

If a chemical does not work, try another in a different family of pesticides. Some insects are difficult to control; but, persistence and well-informed decisions are very helpful.

TABLE 1

Quick List of Chemicals For External Parasite Control on Horses
(For more details, see the following tables)

Horn Flies, Face Flies, House Flies and Stable Flies

Automatic Spray Systems:	Permethrin:
Natural pyrethrins + piperonyl butoxide	Atroban
Permethrin	Ectiban
Resmethrin	Permethrin II
Vapona	Tech-Trol
Ectrin Strips	Poridon
Ectrin 10 WDL	Rabon Oral Larvicide
Flysect - 7	Vapona + pyrethrin + piperonyl butoxide
Flies, Lice and Ticks	
Atroban	Permethrin II
Delnav	Poridon
Del-Tox	Purina Hard Hitter
Ectrin	Pyrethrin + synergist
Ectrin Collar/Brow Band	Py-Vona
Expar	Repel-X
Fly Away II	Roll-On
Fly-Bye	Simax
Fly Gone 7000	Stirofos Feed Supplement:
Flysect Spray or Lotion	Drive
Flysect Super 7	Equitrol
Horse Spray or Rub-On	Rabon
Insectaban	Vita-Plus
Insectrin	Super Dairy & Stock Spray
Lintox-D	Swat
Malathion	Tech-Trol
Methoxychlor	Tri-Tec
Over-Kill	Wipe

TABLE 1 CONT'D.	
Quick List of Chemicals For External Parasite Control on Horses Cont'd.	
Mange	Bots
Lindane	Equiguard
Malathion	Ivermectin:
Permethrin	Eqvalan
	Zimecterin
	Megabot-Plus Paste
	Parvex Plus
	Trichlorfon:
	Anthon
	Combot Paste
	Dyrex
	Megabot Paste
Residual and Bait Sprays	
Baytex	Methoxychlor
Ciovap	Permethrin
Cygon	Pyrethrin
Dibrom	Rabon
Ectrin	Ravap
Malathion	Vapona
Baits	
Golden Malrin	
True Grit Blue	

For more details, see the following tables.

Horses -- External Parasite Control

TABLE 2			
External Parasite	Insecticide ¹	Formulation & M i x i n g Instructions	Application Instructions & Use Restrictions
FLIES: Black flies, Deer flies, Face flies, Gnats, Horn flies, Horse flies, Mosquitoes, Punkies, Stable flies, Wound infesting larvae	coumaphos (Co-Ral) OP, LE	Fly Control -- 1% dust, Ready-to-Use	Dust--Apply 2 ozs./animal, but no more, evenly to infested areas. Repeat as needed. Provide thorough ventilation while dusting. No waiting period between application and slaughter.
		Screwworm and Ear Tick Control -- 5% dust, Ready-to-Use	Dust lightly in ear for ticks. For wound-infesting larvae, treat wound thoroughly. Repeat as needed for ear ticks and wound infesting larvae. Provide thorough ventilation while dusting. No waiting period between application and slaughter.
		Fly, Lice and Tick Control -- 0.06% to 0.125% WP or EC spray. Mix 1-2 lbs. 25% WP in 50 gals. water or 2 oz. - 5 ozs. 11.6% EC in 4 gals. water.	Spray--Apply higher concentrations for ticks. Treat animal thoroughly. Don't treat animals less than 3 months old. Don't treat sick, convalescent or stressed horses or those that have been treated with other drugs. Treat wounds for wound-infesting larvae. Don't treat horses intended for slaughter.
		Screwworms Control - 3% spray foam, Ready-to-Use.	Spray -- Wound treatment for wound-infesting larvae control on horses. No waiting period between application and slaughter.
HORSEFLY, DEER FLY, MOSQUITOES	For other materials and control suggestions, see cattle section.		
HORN FLIES, FACE FLIES, HOUSE FLIES, STABLE FLIES	fenvalerate (Ectrin) 10 WDL	1 qt./25 gals. See label. 2 ozs./10 gals.	Spray.
	Ectrin strips (Farnum)		Use on halter or brow band.
	Rabon oral larvicide		In feed, mixed or topdressed for control of fly larvae in manure.

TABLE 2			
External Parasite	Insecticide ¹	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
HORN FLIES, FACE FLIES, HOUSE FLIES, STABLE FLIES (Cont'd.)	permethrin (E c t i b a n , A t r o b a n , T e c h - T r o l , Tech-Trol 12 , Permethrin II)		Follow label instructions.
	permethrin + piperonyl butoxide (Poridon)		Pour on for fly control.
	permethrin + piperonyl butoxide (Flysect-7)		Spray.
	V a p o n a + pyrethrin + p i p e r o n y l butoxide		Follow label instructions.
	Automatic Spray Systems: resmethrin n a t u r a l pyrethrins + p i p e r o n y l butoxide Vapona permethrin		Follow label instructions.
FLIES, LICE AND TICKS	crotoxyphos + dichlorvos, OP, ME , 15 % crotoxyphos + 1% dichlorvos (Simax) OP, ME	Fly Control -- Mix 1 gal. Simax EC with 14 gals. of water.	Spray all parts of the animal including the legs with 1 to 2 pints of spray. Check label for waiting period between application and slaughter.
		Fly Control -- Mix 1 gal. Simax EC with 7 gals. of water.	Mist Spray -- Apply as a fine mist at the rate of 2 ozs. per animal. Cover all parts of the animal thoroughly. Don't exceed 2 ozs. per animal per day. Check label for waiting period between application and slaughter.
		Lice and Tick Control -- Mix 1 gal. Simax EC in 50 gals. water.	Spray animal thoroughly. Make second application in 14 days, if needed. Repeat as necessary but not more than once every seven days. Check label for waiting period between application and slaughter.

TABLE 2

External Parasite	Insecticide ¹	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
FLIES, LICE AND TICKS (Cont'd.)	0 . 2 5 % crotoxyphos + 1% dichlorvos (Super Dairy and Stock Spray)	Fly Control -- Ready-to-Use	Mist Spray -- Apply for immediate kill of directly contacted flies. Use 1 fluid oz. per animal as a light mist spray to moisten the hair coat. No waiting period between application and slaughter.
	dioxathion 1 0 . 5 % + dichlorvos 0.5% EC OP, ME (Lintox-D)	Fly, Lice and Tick Control -- Mix 1 gal. of EC in 100 gals. of water.	Spray or Dip -- Apply thoroughly to set the hair to the skin or dip. Up to 2 qts. of spray will be needed for larger animals and less for smaller animals. Don't treat more often than once every two weeks. No waiting period between application and slaughter.
	dioxathion 20.4%, EC, OP, ME, (Delnav, Del-Tox)	Flies, Lice and Tick Control -- Mix 1 gal. of 20.4% EC in 200 gals. of water.	Spray or Dip -- Spray or dip thoroughly but not more often than every 14 days. Water animals before treatment. Don't treat more often than once every two weeks. No waiting period between application and slaughter.
	fenvalerate 8% Collar/ Brow Band PY, LE (Ectrin, Fly Guard)	Fly Control -- Ready-to-Use	Collar/Brow Band -- Apply one per animal when flies reach damaging levels. Remove when control begins to drop off and during cooler months. Due to fly resistance problems, don't reapply except during alternate years.
	fenvalerate (Ectrin) PY, ME	Fly Control -- 0.12% spray. Mix 1 qt. of 10% WDL in 25 gals. water or mix 2 ozs. in 1n gals. water.	Mist Spray -- Apply 8 ozs. as light spray with attention to head and legs. Repeat as needed. Don't treat animals intended for slaughter.
	malathion (Cythion) OP, LE	Fly Control -- 0.5 - 0.6% spray. Mix 1 gal. 57% EC in 100 gals. water.	Spray animals thoroughly. Apply about 2 qts. spray/mature animal. Apply every three weeks, if needed. Don't treat animals under 1 month old. No waiting period between application and slaughter.
		Fly Control -- 4 - 5% dust, Ready-to-Use.	Repeat, if needed, every 10-14 days. No waiting period between application and slaughter.

TABLE 2			
External Parasite	Insecticide ¹	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
FLIES, LICE AND TICKS (Cont'd.)	methoxychlor 5% EC (Purina Horse Spray Insecticide) CH, LE	Fly Control -- Mix 1 pt. of 5% EC in water to make a gallon.	Sponge-on. Apply 1 pt. - 1 qt. per animal to infested areas such as ears, neck, back (not under saddle), belly and legs. Treat as needed to maintain control. No waiting period between application and slaughter.
		Fly and Lice Control -- Mix 1 qt. of 5% EC in 9 qts. of water.	Spray entire animal until hair is wet to the skin. Apply 1 pt. - 1 qt. per animal. Treat as needed to maintain control. For lice, retreat in 10 days. No waiting period between application and slaughter.
	permethrin, 5.7% EC, PY, ME (Purina Hard Hitter Stable Spray, Insectrin, Insectaban)	Fly, Mange, Tick and Lice Control -- Mix 1 pt. of 5.7% EC in 12n gals. water.	Spray 1-2 qts. per animal over whole body surface. For mange, lice and simabies control, thoroughly soak animal and apply second treatment 14 days later. No waiting period between application and slaughter.
		Lice Control -- Mix 1 pt. of 5.7% EC in 25 gals. water.	Spray until animal is thoroughly treated. A second application is recommended 14 days later. No waiting period between application and slaughter.
		Fly and Ear Tick Control -- Mix 1 pt. of 5.7% EC in 1n gals. of water.	Spray Mist--Apply 1-3 ozs. per animal. Spot treat back, face, legs and ears.
	permethrin 11%, EC, PY, ME (A t r o b a n , Over-kill)	Fly and Lice Control -- Mix 1 pt. of 11% EC in 25-50 gals. of water (1 oz. in 6 qts. of water).	Spray--Use high concentrations for stable flies and face flies. Apply directly to animals at 1 - 2 qts. per animal. Light rates are for horn fly control only. Repeat as needed but not more often than once every two weeks.
	permethrin 1%, Ready-to-Use Spray or Wipe-on. PY, ME (Expar, Tech-Trol)	Flies, Lice and Tick Control -- Ready-to-use when purchased.	Spray or wipe-on -- Apply lightly as needed. Don't soak hair or skin. Pay particular attention to legs, shoulders and neck. Don't get in animals's eyes.

TABLE 2			
External Parasite	Insecticide ¹	Formulation & M i x i n g Instructions	Application Instructions & Use Restrictions
	permethrin 1.84%, Pour-on P Y , L E (P o r i d o n Insecticide Pour-on)	Aids in Fly Control -- Ready-to-use when purchased.	Pour-on--Apply 2-4 ozs. per animal. Start by pouring a line head from the poll, along the neck, and continue posteriorly down the back parallel with the spinal column or apply as a wipe-on.
FLIES, LICE AND TICKS (Cont'd.)	permethrin 0.20% + pyrethrin 0.20% + synergist (F l y s e c t Super 7)	Flies, mosquitoes, gnats, mites, chiggers and lice.	Spray--Spray entire surface of animal. Avoid getting into eyes, mouth and nose. Brush against grain while spraying. Wipe-on--Apply with clean cloth or sponge. Apply daily for 2-3 days, then every 5-10 days.
	permethrin 10% (Permethrin II)	Flies, mosquitoes, lice, ticks and mites. 1 qt./200 gals. water.	Livestock and premise spray -- Spray thoroughly.
	cypermethrin 0.15% + pyrethrin 0.20% + synergist (Tri-Tec)	Flies, gnats, mosquitoes, lice and ticks -- ready-to-use.	Spray or Wipe--Wipe or spray while brushing against coat. Reapply every five to seven days. When low populations, reapply every 10-14 days.
	pyrethrins plus synergist NPY, L E (F l y Screen, Fly Repellent Lotion, Fly-Bye) Fly Gone 7000, Fly Away II, Wipe, Flysect Spray or Lotion, Roll-on, Horse Spray or Rub-on)	Fly, Mosquitoes & Gnats Control -- 0.05% to 0.4% plus synergist mist spray. Ready-to-use.	Spray or Wipe-on--Apply mist spray or wipe-on to wet the ends of the hair but not enough to wet the hide (1-2 fluid ozs. per animal). Direct application will kill ticks. Repeat as needed. Rub into coat. Spray--Lightly mist legs, underside and stomach, back of shoulders and neck and around ears. About eight seconds is required for the average size animal. Use only in well-ventilated areas.
	pyrethrins 0.4% + synergist EC N P Y , L E (Repel-X, Fly Away II, Wipe)	Fly and Tick Control -- Mix 1 pt. of 0.4% EC in enough water to make 1 gal. of mixture. For horse flies, deer flies (Tabanids), Stable flies and ticks, mix 1 pt. of 0.4% EC in 2 qts. of water.	Spray or Sponge-On -- Apply heavily to wet animal every three to four days or as needed to control flies and ticks. Avoid animal's eyes.

TABLE 2			
External Parasite	Insecticide ¹	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
	pyrethrins 0.36 _ synergist spray NPY, LE (Swat)	Fly, Lice, Tick and Flea Control -- Ready-to-use when purchased.	Spray or Wipe-On--Apply to wet hair, but not skin of animal. Remove excess dirt and dust before treating. Repeat as needed.
FLIES, LICE AND TICKS (Cont'd.)	pyrethrin 0.03% + DDVP 0.23% (Py-Vona)		Apply 2 fl. ozs. per 1000 cu. ft. as a mist spray, uniformly throughout the area. Leave windows closed 10 minutes after spraying and then ventilate. Repeat daily, morning and afternoons, as needed.
	pyrethrin 1.84% + synergist (Poridon)	Flies, mosquitoes, gnats and ticks. Wipe-on.	Apply 2-4 ozs./animal.
	pyrethrin 0.03% + DDVP 0.23% + synergist (Py-Vona)	F l i e s a n d mosquitoes. Aids in face fly control.	Mist--1-2 fl. ozs. per animal. Reduce application rate by one-half for young animals. Spray from rear, directing spray along both sides, including belly, flanks, withers, legs, over back and around poll. Repeat as needed.
	stirofos (rabon) (O P) , + pyrethrins (NPY) + Synergist LE (Purina Fly Screen)	Fly Control -- Available in ready-to-use gels, wipe-ons, aerosol sprays, and dust formulations. Primarily for temporary relief.	Prior to application, brush dirt and dust from the hair coat. Apply aerosol mist or wipe-on lightly to the hair coat. Treat areas on animal needing protection. Apply up to 1-2 fl. ozs. per animal. Don't wet the skin of the animal. Treat only the hair. Apply as needed to provide protection. No waiting period between application and slaughter.
	stirofos 0.45% Horse Feed Supplement OP, LE (Rabon, Equitrol, Vita-Plus, Drive)	Manure Breeding Flies -- Ready-to-use Feed Supplement. Each horse must consume 70 mg. of stirofos per 100 lbs. of body weight daily.	Feed Additive--Follow feeding instructions on label. Each horse must consume sufficient quantities if adequate control is to be achieved. Don't feed to horses intended for slaughter. This product must be supplemented with other fly control products.
	Ectrin 8% (Fly Guard)	Face flies, horn flies and aids in control of house flies and stable flies.	Place on horse when flies first appear in spring. Effective 4-5 months.
MANGE Sarcoptic or Psoroptic	l i n d a n e (Restricted use), OCL, ME	0.03 - 0.05% spray or dip. Mix 1/4-3/4 lb. 25 WP in 50 gals. water.	Treat animal with 2 qts. spray. Retreat after seven days. Don't treat sick or otherwise weakened animals. Waiting period: 60 days.

TABLE 2			
External Parasite	Insecticide ¹	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
malathion OP, LE			
permethrin 5.7% EC PY, LE (Purina Hard Hitter Stable Spray, Insectabin)	When applied as for flies, will provide marginal control if great care is taken to thoroughly treat infested area. Fly, Mange, Tick and Lice Control -- Mix 1 qt. of 5.7% EC 12 n g als. water.	Spray 1-2 qts. per animal over whole body surface. For mange, lice and scabies control, thoroughly soak animal and apply a second treatment 14 days later. No waiting period between application and slaughter.	
BOTS	carbon disulfide (Parvex plus) OP, LE		Highly dangerous but will provide good bot control if used properly. Acts as a fumigant when released in horse's stomach. Follow label instructions exactly. Consult veterinarian.
	dichlorvos (Equiguard, Horse Wormer) OP, ME	17.5% PVC pellets. 1 packet (19.5 grams)/300 lbs. animal body weight.	Give to individual horses in half the grain portion at a single feeding to ensure maximum bot removal. Withhold all water 4-6 hours before and three hours after consumption of drug. Don't treat sick animals. Don't give with or within one week of the administration of tranquilizing drugs or other internal parasite drugs. Non-food use. Veterinary consultation recommended.
	ivermectin (Eqvalan, Zimecterin) ME	1.87% oral paste, Ready-to-use.	Follow directions on pre-filled syringe. See limitations.

TABLE 2			
External Parasite	Insecticide ¹	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
	trichlorfon (Anthox , Dyrex , Comboto Paste , Megaboto Paste) OP, ME	40% paste. Administer 16 mg./lb. orally.	Treat 30 days following first killing frost. Repeat after 3-6 months, but never more frequently than every 30 days. Don't treat sick animals, horses to be used for food, colts under four months of age or mares in the last month of pregnancy. Don't give horses intravenous anesthetics, especially muscle relaxants, within two weeks after treatment. Be sure to follow label directions carefully. Consult veterinarian.
BOTS (Cont'd.)	trichlorfon 16g. + febantel 2.7g. (Megaboto Plus Paste)	Boticide & Horse Wormer -- Oral use only.	Administer directly from syringe into back of horses tongue. Dose depends on rate (see label). Do not administer on empty stomach. Do not use on horses intended for food purposes. Do not use simultaneously or within a few days with other cholinesterase inhibiting drugs, pesticides or chemicals. Do not administer with or within one week of succinylcholine chloride, phenothiazine-derived tranquilizers or anesthetics.
OP -- organophosphate, PY -- pyrethroid, OCL -- organochlorine, NPY -- natural pyrethrins, CAR -- carbamate, LE -- less effective or effectiveness not determined, ME -- most effective.			
PHEROMONE TRAP			
	muscalure (Fly Stik Fly Trap)	Flies	Hang wherever flies are a problem inside and outside. Hang out of reach of children or horses. Replace when 80% or more of exposed surface is covered with trapped insects.

Fly Control In Horse Facilities

TABLE 3		
Insecticide	Spray Concentration & Mixing Instructions	Methods of Application & Safety Restrictions
Residual (Contact) and Bait Sprays¹		
fenthion (Baytex) 4 lbs. a.i. per gal. (45%) EC, OP, ME	1.5% spray. Mix 40 ozs. EC in 10 gals. water.	Direct a coarse, wetting spray to surface in animal operations where flies congregate, to include ceilings, walls, fences, posts, floors, manure, etc. Apply to point of runoff (1 gal. per 500 to 1,000 sq. ft.) Don't contaminate feed or drinking water. Don't apply as a space spray. Repeat as needed. Don't apply directly to animals. For baited solutions add 1 lb. of sugar per gal. of spray.
10% Crotoxyphos + 2.5 dichlorvos (Ciovap) EC, OP, ME	1% spray. Mix 2 qts. EC in 6 gals. water.	Same as methods of application and safety restrictions for Baytex above.
dimethoate (Cygon) 2 lbs. (23.4%) a.i. per gal. EC, OP, ME	1% spray. Mix 1 gal. of 2 lbs. per gal. EC in 25 gals. water.	Same as methods of application and safety restrictions for Baytex above. Remove animals before spraying and return when spray dries.
fenvalerate (Ectrin) 10% WDL PY, ME	Mix 1 qt. of 10 WDL in 10 or 25 gals. of water. (Longer residual results from higher concentration).	For spraying horse barns. Spray to point of runoff (approximately 1 gal. of finished spray per 500 to 1,000 feet.) Repeat in 14-30 days, if needed. Spray ceilings, walls and walkways. Don't treat horse barns if horses are intended for slaughter.
malathion (Cythion) 5 lbs. a.i. per gal. premium grade 57% EC, OP, LE	Mix 1 qt. EC in 12 gals. water.	Same as methods of application and safety restrictions for Baytex above. Remove all animals under 1 month of age before treating.
methoxychlor 2 lbs. a.i. per gal. (25%) EC or 50% WP, OCL, LE (Marlate)	2.5% to 5% spray. Mix 1 gal. EC or 4 lbs. WP in 10 gals. water.	Same as methods of application and safety restrictions for Baytex above. Remove animals before spraying. When spray dries, animals can be returned.
permethrin (Atroban, Ectiban, Insectrin, Overkill, Permaban, Permectin) 5.7% EC, 11% EC or 25% WP, PY, ME	5.7% EC is ready-to-use as a mist spray OR mix 1 qt. 5.7% EC in 12n gals. water OR mix 6 ozs. 25% WP in 11 gals. water OR mix 1 pt. 11% EC in 10 gals. water.	Apply as a residual surface spray to fly resting areas. Don't spray manure or litter. Don't apply directly to horses. Apply 5.7 percent EC undiluted at 4 ozs. per 1,000 sq. ft. of surface area or apply diluted WP and EC mixtures at 1 gal./750 sq. ft. Don't apply more often than once every two weeks.
tetrachlorvinphos, stirofos (Rabon) 50% WP -- OP, LE	1% or 2% spray. Mix 4 or 8 lbs. WP in 25 gals. water.	Same as methods of application and safety restrictions for Baytex above.

TABLE 3		
Insecticide	Spray Concentration & Mixing Instructions	Methods of Application & Safety Restrictions
tetrachlorvinphos, stirofos 2 lbs. a.i. per gal. (23%) + dichlorvos 0.5 lb. a.i. per gal. (5.7) (Ravap) EC, OP, ME	1.25% to 2.5% spray. Mix 1 gal. or 2 gals. EC in 25 gals. water.	Same as methods application and safety restrictions for Baytex above.
Space Sprays (Fogs or Mists)²		
naled 1% (Dibrom) OP, LE	1% Ready-to-use.	Apply 1 fl. oz. per 3,000 cubic feet as fine atomized spray. Safety restrictions same as for Vapona below.
permethrin 5.7% EC, PY, ME	Mix 1 pt. of 5.7% EC in 60 gals. diesel or mineral oil.	Apply fog at 4 fl. ozs. per 1,000 cubic feet of air space in confined facility. Repeat as needed.
Pyrethrin (0.1 to 0.75%) + Synergist (0.5 to 3.75%) NPY, ME	Ready-to-use.	Apply fogs or spray mists at 1 fl. oz. per 1,000 cubic feet as fine atomized spray. Repeat as needed.
dichlorvos 1% Ready-to-use Animal Spray Solution OR 2 lbs. a.i. per gal. (23.4%) (Vapona or DDVP) EC, OP, LE	0.5% or 1% Ready-to-use fogging solution or mix 1 pt. EC in 3 gals. or 6 gals. water.	Apply 1 pt. of 1% solution or 1 qt. of 0.5% solution per 8,000 cu. ft. as a fog or mist. Repeated applications will provide adult fly suppression. Don't use more often than once every 24 hours. Don't use if animals have been treated with other insecticides within 8 hours. Don't apply directly to animals. Close all doors and windows when fogging. Don't contaminate feed or water.
Baits		
bomyl (True Grit Blue) OP, ME	Ready-to-use.	Scatter on floors, walkways, etc., throughout operations but away from animals. Apply heavy (about 1/4 lb. per 500 sq. ft.) until flies are suppressed. Wear rubber gloves when applying baits. Don't allow workers on treated floors without shoes. Don't allow animals to come in contact with baits.
methomyl (Golden Malrin) CAR, ME	Ready-to-use.	Apply and follow precautions as for bomyl above.

- 1 Residual sprays can be applied as spot sprays to control maggots in manure accumulations.
- 2 ME = Most effective, LE = less effective or effectiveness not established;
OP = organophosphate; CAR = carbamate; PY = pyrethroid; NPY = natural pyrethrum;
OCL = organochlorine, chlorinated hydrocarbon.
- 3 Space sprays are designed to kill only adult house flies that are present when the fog or mist is applied. There is little or no residual insecticide deposit remaining after the application. Fogs or mists must come in contact with the fly. These materials are especially effective in enclosed areas where air

movement is minimal. Heavy mists can offer good adult house fly kill in open areas.

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Agricultural Extension Service

Billy G. Hicks, Dean