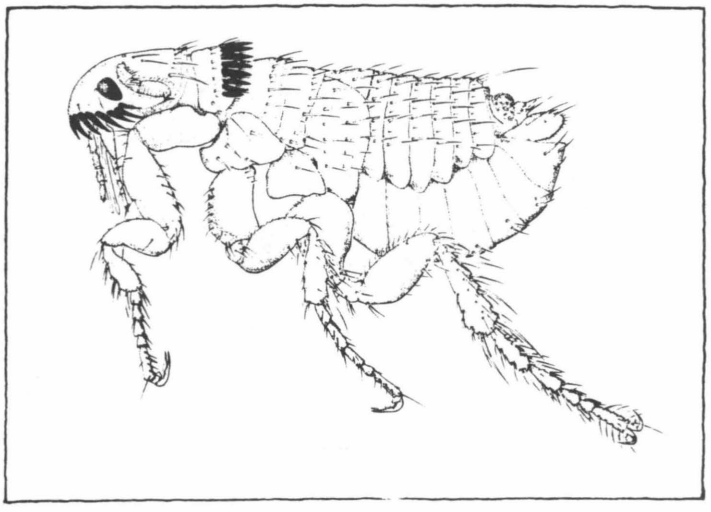
Virginia Cooperative Extension Service

Publication 456-012
Revised January 1988

1988-89
Insect Pest Management
for
LIVESTOCK and PETS



Virginia Tech and Virginia State - Virginia's Land Grant Universities

Produced by the Department of Entomology and the Department of Plant Pathology, Physiology and Weed Science, VA Tech. Coordinator: J. M. Luna, Department of Entomology

Keys to the Proper Use of Pesticides

1. Read the label on each pesticide container before each use. Follow the printed instructions to the letter; heed all cautions and warnings; note precautions about residues.

2. Store pesticides in the containers in which you bought them. Put them where children and animals cannot get to them -- preferably locked-up and away from food, feed, seed and other materials that may become harmful if contaminated.

3. Dispose of empty pesticide containers in the manner specified on their labels.

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES

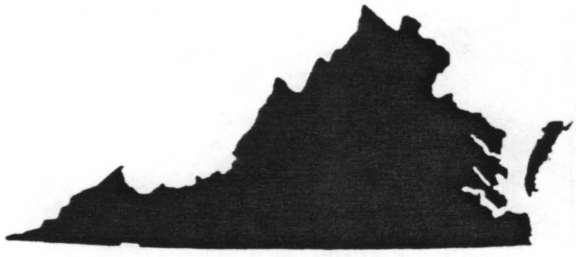
Disclaimer

Commercial products are named in this publication for informational purposes only. The Virginia Cooperative Extension Service does not endorse these products and does intend discrimination against other products which also may be suitable.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, and September 30, 1977, in cooperation with the U.S. Department of Agriculture. Mitchell R. Geasler, Director, Virginia Cooperative Extension Service, and Vice Provost for Extension, Virginia Polytechnic Institute and State University, Blacksburg, Virginia; Clinton V. Turner, Administrator, 1890 Extension Program, Virginia State University, Petersburg, Virginia.

Virginia Cooperative Extension Service
Publication 456-000

PEST MANAGEMENT GUIDES FOR VIRGINIA -- 1988-89



Contents:

Virginia Tech and Virginia State ■ Virginia's Land-grant Universities

Insect Pest Management for Livestock Pests & Animal Premises

J. E. Roberts, Sr., Associate Professor, Entomology

Fly Control in Animal Premises and Milk Rooms

Strict sanitation should be the first line of defense in the control of house flies. All manure should be spread regularly to pastures or fields. Remember that house flies may complete their life cycle (egg to adult) in 6-7 days under optimum conditions. This means that manure should be spread to the field on a 5 day interval during the summer months in order to break the life cycle. Other fly breeding sites such as spilled feed should be cleaned up regularly. The next line of defense should be residual sprays applied both to outside and inside of buildings. Other practices such as the application of larvicides, space sprays and baits should be supplementary to sanitation and residual sprays.

RESIDUAL SURFACE SPRAYS [*1]

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Adult flies, especially house flies	Chlorfenviphos (Coopers' Residual Surface Spray and Larvicide)	Follow directions on label for all these insecticides.	Remove all animals (except birds in poultry houses) from buildings when applying residual wall and ceiling sprays. Do not contaminate feed, water, milking utensils or milkrooms. Do not use inside homes. Do not apply to livestock.
	Dimethoate (Cygon 2-E or De-Fend E-267		
	Fenthion (Batex) 1.5%		
	Atroban (WP) **[*2]**		
	Bioceutic Overtime **[*2]**		
	Ectiban EC **[*2]**		
	Ectiban WP **[*2]**		
	Ectrin		
	Hard Hitter EC **[*2]**		
	Hard Hitter WP **[*2]**		
	Insectrin EC **[*2]**		
	Insectrin WP **[*2]**		
	Permectrin 10% EC **[*2]**		
	Stirofos (Rabon) W 1% or 2%		

SPACE TREATMENTS [*3]

Adult flies, especially *house flies*	Pyrethrins, 0.1 to 0.25% plus synergist, 0.1 to 0.6% prepared aerosol	Follow directions on container. Read carefully. Do not use where animals will receive direct applications. Pyrethrins-Treat at rate of 5 to 6 sec. per 1000 cu. ft. Keep room closed for 10 min.	Follow manufacturers' directions. Do not inhale fumes. Use NIOSH approved mask and caution while applying in tightly enclosed room. OBSERVE STRICT FIRE HAZARD PRECAUTION. Do not contaminate feed, water, or milk utensils.
	Dichlorvos (Vapona) 1.0%	Dichlorvos - Saturate the atmosphere with electric fogging gun for quick kill when adult flies are numerous.	
	Dichlorvos (Vapona) 20% Resin Strips	No mixing is necessary. Suspend from ceiling as directed on label, using 1 strip per 1,000 cubic feet. More effective in closed system.	Do not place over feed or water. Keep out of reach of animals and children.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
	Malathion	Malathion - Use 5 tbsp. 57% EC plus 7 tbsp. sugar or molasses (unsulfurized) or corn syrup plus 1 gal. water OR 1 cup 57% EC plus 1 cup sugar or molasses (unsulfurized) or corn syrup plus 2 1/2 gal. water.	Do not contaminate feed, water, milking utensils, or milkrooms.
	Dichlorvos, Methomyl, and Bomyl and other chemicals are available as "Ready to Use" baits, and are very effective when used in conjunction with other measures.	Read label on "Ready to Use" Baits.	
	Naled (Dibrom) (Fly Killer D)	Dibrom-Use 1 tsp. 36% EC in 3 gal. granulated sugar (mix thoroughly) or use 2 1/2 tbsp. 36% EC in 3 gal. water + 2 pt. molasses or syrup. Malathion and Dibrom - Sprinkle very lightly on aisles. floors, window sills, etc. or brush on walls, posts, uprights, etc.	
Fly larvae, especially *house fly maggots*	Stirofos (Rabon) 1%	Use 4 gal. of 23% EC or 16 lb. of 50% WP per 100 gal. of water. Apply to droppings at rate of 1 gal. per 100 sq. ft.	
	Larvadex 3% Premix	Mix thoroughly with feed at the rate of one pound of 3% premix per ton of feed.	Feed to laying hens only. Do not feed to broilers or birds that are being used to produce hatching eggs.
	(Ravap) - A commercial mixture of Stirofos (Rabon) 23% + Dichlorvos (Vapona) 5.7%	Use 4 gal. of EC per 100 gal. of water. Apply, as a coarse spray, 1 gal. of solution to every 100 sq. ft. of manure area.	0 days. Birds do not have to be removed from the house while spraying. Do not contaminate feed or water.
		LARVICIDES - SWINE	
Fly larvae, especially *house fly maggots*	Swine Oral Larvicide (Rabon) 7.8% Premix	Pigs: Mix 1.3 lb. with 1 ton meal type feed. Adults: 2.6 lb. with 1 ton meal type feed. Offer 4-6 lb. of feed per animal per day. Start in spring and continue through fly season.	Follow directions on label.

[*1] Residual surface sprays are used for treatment of inside and outside walls and ceilings to kill adult flies that rest on treated surfaces. Do not treat freshly whitewashed surfaces.

[*2] All of these insecticides are synthetic pyrethroids. During the past few years a number of chemicals in this new family of insecticides have been registered for sale in Virginia under a state label commonly known as 24(C). All of these that have been registered for the control of flies in and around animal premises are listed above. In order to conserve space much of the details have been omitted with hopes that anyone desiring to use one of these insecticides will read the label and act accordingly.

[*3] Synthetic pyrethroids may also be used as space sprays. See labels for details.

Control of Flies In and Around Poultry Houses

One of the largest management problems facing the poultry producer of today is fly control. The shift from many small farm flocks to fewer large poultry operations has greatly increased fly problems by providing concentrated breeding areas in large volumes of waste that cannot be removed frequently. As urbanization and rural non-farm residence increase, poultry producers are faced with increasing pressures to reduce fly poulations to low levels. A dedicated effort is necessary to achieve an acceptable level of fly control.

There are several kinds of flies common in and around caged layer houses in Virginia. Probabely the most common flies are the house fly and the little house fly. Both of these flies are capable of movement up to 20 miles from the site of development but normally move no more than a mile or two from the initial source.

House flies breed in moist, decaying plant material, including refuse, spilled grains and spilled feed, and in all kinds of manure. Although they breed in poultry manure, this is not a favorite medium. Consequently, house flies are more likely to be a problem around poultry houses where sanitation is poor. These flies prefer sunlight and are very active, crawling overfilth, people and food products. This fly is the most important species from the standpoint of spreading human and poultry diseases in addition to fly-specking of eggs. House flies are the intermediate host for the common tapeworm in chickens.

The little house fly is somewhat smaller than the house fly. This fly prefers a less moist medium than the house fly inwhich to breed and reproduce. Poultry manure is preferred over most other media. This fly prefers shade and cooler temperatures and is often seen circling aimlessly beneath hanging objects in the poultry house, egg room and feed room, it is less likely to crawl about on people and food. However, it does cause persons living near poultry establishments to complain about fly problems. The little house fly may hover in large numbers in nearby garages, breezeways and homes because it prefers shade.

Blow flies (green or blue bottle flies) sometimes occur in poultry houses. They prefer to breed and reproduce in decaying animal and bird carcasses, dog manure, broken eggs and wet garbage. Generally, a good sanitation program will hold these flies in check.

Other flies found on the poultry establishment include soldier flies, fruit flies and rattailed maggots.

Fly Biology

All flies pass ;through four life stages: egg, larva, pupa and adult fly. Eggs are deposited on the breeding media, and larvae (maggots) develop in this moist (wet) material until ready to pupate. Mature maggots crawl out of this material and move to a drier place for pupation. The brown seed-like puparia finally yield adult flies. Development from egg to adult fly may take place as quickly as 7 to 10 days under ideal conditions.

Cultural Control

Manure management is the most effective means for fly control. Fresh poultry manure contains 60 to 80 percent moisture. Fly breeding in this material can be practically eliminated by reducing the moisture content to 30 percent or less or by the addition of moisture to liquify it. Drying manure is preferred because it occupies less space and usually has less odor.

Dry Manure Management

Frequent removal of manure (at least weekly or more often) prevents fly breeding because it breaks the fly breeding life cycle. It is important to scatter the manure lightly outdoors to kill the eggs and larvae by drying. Avoid piling or clumps of manure. Adequate agricultural land is needed to spread manure.

In-house storage of manure requires drying the manure to less than 30 percent moisture level or less and maintaining this level for up to a year where sufficient storage space isavailable. Any practice that limits moisture in the droppings or aids in rapid drying is important.

Water Management

Prevent leaks in water troughs or cups. Continually flowing cool water in troughs often condenses on the outside of the trough, resulting in dripping of water onto the droppings.

Provide abundant cross ventilation beneath the cages, especially during hot weather. Adequate house ventilation is important at all time.

Should the water table be high, or if there is a danger of water running into the house from the outside, adjust the floor-grade relationship so that the floor is higher than the outside surrounding ground. Have the surface water run away from the building. Drain and fill all low areas around the houses.

Prevent dysentery by keeping waterers clean. Use recommended antibiotics should dysentery develop.

Avoid laxative feed rations.

Avoid excessively high house temperatures that encourage abnormal water intake.

Sanitation

Sanitation is the most important aid in successful fly control. Often, certain conditions in and around the poultry operation will encourage fly outbreaks. They must be eliminated. Sanitation actions to follow:

Quick removal and disposal of dead birds and broken eggs is a must. Dispose of them far away from the poultry premises by burning in an incinerator, deep-ground burial or through commercial garbage collectors on at least a weekly basis during the damp, hot, summer months.

Cleaning up and disposing of feed spills and manure spills, especially if wet.

Reduce feed spills and never throw broken eggs into the manure pits.

Clean out weed-choked water drainage ditches.

Install proper eve troughs and downspouts on poultry houses to carry rain water far away from the buildings. Provide proper drainage in poultry yards.

Minimize sources from other fly-infested animal operations in close proximity to the poultry house.

Biological Control

Entomologists are quite interested in using biological control in poultry houses. Certain commercial companies currently sell fly parasites for fly control. The fly predators are the naturally occurring enemies of manure-breeding flies. Flies are destroyed in the immature maggot and pupa stages. The fly predators are specific to flies and do not attack anything else. They are biteless and stingless and go unnoticed. These parasites are usually very tiny wasps (about the size of the head of a house fly) and are sold to give long-term fly control. These wasps are supposed to self-propagate in the process of controlling pest flies. Usually an initial wasp release with monthly supplemental releases are recommended. Reselases occur before and during the fly season. Chemical sprays must be discontinued in areas of the poultry house where these predator wasps are used at non-manure areas, along the sugar baits and fly paper.

The use of fly predators for biological control in Virginia sounds promising and would reduce chemical residues to man, birds, eggs and the environment. However, until additional scientific data becomes available, it is best to control flies in Virginia by the current conventional practices.

Mechanical Control

Fly traps are limited in their uses. Effectiveness depends entirely on the conditions (extent of the fly problem), where it is located and the legal or safe use of pesticiees.

Many types and styles of fly traps appear on the market each year. Thee traps are usually electrical, employing a black light with an electrically charged grid to kill the insects, or they may be baited traps with a fly attractant material. Regardless of the trap type, they usually attract many kinds of insects that are both harmful and beneficial. Many insects are attracted by a trap that normally would fly out of the area if no trap were present.

Traps do appear to be helpful in tight, enclosed areas, such as restaurants, food stores and ice cream stands, if good sanitation practices are followed. However, in open air sheds, barns and other livestock or poultry building and areas of heavy fly populations, traps are not effective in reducing fly numbers to satisfactory levels.

You should judge a trap by the population of flies remaining in the area and not by the number of flies caught in the trap. Most entomologists feel that fly traps, especially where used alone, are not an effective method of controlling flies, especially in and around livestock and poultry operations.

Use a fan to blow air through a screened doorway from the egg room or other work area into the main poultry house. Flies will not move against the wind into the egg room or other work area. There are commercial electric-powered air curtain fans. However, certain state health departments may required solid doors between the egg room or other main work area into the main poultry house.

Use sticky fly strips where appropriate.

Use good tight screens on the poultry house doors and windows. Use screens 14 to 16 meshes to the inch. Copper, aluminum, bronze, plastic or rust-resisting screens are best.

Chemical Control

Insecticides should be considered supplemental to sanitation and management measures directed to prevent fly breeding.

Fly resistance to insecticides has developed at differing levels in various locations, depending somewhat on prior exposure. If one compound does not perform well, try a different one.

Residual Sprays

Residual sprays usually are the most effective and economical method for controlling potentially heavy populations of adult flies of any species present. These sprays should be applied in the spring at the beginning of fly season. Apply to surfaces on which flies locate, such as poultry house framework, the ceiling, walls, trusses, wires supporting cages, electric light cords and other areas marked by fly specking. Also, treat outside the poultry house around openings and on shrubs and other plants where flies rest.

Apply coarse, low-ressure sprays to the point of runoff at pressures of 80 to 100 pounds per square inch, using a power sprayer or good proportioner-type sprayer. As many as four or more applications of certain sprays may be needed for the entire season.

Avoid contamination of feed, water and eggs. Cover drinking and feed troughs during spraying.

Any of these residual sprays are recommended:

1. DDVP: Use 2 quarts DDVP 23.4% EC per 25 gallons water. Apply 1 quart of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying. Follow label directions.

2. Fenthion (Baytex): Use 5/6 ounce Baytex 93% EC per gallon water or 4 ounces Baytex 45% EC per gallon water. Apply 2 gallons of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying. Follow lable directions.

3. Malathion (Cythion): Use 5 ounces Cythion 25% WP per gallon of water or 5 tablespoons Cythion 57% EL per gallon of water. Apply 1 to 2 gallons of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying. Follow label directions.

4. Permethrin (Atroban): Use 6.67 ounces Atroban 25% WP per 5 to 10 gallons of water. Apply 1 gallon of finished spray per 750 square feet as a coarse, wet spray. Follow label directions. Permethrin (Ectiban, Insectaban, Insectrin, Hard Hitter): Use 1 quart 5.7% EC per 10 gallons water or 6 ounces 25% WP per 11 gallons water. Apply 1 gallon of finished spray per 750 square feet as a coarse, wet spray. Follow label directions. Permethein (Permectrin II, OverTime): Use 1 quart 10% EC per 25 to 50 gallons of water. Apply 1 gallon of diluted mixture per 1,000 square feet as a coarse, wet spray. Permethrin: Use 1 pint Expar 11% EC to 10 gallons of water. Apply finished spray to surfaces wehre flies rest at the rate of 1 gallon per 750-1,000 square feet or to the point of runoff. Do not apply more than once every 2 weeks. Birds no not have to be removed from the building before spraying. Cover feed and water. Follow label directions.

5. Fenvalerate (Ectrin): Use 1 qt. 10% EC per 24 gallons water. Apply 1 to 2 gallons of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying. Follow label directions.

6. Stirofos (Rabon): Use 4 to 8 pounds Rabon 50% WP per 25 gallons water. Apply 1 to 2 gallons of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying. Follow label directions.

Mist Machine (Portable)

These machines, known as "mechanical foggers," are convenient, efficient and labor-saving, especially for caged birds. Use 1 pint of DDVP 1% oil base (Ready-to-use) per 8,000 cubic feet or 2 ounces naled Dibrom) 36% EC (Ortho Fly Killer D) per 2 1/2 gallons water or permethrin (Ectiban) 5.7% undiluted at the rate of 4 fluid ounces per ;1,000 square feet or 1 pint (16 ounces) permethrin (Permectrin II, OverTime) 10% EC per 8,000 cubic feet. Fly kill is good. Never retreat more than once in two weeks. Follow label directions and precautions.

Building Atomizers (Stationary)

Use pyrethrum oil-based space sprays (0.06% to 0.1% pyrethrins plus piperonyl butoxide) as a mist or fog in the air throughout the poultry house at the rate of 1/2 fluid ounce per 1,000 cubic feet on a daily basis for best fly control. This treatment is especially useful in the closed egg rooms and other work area where there is little or not air movement.

Baits

Do not use baits where loose birds are housed. Place baits outside of cages where birds cannot eat the bait. Construct long troughs or boxes to hold the bait and hang outside of cages. Begin baiting when flies first appear in the spring. You can scatter bait where flies rest upon spilled feed, in floor spaces not satisfactorily treated by sprays, or on the surface of the manure.

Dry sugar baits of DDVP, trichlorfon (Neguvon, Dipterex) or naled (Dibrom) can be used as purchased at the rate of 4 tablespoons of bait per 1,000 square feet of area.

Dry sugar baits of methomyl (Improved Golden Malrin, Golden Muscamone) and bomyl (TrueGrit Blue) can be scattered thinly, a purchased, in areas where food animals do not have access. Otherwise, they can be used freely on walkways, on the surface of manure, and outside of broiler houses, processing plants and refuse dumpsters. Follow label directions.

Fresh sugar baits can be prepared by mixing 1 teaspoon naled (Dibrom) 36% EC per pound sugar per 2 1/2 gallons water. Unused bait will remain effective 2 to 3 weeks if kept in closed containers. Spray or sprinkle at 2-day intervals until control is obtained. Use dibrom at the rate of 4 tablespoons per 1,000 square feet.

Liquid house fly adulticide erythrosine B (Synerid Fly Control B) is pending EPA registration. It will be dispensed, as purchased, in hanging bait stations throughout the poultry facility. We have insufficient information to make a firm recommendation for its use until additional data become available.

Resin Strips and Fly Belts

Ready-to-use DDVP 20% resin strips can be used at the rate of 1 strip per 1,000 cubic feet of enclosed area. Strips will need to be replaced as they lose their effectivensss, which is about every 3 months.

Methomyl (Golden Malrin) fly belts can be attached to surfaces out of reach of food-producing animals. The belt may be cut to any desired length and attached to surfaces such as walls and ceilings. Follow label directions.

Manure Treatments

When other recommended fly control measures cannot be used, manure drenchs of DDVP, malation (Cythion), Ravap or stirofos (Rabon) in water can be used.

A sprinkling can may be used to apply the larvicide lightly but evenly over the manure. Water emulsions can be used. Do not dilute the insecticide with kerosene, fuel oil or diesel oil, as egg taint may result.

Cover the surface of the manure evenly. Treat at least once every 2 weeks. Do not allow spray to contact the birds.

Feed-Through Larvicide

An insect growth regulator known as Larvadex was registered for use in 1985 as a poultry feed additive to control manure-breeding flies in and around caged or slatted flooring layer operations (chickens only). Larvadex, a trizine or substituted melamine, known as cyromazine, is mixed into the feed at the feed mill.

Larvadex will provide a high degree of fly control and will give best results when integrated with a well-managed fly control program.

First, monitor adult flies in and near the poultry house. When the population reaches a level to cause concern, use a registered adulticide spray or fogger to reduce the breeding potential.

Then, examine manure in the pits for maggot activity. If maggots are active, start Larvadex in the ration.

Feed Larvadex continuously as directed for 4-6 weeks. Usually, this is enough time for Larvadex to thoroughly cover the droppings and break the fly population cycle in the poultry house. If necessary, registered adulticide baits or surface sprays can be used during Larvadex feeding to help control an influx of adult flies.

After 4-6 weeks of Larvadex feeding, carefully examine the manure pits. If little or no activity is observed in the manure, one of the following is recommended:

1. Discontinue Larvadex and continue the sanitation and management program; continue monitoring the manure pits. If maggots become active again, repeat the procedure.

2. If maggot activity cannot be monitored diligently, an interrupted use of Larvadex may be considered. Interrupted use regimes of 5-7 days on and 5-7 days off are suggested. Do not interrupt feeding for more than seven days unless maggot infestations are monitored.

Do not feed Larvadex-treated feed to broiler poultry. Larvadex use in poultry is limited to use as a feedthrough in chickens only and may not be fed to any other poultry species.

To avoid illegal residues, Larvadex-treated feed must be removed from layers at least 3 days (72 hours) before slaughter. Meat and eggs from breeders treated with Larvadex are not be used for food. Manure from animals fed Larvadex may not be used as a soil fertilizer supplement.

Do not apply more than 5 tons of manure per ;acre per year. Do not apply to small grain crops that will be harvested or grazed, or illegal residues may result.

There is concern about the level of fly resistance to Larvadex developing in large poultry operations. It is not known how high resistance levels will reach. It seems likely that the point will be reached whereby necessary control no longer is provided.

**Do not apply DDT, BHC, lindance, dieldrin, endrin, aldrin, chlordane, heptachlor or toxaphene to poultry or in poultry houses. The use of these insecticides is either illegal or highly restricted in Virginia and none is permitted on or around poultry.

Pesticide Application and Treatment Devices

Mist Sprays

Mist Machines are concentrate applicators and should not use the same mixtures as in ordinaty compressed air sprayers. Generally, 5 to 10 times the concentration and 1/5 to 1/10 the volume is used in mist machines. Machines will spray water suspensions of pesticide as emulsions and oil solutions. They are excellent for cage birds as well as birds in conventional houses. Mist machines may be called "mechanical foggers" although they actually produce a coarse, wetting mist. Mist sprays are rapid and save labor.

Coarse Sprays

Cylindrical, compressed-air sprayers are effective but slow for cage birds and roost or wall treatment. The knapsack sprayer gives a continuous spray as pumped and is considered more efficient. Use power sprayers; they are rapid and efficient, especially in large operations. Be sure to have high-pressure and large-volume output to drive the spray into all cracks and crevices of poultry houses.

Dusts

Dust bath boxes are a simple method of getting the birds to dust themselves. For each 50 floor birds, use one box or one box in each colony cage. It may not be practical to have dust boxes in all cages at the same time. Use a shallow 3-inch dusting box about 1 foot by 1 1/2 feet in size. For conventional houses, apply dust to the litter by means of a scoop (grain scoop) or large can, uniformly covering the floor area. Use a crank-type rotary hand-duster to blow dust at birds in cages or over birds on the floor. Applying dust directly to individual birds is usually too slow and involves too much labor for the large operations.

INSECT CONTROL IN HORSE BARNS

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
House flies, Stable flies, Gnats, Spiders and *Mosquitoes*	Stirofos (Rabon) 23.3% + Dichlorvos (Vapona) 5.7%	Mix 1 gal. of Ravap in 25 gal. of water. Apply solution to walls and ceilings with coarse spray, 1 gal. of solution for every 500-1000 sq. ft.	
Adult flies, especially *house flies*	Chlorfenviphos (Coopers' Residual Surface Spray and Larvicide)	Follow directions on label for all these insecticides.	Remove all animals from buildings when applying residual wall and ceiling sprays. Do not contaminate feed, water, milking utensils or milkrooms. Do not use inside homes. Do not apply to livestock.
	Dimethoate (Cygon 2-E or De-Fend E-267		
	Fenthion (Batex) 1.5%		
	Atroban (WP) *		
	Bioceutic Overtime *		
	Ectiban EC *		
	Ectiban WP *		
	Ectrin		
	Hard Hitter EC *		
	Hard Hitter WP *		
	Insectrin EC *		
	Insectrin WP *		
	Permectrin 10% EC *		
	Stirofos (Rabon) W 1% or 2%		
	This is not meant to be a complete listing.		
Fly maggots	Stirofos (Rabon) 23.3% + Dichlorvos (Vapona) 5.7%	Mix 1 gal. of Ravap in 25 gal. of water. Apply solution by sprayer or sprinkler to every 100 sq. ft. of manure, old wet straw, under or around feed troughs, or similar breeding areas.	Repeat every 7-10 days thereafter.
Ticks and *fleas*	Stirofos (Rabon) 23.3% + Dichlorvos (Vapona) 5.7%	Mix 1/2 gal. of Ravap in 25 gal. of water. Thoroughly treat infested areas with spray.	Avoid direct contact with flowers and shrubs.
Flies, *Gnats* and *Mosquitoes*	Dichlorvos (Vapona) 23.4% or Resin strip	Mix 1 gal. Vapona in 25 gal. of water. Apply at the rate of 1 pt. solution per 8,000 cu. ft. for resin strips, hang one strip per 1,000 cu. ft. of enclosed area. Replace strips if effectiveness diminishes.	

*One of the most effective ways of treating horses for control of external parasites is by spraying. However, if only a few animals are being treated or if the animals are too nervous to tolerate spraying, sponging the animals with a spray mixture may be desirable. Rubber gloves that will give complete protection should be worn by anyone who chooses the sponge or wipe-on method or treatment.

Do not apply to sick, convalescent or stressed animals less than three months old. Do not dip or spray animals for 10 days before or after shipping, weaning, or after exposure to contagious or infectious disease. Do not apply in conjunction with oral drenches or other internal medications such as phenothiazine, or with natural or synthetic pyrethroids or their synergists, or with other organic phosphates. Do not spray in a confined or non-ventilated area.

Results of research conducted in Virginia indicate that vaseline applied in the ears of horses will give up to four days protection from blackflies.

MGK R-11 or R-326, Tabutrex or Crag fly repellents may be added to synergized pyrethrins for increased effectiveness, especially against horse flies.

CONTROL OF FLIES IN MILKROOMS

Extremely small amounts of pesticides can be detected in milk, and their presence is usually illegal.

To avoid residues in milk, dairy farmers are cautioned not to use on the farm chlorinated hydrocarbon insecticides, such as aldrin, chlordane, benzene hexachloride, dieldrin, DDT, endrin, heptachlor, lindane, TDE, Strobane or toxaphene. For best control of flies in the milkroom, the following steps are recommended:

1. Use good sanitation and recommended insecticides in the dairy barns to reduce the number of flies entering the milkroom.

2. Use sticky fly paper (Lure-fly ribbons), sex pheromone sticky paper (Fly Stik with Muscalure) or aluminum foil sticky fly trap paper with flies printed on it to attract other flies.

3. Use good tight screens on the milkroom doors and windows. Use screens 14-16 meshes to the inch. Copper, aluminum, bronze, plastic or rust-resisting screens are best.

4. DDVP resin strips will give excellent control if windows and doors are kept closed when one strip per 1,000 cubic feet of space is used. Replace strips when they become ineffective.

5. Use a mist or aerosol spray of 0.06-0.1% pyrethrins plus piperonyl butoxide oil-base fly sprays in the milkroom when the above strips do not give adequate fly control. All milking utensils, cans, bulk tanks and containers should be covered before spraying to prevent milk contamination.

Check with federal or state sanitary codes regarding legality of insecticide baits, residual sprays or space sprays other than pyrethrins for milkrooms.

Control of Flies In and Around Livestock Barns

Good sanitation is the basis for all fly control programs. Sanitation is at least 75 percent of the fly control program preventing fly breeding. Nevertheless, it is often necessary to supplement sanitation practices with pesticides.

For successful fly control, organize a control program that best fits your farm. A single pesticidal product rarely gives the most effective and economical control. It is normally best to use a combination of pesticide formulations such as baits, residual sprays, space sprays, larvicides, etc. during the fly season. Do not wait for heavy fly populations. It is much easier and less expensive to prevent heavy fly build-up than to contro lheavy fly populations after build-up. As fly populations begin to build-up, take time and treat regularly.

Sanitation

(a) Remove all manure from livestock pens as frequently as possible. Calf and bull pens with animals in them require special attention. It is best to clean these pens once a week. A clean livestock barn has fewer fly problems.

(b) Spread the manure thinly outdoors in order that fly eggs and larvae will be killed by drying, or stack this waste and cover with black plastic.

(c) Eliminate silage seepage areas, wet litter, manure stacks, old wet hay or straw bales and other organic matter accumulations that may attract flies anywhere on the farm. Wet feed remaining at the ends of mangers will breed flies.

(d) Provide proper drainage in barnyards. Use clean gravel and other fill eliminate low spots in livestock yards. Proper tiling can reduce wet barnyards.

Baits

Fly resistance to residual sprays means more reliance on baits or space sprays. Although fresh bait will help control flies, results may be poor if fly breeding is excessive. Apply baits (moist) after floor litter and manure have been removed. Use baits liberally for best control. Apply a minimum of 4 tablespoons of bait per 1,000 square feet of floor area. Increase amounts when flies are breeding prolifically. Repeat as needed. Baits are most effective when used in conjunction with other contgrol measures. Either dry sugar or liquid syrup baits are effective. Do not apply where animals can slip and fall or where children can be present.

(a) Use 2 ounces Diazinon 50% WP per one pound of sugar per 5 gallons water. Apply with a sprinkling can or other container.

(b) Use 2 or 3 teaspoons DDVP 23.4% EC per pound of sugar. Mix thoroughly and apply 1/4 pound per 1,000 square feet. Do not contaminate feed or water.

(c) Use 4 teaspoons malathion (Cythion) 57% EC per pound of sugar. Sprinkle lightly on aisles, floors and windowsills, or brush on walls, posts or uprights. Or, use 5 tablespoons malathion (Cythion) 57% per 7 tablespoons sugar, molasses (unsulfurized) or corn syrup per one gallon of water. Or use malathion (Cythion) 3.5% ready to use formulation.

(d) Use 1 teaspoon naled (Dibrom) 36% EC per pound of sugar. Mix thoroughly. Unused bait will remain effective for 2 to 3 weeks. Keep in closed container. Or use 2 tablespoons naled (Dibrom) 36% EC per pound of sugar per 2 1/2 gallons of water. Prepare new bait each time. Or use naled (Dibrom) .5% ready to use formulation.

(e) Use trichlorfon (Dipterex, Dylox, Neguvon) 1% ready to use formulation. Apply baits to clean concrete or wherever flies gather. Apply a minimum of 4 tablespoons per 1,000 square feet of floor area. Do not apply to area where animals can slip and fall.

(f) Dry sugar baits of methomyl (Improved Golden Malrin, Golden Muscamone) and bomyl (True-Gait Blue) can be scattered thinly, as purchased, in areas where food animals do not have access. Otherwise, they can be used freely on walkways, along fences, etc. Follow label directions.

Liquid house fly adulticide, erythrosine B (Synerid Fly Control B), will be available for purchase after approval of the pending EPA registration. Apply the product, as purchased, in hangnig bait stations throughout the confined animal facility. (We have insufficient information to make a firm recommendation for its use.)

Space or Aerosol Sprays

Space sprays or aerosols can be effective for rapid knockdown and kill of adult flies. Daily use of atomizers or foggers is necessary when they are used alone. Reduce air movement as much as possible. Do not use in areas where animals have received a direct application of pesticide within the previous 8 hours. Avoid contamination of milk and milk utensils.

(a) Mix 1 pint of DDVP 23.4% EC per 6 gallons of water. Apply 1 quart of spray per 8,000 cubic feet of area. Or mix 1 pint of DDVP 23.4% EC per 3 1.2 gallons of diesel oil. Apply one pint of spray per 8,000 cubic feet of area. Reduce air movement as much as possible. Or apply ready-to-use DDVP 0.93% as a fog about 2 oz. per 1,000 sq. ft. Before milking, the fog can be applied around each aminal to kill flies. For best results, the treated area should be closed for 10 minutes. Do not use in areas where animals have received a direct application within 8 hours.

(b) Apply 1 ounce of naled (Dibrom) 1% ready to use formulation per 3,000 cubic feet of area. Spray around and above animals but not directly at them.

(c) Apply permethrin (Ectiban) 5.7% EC undiluted at rate of 4 fluid ounces per 1,000 square feet or 1 pint (16 ozs.) permethrin (Permectrin II) 10% EC per 8,000 cubic feet. Follow label directions.

(d) Apply 1 to 2 fluid ounces of pyrethrins and synergist 0.1% to 0.2% ready to use formulation per 1,000 square feet of area. Apply as a fog at the rate of 5 to 6 seconds per 1,000 cubic feet when adult flies are present. Keep room closed 15 minutes following application.

Whitewash and Fly Control Together

Never mix insecticides in ordinary lime whitewash. Lime whitewashes are very alkaline and cause insecticides to become ineffective in controlling insects. There are non-alkaline whitening agents available that may be used with insecticides. Do not apply sprays or fogs within 1 week of applying lime whitewash. Follow label directions and precautions.

Oral Larvicides

Certain states do not recommend the use of oral larvicides or insecticides given through the feed such as stirofos (Rabon), methoprene (Altosid) and phenothizine. These feed additives often are not the answer to fly control unless used very extensively. All feces must be treated within an area in order to effectively reduce the fly population on the livestock. The area must usually be many miles across because flies do move very readily from herd to herd over an area of several miles within a day or two. This treatment is usually more effective against the horn fly than for the face fly. We have had little success in controlling the face fly by this method.

Oral larvicides, when fed, prevent the development of flies in the manure. They are not effective against existing adult flies. These oral larvicides should be used in conjunction with good manure sanitation. Supplemental fly control is needed where flies breed in manure from untreated animals such as indoor penned young stock or other organic sources.

Rabon 97.3% oral larvicide is fed at the rate of 70 mg/100 lbs. body weight (lactating dairy cattle, beef cattle and horses) or 50 mg/100 lbs. body weight (swine) as a mineral mix or block from May to September. Start feeding early in the spring before flies begin to appear and continue feeding throughout the summer and into the fall until cold weather restricts fly activity. Animals must consume the recommended dosage for the feed additive to be effective. This method provides reduction of fly larval development only in manure from treated animals. Follow label directions and precautions.

Strips

DDVP resin strips may be hung from the barn ceiling in the place of residual sprays. use DDVP strips at the rate of 1 strip to each 1,000 cubic feet of space. Do not hang strips near light bulbs or within reach of humans. Strips are not very effective where there is continuous air movement. Usually they effectively release insecticide for 2 to 3 months.

Methomyl (Golden Malrin) fly belts may be hung in similar locations. The belt may be cut to any desired length and attached to surfaces such as walls and ceilings. Do not contaminate feed or food stuffs. Do not apply to surfaces within reach of poultry or animals, especially young calves. Do not use in homes or where milk is processed or stored. Follow label directions and precautions.

Manure Treatments

Drenching the manure with pesticides will kill fly larvae. However, this practice is recommended only when manure cannot be disposed of on a timely basis. Flies can become resistant to a particular pesticide if exposed to the same material many times in succession such as through manure drenching. When drenching, it is suggested that pesticides be applied with a low pressure spray or sprinkling can at 1 gallon per 100 square feet of manure. Wet the manure surface, not necessarily soaking it. Repeat application every 7 to 10 days if needed. Apply the long residual spray pesticides.

(a) Use 1/2 pint of dimethoate (Cygon) 2E per 5 quarts of wate5r. Apply as a doarse spray or with a sprinkling can.

(b) Use 1 pint of DDVP 23.4% EC per 6 gallons of water. Apply 1 to 2 quarts per 100 square feet once a week.

(c) Use 2 quarts of malathion (Cythion) 57% EC per 25 gallons of water. Apply as a spray over the manure surface.

(d) Use 1/2 pound of stirofos (Rabon) 50% WP per 3 gallons of water. Apply 1 gallon of solution per 100 square feet of manure. Repeat ever 7 to 10 days.

(e) Use 1 pint of stirofos and DDVP (Ravap) per 3 gallons of water or 3 1/2 gallons of fuel oil. Apply 1 gallon of solution per 100 square feet of manure. Repeat every 7 to 10 days.

Residual Sprays

Residual sprays applied to walls, ceilings, partitions, stanchions, posts and other fly resting places are still the "mainstay" of fly control on livestock farms. These sprays are much more effective in stanchion barns than in loose-housing management where surfaces on which flies alight are minimal and buildings are very open. Also, barn surfaces vary in the amount of spray that should be applied to them. Smooth surfaces require less spray than rough, porous surfaces. Thoroughly wet the surface to the point of runoff at low pressures of 80 to 100 pounds per square inch using a power sprayer of good proportioner type sprayer. Avoid contamination of feed, water and milking utensils. Cover drinking cups and mangers during spraying. Never spray in the milk house. Do not contaminate milk, milk handling equipment, feed or drinking water. Follow label directions.

Long Residual Sprays

(a) Dimethoate-Mix one pint Cygon 23.4% EC per 3 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet of interior and exterior surfaces. Remove animals before spraying. Keep animals out of treated buildings for at least 4 hours.

(b) Fenthion-Mix 1 quart of Baytex 93% EC per 25 gallons of water. Apply 2 gallons of spray per 1,000 square feet. Or mix 3 quarts of fenthion (Baytex) 45% EC per 25 gallons water. Apply 2 gallons of spray per 1,000 square feet. Remove animals from building before spraying. Keep all animals out of treated buildings for at least 4 hours.

(c) Fenvalerate-Mix 1 quart Ectrin 10T WDL in 10 gallons water. Apply 2 gallons of spray per 1,000 square feet. (Use only in horse or swine buildings.) remove animals before spraying. Do not contaminate feed or water.

(d) Permethin-Use 6.67 ounces Atroban 25% WP per 5 to 10 gallons of water. Apply 1 gallon of finished spray per 750 square feet of surface as a coarse, wet spray.

Permethrin-Use 1 quart Ectiban, Hard Hitter, Insectaban, or Insectrin 5.7% EC per 12 1/2 gallons of water or 6 ounces 25% WP per 11 gallons of water. Apply 1 gallon of finished spray per 750 square feet of surface as a coarse, wet spray.

Permethrin-Use 1 quart Permectrin 10% EC per 25 to 250 gallons of water. Apply 1 gallon of diluted mixture per 1,000 square feet of surface oas a coarse, wet spray.

Permethrin-Use 1 pint Expar 11% EC to 10 gallons of water. Apply finished spray to surfaces where flies rest at the rate of 1 gallon per 750-1,000 sq. ft. or to the point of runoff. Do not apply more often then once every two weeks.

(e) Stirofos-Mix 4 to 8 pounds Rabon 50% WP per 25 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet of surface to the point of runoff. Keep all animals out of treated building for at least 4 hours.

(f) Stirofos and DDVP - Mix 1 to 2 gallons Ravap 28.3% EC per 25 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet of walls, ceilings or other areas where flies rest or congregate. Keep all animals out of treated buildings for at least 4 hours.

Medium Residual Sprays

(a) Mix 2 to 4 pounds of Diazinon 50% WP per 25 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet. Do not use in dairy barns or milk houses. Keep all animals out of treated buildings for at least 4 hours.

(b) Mix 5 pounds of Dylox 80% SP per 40 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet. Keep all animals out of treated buildings for at least 4 hours.

(c) Mix 2 quarts of malathion (Cythion) 57% EC per 25 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet. Do not apply to freshly whitewashed surfaces, wait 14 days. Remove animals under 1 month of age when treating. Do not contaminate milk or milking equipment.

(d) Mix 2 pounds of methoxychlor (Marlate) 50% WP per 5 gallons of water. Apply 2 gallons of spray per 1,000 square feet. Dairy animals should not be present while spraying. Avoid contamination of milk handling equipment, feed troughs and water receptacles.

(e) Mix 2 gallons of crotoxyphos and DDVP (Ciovap) 12.5% EC per 25 gallons of water. Apply 1 to 2 gallons of spray per 1,000 square feet to the point of runoff. Spray at least twice monthly.

Short Residual Spray

(a) Mix 2 quarts of DDVP 23.4% EC per 25 gallons of water. Apply 1 quart of spray per 1,000 square feet. Reduce air movements as much as possible. Do not contaminate water, feed or milking utensils.

(b) Mix 1 pint of naled (Dibrom) 36% EC per 20 gallons of water. Add 1/4 pound of sugar or 1/4 pint of Karo syrup for best results. Do not apply directly to animals. Repeat as needed.

(c) Apply pyrethrins plus synergist 0.1% to 0.2% as directed on the container. Apply as a space spray for quick knockdown and kill of lies in the milk rooms or dwellings.

Rattailed Maggots (Syrphid Fly Larvae)

Frequently during the warm summer months, rattailed maggots are reported as a nuisance pest migrating from livestock lagoons and manure pits. These creatures are not a problem as long as they remain in the liquid manure pit. However, they are known to move out of the pit, or lagoon, in large numbers , contaminating livestock, feed, accumulating in electrical boxes and causing short circuits and congretaging in stacks of egg cartons and other unwanted places. The maggots migrate to a drier place for pupation.

Rattailed maggots, known as the larval or immature stage of Syrphid flies, are about 1 1/4 inches long. The body portion is about 3/4 inch long and the tail portion (breathing tube) 1/2 inch long. These maggots are white-colored with the body portion an elongated, oval, cylindrical shape, which is wrinkled and semi-transparent, protracting into a long breathing tube (tail).

These larvae of the Syrphid fly live in highly polluted water such as livestock lagoons, polluted abandoned fish pools, foul pools and streams associated with barnyards, etc. Maggots are able to live in the water, if sufficient solids are present as food. The adult flies resemble honey bees in appearance and are often seen "hovering" near the ground in the barnyard vicinity. These flies do not bite or sting man, and are considered beneficial because they are predaceous on aphids, etc.

Non-chemical treatment-Because this maggot breeds and feeds in highly polluted water, an effort must be made to keep the lagoon in the optimum condition. Usually the lagoon becomes "out-of-balance" with the water level not in proper relationship with the solids. Never allow accumulations of manure above the water line, either floating or sticking to the sides, because these conditions enhance fly development. Keep the banks steep and weeds under control.

Use loose soil and construct a soil barrier between the milk house and the rattailed maggot source. As maggots migrate to the soil barrier, they will dig into it to pupate rather than move into the milk house.

Try to agitate the pit contents frequently during the spring and summer by pumping the pits routinely (at least once a week) to disrupt maggot development. Always maintain a waterline above the manure solids. Clean out the pit contents on a routine basis, if practical.

Usually the occurrence of rattailed maggots is a management problem directly related to improper care of the lagoon or a poorly constructed lagoon. The Environmental Protection Agency (EPA) is presently very concerned with run-off and over-flow leading to pollution. it is very important to coordinate with agricultural designers and Health Department officials before constructing new liquid manure tanks and lagoons. Plans are available from these agencies for constructing tanks to prevent manure seepage and polluted waters thereby avoiding a rattailed maggot problem.

Chemical treatment-Unfortunately, there are no good pesticide control measures. There has been some success by layering a larvicide on the liquid and manure in the pits. Apply 1 pint of Rabon or Ravap emulsion concentrate per 3 1/2 gallons of fuel oil Mix 1 gallon of prepared solution per 100 square feet of manure pit once every 7 to 10 days. The pesticide in the fuel oil will clog up the long breathing tube of the rattailed maggot in the manure pit similar to oils applied to the surface of stagnant, non-moving water to kill mosquito larvae. Of course, one would not want to agitate the pit contents soon after treatment.

EXTERNAL PARASITES OF BEEF CATTLE

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions and Days Between Last Application and Slaughter
		DUST BAGS	
Horn flies, Lice (Aids in control of *face flies*)	Coumaphos (Co-Ral) 1% D Malathion (Cythion) 4% or 5% D Stirofos (Rabon) 3% D Famphur (Warbex) 1% D control.	No mixing is necessary. DUST BAGS MUST BE HUNG 18 TO 24 IN. ABOVE GROUND TO CONTROL FACE FLIES. install burlap bags or commercial ready-to-use bags of dust in areas, etc. Keep bags in place during winter for lice	Do not contaminate feed or water. 0 days.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
		HAND DUSTING	
Face flies, *Horn flies*, *Lice*	Stirofos (Rabon) 3% D	No mixing necessary. Apply approximately 2 oz. of dust by shake can, rotary duster or by spoon to the upper portions of the back, neck and poll, and to the face as an aid in the control of face flies. Rub in lightly to carry the dust beneath the hair. Repeat as necessary.	0 days.
Horn flies, *Lice*	Coumaphos (Co-Ral) 1% D	No mixing necessary. Apply 1-2 heaping tablespoonfuls (1-2 oz.) to the backline, poll, neck and upper portions of the sides. Repeat in 14 days if necessary. For aid in controlling face flies, apply dust lightly, but thoroughly, to the face and neck areas as required.	Do not contaminate feed or water. 0 days.
		BACKRUBBER [*1] AND FACERUBBER	
Face flies, *Horn flies*	Crotoxyphos (Codrin) 1% in No. 2 diesel fuel	Use 24 oz. of 14.4 EC in 3 gal. of diesel fuel or any backrubber base oil.	Do not use motor oil or waste oils on backrubbers. 0 days
Horn flies, *face flies*, *stable flies*, *house flies*, *lice*, *horse flies*, *black flies*, *mosquitoes*, *eye gnats*, *mange*	Ectiban Permectrin Insectrin Atroban and others	Read labels and follow directions on labels.	Read and adhere to all precautions on labels.
Horn flies	Coumaphos (Co-Ral) 1% in No. 2 diesel fuel	Use 1 qt. Co-Ral 11.6% EC or 1 pt. Korlan 24% EC or 3/4 pt. Malathion 57% EC in 3 gal. of diesel fuel or any approved backrubber base oil. To obtain forced use, install burlap-wrapped cable or similar device in gates, doorways, loafing areas, etc. at first sign of pest. Slowly pour 1 gal. of mixture on 20 ft. of cable. Repeat every 2 weeks. Keep in place until killing frost.	0 days
Horn flies and *Lice*	Malathion 2% in No. 2 diesel fuel		DO NOT USE MOTOR OIL OR WASTE OIL ON BACKRUBBERS.
Horn flies	10% Crotoxyphos (Clodrin) + 2.5% Dichlorvos (Vapona) (Clovap) EC	Use 2 qts of Ciovap EC (1.1 lbs/gal.) in 8 gal. of diesel fuel, or any approved backrubber base oil.	0 days
	1% Crotoxyphos (Clodrin) + 0.25% Dichlorvos (Vapona)	No mixing necessary.	

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Horn flies	Ravap 1.25%	Mix with diesel fuel or any approved backrubber base oil. Pour solution into oil reservoir of mechanical rubbing devices or pour one gallon per 20 linear feet on burlap or rope backrubbers. Keep backrubber or facerubber charged.	0 days
Face flies (aids in control)			
		SPRAYS	
Grubs	Coumaphos (Co-Ral) 0.25%	Follow directions on container. As a 0.25%, 0.06% and 0.12% spray diluted with water, use 250 lb of pressure. Apply between AUGUST 1 AND NOVEMBER 1 FOR GRUB CONTROL. **[*5]**	Do not apply to sick animals or those less than 3 months old. Do not apply in conjunction with oral drenches or internal medications. 0 days.
Horn flies	Coumaphos (Co-Ral) 0.06%		
Lice	Coumaphos (Co-Ral) 0.06%		
Ticks	Coumaphos (Co-Ral) 0.12%		
Horn flies, *Lice*	Malathion 0.5%	Amount of Water 100 gal. — 3 gal. 3 qt. of + 3 oz. of 57% EC + 57% EC As a 0.5% spray diluted with water, use 200 lb. of pressure.	0 days.
Face flies, *horn flies*, *lice* and *ticks*	Rabon 50 WP 0.35%-0.5%	Apply as coarse spray. Use between 1/2 and 1 gallon of spray per animal depending on size and hair coat.	0 days.
Horn flies, *lice*, *Lone Star ticks* *Horn flies*, *face flies* (aids in control)	Ravap 0.45% - 0.6% (Mixture of Rabon + Vapona may be available under other trade names.)	Apply as coarse spray. Use between 1/2 to 1 gallon of spray per animal depending on size and hair coat. Do not treat more often than every 10 days.	0 days.
Horn flies, *lice*, *Lone Star ticks* (Aids in control of *face flies*)	Supona	Mix 1 pint with 10 gal water. Apply as a coarse spray. Use 1/2 to 1 gal. of spray per animal.	0 days.
	Fenvalerate (Ectrin)	Mix 1 pint with 25 gal. water. Apply to wet animals thoroughly. Use up to 1/2 gal. of spray per animal.	0 days
	Permethrin (Ectiban, Atroban, Permectrin and others)	Follow directions on label.	Read label.
Grubs, *Horn flies*	Prolate (GX-118) See footnote **[*2]**	Amount of Water 100 gal. — 3 gal. 2 gal. of + 8 oz. of 11.6% EC + 11.6% EC As a 0.25% spray diluted with water, use 200 lb. of pressure. Do not use more than 1 gal. per adult animal. Apply between AUG. 1 and NOV. 1 for grub control.	Do not treat sick animals or those less than 3 months old. Do not spray more often than once per weeks. 21 days

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Face flies, Horn flies, Stable flies	10% Crotoxyphos (Ciodrin) + 2.5% Dichlorvos (Vapona) (Clovap) EC	Follow directions on label. Spray thoroughly, especially on back and upper portion of sides, using 1-2 pts. of spray per animal.	0 days. Do not apply more than once every 7 days.
Grubs *Horn flies* *Lice* *Ticks*	Coumaphos (Co-Ral) 0.25% **[*5]** 0.06% **[*5]** 0.3-0.6% **[*5]** 0.12% **[*5]**	Amt. of 25% WP/100 gal. water 8 lb. 2 lb. 1-2 lb. 4 lb. Apply by means of a dipping vat.	Apply grub treatment between AUGUST 1 and NOV 1. 0 days.
		POUR-ONS [*3]	
Grubs	Coumaphos (Co-Ral) 4% **[*5]**	No mixing is necessary; available as a ready-to-use pour-on. Use as directed on label. Apply evenly along animal's backline by means of long-handled dipper. Use 1/2 oz. per 100 lb. of body weight.	Do not treat sick animals or those less than 3 months old. Do not use in conjunction with oral drench or other medication. 0 days
Grubs, Lice	Famphur **[*8]** (Warbex) 13.2%	No mixing is necessary. Available as a ready-to-use oil solution. Use as directed on label. Apply Warbex on backline as above. Use 1 oz. per 200 lb. of body weight.	Do not treat sick animals or those less than 3 months old. Do not repeat treatment. (See footnote **[*2]**) 35 days
	Fenthion **[*6]** (Tiguvon) 3%	Apply Tiguvon evenly along animal's backline by means of long handled dipper. Use 1/2 oz. per 100 lb. of body weight.	35 days for one application; 45 days for 2 or more applications. Do not apply in conjunction with oral drench or other medication.
Grubs	Prolate (GX-118)	Use 1 gal. of 11.6% EC in 2 gal. of water. It is also available as a ready-to-use pour-on. Use as directed on label. Apply on back-line as above. Use 1 oz. per 100 lb. of body weight, but not more than 8 oz. per animal.	Do not treat sick animals or those less than 3 months old. (See footnote **[*2]**). 21 days
Grubs, Lice	Trichlorfon **[*7]** (Neguvon) 8%	No mixing is necessary. It is also available as a ready-to-use oil solution. Use as directed on label. Apply on backline as above. Use 1/2 oz. of 8% per 100 lb. of body weight.	Do not treat sick animals or those less than 3 months old. Do not repeat treatment.
Lice	Fenthion (Lysoff)	Apply with calibrated dipper along center line of back of the animal. Spread over entire length of animal. MIX VERY CAREFULLY IN ACCORDANCE WITH LABEL ON CONTAINER. Read label carefully to determine the amount of mix to be applied to each animal. Dose per animal is based on recommended weight. Use no more than 3 applications at not less than 14 day intervals depending upon reinfestations that may occur. However, to eliminate louse cycle subsequent treatments at 21-28 day intervals are most effective.	Do not use in combination with or a few days before or after treatment with other grubs and pesticides. Do not use on animals under 3 mos. old. Do not use within 10 days before or after weaning, dehorning, or after exposure to contagious or infectious diseases. READ LABEL CAREFULLY. 21 days following single treatment 35 days following second or third application

SPOTTONS

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Grubs	Spotton (Fenthion) 20% Ready-to-use solution	No mixing is necessary. Amount of solution used is based on weight of animal. Follow directions on container. Apply with a calibrated glass or metal syringe. Use a single application placed onto the backline of animal.	Do not treat dairy cattle of breeding age calves less than 3 months old, sick, convalescent, or severely stressed livestock. Do not slaughter within 45 days of treatment. Do not treat cattle for 10 days before shipping, weaning, or dehorning or after exposure to contagious or infectious diseases.
Lice	Dursban 44 (chlorpyrifos 43.2%) (ready to use solution)	No mixing necessary do not dilute. Amount to be applied is based on body weight of animal. Use 2cc per 100 lbs. of weight. Apply no more than 16cc per animal. FOLLOW INSTRUCTIONS CAREFULLY. Apply just behind the shoulder blade and neck junction.	DURSBAN 44 contains a cholinesterase inhibitor. Do not use any drug or other pesticidal chemical having cholinesterase inhibiting activity, either simultaneously or within 45 days before of after treatment with it. The solvent system in DURSBAN 44 evaporates quite rapidly which may cause a cold sensation to the animal at the site of application. This may manifest itself as a very mild transitory irritation to the animal. Do not brand animals with a hot iron while treating with DURSBAN 44. The solvent system is combustible and could cause a serious burn to the animal(s). DO NOT TREAT bulls over 8 months of age of any breed; dairy breed cattle of any age; purebreed continental or exotic breed cattle such as Simmental, Chianina, Charoials or Gelbvieb; cows within 21 days prior to or 14 days after calving; veal calves; beef-breed calves under 12 weeks of age. Dairy, Brahma, continental or exotic breed cattle crossed with beef breeds (British) may be treated. Do not treat sick, convalescent or severely stressed animals. Do not treat cattle for 10 days before or after shipping, dehorning, castration, vaccination, etc. Do not slaughter animals within 14 days of initial treatment. If reinfestation does occur, animalsmay be re-treated according to the following schedule: (1) 45 days after initial treatment with a 14 day withdrawal prior to slaughter or (2) 30 days after initial treatment with a 21 day withdrawal prior to slaughter. Do not re-treat animals within less than 30 days.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
MINERAL MIXTURES AND FEED ADDITIVES			
Horn flies	Altosid (Methoprene) (IGR) Formulation: 0.02% Methoprene in a mineral mixture	No mixing necessary. Available in block or granular form. Recommended consumption is 0.25 to 0.5 lb. per 100 lbs. of body weight per month.	Do not feed to dairy cattle. Rate of consumption may be decreased by reducing the number of feeding locations or increased by increasing the feeding locations.
Face fly, horn fly, stable fly, house fly	Rabon oral larvicide 97.3%	Feed in complete feeds concentrates, or protein and mineral supplements to deliver 2 mg. per 100 lbs. body wt. Start feeding early in the spring before flies begin to appear and feed continuously throughout the summer and into fall until cold weather restricts fly activity.	0 days
EAR TAGS			
Face flies, Horn flies	Ectrin, Atroban, Gard Star, Guardian Fearing, Insecta-gard Permectrin, Ectiban Tape, Insecti-Shield, Starbar, Appolo, Vet Shock, Star Bar, Du-flex, Terminator, Max-Con.	Apply with the recommended applicator. Apply 2 tags per animal (one in each ear). Effective up to 5 mo.	Read instructions carefully to avoid ear damage. Remove tags before slaughter. Terminator and Max-Con ear tags were devised to circumvent genetic resistance of horn flies to synthetic pyrethroid ear tags.
INJECTABLES			
Lice (sucking): *Linognathus vituli, Haematopinus eurysternus*	Ivermectin (IVOMEC) 1%	IVOMEC should be given only by subcutaneous injection at the recommended dose level of 200 mcg ivermectin per kg of body weight. Each ml of IVOMEC contains 10 mg of ivermectin, sufficient to treat 110 lb (50 kg) of body weight. Use of 16 gauge, 1/2 to 3/4" needle is suggested. under the loose skin in front of or behind the shoulders. Any single-dose syringe or standard automatic syringe equipment may be used with the 50 ml pack size. When using the 200 ml, 500 ml or 1000 ml pack size, use only automatic syringe equipment. Use sterile equipment and sanitize the injection site by applying a suitable disinfectant. Clean, properly disinfected needles should be used to reduce the potential for injection site infections. No special handling or protective clothing is necessary.	Do not treat cattle within 35 days of slaughter. Because a withdrawal time in milk has not been established, do not use in female dairy cattle of breeding age. This product is not for intravenous or intra-muscular use. Animals should be appropriately restrained to achieve the proper route of administration. Use sterile equipment and sanitize the injection site by applying suitable disinfectant. Clean, properly disinfected needles should be used to reduce the potential for injection-site infections. See Footnote 9.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
		ORAL PASTE	
Lice (sucking): *Linognathus vituli*,	Ivermectin (IVOMEC) 1%	The recommended dose of IVOMEC Cattle Paste is 200 mcg/kg body weight. Each depression of the trigger of the MEDIGUN provides the correct dose of ivermectin (23 mg) for 250 lbs (113.5 kg) body weight. The paste should be given only by oral administration using the standard MEDIGUN package tube and MEDIGUN applicator. See instructions.	Do not treat cattle within 24 days of slaughter. Because a withdrawal time in milk has not been established, do not use in female dairy cattle of breeding age. See Footnote 10.
Cattle grubs (parasitic stages): *Hypoderma bovis*, H. *Lineatum*.	Ivermectin (IVOMEC) 1%		
		BOLUS	
	Diflubenzuron (Vigilante)	Administer 1/2 bolus for cattle weighing 300-500 lb., 1 bolus for 550-825 lb., 1 1/2 boluses for 825-1,100 lb. and 2 boluses for for 1,100 lb. or greater. Do not administer to cattle weighing less than 300 lb. nor more than 2 boluses to any animal weighing more than 1,100 lb. Use standard balling control of stable flies and house flies.	0 Days.

For information on BIOLOGY AND CONTROL METHODS FOR EXTERNAL PARASITES OF BEEF CATTLE, see Publication 444-411.

[*1] Backrubbers will repress cattle lice, but usually do not result in complete control.

[*2] Do not use any drug, pesticide, or other chemicals having chloinesterase-inhibiting activity either simultaneously or within a few days after treatment.

[*3] Do not use any pour-ons for lice control between Nov. 15 and Feb. 1. APPLY ALL POUR-ON GRUB TREATMENTS AFTER AUG. 1 BUT NO LATER THAN NOV. 1.

[*4] Do not load cattle into poorly ventilated trucks within 24 hours following treatment. Do not treat animals under stress from castration, dehorning, overexertion, excitement, or within 10 days of shipping, weaning, or exposure to disease. Do not treat animals simultaneously or within a few days before, or after, treatment with, or exposure to, cholinesterase-inhibiting drugs, pesticides or other chemicals. Cattle should have free access to water and feed before and after treatment.

[*5] Cattle grubs - dips and sprays - Do not apply to sick, convalescent, or stressed animals or animals less than three months old. Do not dip or spray animals for 10 days before or after shipping or weaning, or after exposure to contagious or infectious diseases. Do not apply in conjunction with oral drenches, or with internal medications, such as phenothiazine, or with natural or synthetic pyrethroids or their synergists, or with other organic phosphates. Do not apply in a confined, non-ventilated area.

[*6] Do not apply directly (spray or pour-on) to sick, convalescent, or stressed animals. Do not spray animals less than 6 months old or use pour-on application on animals less than 3 months old. Do not apply directly (spray or pour-on) for 10 days before or after shipping or weaning, or after exposure to contagious or infectious diseases. Do not apply in conjunction with or within a few days of treatment with other cholinesterase-inhibiting drugs, pesticides, or other chemicals including other fenthion products. If freshening occurs within 28 days after treatment, do not use milk for human consumption for balance of the 28-day interval.

[*7] Do not apply in conjunction with oral drenches, other external medication, or with other organic phosphates or materials having cholinesterase-inhibiting activity. Seven day prefreshening interval. If freshening occurs within 7 days after treatment, do not use milk for human consumption for the balance of the 7 day interval. Apply a single treatment along the backline. Proper timing of treatment is important. For most effective results, cattle should be treated as soon as possible after fly activity ceases. Host-parasite reactions sometime occur when cattle are treated while common cattle grub is in the gullet, or while the northern cattle grub is in the area of the spinal cord. If it is impossible to determine the origin of the cattle, and thus the exact stage of the grubs is unknown, it is recommended they receive only a maintenance ration of low energy feed during the treatment period. This lessens the likelihood of severe bloat which may occur in cattle on full feed when the common cattle grub is killed while in the gullet. Do not treat animals for 10 days before or after shipping, weaning, or after exposure to contagious or infectious diseases.

[*8] Do not use on dry dairy cows within 21 days of freshening. Cattle from or in Texas, Oklahoma, Kansas, Arkansas, Louisiana, Mississippi, eastern third of New Mexico, Colorado, and southwestern half of Missouri should not be treated after October 1; cattle from the rest of the U.S. not after November 1. On occasion, cattle treated with famphur may show signs of organphosphate poisoning such as excessive salivation, stiffness of limbs, and dyspnea. Atropine is antidotal. A veterinarian should be consulted. Do not use any drug, pesticide, insecticide, or other chemicals having cholinesterase-inhibiting activity either simultaneously or within a few days before or after treatment with famphur. Do not treat calves less than 3 months old; dehydrated animals; animals stressed from shipment, castration, over-excitement, or dehorning, and sick or convalescent animals.

[*9] Instruct clients to observe cattle for injection site reactions. Reactions may be due to clostricial infection and should be aggressively treated with appropriate antibiotics.

IVOMEC is highly effective against all stages of cattle grubs. However, proper timing of treatment is important. For most effective results, cattle should be treated as soon as possible after the end of the heel fly (warble fly season).

Destruction of Hypoderma larvae (cattle grubs) at the period when these grubs are in vital areas may cause undesirable host-parasite reactions including the possibility of fatalities. Killing Hypoderma Lineatum when it is inthe tissue surrounding the gullet may cause salivation and bloat; killing H. bovis when it is in the vertebral canal may cause staggering or paralysis. These reactions are not specific to treatment with IVOMEC, but can occur with an successful treatment of grubs. Cattle should be treated either before or after these

Cattle treated with IVOMEC after the end of the heel fly season may be retreated with IVOMEC during the winter for internal parasites, mange mites, or lice without danger of grub-related reactions. A PLANNED PARASITE CONTROL PROGRAM IS RECOMMENDED.

Transitory discomfort has been observed in some cattle following subcutaneous administration. A low incidence of soft-tissue swelling at the injection site has been observed. These reactions have disappeared without treatment. Divide doses greater than 10 ml between two injection sites to reduce occasional discomfort or site reaction.

Protect from light.

CAUTION: IVOMEC Injection for cattle has been developed specifically for use in cattle and reindeer only. This product whould not be used in other animal species as severe adverse reactions including fatalitites in dogs, may result.

[*10] IVOMEC Cattle Paste is effective against all stages of cattle grubs. However, as with any grubicide, proper timing of treatment is important to avoid undesirable host-parasite reactions such as bloat, salivation, staggering or paralysis. Consult your veterinarian or extension entomologist regarding timing of treatment.

Cattle treated for grubs after the end of the heel fly season may be treated with IVOMEC Paste during the winter and spring for internal parasites and lice without danger of grub-related reactions.

IVOMEC Cattle Paste has been formulated specifically for use in cattle only. This product should not be used in other animal species as severe adverse reactions, including fatalities in dogs, may result.

Refrain from smoking and eating when handling. Wash hands after using.

Keep this and all drugs out of reach of children.

When to Treat for Cattle Grubs

Proper timing of treatment is important when using systemic grubicide pour-ons and spot-ons on beef and non-lactating dariy cattle. For most effective results, cattle should be treated as soon as possible after heel fly activity ceases. Host-parasite reactions such as bloat, salivation, staggering and paralysis may sometimes occur when cattle are treated while the common cattle grub, Hypoderma Lineatum, is in the gullet, or while the northern cattle grub, H. bovis, is in the area of the spinal cord. Cattle should be treated either before or after these stages of grub development.

Follow Instructions on the Label
If it is impossible to determine the origin of the cattle, and thus the exact stage of the grubs is unknown, it is recommended that the cattle receive only dry hay or a maintenance ration of low energy a couple of days before an during the treatment period. This lessens the likelihood of severe bloat, which may occur in cattle on full feed when the common grub is killed in the gullet.

When to Treat for Cattle Lice

Systemic pour-ons and spot-ons for lice control on beef and non-lactating dariy dattle are convenient. Grub treatment before November cutoff date will often not take care of cattle lice problems. Louse eggs are not as susceptible to insecticides as the lice themselves and therefore animals should be re-examined about three weeks after treatment to determine if viable lice eggs have hatched and reinfested the herd.

Do not use grubicides such as coumaphos (Co-Ral), famphur (Warbex), fenthion (Tiguvon), fenthion (Spot-ton), phosmet (Prolate) or trichlorfon (Neguvon) during November and December on cattle not previously treated for grubs due to possible host-parasite reaction. After January 1, grub larvae have migrated from the spinal canal, or esophagus, and usually encyst in the back and cattle may then be safely treated with grubicides. It is then safer to treat for lice to minimize the host-parasite reaction.

For cattle previously treated for grubs, a second treatment later in the season may bec ome necessary should lice become a problem. The second treatment usually should not be applied sooner than 35 days after the first treatment. Be sure to follow instructions on the label for any safety precautions.

There are systemic spot-ons and pour-ons such as chlorpyrifos (Dursban) and fenthion (Lysoff) registered only for lice control and applied anytime throughout the autumn and winter months because they do not kill grubs. However, Dursban is limited for use on beef cattle only, and Lysoff has a warning of rare (but possible) host parasite reactions. Be sure to follow instructions on the label for any safety precautions.

EXTERNAL PARASITES OF LACTATING DAIRY CATTLE

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
DUST BAGS [*2]			
Horn flies (Aids in control of *face flies*)	Coumaphos (Co-Ral) 1% D	No mixing is necessary. install burlap bags of dust in doorway where cattle leave milking barn or enter loafing barn. Do not contaminate feed or water. Keep in place during winter months for sid in control of lice.	0 days
	Stirofos (Rabon) 3% Dust		0 days

back a

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
BACKRUBBERS			
Horn flies	Coumaphos (Co-Ral) EC	Use 1 qt. (1 lb. per gal. EC) to 3 gal. of diesel fuel when mixing Co-Ral. No mixing is necessary for the Ciodrin-Vapona mixture. It is available in a ready-to-use light oil.	See Footnote **[*3].** 0 days To obtain forced-use install burlap-wrapped cable or similar device in gates, doorways, or loafing areas, etc., at first sign of pest. Pour one gal. of mixture on 20 ft. of cable. Re-treat once each week.
	1% Crotoxyphos (Ciodrin) + 0.25 Dichlorvos (Vapona) sold under labels such as Ciovap Super Kleen Kow		
Horn flies, face flies, stable flies, house flies, lice, black flies, mosquitoes, eye gnats, mange	Ectiban, Permectrin, Insectrin, Atroban, and others	Read and follow directions on labels.	Read label.
HAND DUSTING - LACTATING COWS			
Horn flies	Malathion 4% or 5% D	No mixing is necessary. Apply with shaker can to back, neck and flanks using 4 tbsp. per head of 4% dust or 3 tbsp. per head of 5% dust. THE BEST TIME TO APPLY IS JUST AFTER MILKING.	Allow a 10-14-day interval between treatments. Do not apply within 5 hours prior to milking or during miling. 0 days.
Face Flies, Horn flies, Lice	Stirofos (Rabon) 3% D	No mixing is necessary. Apply approximately 2 oz. of dust by shake can, rotary duster or spoon to the upper portions of the back, neck and poll, and to the face as an aid in the control of face flies. Rub in lightly to carry the dust beneath the hair. Repeat as necessary.	0 days.
Horn flies, Lice	Coumaphos (Co-Ral) 1%		
WETTING SPRAYS - LACTATING COWS			
Face flies, Horn flies, Stable flies, Lice, Ticks	10% Crotoxyphos (Ciodrin) + 2.5% Dichlorvos (Vapona) (Ciovap EC)	Use 2 qts. of Ciovap EC (1.1 lbs. per gal.) per 6 gal. of water. Spray thoroughly, especially on back and upper portion of sides, using 1-2 pts. of spray per large animal and proportionately less for smaller animals.	0 days. Do not apply more than once every 7 days. Do not apply regularly to calves under 6 months old. Do not spray udders.
Horn flies, lice, Lone Star ticks, (Aids in control of face flies)	Supona	Mix 1 pint with 10 gal. water. Apply as a coarse spray. Use 1/2 to 1 gal. of spray per animal.	0 days. Read label.
	Fenvalerate (Ectrin)	Mix 1 pint with 25 gal. water. Apply to wet animals thoroughly. Use up to 1/2 gal. of spray per animal.	0 days. Read label.
	Permethrin (Ectiban, Atroban, Permectrin, and others)	Read and follow directions on labels.	Read labels.

MIST SPRAYS - LACTATING COWS

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Horn flies, *Horse flies*, *Stable flies*	Synergized pyrethrins 0.05% to 0.1% + synergist 0.5% to 1% **[*4]**	Follow directions on container. Apply 1 to 2 oz. daily as a mist spray, with hand sprayer, electric mister or automatic sprayer.	If other mist sprays are used on lactating dairy cattle, please read label carefully. 0 days
	Crotoxyphos (Ciodrin) 1% + Dichlorvos (Vapona) 0.25%. Sold under labels such as Ciovap and Super Kleen Kow	Improve control by adding 1 tsp. of sugar per pt. of spray solution. No other mixing is necessary. Ready-to-use.	Do not contaminate food, feed, or drinking water.
Face flies, *Horn flies*, *Stable flies*	Dichlorvos (Vapona) 1%	No mixing necessary. It is available in a ready-to-use light oil. Apply 1 to 1 1/2 oz. daily as a mist spray with hand or automatic sprayer. Spray to thoroughly cover all parts of the animal, including the legs but do not wet the skin.	0 days.
Face flies, *Horn flies*, *Stable flies*	10% Crotoxyphos (Ciodrin) + 2.5% Dichlorvos (Vapona) EC) (Ciovap EC)	Mis 1 qt. of Ciovap EC with 3 gal. of water. Apply 1-2 oz. daily per animal with a low-pressure sprayer or electric mister.	0 days. Do not apply more than once every 7 days. Do not exceed 2 oz. per animal.

INJECTABLES - MALES AND FEMALES NOT OF BREEDING AGE

Lice (sucking): *Linognathus vituli*, *Haematopinus eurysternus*	Ivermection (IVOMEC) 1%	IVOMEC should be given only by subcutaneous injection at the recommended dose level of 200 mcg ivermectin per kilogram of body weight Each ml of IVOMEC contains 10 mg of ivermectin, sufficient to treat 110 lb (50 kg) of bodyweight. Use of 16 gauge, 1/2 to 3/4" needle is suggested. Inject under the loose skin in front of or behind the shoulders.	Do not treat cattle within 35 days of slaughter. Because a withdrawal time in milk has not been established,do not use in female dairy cattle of breeding age. This product is not for intravenous or intra-muscular use. Animals should be appropriately restrained to achieve the proper route of administration.
		Any single-dose syringe or standard automatic syringe equipment may be used with the 50 ml pack size. When using the 200 ml, 500 ml or 1000 ml pack size, use only automatic syringe equipment.	Use sterile equipment sanitize the injection site by applying a suitable disinfectant. Disinfected should be used to prevent the potential for injection-site infections.
		Use sterile equipment and sanitize the injection site by applying a suitable disinfectant. Clean, properly disinfected needles should be used to reduce the potential for injection site infections. No special handling or protective clothing is necessary.	See Footnote 1.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
ORAL PASTE - MALES AND FEMALES NOT OF BREEDING AGE			
Lice (sucking): *Linognathus vituli*, *Haematopinus eurysternyus*.	Ivermectin (IVOMEC) 1%	The recommended dose of IVOMEC Cattle Paste is 200 mcg/kg body weight. Each depression of the trigger of the MEDIGUN provides	Do not treat cattle within 24 days of slaughter.
Cattle grubs (parasitic stages): *Hypoderma bovis*, *H. lineatum*.	Ivermectin (IVOMEC) 1%	the correct dose of Ivermectin (23 mg) for 250 lbs (113.5 kg) body weight. The paste should be given only by oral administration using the standard MEDIGUN tube and MEDIGUN applicator. See package instructions.	Because a withdrawal time in milk has not been established, do not use in female dairy cattle of breeding age. See Footnote 11.
BOLUSES - MALES AND FEMALES NOT OF BREEDING AGE			
Face Fly, *Horn Fly*, *House Fly*, *Stable Fly*	Diflubenzuron (Vigilante)	1/2 to 2 boluses. Administer 1/2 bolus for cattle weighing 300-550 lb., 1 bolus for 550-825 lb., 1 1/2 boluses for 825-1,100 lb. and 2 boluses for 1,100 lb. or greater. Do not administer to cattle weighing less than 300 lb. or more than 2 boluses to any animal weighing more than 1,100 lb. Use standard balling gun.	
Late Summer or Fall applications for Cattle Grub Control on NON-LACTATING (DRY) Cows ONLY			
SPRAYS - NON-LACTATING COWS			
Cattle grubs (Aids in control of *cattle lice*)	Coumaphos (Co-Ral) 375%	Amount of Water 100 gal. + 3 gal. 12 lb. of + 6 oz. of 25% WP or + 25% WP or 3 gal. of + 12 oz. of 11.6% EC + 11.6% EC Spray once to point of drip (Up to 1 gal. per adult) between July 15 and October 1.	Do not apply closer than 14 days of freshening. **[*3]** if freshening occurs within 14 days of treatment, do not milk for human consumption for balance of 14 days. 0 days. DRY COWS ONLY.
POUR-ONS - NON-LACTATING COWS [*6]			
Cattle grubs (Aids in control of cattle lice)	Coumaphos (Co-Ral) 4%	No mixing is necessary. It is available as a ready-to-use oil solution. Pour on evenly along animal's back by means of long-handled dipper. Use 1/2 oz. per 100 lb. of body weight.	Do not treat animals less than 3 months old. Do no apply within 14 days of freshening. **[*3]** If freshening occurs within 14 days of treatment, do not milk for human consumption for the balance of 14 days. 0 days DRY COWS ONLY.
Cattle grubs (Aids in control of cattle lice)	Fenthion **[*7]** (Tiguvon) 3%	No mixing is necessary. Available as a ready-to-use oil solution. Use as directed on label. Apply evenly along animal's backline by means of long-handled dipper. Use 1/2 oz. per 100 lb. of body weight.	35 days for 1 application. 45 days for 2 or more application. Do not apply in conjunction with oral drench or other medication. 28 days pre-freshening interval. DRY COWS ONLY.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Cattle grubs (Aids in control of cattle lice)	Trichlorfon **[*8]** (Neguvon) 8%	No mixing is necessary. Ready-to-use oil solution. Use as directed on label. Apply on backline as above. Use 1/2 oz. of 8% Neguvon per 100 lb. of body	Do not treat sick animals or those less than 3 months old. Do not repeat treatment. Do not treat animals if they are likely to get wet. 21 days. DRY COWS ONLY
	weight. Use 1 oz. of Famphur **[*9]** (Warbex) 13.2%	13.2% Warbex per 200 lb. of body weight, not to exceed a total dosage of 4 oz. applied from shoulder to the tail head as a single treatment. Do not treat if rain conditions prevail allowing animals to become wet.	Do not treat sick animals or those less than 3 months old. Do not repeat treatment. (See footnote **[*3]**). 35 days. DRY COWS ONLY
	DAIRY CATTLE (LACTATING AND NON-LACTATING)		
	EAR TAGS		
Face flies and *Horn flies*	Ectrin Ear Tags Atroban Ear Tags Gard Star Guardian Fearing Permectrin Ectiban Tape Insecti-Shield Starbar	Apply with recommended applicator. Apply 2 tags per animal (one in each ear) READ INSTRUCTIONS CAREFULLY for proper placement. Replace as necessary.	Remove tags before slaughter.

RABON ORAL LARVACIDE IS NOW LABELED AS A FEED ADDITIVE FOR THE CONTROL OF HORN FLIES, HOUSE FLIES AND STABLE FLIES IN THE MANURE OF TREATED DAIRY CATTLE. USE IN ACCORDANCE WITH LABEL.

[*1] Insecticides should be applied with extreme caution to cows or calves in poor health. This means light applications of safer materials.

[*2] Close mesh bags must be used to prevent waste of dust.

[*3] Do not apply to sick, convalescent, or stressed animals, or animals less than three months old. Do not dip or spray animals for 10 days before or after shipping, weaning, or after exposure to contagious or infectious disease. Do not apply in conjunction with oral drenches or other internal medications such as phenothiazine, or with natural or synthetic pyrethroids or their synergists, or with organic phosphates. Do not spray in a confined non-ventilate area.

[*4] MGK R-11 or R-326, Tabutrex or Crag fly repellent may be added to synergized pyrethrins for increased effectiveness, especially against horse flies.

[*5] Do not apply to dry dairy cows within 3 days of freshening, or to cows producing milk for human consumption. If cows freshen during treatment, or if treatment has not been withdrawn the required 3 days prior to freshening, milkmust not be used for food for 3 days after the last treatment. Do not load cattle into poorly ventilated trucks within 24 hours following dehorning, overexertion, or excitement; or within 10 days of shipping, weaning, or exposure to diseases. Do not apply to meat animals within 7 days of slaughter. Cattle should have free access to water and feed before and after treatment. Do not treat animals simultaneously or within a few days before or after treatment with or exposure to cholinesterase-inhibiting drugs, pesticides, or other chemicals.

[*6] If other pour-ons for grub control are used on non-lactating dairy cattle, please read label carefully.

[*7] Fenthion - Do not apply directly (spray or pour-on) to sick, convalescent, or stressed animals. Do not spray animals less than 6 months old or use pour-on application on animals less than 3 months old. Do not apply directly (spray or pour-on) for 10 days before or after shipping or weaning, or after exposure to contagious or infectious diseases. Do not apply in conjunction with or within a few days of treatment with other cholinesterase-inhibiting drugs, pesticides, or other chemicals including other fenthion products. If freshening occurs within 28 days after treatment, do not use milk for human consumption for balance of the 28-day interval.

[*8] Trichlorfon - Do not apply in conjunction with oral drenches, other external medication, or with other organic phosphates or materials having cholinesterase-inhibiting activity. Seven day prefreshening interval. If freshening occurs within 7 days after treatment, do not use milk for human consumption for the balance of the 7 day interval. Apply a single treatment along the backline. Proper timing of treatment is important. For most effective results, cattle should be treated as soon as possible after fly activity ceases. Host-parasite reactions sometime occur when cattle are treated while common cattle grub is in the gullet, or while the northern cattle grub is in the area of the spinal cord. If it is impossible to determine the origin of the cattle, and thus the exact stage of the grubs is unknown, it is recommended they receive only a maintenance ration of low energy feed during the treatment period. This lessens the likelihood of severe bloat which may occur in cattle on full feed when the common cattle grub is killed while in the gullet. Do not treat animals for 10 days before or after shipping, weaning, or after exposure to contagious or infectious diseases.

[*9] Famphur - Do not use on dry dairy cows within 21 days of freshening. Cattle from or in Texas, Oklahoma, Kansas, Arkansas, Louisiana, Mississippi, eastern third of New Mexico, Colorado, and southwestern half of Missouri should not be treated after October 1; cattle from the rest of the U.S. not after November 1. On occasion, cattle treated with famphur may show signs of organphosphate poisoning such as excessive salivation, stiffness of limbs, and dyspnea. Atropine is antidotal. A veterinarian should be consulted. Do not use any drug, pesticide, insecticide, or other chemicals having cholinesterase-inhibiting activity either simultaneously or within a few days before or after treatment with famphur. Do not treat calves less than 3 months old; dehydrated animals; animals stressed from shipment, castration, over-excitement, or dehorning, and sick or convalescent animals.

[*10] Instruct clients to observe cattle for injection site reactions. Reactions may be due to clostricial infection and should be aggressively treated with appropriate antibiotics.

IVOMEC is highly effective against all stages of cattle grubs. However, proper timing of treatment is imortant. For most effective results, cattle should be treated as soon as possible after the end of the heel fly (warble fly) season.

Destruction of Hypoderma larvae (cattle grubs) at the period when these grubs are in vital areas may cause undesirable host-parasite reactions including the possibility of fatalities. Killing Hypoderma lineatum when it is in the tissue surrounding the gullet may cause salivation and bloat; killing H. bovis when it is in the vertebral canal may cause staggering or paralysis. These reactions are not specific to treatment with IVOMEC, but can occur with any successful treatment of grubs. Cattle should be treated either before or after these stages of grub development. Consult your veterinarian or extension entomologist concerning proper timing of treatment.

Cattle treated with IVOMEC after th end of the heel fly season may be retgreated with IVOMEC during the winter for internal parasites, mange mites, or lice without danger of grub-related reactions. A planed parasite control program is recommended.

Transitory discomfort has been observed in some cattle following subcutaneous administration. A low incidence of soft-tissue swelling at the injection site has been observed. These reactions have disappeared without treatment. Divide doses greater than 10 ml between two injection sites to reduce occasional discomfort or site reaction.

Protect from light.

CAUTION: IVOMEC Injection for cattle has been developed specifically for use in cattle and reindeer only. This product should not be used in other animal species as severe adverse reactions including fatalities in dogs, may result.

[*11] IVOMEC Cattle Paste is effective against all stages of cattle grubs. However, as with any grubicide, proper timing of treatment is important to avoid undesirable host-parasite reactions such as bloat, salivation, staggering or paralysis. Consult your veterinarian or extension entomologist regarding timing of treatment.

Cattle treated for grubs after the end of the heel fly season may be treated with IVOMEC Paste during the winter and spring for internal parasites and lice without danger of grub-related reactions.

IVOMEC Cattle Paste has been formulated specifically for use in cattle only. This product should not be used in other animal species as severe adverse reactions, including fatalities in dogs, may result.

Refrain from smoking an eating when handling. Wash hands after using.

Keep this and all drugs out of reach of children.

For additional information, see Publication 412, BIOLOGY AND METHODS OF CONTROL FOR EXTERNAL PARASITES OF DAIRY CATTLE, Publication 411, BIOLOGY AND METHODS OF CONTROL FOR EXTERNAL PARASITES OF CATTLE, may also be helpful with regard to treating non-lactating (dry) dairy cattle.

EXTERNAL PARASITES OF SWINE

SPRAYS

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Lice	Coumaphos (Co-Ral) 0.06%	1 gal ± 10 gal. 2 Tbsp. ± 3 oz. 25% WP ± 25% WP Spray to point of runoff.	See footnote **[*1]** for special precautions pertaining to use of Coumaphos. 0 days
	Malathion 0.5%	1 gal. ± 10 gal. 2 tbsp. ± 3/4 pt. 57% EC ± 57% EC Spray to point of runoff.	Treat every 2 to 3 weeks, if needed. Do not use on animals less than 1 month old. Sprayed hogs should be kept out of sun and wind for a few hours after treatment. 0 days.
	Stirophos (Rabon)	1 gal. ± 10 gal. 1 1/4 oz ± 12 oz. 50% WP ± 50% WP approximately 1-2 quarts per animal.	Repeat in 2 weeks if necessary. 0 days Apply as a course spray,

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
	Crotoxyphos (Ciodrin) 1% + Dichlorvos (Vapona) 0.25%	1 gal. + 10 gal. 2-3/4 oz. + 1-3/4 pt. Amount per animal depends on animal size and hair coat. Apply second application 14 days later.	Repeat application as necessary for control, but not more often than once every 7 days. 0 days
	Dioxathion (Delnav) 0.15%	1 gal. + 10 gal. 4 Tsp. + 6 1/2 oz. 21% EC + 21% EC Spray thoroughly, amount depending on animal size and hair length. It is best with 2 applications 10 days to 2 weeks apart.	Do not treat swine less than 3 months old. Do not reapply within 2 weeks. 0 days
	Fenvalerate (Ectrin)	Mix 2 fl. oz with 3 gal. water. Apply up to 1 pt. per animal. Repeat in 30 days if necessary.	0 days
Mange	Malathion 0.5%	1 gal. + 10 gal. 2 tbsp. + 3/4 pt. 57% EC + 57% EC Spray to point of runoff. Use extreme care to cover all body surfaces, bedding, etc. Extreme cases will require a second treatment about 10 days after first application.	Treat every 2 to 3 weeks, if needed. Do not use on animals less than 1 month old. Sprayed hogs should be kept out of sun and wind for a few hours after treatment. 0 days
	Lindane 0.06%	10 gal. + 25 gal. 2 1/2 oz. + 6 oz. 25% WP + 25% WP Spray thoroughly, amount depending on animal size and depending on animal size and hair length. To apply as a dip, follow label directions.	Do not treat pigs before weaning. 30 days for spray 60 days for dip. LINDANE MAY BE SUBJECT TO IMMEDIATE CANCELLATION.
Lice, Mange	Permethrin (Ectiban, Permectrin, and others)	Follow directions on label.	Read label.
		HAND DUSTING	
Lice	Malathion	4% to 5% dust. No mixing necessary. Ready-to-use. Dust large animals thoroughly. Use 1/4 to 1/2 tbsp. per animal for pigs less than 1 month old.	Treat every 2 to 3 weeks if needed. 0 days
	Coumaphos (Co-Ral)	1% dust. No mixing necessary. Ready-to-use. Do not use more than 1 oz. of 1% per head. Dust evenly into hair on head, neck shoulders and tall head.	Do not use more frequently than every 10 days. 0 days.
	Stirophos (Rabon) 3%	Use 3 to 4 oz. per animal. Repeat as necessary, but not more often than once every 14 days. In severe infestations both animals and bedding should be treated. Use 1 lb./150 sq. ft. of bedding.	0 days

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
		POUR-ONS	
Lice	Fenthion (Tiguvon)	No mixing necessary. Ready-to-Use. Apply at rate of 1/2 fluid oz. per 100 lbs. of body weight. Pour the correct amount of solution uniformly along the animals back, starting just behind the ears and continuing to the rump.	14 days. Do not treat sick, convalescent or stressed animals. Do not use this product on animals at the same time or within a few days of treatment with other cholinesterase inhibiting pesticide, drugs, or chemicals.
		EAR TAGS	
Lice, house flies, stable flies	Permethrin (Permectrin Ear Strips)	Fasten tag to ear.	0 days
		INJECTABLES	
Sucking Lice (Haematopinus suis) Mange mites (Sarcoptes scabiei var. suis)	Ivermectin (IVOMEC) 1%	IVOMEC should be given only by subcutaneous injection at the recommended dose level of 300 mcg ivermectin per kgm of body weight. Each ml of IVOMEC contains 10 mg of ivermectin, sufficent to treat 75 lb (33 kg) of body weight. Use of a 16-gauge, 1/2 to 3/4" needle is suggested. The recommended route of administration is by subcutaneous injection in the neck. Use aseptic technique. Protect product from light. Keep this and all drugs out of the reach of children.	Do not treat swine within 18 days of slaughter. This product is not for intra-muscular use. Animals should be appropriately restrained to achieve the proper route of administration. Use sterile equipment and sanitize the injection site by applying a suitable disinfectant. Clean, properly disinfected needles should be used to reduce potential injection-site infections.

NOTE: Do not treat animals less than 3 months old, or sick, convalescent or stressed animals. Do not dip or spray animals for 10 days before or after shipping or weaning, or after exposure to contagious or infectious diseases. Do not spray in confined non-ventilated area . Do not apply in conjunction with oral drenches or other internal medications, or with natural or synthetic pyrethroids or their synergists or with other organic phosphates. Do not use this product on animals simultaneously or within a few days beftreatment with or exposure to cholinesterase inhibiting drugs, pesticides, or chemicals.

EXTERNAL PARASITES OF SHEEP

		DUST	
Lice, ticks (keds)	Malathion (Cythion) 4% dust OR Malathion (Cythion) 5% dust	No mixing necessary. Treat animals thoroughly. Apply by means of hand or power duster.	0 days
		SPRAYS OR DIPS [*2]	
Blow Flies, Keds, Lice	Permethrin (Permectrin II) 25% WP	Add 1 lb. to 120 gal, or 1/3 lb to 40 gal. of water. Spray 1 qt. on large animals or 1 pt. on small animals. Treat entire animal. Repeat after 4-6 weeks or as needed.	Do not spray on feed. Meat animals should not be slaughtered within 14 days of treatment.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Lice, Keds **[*4]**	Permectrin (Ectiban) 5.7% EC	Mix 1 qt. to 25 gal of water (2 1/2 tbs/gal). Spray 1-2 qt. per animal over whole body surface.	Read Label
Lice, Keds	Fenvalerate (Ectrin WDL)	Mix 1 qt Ectrin with 100 gal water. Wet animal with up to 1 qt of Dilution.	Repeat application in 30 days if necessary. Do not apply more than 2 times in spring and 2 times in fall. Do not apply within 30 days of slaughter.
Lice, Keds	Coumaphos (Co-Ral) 25% WP **[*2]**	Mix 2-4 lbs. in 100 gal of water. Treat entire animal.	Repeat as necessary but not within 15 days of slaughter.
Lice, Ticks, Keds, Wool maggots	Cydrin 14.4%EC or Ciovap **[*1]**0.25%WP or Diazinon .03% or Dioxathon **[*2]** (Delnav) .15% or Malathion (Cython) .5%	Mix with water in accordance with labels. Read labels carefully. Spray animals thoroughly. To penetrate wool coating, animals must be wetted to the skin. To adequately control lice, it may be necessary to spray animals twice at 10-14 day intervals.	Repeat as necessary, but not more often than once every 7 days. Ciodrin - 0 days; Ciovap - 1 day; Diazinon - 14 days; Dioxathion - 0 days; Malathion - 0 days.
		EAR TAGS	
Lice, house flies, stable flies	Permethrin (Permectrin Ear Strips)	Fasten tag to ear	0 days
Lice, house flies, stable flies	Permethrin (Permectrin Ear Strips)	Fasten tag to ear	0 days
		POUR-ON	
Lice, Ticks, Keds, Wool maggots	Fenvalerate (Ectrin) 10% WDL	Mix 4 ozs. Ectin 10% WDL per 1 1/2 gal. water One application after shearing is usually adequate. Repeat application in 30 days if needed but not more often than 2 times in the spring and 2 times in the fall pest seasons. 4 oz. of dilution down midline of back.	2 days wait time.
		SPRINKLE-ON	
Lice, Ticks, Keds, Wool maggots	Diazinon 50% WP	Mix 1/2 oz. of Diazinon 50% WP in 3 gallons of water in a garden sprinkling can. Apply 6 gallons over the heads, necks, tops and sides when walking among 25 sheep in a pen. Do not treat lambs less than 2 weeks old.	14 days waiting period.

[*1] Apply up to one gallon of Ciovap spray solution per animal with a second application 10 to 14 days later.

[*2] Co-Ral and Dioxathion may be applied as a spray or dip.

[*3] Do not apply to sick, convalescent or stressed livestock, or to any animals less than 3 months old except in Federal and State eradication programs. Do not treat animals for 10 days before or after shipping or weaning, or after exposure to contagious and infectious diseases except in Federal or State eradiction programs. Do not spray in confined non-ventilated area. Do not apply in conjunction with oral drenches or other internal medication, such as phenothiazine. Co-Ral is a cholinesterase inhibitor. Do not use this product on animals simultaneously or within a few days before or after treatment with or exposure to cholinesterase inhibiting drugs, pesticides or chemicals.

[*4] Animals must be wet thoroughly to penetrate wool for control of lice next to the skin. Dipping is most reliable method of eliminating lice on sheep.

Scabies

Sheep scabies is a disease caused by mange mites. Virginia has been declared free of this disease for several years. Nevertheless, scabies may occur occasionally on sheep in areas that have been declared free of the disease. Scabies suspected on sheep in Virginia should be reported immediately to your county Extension Office or to representatives of the State Veterinarian's office of the Virginia Department of Agriculture and Commerce, Richmond, Virginia. Inspection and diagnosis is a free service. If scabies is positively identified, the necessary treatment will be applied without charge by the Virginia Department of Agriculture and Consumer Services.

EXTERNAL PARASITES OF HORSES

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Bots	Trichlorfon (Anthon) Treat 30 days after first killing frost. Repeat 30 days later.	Mix with a palatable (tasty) ground feed. Use one 5-gram pkg. per 250 lb. of body weight. Do not exceed this dose. Withdraw all feed 12-18 hr. prior to treatment to help insure complete intake of treated feed. Do not offer additional feed for 12 hr. or until all medicated feed is consumed.	Do not treat sick animals, colts under 4 mo. of age, mares in last mo. of pregnancy, or animals to be used for food. Do not repeat more often than every 30 days. Remove and destroy any food not consumed after 12 hr. Do not administer along with other organic phosphates or cholinesterase inhibitors. Do not treat slaughter animals. READ LABEL CAREFULLY BEFORE USING.
	Dichlorvos (Horse Wormer)	Mix with 1/2 the grain portion of the ration normally used in a single feeding. Use 3.2 grams per 200 lb. of body weight. Do not exceed this dose. To insure maximum bot removal, withhold all water for 4-6 hrs. before and for 3 hrs. after consumption of the medicine. READ LABEL CAREFULLY BEFORE USING. Do not allow fowls to have access to feed containing this chemical or to manure from treated animals.	Do not administer Dichlorvos Horse Wormer to horses affected with heaves or suffering from colic, diarrhea, constipation or infectious disease until such conditions have been corrected. Dichlorvos should not be given in conjunction with, or within 1 wk. of the administration of tranquilizing drugs or other worm medicines. Horses should not be subjected to any insecticide treatment for 5 days prior to or after Dichlorvos treatment. Do not treat slaughter animals.
	Bathe or sponge with warm water. (Apply 30 days after first killing frost.) Repeat at weekly intervals.	No mixing is necessary, but water should be kept warm to the point where the hand can be immersed without discomfort. Apply warm water with sponge where eggs are present. (Clipping of hairs infested with fly eggs will aid in control.)	Firm rubbing is a must. Water must be kept warm (115-120° F.) Worms will hatch and die when wet thoroughly with warm water.
	SPRAYS AND WIPE-ONS		
Horn flies and *lice* and *ticks*	Coumaphos (Co-Ral) 0.06%	Per 100 gal. ± Per 3 gal.	Read label and observe precautions pertaining to use of coumaphos (Co-Ral). See footnote **[*2].** Do not treat slaughter animals.
		2 lb. of 25% WP or 2 qt. of 11.6% EC ± 1 oz of 25% WP or ± 2 oz. of 11.6% EC Apply as a spray **[*1]** when pests are present. Use 2x concentration for tick control.	

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
	Malathion 0.5%	Mix 1 gal. + Mix 4 oz. of 57% EC + of 57% EC Apply up to 2 qts. per animal depending on size by means of spraying or with a sponge that has been dipped in solution.	Do not contaminate feed, water, water utensils or feed troughs. Do not treat slaughter animals.
Horn flies, *Face flies*, *House flies*, *Stable flies*	Fenvalerate (Ectrin WDL)	Mix 1 qt. Ectrin with 25 gal water. Apply 8 oz. as light spray with attention to head and legs. Repeat as necessary.	Do not treat animals intended for slaughter.
Face flies *House flies*	Stirofos (Rabon) 1% + pyrethrum + 0.09% Piperonyl Butoxide 0.18% + Repellent 1.3%	No mixing necessary. Available in ready-to-use oil base. Apply only as a wipe-on, preferably, to the head area. Pay particular attention to around the nostrils and eyes.	Avoid direct contact with the eye itself. Do not treat slaughter animals. Repeat as necessary on perspiring animals.
Stable flies		Apply as a wipe-on or spray to the legs and flanks, leaving no unprotected area.	More frequent application may be necessary if the legs are exposed to high grass or water. Repeat as necessary on perspiring animals.
Biting gnats		Apply only as a wipe-on preferably, to the head, neck, belly and forelegs. Be sure to apply the insecticide/repellent to the inside surfaces of the ears.	
Mosquitoes, *Horse flies*, *House flies*, *Deer flies*, *Horn flies*	Stirofos (Rabon) 1% + Pyrethrum + 0.09% Piperonyl Butoxide 0.18% + Repellent 1.3%	No mixing necessary. Available in ready-to-use oil base. Apply as a wipe-on or spray to evenly cover the flanks, belly, and back of the horse or pony.	More frequent applications may be necessary if the legs are exposed to high grass and water. Do not treat slaughter animals. Repeat as necessary on perspiring animals.
Face flies, *House flies*, *Stable flies*	Stirofos (Rabon) 2.0% + Pyrethrum 0.09% + Piperonyl Butoxide 0.18% + Repellent 10.0%	No mixing necessary. Available in ready-to-use gel base. Apply a thin film of the gel as a wipe-on to the head area paying particular attention to around the nostrils and eyes, however, avoid direct contact with the eye itself. For Stable Flies: Apply as a thin film to the legs and flanks leaving no unprotected area. More frequent applications may be necessary if the legs are exposed to high grass or water.	
Biting gnats	Rabon 2.0% + Pyrethrum 0.09% + Piperonyl butoxide 0.18% + Repellent 10.0%	Apply a thin film as a wipe-on to the head, neck, belly and forelegs. Be sure to apply gel both inside and outside surface of the ears.	More frequent applications may be necessary if the legs are exposed to high grass or water. Do not treat slaughter animals.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Horn flies, face flies, stable flies, deer flies, **[*3]** *mosquitoes,* and *gnats* and *punkies*	Synergized pyrethrins **[*4]** 0.05% to 0.1% + synergist 0.5% to 1%	Follow directions on container. Many ready-to-use mixtures have these ingredients. Apply 1 to 2 oz. as a fine mist with hand or automatic sprayer or as a wipe-on when pests are present. Repeat as necessary.	This chemical is very safe with normal precautions. May be available with a repellent added. Do not treat slaughter animals.
Horse flies, House flies, Stable flies, Deer flies, Gnats, Mosquitoes	Synergized Pyrethrins 0.958% MGK Repellent 326 0.998% Oil of Citronella 2.00% Crag Fly Repellent 20.00%	Before application, brush animal to remove loose dust, dirt and debris. Moisten (don't soak) a folded piece of turkish towelling (12" x 15") with solution. Rub briskly against the growth of hair, giving special attention to shanks, legs, shoulders, neck and facial area of the horse. Add more solution to toweling as needed to apply approximately two ounces daily, depending on the size of the animal, then groom with a brush (SHAKE WELL BEFORE USING)	Avoid contact with eyes, mucous membranes, and skin. Avoid using excess amounts on animals. Do not wet the hide. This product is toxic to birds and fishes. Do not contaminate water by cleaning of equipment or disposal of wastes.

EXTERNAL PARASITES OF POULTRY

CAGED LAYER TREATMENTS

Northern fowl mite only **[*3]**	Ectiban (Permethrin) 12.5Ec Permectrin 25% WP Apply as a spray	Mix 1 pint in 12.5 gal. of water. Apply 1 gal. of diluted spray material to each 100 birds. Be sure to treat vent area thoroughly.	Read label carefully. 0 days
Northern fowl mite and *lice*	Carbaryl (Sevin) 5% D Apply as a spray	No mixing is necessary. Dust birds thoroughly with shaker can or hand-operated crank duster. **[*4]** Direct dust to vent and fluff areas. Apply 1 lb. per 100 birds. Repeat in 4 weeks if necessary.	Do not apply to poultry or their premises within 7 days of slaughter. Avoid contamination of nests, eggs and feeding and watering troughs.
	Carbaryl (Sevin) 50% WP or 80% S to be diluted as indicated	To apply to birds use electric fog machine, mix 10 oz. of Sevin 50% WP or 6 oz. of Sevin 80% S in 1 gal. of water. Use 1 1/2 gal. per 1,000 hens.	
	Malathion 4% or 5% D Apply as a spray	No mixing necessary. Dust birds thoroughly with hand-operated crank duster. **[*4]** Apply 1 lb. per 100 birds.	0 days
	Malathion 5.7% S Apply as a spray	Mix 6 1/4 pt. of 57% EC or 16 lb. or 25% WP in 100 gal. of water. Spray directly on birds. Apply 1 gal. per 100 birds	
	Permectrin strips	Hang 1 strip inside cage.	Read label.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Lice, *Chicken mites*, *Northern fowl mites*	Stirofos (Rabon) 50% WP Apply as a spray	Mix 8 lb. of 50% WP Rabon EC per 100 gal. of water. Apply directly on birds, spray vent and fluff areas from below. Repeat when necessary. Treat roosters thoroughly and individually in breeding flocks.	Do not repeat more often than every 14 days. 0 days.
	Stirofos (Rabon) 23% +	Use 1 gal. of RAvap in 50	
	Dichlorvos (Vapona) 5.3% (Ravap) Dilute as indicated	gal. of water. Apply1 gal. of solution/10C birds under high pressure (no less than 100-125 psi) to the vent and fluff areas from below.	however, not more often than every 14 days. 0 days.
		LITTER TREATMENT	
Bedbugs, *fleas*, *lice*, and *mites*, including *northern fowl mites, lesser mealworms* (*Darkling beetles*)	Carbaryl (Sevin) **[*6]** 5% D	No mixing is necessary. Apply 1 lb. per 40 sq. ft.	Avoid direct contamination of eggs or nest litter. Do not contaminate feed or drinking water. Do not house birds in treated houses within 7 days of slaughter.
Fleas, *lice* and *mites*, including *northern fowl mites*.	Malathion 4% or 5% D	No mixing is necessary. Apply 1 lb. per 50 sq ft.	0 days
	Stirofos (Rabon) 50% WP (not for fleas)	No mixing is necessary. Apply 2.5 oz. per 100 sq. ft. as a dry dust. Treat evenly and thoroughly	0 days
Lice, and *mites*, including *northern fowl mites litter beetles*	Stirofos (Rabon) 0.5%	Mix 8 lb. of 50% WP or 2 gal. of 24% Rabon EC per 100 gal. of water. Apply 1 gal. per 1,000 sq. ft. Spray evenly for penetration to litter surface. Spray also thoroughly to walls, roosts, cracks, crevices, and interior.	Same as for lice above. 0 days
		SMALL FLOCKS	
Northern fowl mite, and *Lice*	Carbaryl (Sevin) 50% WP or 80% S to be diluted as directed.	To spray with a knapsack or cylinder type compressed air sprayer, mix 6 oz. of 50% WP or 4 oz. of Sevin 80% S in 5 gal. of spray. Use 1 gal. per 100 hens. Repeat in 4 wks. if necessary.	Do not apply to poultry or their premises within 7 days of slaughter. Ventilate while spraying Avoid contamination of nests, eggs and feeding and watering troughs.
Feather mite & *Lice*	Nicotine Sulphate (Black Leaf 40) 40%	Paint a thin coating on tops of roost approx. 1 hr. before roosting time. Use 1 oz. per 15 ft. of roost. Avoid strong drafts, but provide sufficient fresh air for chickens. For feather mite, paint roost three times, three days apart.	Do not use on immature chickens or mothering hens. Avoid contamination of feeding and watering troughs. Follow container direction closely. 0 days.

[*1] Do not underdose with these insecticides.
[*2] Do not contaminate feed or water with any insecticide used in poultry house.
[*3] This treatment will aid in the control of adult house flies.
[*4] Wear face mask respirator when applying any dust inside poultry house.
[*5] Do not use this product on animals simultaneously or within a few days before or after treatment with or exposure to cholinesterase inhibiting drugs, pesticides, or chemicals.
[*6] This treatment will aid in the control of the darkling beetle in the litter.

EXTERNAL PARASITES OF DOGS AND CATS

BIOLOGY AND CONTROL OF FLEAS

Due to the increased difficulty in controlling fleas, some general information on this pest is included for the concerned owner.

Fleas pass through 4 stages of development - egg, larva (maggot), pupa, and adult. The female adult lays eggs on animal or in its sleeping place. The eggs fall off the animal and within a few days, hatch into larvae. The larvae are fully grown in about 2 weeks; then they spin tiny cocoons in which they change into pupae.

The pupae change into adults in about 1 week and emerge from the cocoons.

Fleas feed on animal or human blood; they cannot breed or survive without it. Adult fleas can live several weeks without food.

Control of fleas on animals and in animal habitats is necessary to prevent infestations in homes, animal quarters, and yards. Carpets should be vacuumed and bedding should be washed frequently as long as fleas are a problem. Contents of vacuum cleaner bags must be carefully disposed of in order to prevent fleas from escaping back into a home or elsewhere.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
*Fleas** and *Ticks*	Malathion 4% or 5% D OR Malathion 57% EC Carbaryl (Sevin) 5% D	No mixing is necessary for Malathion 4% or 5% D OR Carbaryl 5% D. Use 1 oz. of 57% EC per gal. of water. Apply with shaker can or other suitable device. Repeat every 2 to 3 weeks as needed. These insecticides may also be used for treatment of kennels, beddings, and pens to aid in control of fleas and ticks. Wet animal thoroughly with Malathion EC spray. Premise spray can go to 5 oz. per gal. per 1,000 sq. ft.	Do not contaminate food or water containers. Do not use on puppies and kittens less than 4 weeks old. Insecticides other than those recommended here have label approval for control of pests on these animals; use them according to label directions.
	Chlorfenviphos (Dermaton Dip)	Thoroughly mix at the rate of 1/2 fluid once (1 tbsp.) of 24.5% with one gal. of water. Bathe or dip dog, making sure dog is thoroughly wet. Repeat treatment as necessary but not more often than once a week.	Do not use dilute emulsion which has been prepared more than 30 days. Discard and prepare fresh material. DO NOT USE DERMATON DIP ON CATS. For use by or on the order of a veterinarian.
Fleas and *Ticks*	Dibrom 7.0% Baygon 2.4% (Collar)	Place collar around animal's neck and adjust for fit. The collar must be worn loosely to permit it to move about the neck. Leave 2 or 3 inches for extra adjustment.	Collar is intended for external use only; not to be taken internally. Do not use any other pesticide while collar is worn. Do not use on animals under 3 mos. of age. Replace collar every 5 mos. or when effectiveness diminishes.
Fleas and *Ticks*	Rabon 13.7% (Collar)	Place collar around animal's neck and adjust for fit. The collar must be worn loosely to permit it to move about the neck. Leave 2 or 3 inches for extra adjustment.	Some animals may become irritate by the collar if it is applied too tightly. If this occurs loosen the collar; if irritation continues, remove the collar. Replace collar every 3 mos.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Fleas and *Ticks*	Baygon 9.4% (Collar) Sendran 4.2% (collar) Dursban 8% (collar)	Place collar around animal's neck and adjust for fit. The collar must be worn loosely to permit it to move about the neck. Leave 2 or 3 inches for extra adjustment. Effective for 5 mos.	Dust will form on this collar during storage. Do not get dust or collar in mouth, harmful if swallowed. Do not get dust in eyes. Wash hands thoroughly after handling collar. Remove collar at the first sign of irritation or adverse reaction. Not to be taken internally. Do not use on sick or convalescing animals. Do not use other pesticides while collar is worn. READ LABEL CAREFULLY.
Fleas	Vapona 18.6% (Tag)	For use on dogs weighing 50 lbs. or more. Clip tag to dog's collar.	For continuous protection replace tag every 4 mos. Not to be taken internally. Do not use on sick or convalescing dogs. Do not use on cats, whippets, or greyhounds. Do not use other pesticides while tag is worn. Remove tag if any adverse reactions are observed.
Fleas	Synergized Pyrethrins 0.159%, Petroleum Distillates 0.120% Anhydrous soap 89.0% (Soap)	Wet pet thoroughly. Apply soap and work up good lather. Let stand 5 to 10 minutes to kill fleas. Rinse	The lather of this soap cleans, grooms, and deodorizes as it kills fleas.
Fleas and *Ticks*	Rabon 3.0% D	Dust entire animal beginning at head and working back. Make sure dust gets down to the skin. Treat feet and legs. Dust bedding and living quarters. Repeat at weekly intervals if necessary.	Wash hands after use. Avoid contact with eyes. Do not contaminate water by disposal of waste.
Fleas and *Ticks*	Bioallethrin 0.100% Related compounds 0.008% MGK 264 0.135% (Shampoo)	Wet pet thoroughly. Rub shampoo into coat, starting with head. Work backward until coat is completely covered with lather. Let lather stay on 5 minutes, then rinse and towel dry. Repeat as required.	Avoid contact with eyes. In case of contact immediately flush eyes with water.
Fleas and *Ticks*	Baygon 8% EC	Mix 1/2 oz. to a quart of water or 2 oz. to a gallon of water. Use warm tap water. Sponge or sprinkle on, or dip animal until coat is thoroughly wet. Rub well into fur, between toes, and in ears. For better lasting effects do not rinse but, allow to dry naturally, then comb and brush if desired. Use once a week if needed. For faster kill of engorged female ticks on dogs, 1 oz. to a quart or 4 oz. to a gallon of water may be used.	Do not use full strength. Avoid contact with skin, eyes, or clothing. Harmful if swallowed, inhaled, or absorbed through skin. Do not treat nursing animals under 1 month of age. Do not use within two weeks on animals being treated with other insecticides including flea collars or internal organophosphate worming drugs.

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Fleas, ticks, sarcoptic mange.	Imidan 11.60% EC Aromatic petroleum solvent 72.90%	DOGS: Mix 1 oz. with 1 gal. water. Dip or sponge on solution until skin is wet. For maximum residual control, allow to dry on animal. CATS: Mix 1/2 oz. with 1 gal. water.	Retreat as necessary. But not more often than every 7 days. Do not treat dogs or cats under 8 weeks of age. Do not use on animals simultaneously or within a few days before or after treatment with or exposure to chlorinesterase inhibiting drugs, pesticides, or chemicals. Do not treat sick or debilitated animals. May be harmful if swallowed, inhaled or absorbed through skin. Do not contaminate food or feed. This product is toxic to fish and wildlife. Keep out of lakes, streams, or ponds.
Fleas and *ticks*	Carbaryl (Sevin) 0.50% MGK Repellent 110.25% (Non-aerosol spray)	Shake well. Point sprayer toward animal and pump. Apply evenly to coat (until tips of hair are moist). Ruffle long hair for spray to reach skin.	Prevent reinfestation by using on animal weekly. Use on bedding and immediate area as needed. Do not use on cats. Do not treat puppies under 4 weeks of age. Do not spray in eyes or on foods. Harmful is swallowed or inhaled.
Fleas and *ticks*	Carbaryl (Sevin) 2.50% Crag Repellent 5.00% (Non-aerosol spray)	Direct the spray from a distance of 6 to 12 inches over the animal until the entire coat is slightly damp. On a heavily coated animal, ruffle the coat and spray against the lay of the hair. For best results in controlling ticks, spray directly on the tick. Thoroughly spray interior of kennel or sleeping quarters.	Repeat treatment as necessary but not more often than once weekly. Harmful is swallowed or inhaled. Do not contaminate foods. Do not spray kittens and puppies. Do not use this product on animals simultaneously or within a few days before or after treatment with exposure to cholinesterase inhibiting drugs, pesticides, or chemicals.
Fleas, ticks and *lice*	Synergized pyrethrins 0.180% MGK Repellent 11.200% MGK 264 0.200% Petroleum distillate 0.288% (Aerosol)	Hold can upright about 10 to 12 inches from pet. Apply lightly fluffing hair to allow spray to reach skin. Dry with towel. Comb and brush coat. Use no more frequently than once a week. Kills fleas in 5 to 10 minutes. Spray ticks directly.	Contents are under pressure. Do not use near heat, or animals such as: birds and fish. Keep away from foodstuff. Do not spray in face or eyes.
	Synergized Pyrethrins 0.21% MGK 264 0.23% Marlate 0.50% MGK Repellent 11.20%	Shake gently before use. Hold can 10 inches from animal in an upright position Fluff hair for best	Contents are under pressure. Avoid heat. Avoid exposure to food or skin. Avoid heat. breathing of vapor.
	Petroleum Distillate 6.36% (Aerosol)	results. Spray all ticks individually. Rub spray into animals coat. Spray weekly or as directed by a veterinarian. Also use on bedding.	

Pests	Insecticide and Percent Dilution	How to Mix and Apply	Precautions
Fleas and *ticks*	Baygon 0.25% (Aerosol)	Hold container 6 to 10 inches from the animal and spray lightly over the entire body. Do not spray in eyes. For best penetration of spray to the skin, direct spray against the natural lay of the hair to cause fluffing of the coat. Repeat not more often than once weekly.	EXTREMELY FLAMMABLE. Avoid breathing mist. Contact with skin, eyes, or clothing should be avoided.
	Pyrethrin 0.056% Rotenone 0.024% Other cube resins 0.048% Carbaryl (Sevin) 0.500% Petroleum Distillate 0.224% (Aerosol) Dursban 0.225% (Aerosol)	Shake well before using. Always hold can upright while spraying. Spray at a distance of 8 to 12 inches from animal. Start spraying at the tail and move rapidly over the entire body. Including legs and under-belly. Fluff hair during process to penetrate to skin. Wet ticks thoroughly. Do not spray eyes, face, or scrotum, Repeat no more often than necessary.	Harmful is swallowed, inhaled, or absorbed through the skin. Wash thoroughly after using. Do not spray on birds, kittens, nursing puppies or around fish bowls.
Fleas, *Ticks*, *Mange mites*	Permethrin (Permectrin II) 10.0%	Mix 1 oz. in 3-5 gal. water. Spray, paint, or dip 1 qt. solution on large animals, 1 pt. on small animals. Retreat after 4-6 wks. or as needed.	Read label carefully.

* Collars containing dichlorvos (Vapona) in a synthetic resin have been shown to be very effective for control of fleas on dogs and cats, but they are not as effective for control of ticks.