



Texas Agricultural Extension Service  
The Texas A&M University System

# Poultry Pest Management



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# Poultry Pest Management

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## Restricted Pesticides

Under Texas' Pesticide Law, certain pesticides are restricted and can be purchased and used only by pesticide applicators and public operators who are licensed by the Texas Department of Agriculture.

Restrictions on the use of some of these pesticides require the applicator to notify the occupants of lands within 1,000 feet of the boundaries of the area to be treated at least 24 hours before the application is made. The applicator should also inform the occupants of precautions necessary for the safety of people and animals.

## Licensing

Any person who applies a pesticide on public property must be licensed by the Texas Department of Agriculture or be a trained applicator working under the supervision of a licensed applicator. This is true even if the pesticide is not restricted. For application procedures and more information, contact:

Texas Department of Agriculture  
License Section  
Box 12847  
Austin, Texas 78711  
1-800-Tell-DTA (835-5382)

Study materials to prepare for the license exam are available from the Texas Agricultural Extension Service. Call the Extension Agricultural and Environmental Safety office at (409) 845-3849.

## Rinsing Containers

Current hazardous waste regulations went into effect November 19, 1980. These regulations require that waste pesticides and empty containers of chemicals classified by EPA as hazardous waste be disposed of in a designated hazardous waste site, unless triple-rinsing and other requirements are followed by commercial pesticide applicators. Farmers or private applicators are exempt from the new regulations, providing they follow the instructions on the pesticide label when they dispose of waste pesticides and empty containers.

Triple-rinsing each emptied pesticide container and using the rinse in the tank mix whenever possible or disposing of the residue on the farm are required. Triple-rinsed containers may be recycled by the Texas country clean-up program.

## Disclaimer Clause

This publication contains pesticide recommendations that are subject to change at any time. These recommendations are provided only as a guide. It is **always** the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used.

Because labels and product registrations constantly change, some of the recommendations given in this writing may no longer be legal by the time you read them. If information in these recommendations disagrees with the label, the recommendation must be disregarded. **The label is the law.**

No endorsement is intended for products mentioned, nor is criticism meant for products not mentioned. The author and The Texas A&M University System assume no liability resulting from the use of these recommendations.

## Controlling Flies In and Around Poultry Houses

Texas ranks among the nation's leaders in caged layer egg production.

One of the largest management problems facing the poultry producer of today is filth fly control. The shift from many small farm flocks to fewer large poultry operations has greatly increased fly problems by creating concentrated breeding areas and large volumes of waste that cannot be removed frequently. As urbanization and rural non-farm residence increase, poultry producers face increasing pressures to reduce fly populations. Fly populations (manure-breeding flies) may cause a public health nuisance, resulting in poor community relations and threats of litigation. A dedicated effort is necessary to achieve an acceptable level of fly control.

Several kinds of flies are common in and around caged layer houses in Texas. Probably the most common flies are the house fly and the little house fly. About 95 percent of problems involve the house fly. Both of these flies can move up to 20 miles from the site of development, but normally no more than a mile or two from the initial source.

**House flies**, *Musca domestica* L., about 1/2 inch long, breed in moist, decaying plant material, including refuse, spilled grains, spilled feed, and in all kinds of manure. For this reason, 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 over filth, people, and food products. This fly is the most important species because it can carry and spread human and poultry diseases and cause flyspecking problems of the eggs. For example, house flies are the intermediate host for the common tapeworm in chickens, and they carry millions of bacteria.

The **little house fly**, *Fannia canicularis* (L), about 3/16 inch long, is somewhat smaller than the house fly. This fly prefers a less-moist medi-

um than the house fly for breeding and reproduction. The little house fly will choose poultry manure over most other media. This fly also 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 people 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.

The **black garbage fly**, *Ophyra aenescens* (Wiedemann), is slightly smaller than the house fly and shiny bronze-black in color. The wings are held straight back. This fly tends to stay on the food source at night rather than resting on the ceiling or on outdoor vegetation, as does the house fly. The female fly doesn't seem to fly great distances, but has been found about 5 miles from its breeding area. Although black garbage fly larvae have been known to exterminate house fly populations, they should not be considered entirely beneficial because these flies can build large populations on the farm and disperse as adults to nearby communities. All stages are found throughout the year under suitable conditions, and they show rather good tolerance to cold weather. The life cycle is similar to that of the house fly.

**Blow flies**, sometimes known as green or blue bottle flies, are slightly larger than house flies and sometimes live 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**, **small dung flies**, **fruit flies**, and **rattailed maggots**.

### Fly Biology

All flies develop through four life stages: egg, larva, pupa, and adult. Adult flies lay small, white, oval eggs on the breeding medium, and creamy white larvae (maggots) develop in this moist (wet) material. Mature maggots crawl out of this material and move to a drier place for the pupal stage. The brown, seedlike pupae finally yield adult flies. Development from egg to adult

fly may take just 7 to 10 days under ideal conditions.

Adult house flies live about 3 to 4 weeks, and females lay two to 20 batches of 75 to 200 eggs at 3- to 4-day intervals. At this rate, a pair of flies beginning operation in April, if all offspring were to live, would result in 191,010,000,000,000,000,000 (191 quintillion, 10 quadrillion) flies by August. Allowing  $\frac{1}{8}$  cubic inch to a fly, this number would cover the earth 47 feet deep. Of course, this does not happen because beneficial predators and parasites keep the populations under control.

Flies can be present in poultry houses year-round if there are warm temperatures and no true diapause.

## Cultural Control

Manure management is the most effective way to control flies. As many as 1,000 house flies can complete development in 1 pound of breeding material. Fresh poultry manure contains 75 percent to 80 percent moisture, which makes it ideal for fly breeding. You can practically eliminate fly breeding in this material by reducing the moisture content to 30 percent or less or by adding moisture to liquefy it. Drying manure is preferred because the product occupies less space and usually has less odor.

## Dry Manure Management

Frequent removal of manure (at least once a week) prevents fly breeding because it breaks the breeding life cycle. It is important to scatter the manure lightly outdoors to kill the eggs and larvae by drying. Avoid piles or clumps of manure. You must have access to enough land so the manure can be spread thinly; this keeps excessive amounts of nutrients from building up in the soil. Spread at an agronomic rate for your area.

In-house storage of manure requires drying it to a 30-percent moisture level and maintaining this level where sufficient storage space is available. Dry manure can be held for several years. Any practice that limits moisture in the droppings or aids in rapid drying is important for fly control.

## Water Management

Managing the water content of manure is important in controlling flies. Following these steps can help minimize water content:

- Prevent leaks in water troughs or cups. Regulating water flow to an on/off cycle may help eliminate moisture problems.
- Provide abundant cross-ventilation beneath cages, especially during hot weather. Using 36-inch pit fans blowing across the manure can be very effective. Placing a curtain above the manure every 100 feet helps keep air moving over the manure. Adequate house ventilation is important at all times.
- If the water table in your area is high, or if there is a danger of water running into the house from the outside, adjust the floor-grade relationship so that the house floor is higher than the outside surrounding ground. Have surface water run away from the building. Drain and fill all low areas around the houses.
- Prevent dysentery by keeping water clean. Use recommended antibiotics if dysentery develops.
- Prevent excessively high house temperatures, which encourage the chickens to drink abnormal amounts of water.
- Practice good husbandry by restricting excess water consumption, but not to the point of reducing egg lay.
- If your resources allow it, consider using a new housing system designed to dry manure in the pits.

## Sanitation

Sanitation is the most important aid in successful fly control. Often, certain conditions in and around the poultry operation will encourage fly outbreaks. These must be eliminated. Follow these steps to improve sanitation:

- Quickly remove and dispose of dead birds and broken eggs. Dispose of them far from the poultry premises by burning in an incinerator or other approved management method.

- Clean up and dispose of feed spills and manure spills, especially if wet, immediately.
- Clean out weed-choked water drainage ditches.
- Install proper eave troughs and downspouts on poultry houses to carry rain water far from buildings. Provide proper drainage in poultry yards.
- Minimize the migration of flies from other fly-infested animal operations close to the poultry house.

## Biological Control

Entomologists encourage the use of biological control in poultry houses. If you are considering biological control for your operation, be sure to purchase beneficial insects (also called “beneficials”) adapted to the climate in your area.

These fly parasites, actually very tiny wasps, are the naturally occurring enemies of manure-breeding flies. They destroy flies in the pupal stage. These wasps, *Spalangia nigroaenea*, are about the size of the head of a house fly (1/16 to 1/8 inch) and live in the manure, depositing eggs in fly pupae. Adult female wasps lay an egg on the fly pupa within the puparium (the hard case containing the pupa). Then the developing wasp larva consumes the pupa and emerges as an adult. These fly parasites are specific to flies and attack nothing else. They are biteless and stingless to people and usually go unnoticed by those living near poultry operations. They self-propagate in the process of controlling pest flies. However, mass releases are needed. Also, the wasp lays fewer eggs than the fly over the same period, making it necessary to start with an initial wasp release and follow up with weekly supplemental releases. You should make these releases before and during the fly season.

Whenever you use beneficial insects, you must be very careful with insecticides. Chemical sprays must be discontinued in areas of the poultry house where these wasps are used. And never treat the entire manure surface with insecticides, with the exception of cyromazine (Larvadex®); otherwise, beneficial insects as well as the pest flies will be killed.

To improve the chances of successful biological control with these wasps, you should also follow a strict sanitation program, involving manure management, water management, weed mowing, etc. Keep the manure dry, since wet manure promotes fly breeding and inhibits beneficial insect breeding. Also, when you clean the poultry house, leave areas of old dry manure to provide a reservoir of beneficials to repopulate the house as new flies occur.

According to the Cornell and Penn State Cooperative Extension publication, “Pest Management Recommendations for Poultry,” other beneficials in poultry manure include mites and beetles. Both are major predators in caged-layer operations. The macrochelid mite, *Macrochelis muscaedomesticae*, is reddish brown and less than 1/16 inch long. It feeds on house fly eggs and first-instar larvae. These mites, found on the outside layer of manure, can consume up to 20 house fly eggs per day. Another mite is the uropodid mite, *Fuscuropoda vegetans*, which feeds only on first-instar house fly larvae deeper in the manure.

A hister beetle, *Carcinops pumilio*, is black and about 1/8 inch long and feeds on house fly eggs and first-instar larvae. This effective beetle predator, common in both broiler and layer houses, can consume 13 to 24 house fly eggs per day. Both adult and immature hister beetles live in the surface layers of manure. Another hister beetle, *Gnathoncus nanus*, is present at lower numbers on poultry farms.

Using fly parasites for biological control in Texas would reduce chemical residues to people, birds, eggs, and the environment. However, to date, claims that wasps will provide long-term fly control have not always been backed by scientific research results. When using biological control methods, remember to manage the habitat for biological control by keeping the manure dry. Accumulations of poultry manure left undisturbed over long periods of time will support large populations of native fly parasites (wasps and mites) and fly predators (beetles). Be sure to encourage the native strains of beneficials already present in the dry manure to populate. Remove manure only during the fly-free time of the year and eliminate insecticide sprays in manure pits.

## Mechanical Control

Many types and styles of fly traps appear on the market each year. These traps are usually electrical, employing a black light with an electrically charged grid to kill the insects. Some traps are baited with a fly attractant material.

Traps do appear to be helpful in tight, enclosed areas such as egg rooms—where there is a breeding fly population, if good sanitation practices are followed. However, in areas of heavy fly populations, traps are not effective in reducing fly numbers to satisfactory levels. Use traps in the middle of the night away from doors and windows.

One 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 used alone are not effective in 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 require solid doors between the egg room or other main work area into the main poultry house.

Use sticky fly strips where appropriate.

## Surveillance

It is important to monitor fly populations to make wise control decisions. Visual observations alone can be misleading. One needs to know the fly's behavior patterns and history. Documentation is very helpful in legal defense if needed.

**Moving tape count.** This is the best surveillance method, taking about five minutes each day walking on a 1,000-foot walk to catch 25 to 75 flies. Walking down and back in each house is cheap and easy. Use the same walk pattern, the same time of day, when carrying the sticky fly tape.

**Sticky fly tapes.** Tapes that hang often tell nothing. Tapes fill up fast during summer months within a chicken house. However, one can determine fly species. Some hang sticky fly

ribbons along aisles. Captured flies are counted weekly and ribbons replaced. A weekly count of 100 flies per ribbon may indicate fly control is required. Ribbons may become ineffective after 2 to 3 days because of dust and fly covering. Tapes are messy to use and location is important.

**Speck fly count.** A 3- x 5-inch white file card fastened flush against feed troughs, ceilings, braces or other fly resting areas, left for a period of several days to a week, will provide documented evidence as to the number of "fly specks" counted on a given date, over a period of time within a given house. Place cards on head rafters (three cards per house) and count fly specks on one side. Change cards once each day or week, depending on populations present. Fifty or more spots per card per week may indicate fly-control measures are required. Place cards in the same position of each renewal. Fly species cannot be determined from the spots. The spot card method is very economical.

**Baited jug trap.** This is more expensive than other sampling methods, but offers greater sensitivity to fly population changes. A plastic milk jug, with four access holes (2 inches in diameter) around the upper part of the jug with a wire attached for hanging about 3 feet above the floor around the pit periphery, may indicate need for control. The jug is baited with a commercial fly bait (about 1 oz.) placed inside the jug bottom. Use fly pheromone muscalure (Muscamone) for effectiveness.

**Larval sampling.** It is most important to walk the pits to determine "hot spots" where the manure appears flattened and wet and contains heavy populations of fly eggs and maggots. Always take a hoe or trowel to sample the larvae present. Keep pits walkable, clean, and water-free. "Hot spots" usually appear where water was standing in the manure. Some producers may carry a knapsack sprayer to treat only the "hot spots" to halt excessive fly larval breeding. Treating manure widely and excessively will kill beneficial agents. It is best not to treat with chemicals in the manure pits. Pit manure should appear tall, narrow, capped, and dry, perhaps with beetles to assist in aerating the manure, making it drier. (Manure will cone with proper fly management.) Beneficial arthropods should

be monitored and establishment encouraged to suppress fly populations.

## Chemical Control

Insecticides should be considered supplemental to sanitation, and management measures must be directed to prevent fly breeding. Accurate records should be kept on insecticides and dosage rates used.

Resistance to insecticides has developed at different levels in various poultry house locations, depending somewhat on prior exposure. The use of a variety of different classes or families of insecticides can minimize the development of resistance. Rotate the use of organophosphate, carbamate, pyrethroid, and other classes of insecticides when necessary.

## 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 spring at the beginning of fly season. Application after manure removal will reduce fly build-up that usually follows house clean-out. A second application should be made 5 to 6 weeks later. (Two sprays are required.) 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-pressure sprays to the point of runoff at pressures of 80 to 100 pounds per square inch, using a power sprayer or good proportioned-type sprayer. Depending on the insecticide used and the type of surface sprayed, treated areas may remain toxic for 2 to 15 weeks.

Avoid contamination of feed, water, and eggs during spraying. Do not spray birds.

Any of these residual sprays are recommended:

1. Dichlorvos (Vapona®): Use 1 quart Vapona® 40.2% EC per 25 gallons of water. Apply one 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. Malathion: Use 5 tablespoons of 57% EC 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.
3. Permethrin (Atroban®): Use 6.67 ounces permethrin 25% WP per 5 to 10 gallons of water. Apply 1 gallon of finished spray per 750 feet as a coarse, wet spray. Follow label directions.

Permethrin (Insectaban®, Insectrin®, Gardstar®, Insectrin X®, Hard Hitter®): Use 1 quart 5.7% EC per 10 gallons of water or 6 ounces 25% WP per 11 gallons of water. Apply 1 gallon of finished spray per 750 square feet as a coarse, wet spray.

Permethrin (Expar®, Permaban®): Use 1 pint permethrin 11% EC to 10 gallons of water. Apply no more than once every 2 weeks. Birds do not have to be removed from the building before spraying.

4. Tetrachlorvinphos and dichlorvos (Ravap®): Use 1 gallon Ravap® 28.7% EC per 25 gallons of water. Apply 1 gallon of diluted mixture per 500 to 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying. Follow label directions.
5. Tetrachlorvinphos (Rabon®): Use 4 to 8 pounds Rabon® 50% WP per 25 gallons 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.
6. Lambda cyhalothrin (Grenade®) in a new 10% wettable powder formulation for premise treatments: Apply 2 packets (0.2 ounce) in 1 gallon of water and spray to runoff. Each gallon should treat 750 square feet.
7. Permethrin (Gardstar®) is a 40% permethrin formulation: Apply 4 oz. to 10 gallons of water. Apply 1 gallon of finished spray to 750 to 1,000 square feet.

## Portable Mechanical Foggers and Misters

It is often impractical to treat large poultry houses with residual sprays. Portable, light-weight, mechanical fogging machines are convenient, efficient, and labor-saving in caged bird operations to quickly reduce adult fly populations, providing quick fly knockdown with poor residual action. Spraying with gasoline-powered side-pack [Ultra-Low Volume (ULV)] aerosol generator, using micron-particle-size spray droplets, is a very effective contact application with little or no residual effect. Space applications should fill the room with fog or mist.

For indoor space application to kill flies, close windows and doors. Natural pyrethrins, used inside for adult fly control through a ULV machine, are easy to use at 1% pyrethrin + 5% piperonylbutoxide. The ration of 1:5 pyrethrin to P.b. is most effective on fly control. When using this equipment, adjust to deliver aerosol droplets (30 microns or less), and apply 1 ounce of pyrethrin per 1,000 cubic feet of space. Direct spray toward upper areas of room. Leave room closed for at least 1 hour. Do not remain in treated areas, and ventilate before re-entry. Repeat application as required.

To kill flies in open areas near buildings, use an outdoor ground application, preferably when the temperature is cool (75°F or less) and wind velocity is approximately 5 mph or less. Apply at the rate of 4 ounces per acre in 50-foot swaths. Allow spray drift to penetrate dense foliage. Repeat application is required.

For additional information contact The Lowndes Engineering Co., 125 Blanchard Street, Valdosta, Georgia 31601, and Clarke Mosquito Control Products, Inc., 159 N. Garden Avenue, Roselle, Illinois 60172 (1-800-323-5727). They have hand-held, backpack, 2-wheel, and 4-wheel ULV sprays for adult fly control inside the poultry house, as well as outside the building. Also, a Hudson Model 98600 Porta-Pack ULV sprayer is quite effective. *Brand names are listed for educational purposes only and must not be considered as an endorsement.* There are several brands of machines on the market, producing various particle-size sprays. Other treatments include using one pint of dichlorvos (Vapona®) 1% oil base

(ready-to-use) per 8,000 cubic feet or permethrin (Ectiban®) 5.7% undiluted at the rate of 4 fluid ounces per 1,000 square feet or 1 pint (16 ounces) permethrin (Permethrin II®) 10% EC per 8,000 cubic feet. Rinse spray equipment after application. Fly kill is good. Never retreat more than once in 2 weeks. Follow label directions and safety precautions.

## Stationary Building Atomizers

Treatments are especially useful in closed egg rooms or other work areas where there is little or no air movement. Use *pyrethrum* oil-base space spray (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 an "as-needed" basis for best fly control.

## Baits

Baits are a supplement to residual and aerosol sprays. Place baits outside cages upstairs in the high-rise house. They can be effectively applied on clean walkways by using a simple push-type Scott's fertilizer spreader. (Baits falling into the pit may destroy beneficial parasites.) These selective adulticides suppress low fly populations, maintaining them at a low level. Never apply baits where they could accidentally be eaten by the birds or mixed into feed. Dry sugar baits of methomyl (Apache®, Fatal Attraction®, Improved Golden Malrin®) are effective. To reduce potential resistance, rotate the baits. Methomyl is a carbamate insecticide, whereas other baits, wet or dry, using dichlorvos (Vapona®), trichlorfon (Dipterex®) and tetrachlorvinphos, (Rabon®) mixed with sugar are organophosphate insecticides.

## Resin Strips and Fly Belts

Ready-to-use dichlorvos (Vapona®) 20% resin strips can be used at the rate of one strip per 1,000 cubic feet of enclosed area. Strips will need to be replaced as they lose their effectiveness, or about every 3 months.

Methomyl (Golden Malrin®) fly belts can be attached to surfaces out of the 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.

Both resin strips and fly belts may become dusty and dirty if used for long periods.

## Feed Additive

An insect growth regulator known as a cyromazine (Larvadex®), when blended into a poultry feed ration, will control manure breeding flies in and around caged or slatted flooring in layer chicken operations and breeder chicken operations. Do not feed to broiler poultry. Larvadex® 1% Premix kills fly larvae before adulthood and does not adversely affect natural predators and parasites. The 1% Larvadex® Premix is blended into feed at the rate of 1 pound Premix per ton of feed. Larvadex® will provide a high degree of fly control, and a feeding program must be followed to prevent potential fly resistance. Resistant flies have developed in large poultry operations where label directions have not been followed. Never feed continuously throughout the year.

First, monitor adult flies in and near the poultry house. When the population reaches a level to cause concern, spray or fog with an adulticide such as pyrethrins to reduce the breeding potential. Spray adults for as long as possible. Then check the manure first at "hot spots" in the pits for maggot activity. If maggots are active, start Larvadex® in the ration. Feeding could begin March 15 or April 15, depending on maggot activity. Feed Larvadex® continuously as directed for 4 to 6 weeks (minimum of 4 weeks) and, if little or no maggot activity is observed in the manure, discontinue Larvadex® feeding. This is usually enough time to break the fly population life cycle. Continue monitoring manure pits and, if maggots become active again, repeat the procedure. Use baits, sprays or fogs as needed during and between Larvadex® feeding periods to control flies. Do not spray manure pits.

During winter months or periods of low fly pressure (October, November, December, January, and February), discontinue Larvadex® for at least 4 consecutive months per year.

Larvadex® use in poultry is limited to use as a feed-through 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.

Manure from animals fed Larvadex® may be used as a soil fertilizer supplement. Do not apply more than 3 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.

## Liquid Spray

Larvadex® 2SL is a soluble concentrate, which when diluted with water according to the Directions for Use acts as a larvicide to control fly species developing in poultry manure and refuse. Larvadex® controls fly infestations by breaking the life cycle at the maggot stage.

**Larvadex® is labeled for fly control in and around chicken layer and breeder operations only.**

Do not apply this product in such a manner as to directly or through spray drift expose workers or other persons, except those knowingly involved in the application.

**For Housefly, Lesser Housefly, and Soldier Fly Control in Poultry Operations, Including Layer and Breeder Chickens**

Fly control in poultry operations should include appropriate sanitary and management practices to reduce the number and size of fly breeding sites. A successful sanitary and management program may allow less than constant use of insecticides. This, in turn, should prolong the effective life of such control agents.

## Controlling Other Pests

### Arthropods

#### Northern Fowl Mite

The northern fowl mite, or feather mite, *Ornithonyssus sylviarum* (Canestrini and Fanzano), is a very important external parasite of poultry with heavy populations capable of reducing egg production 10 to 15 percent. Mites can also annoy egg handlers and other persons. Mites are often first noticed on eggs. Check for mites first on the vent, then tail, back and legs of layers. Feathers become soiled from mite eggs, cast skins, dried blood from feeding, and excrement.

The entire life cycle is completed on the bird and consists of the egg, larva, nymphal stages, and adult. The eight-legged adult is about  $\frac{1}{26}$  inch long and dark red to black in color. The entire life cycle can be completed under ideal conditions within a week.

With early detection, only some of the caged layers may need to be treated. Monitor weekly at least 10 randomly selected birds from each cage row in the entire house. Mite populations will increase in cooler weather.

## Lice

The chicken body louse, *Menacanthus stramineus* (Nitzsch), can reduce egg production in caged layer hens. The skin of infested birds becomes irritated and red, with formation of localized scabs and blood clots. In addition to feeding on skin fragments, feathers, and debris, lice can attack young quill feathers, feeding on blood. Although naturally infected with the eastern encephalomyelitis virus, it is not considered an important vector. Adult chicken lice are flat-bodied, yellowish colored, and  $\frac{1}{16}$  inch long with chewing mouthparts.

## Chicken Mite

The chicken mite, *Dermanyssus gallinae* (DeGeer), sucks blood from poultry at night and remains secluded during the day in cracks and crevices. When mites are numerous, weight gains and egg production can be reduced. These red and gray mites are difficult to see without a magnifying glass. The life cycle may be completed in 7 to 10 days during warm weather with inactivity during cold weather.

## Bed Bug

The common bed bug, *Cimex lectularius* L., occasionally attacks poultry. It hides in cracks within the housing during the day and feeds mostly at night on blood while the host is asleep, causing small, hard, swollen, white welts that become inflamed and itch severely. It is rarely seen on poultry during daylight hours. An infestation can sometimes be recognized by blood stains and dark spots of excreta. The adult is reddish-brown, oval-shaped, flattened and about  $\frac{1}{4}$  to  $\frac{5}{8}$  inch long. There may be three or more generations per year. There is no evidence that they spread disease.

## Flea

Occasionally the flea is found in the poultry house. It is usually first noticed in the litter where a wide range of hosts are attacked, including rats, mice, chickens, humans, etc. Bites annoying egg handlers occur primarily on the ankles and legs, causing a raised (swollen) itching spot. The adult flea, an excellent jumper, passes through a complete life cycle consisting of egg, larva, pupa and adult. The life cycle varies from 2 weeks to 8 months depending on temperature, humidity, food and species. The most common flea found in Texas is the cat flea, *Ctenocephalides felis* (Bouche). The adult is  $\frac{1}{16}$  to  $\frac{1}{8}$  inch long, dark reddish-brown, wingless, hard-bodied; has three pairs of legs; and is flattened vertically (bluegill fishlike).

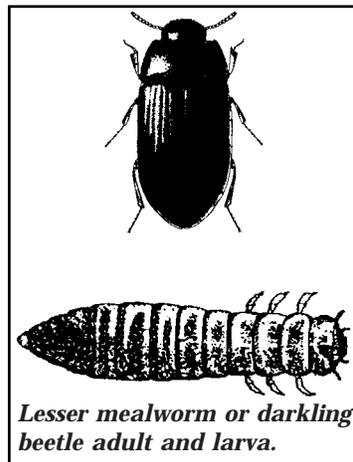
## Darkling Beetle

The darkling beetle or lesser mealworm, *Alphitobius diaperinus* (Panzer), is rapidly becoming more of a nuisance in the poultry operation. Large populations of beetles sometimes migrate into nearby residence areas, especially during litter clean-out time. Although beetles can fly up to a mile, most crawl at night from litter disposed in neighboring fields and homes.

Beetles are frequently associated with poultry feed, preferring grain and cereal products that are damp, moldy, and slightly out of condition. Both adults and larvae consume poultry feed in amounts costly to the producer. Larvae are known as lesser mealworms.

Increased importance has been placed on control of this beetle. Both adult beetles and larvae act as reservoirs for many poultry pathogens and parasites.

Scientists have been able to transmit the causative agent of acute leukosis (Marek's disease) in chickens with this beetle. Positive confirmation of the transmission has been made under both laboratory and field research conditions.



Lesser mealworm or darkling beetle adult and larva.

Marek's disease usually affects birds between 3 and 4 months old. Symptoms are characterized by various degrees of paralysis, most easily observed in legs and wings. Droopy wings, gasping, loss of weight, pallor, and sometimes diarrhea are also symptoms. Birds severely affected may be found lying on their sides with one leg stretched forward and the other held behind. The disease affects both broiler and egg-laying types of poultry. Losses can reach 2 percent of the flock per day, and mortality 30 percent of the flock within a few weeks.

Acute leukosis is highly contagious and has been shown to be airborne. Contamination may persist in the environment because the darkling beetle may serve as a reservoir for residual contamination. Other diseases spread include the causative agents of avian influenza, salmonella, fowl pox, coccidiosis, botulism, and newcastle disease. They also act as vectors of cecal worms and avian tapeworms.

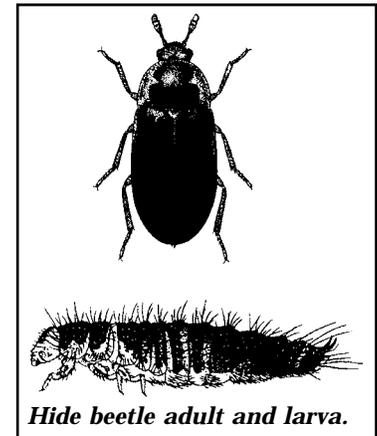
In the poultry house, the beetle can lay up to 800 eggs in litter during a 42-day period. Eggs develop into larvae in 4 to 7 days. The life cycle requires about 42 to 97 days, depending on temperature. Beetles live up to 3 months to a year. Adults are black or very dark reddish-brown, and about 1/4 inch long. Larvae are yellowish-brown (wireworm-like), up to 3/4 inch long, and accumulate in dark corners of manure or litter, especially under sacks, in bins, or in places where feed is stored. Pupation occurs in the litter, soil, and side walls of poultry houses. They migrate frequently throughout the litter, generally coming in soil contact.

Adult chickens and chicks are more likely than poults or turkeys to eat beetles and their larvae. Consumption of beetles and larvae, rather than providing "extra protein" in the diet, actually has a negative effect on feed conversion and rate of gain, according to research.

## Hide Beetle

Mature larvae of the hide beetle, *Dermestes maculatus* (DeGeer), have the habit of boring into various hard surfaces to pupate, usually preferring softwoods. Some may climb 24 to 36 feet and bore into wood posts, studs, and rafters, seriously weakening and "honey-combing" these structures. Larvae are especially trou-

blesome in poultry houses, damaging yellow pine, foam insulation, styrofoam air baffle boards, paneling, drywall, and even PCP (Penta Ready) chemically treated wood, in some cases. Larvae emerge from the litter, climb the walls, and bore into soft building material, often escaping cannibalism during the pupation period. Hide beetles are larger than darkling beetles, about 1/3 inch long, dark brown on top, with a mostly white undersurface (belly). Each female lays about 135 eggs, which hatch in 12 or more days. The life cycle requires 40 to 50 days. Larvae are thickly covered with long, brown hairs, grow to about 1/2 inch long, and have two spines on top near the tail end, which curve forward. Reasonable control has been achieved by applying tetrachlorvinphos (Rabon®) 50% WP in the dry form to building walls. Make treatments with an electrostatic duster to negatively charge the particles, providing better adhesion to the wall surface. A distributor for the duster (model DM-9) is Echo Inc., 3150 MacArthur Blvd., Northbrook, Illinois 60062. Hide beetles can be killed with a 1.35% pyrethrin residual emulsion concentrate.



Hide beetle adult and larva.

## Scaly-leg Mite, *Knemidocoptes mutans* (Robin and Lanquentin)

The female is small with a round body and short, stubby legs. These mites must be magnified to be seen, because they are only 1/50- to 1/100-inch long. Young mites are at first six-legged, then metamorphize through two eight-legged nymphal stages.

**Distribution and hosts.** The scaly-leg mite is distributed widely throughout the world, but its exact range in Texas is unknown.

This mite attacks poultry, commonly chickens and turkeys. The scaly-leg mite also has been reported on pheasants, partridges, bullfinches, gold finches, and many passerine birds. Researchers suspect that wild birds transmit the mites to domestic flocks.

**Life history and habits.** Little is known about the life history and habits of this species. Females burrow under scales on the feet and legs of poultry and deposit eggs. They begin laying a short time after they burrow under the skin and continue to oviposit for about 2 months. Eggs hatch in about 5 days into six-legged larvae that soon molt into nymphs. Nymphs develop into mature males and immature females. The immature female transforms into a mature egg-laying female shortly after she is fertilized. The cycle to egg-laying female probably requires 10 to 14 days.

**Importance and nature of damage.** Burrowing beneath scales on feet and legs results in a powdery material that accumulates and binds into a scab of serum discharge. Affected feet and legs usually have red blotches. Glands in the mouthparts of mites may secrete an irritating fluid that causes the discharge and blotches. Eventually, the feet and legs may be covered with these crusts or scabs. Mites remain beneath the crusts in small oval vesicles. Irritation from mite infestation causes poultry to pick at the crusty formations. As formations extend over the feet and legs, they interfere with joint flexion and cause lameness. Severe infestations may cause loss of toes, loss of appetite, lowered egg production, emaciation, and death.

### Depluming Mite, *Neocnemidocoptes laevis gallinae* var. *gallinae* (Railliet)

This mite is similar to the scaly-leg mite, but is smaller and more oval.

**Distribution and hosts.** Infestation occurs throughout the United States. Hosts include pigeons, pheasants, geese, canaries, and chickens. Many wild birds have been infested with this species or with closely related, unidentified species.

**Life history and habits.** Development stages include egg, larva, nymph, male adult, and immature and mature female adult. Little is known about the life history of this species, but researchers believe transformation from immature to mature female occurs after fertilization. The fertilized female begins depositing eggs within a few hours after starting to burrow and continues at 2- or 3-day intervals for about 2 months. Eggs hatch in about 5 days. The cycle

from egg to egg-laying female requires 10 to 14 days. Less than 10 percent of the eggs mature into adults.

**Importance and nature of damage.** The depluming mite burrows into skin at the base of the feathers on the back, on the top of the wings, around the vent and on the breast and thighs. It causes intensive itching, often resulting in feather pulling. Fowls may lose feathers over large areas of the body. Infestations, especially noticeable in spring and summer, may disappear in autumn.

### Miscellaneous Pests

#### **Chigger, *Trombicula* (*Eutrombicula*) *splendens* (Ewing), *T. alfreddugesi* (Oudemans), *T. batatas* (Linne)**

Chiggers also are known as red bugs, jiggers, and harvest mites, and by other common names. Adults usually are covered with dense, feathered hairs that give them a velvety appearance. They are often bright red with a figure-eight-shaped body about 1 millimeter long. The parasitic larvae are about  $\frac{1}{150}$  inch long, reddish or straw-colored, and not as densely covered with feathered hairs as the adult. Larvae are barely visible to the naked eye. More than 700 species are known, but only three or four are important parasites in the United States.

*T. splendens* is not as widely distributed as *T. alfreddugesi*, but their ranges frequently overlap. It is confined primarily to the eastern half of the United States but ranges into Texas. It prefers more moist habitations than the common chigger (*T. alfreddugesi*), such as swamps, bogs, and rotten logs. Its season pattern is also similar to *T. alfreddugesi*. This species feeds on mammals, birds, reptiles, and amphibians, but reptiles, especially snakes and turtles, appear to be the most common natural hosts.

*T. alfreddugesi* is the most common and widespread species in the United States. It ranges from New England and eastern Canada, west of Nebraska to California, south to Florida and Texas and extends into Mexico, Central and South America, and West Indies. Larvae are most abundant in transitional areas between forests and grasslands and along the margins of swamps. Berry patches and thickets are favored, but chiggers have been collected in most habi-

tats. Larvae are active in the north from July to September, but in southern semi-tropical areas may be encountered throughout the year. This species is found on a variety of hosts including humans, fowls, reptiles, amphibians, and mammals.

*T. batatas* exists primarily in tropical areas and ranges from the United States to Brazil. It prefers open, sunlit, grassy areas, especially where domestic animals are kept, but is not abundant in jungles or wooded areas. It attacks human beings, domestic animals and poultry, but ground-inhabiting birds seem to be preferred hosts.

### ***Neoschongastia americana americana* (Hirst)**

The range of this chigger extends across the southern states from the Carolinas to California. It is more abundant in areas with hard soils that crack open during hot, dry summers and in areas where rock outcroppings occur. Populations begin to increase in late April or May, peak in June, and decline in late July or August. There may be an increase in September or October, and by late October or November it disappears from the host. Domestic hosts are turkeys and chickens. Wild hosts include quail, woodpeckers and other wild birds.

Chiggers differ from other mites in their life cycle. The life cycle of most chiggers includes these developmental stages: egg, deutovum (larvae enclosed in a membrane in addition to the eggshell); larval, nymphochrysalis (quiescent stage that transforms to the nymph); nymphal, imago chrysalis (quiescent stage that transforms into the adult); and the adult stage. Eggs usually are deposited singly in the soil. After a 4- to 6-day incubation period, eggs hatch into the deutovum, which remains in the eggshell fragments for about a week before the six-legged larva emerges. Larvae crawl around rapidly in search of a host and may survive 2 weeks or more without one. The larval chigger usually feeds only once. It most often completes feeding in 1 to 4 days, but in some instances may require up to a month. When feeding is complete, larvae drop to the ground, burrow into upper layers of the soil and become quiescent. Within the larval skin the nymphochrysalis develops and, about a week later, the eight-legged nymph emerges.

The nymph is larger, has a figure-eight-shaped body, and is more hairy than the larva. It probably feeds on insect eggs and early stages of other arthropods.

After about a week, nymphs enter a quiescent stage, the nymphochrysalis, and emerge as adults in another week. Adults are larger, hairier, and sexually mature. The sexes are similar in size and appearance, but the appearance of the genital opening differs. They have essentially the same feeding habits as nymphs. Adults are ready to deposit eggs within a week and egg laying continues for several weeks, probably as long as favorable conditions exist. Under laboratory conditions, observers have counted as many as 4,764 eggs deposited from a single female within 23 days.

The minimum time for a complete cycle of the common chigger, *T. alfreddugesi*, is 55 days; for *T. splendens*, 50 days; and for *T. batatas*, 71 days. The time required to complete the life cycle depends on the species, soil, temperature, humidity, and food availability. From the three species noted above, the minimum time required to complete the life cycle appears to be about 2 months, but under adverse conditions 12 months may be required. Number of generations per year varies from one to three in the temperate zones to continuous breeding in the tropics. In temperate zones, hibernation probably occurs during the adult stage.

*Neoschongastia americana americana* is the most abundant external parasite on turkeys grown on ranges with rocky outcroppings or hard soils that crack during summer when they become dry. Chiggers feed in clusters on the thigh, breast, and underside of wings, and around the vent. These clusters cause scabby lesions that require about 3 weeks to heal after engorged chiggers leave the host. These lesions and scabs result in downgrading of turkeys, a loss that may average more than \$1 per bird.

Chiggers normally do not burrow into the skin or suck blood. When the chigger is firmly attached, it injects a digestive enzyme into the wound that liquefies host tissue. It sucks up the partially digested, liquefied host tissue, leaving a tube called a "stylostome." The digestive enzyme that hydrolyzes the host's tissues is probably responsible for the severe irritation and raised

bump that results from chigger “tubes.” The larval stage is the only parasitic stage in the chigger life cycle.

## Gnat

Several kinds of gnats attack poultry, including black flies, buffalo gnats, and turkey gnats. The most common is the turkey gnat, *Simulium* spp., a vector of leucocytozoan parasites that cause a malaria-like disease in turkeys and ducks.

Eggs are deposited on objects on the surface of, or in, flowing water, usually at the edge. The eggs must be kept wet or submerged to hatch into larvae in 2 to 12 days. Larvae develop in water 1 to 6 weeks before transforming into pupae. Adults emerge after a 4- to 15-day pupal period. Southern buffalo gnats appear during the first warm period of late winter or early spring. The turkey gnat usually appears later in spring.

## Sticktight or Southern Chicken Flea

This flea, *Echidnophaga gallinacea* (Westw.), is found in the southern United States from South Carolina to California. It attacks poultry, cats, dogs, horses, and humans.

Adult males and females are found on the heads of fowl. Females remain attached by their mouthparts in the same spot as long as 2 or 3 weeks. During this time, eggs are laid, being thrown with considerable force from the female’s vagina. Eggs hatch on the ground in 2 days to 2 weeks. The slender white larvae feed on excreta of the adult fleas, filth in cracks, or litter on the poultry house floor or on the ground in dry, protected places. After growing 2 weeks to 1 month, they spin silken cocoons and change to the pupal stage. Adults attach to the host in about a week and females feed approximately 1 week before females begin laying eggs. One to five eggs are laid at one time. The life cycle may be completed in 1 to 2 months. This pest thrives in dry, cool weather, and under these conditions adults may live several months.

In the South and Southwest, fleas sometimes embed themselves in clusters about the face, eyes, ear lobes, comb, and wattles of poultry so that they cannot be brushed off. Young fowls are

often killed; egg production and growth are reduced by loss of blood and irritation caused by bites.

## Boric Acid

A new insecticide labeled for control of darkling beetles, hide beetles and flies, known as orthoboric acid (SafeCide®), provides long residual control up to 9 to 12 months or longer. Both adult beetles and larvae are killed by contact or ingestion.

Usually a quick-kill insecticide is used prior to SafeCide® to kill beetles away from the litter. A 99% IC and/or 30% bait formulation is applied directly to the manure. For poultry houses where birds are grown on litter, remove birds before applying the bait uniformly to the floor or to old litter by fertilizer or seed spreader at the rate of 1 to 2 pounds per 100 square feet, in bands along feeder lines. Spread fresh litter at least 4 inches uniformly over all treated areas (floor or old litter), then introduce birds. Reapply after each grow-out, if needed.

For poultry houses in which birds are grown in cages (layer or high-rise “pit type” houses), birds do not have to be removed prior to application of bait.

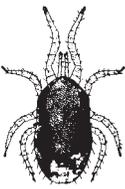
For control of beetle adults and larvae in poultry houses using SafeCide IC, remove birds before dry and wet applications. Use 1 to 2 pounds for each 100 square feet of treated surface for dry application, dusting side walls, top plates, posts and framing. For wet application, mix dust at the rate of 1 to 2 pounds per 3 gallons of water to apply over 100 square feet of treated surface.

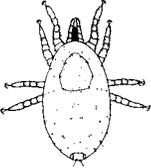
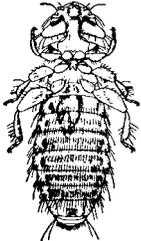
## Resistance

House fly resistance is genetic in nature, developing more quickly under heavy doses of pesticide or very frequent application. Insects resistant to one insecticide can be cross-resistant to other insecticides of the same class or even having a similar mode of action. The only proven solution to resistance problems is to rotate the use of different classes of insecticides.

## Chemical Class or Family

Boron Compound	dimethoate (Cygon, Residual Fly Spray)
boric acid (SafeCide)	malathion
	tetrachlorvinphos (Rabon)
Botanical	tetrachlorvinphos & dichlorvos (Ravap)
	pyrethrins tetrachlorfon (Dipterex)
Carbamate	Pyrethroid
carbaryl (Sevin)	cyfluthrin (Tempo)
methomyl (Apache, Improved Golden Malrin, Fatal Attraction)	permethrin (Atroban, Expar, Insectaban, Insectrin, Gardstar, Insectrin X, Permethrin II, Hard Hitter)
Organophosphate	lambda-cyhalothrin
coumaphos (Co-Ral)	Triazine
dichlorvos (Vapona)	Cyromazine (Larvadex)

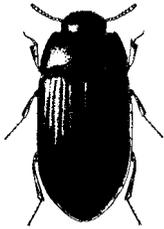
Pests	Material and Formulation	Mixing Directions	Amount Per Bird or Area if Appropriate	Days to Slaughter	Application and Remarks
Mist Sprays					
Chicken Mites	carbaryl (Sevin) 50% WP	10 fl. oz. per gals. water	1 1/2 gals. per 1,000 birds	7	Repeat treatment in four weeks if needed. Ventilate while spraying.
Lice	80% S	6 fl. oz. per gal. water		7	Do not spray nests, eggs, feed or water.
Northern Fowl Mites (Bird Treatment)	4F (43% suspension)	10 fl. oz. per gal. water		7	Do not treat within 10 days of vaccination or other stress influence.
	trachlorvinphos and dichlorvos (Ravap) 2.7% EC	1 pint per 6 gals. water	1 gal. per 100 birds or 1 fl. oz. per bird	0	For cage birds, spray no less than 100 to 125 psi to the vent area from below (high pressure). For floor birds, spray lightly. Do not treat more often than every 14 days.
	tetrachlorvinphos (Rabon) 50% WP	2 lbs. per 25 gals. water	1 gal. per 100 birds 1 fl. oz. per bird	0	For cage birds, spray no less than 100 to 125 psi to the vent area from below (high pressure). For floor birds, spray lightly. Do not treat more often than every 14 days.
Coarse Sprays					
	carbaryl (Sevin) 50% WP	6 fl. oz. per 5 gals. water	1 gal. per 100 birds	7	Repeat treatment in four weeks if needed. Ventilate while spraying.
	80% S	4 fl. oz. per 5 gals. water		7	Do not spray nests, eggs feed or water. Do not treat within 10 days of vaccination or other stress influence.
	4F	6 fl. oz. per 5 gals. Water		7	
Dusts					
	carbaryl (Sevin)	Ready to use	1 lb. per 100 birds	7	Use rotary or other duster. Do not treat birds more often than once every four weeks. Do not treat nests, eggs, feed or water.
Dust Boxes					
	carbaryl (Sevin) 5% Dust	Ready to use	2.5 lbs. per box 1 box per 50 birds	7	Mix dust evenly throughout top layer of box contents.
	tetrachlorvinphos (Rabon)	Ready to use	2.5 lbs. per box	7	Mix dust evenly throughout top layer of box contents.

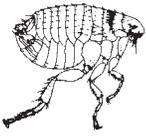
Pests	Material and Formulation	Mixing Directions	Amount Per Bird of Area if Appropriate	Days to Slaughter	Application and Remarks
Mist Sprays					
Northern Fowl Mites (Bird Treatment)	permethrin (Insectrin X, Permethrin II) 10%	1 qt. per 50 gals. water	1 to 2 fl. oz. per bird	0	Aim spray at the vent area. Cover or remove feed and water. Can spray cages or nests. Do not treat more often than once every two weeks.
	Coarse Sprays				
	permethrin (Atroban, Expar) 11% EC	1 qt. per 25 gals. water	1 to 2 fl. oz. per bird	0	Pay particular attention to vent. One application should eliminate an infestation.
	(Insectrin) 5.7% EC	1 qt. per 25 gals. water		0	
	(Permethrin) 25% WP	6 oz. per 11 gals. water	1 to 2 fl. oz. per bird	0	
Dusts					
Lice	permethrin (Insectrin GP, Permethrin) 0.25% Dust	Ready to use	1 lb. per 100 birds	0	Apply with shaker or hand duster. Treat vent area thoroughly.
Northern Fowl Mites (Bird Treatment)					
Sprays					
Chicken Mites	permethrin (Permethrin) 25% WP	6 fl. oz. per 34 gals. water	1 gal. per 750 sq. ft.	0	Spray ceilings, walls, empty cages or nests to runoff. Repeat in 7 to 10 weeks or as needed.
Lice					
Northern Fowl Mites (House and Litter Treatment)	tetrachlorvinphos and dichlorvos (Ravap) 28.7% EC	2 qts. per 24 gals. water	1 to 2 gals. per 1,000 sq. ft.	0	Apply thoroughly to litter, walls, roosts, cracks and crevices.
	tetrachlorvinphos (Rabon) 50% WP	2 lbs. per 25 gals. water	1 to 2 gals. per 100 sq. ft.	0	Apply thoroughly to litter, walls, roosts, cracks, crevices, and interiors.
	Carbaryl (Sevin) 50% WP	2 lbs. per 25 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	Do not treat poultry or game birds. Apply spray to wall, litter or roost surface.
	80% S	1 lbs. per 25 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	Force spray into cracks. Repeat as needed. Avoid contamination of nests, eggs, and feeding and watering troughs. Ventilate while spraying.
	4F (43% suspension)	4 qts. per 100 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	
	XLR (56.6% suspension)	4 qts. per 100 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	
Dusts					
	carbaryl (Sevin) 5% Dust	Ready to use	1 lb. per 40 sq. ft.	7	Treat litter evenly and repeat in 28 days if needed. Do not contaminate feed and water.

Pests	Material and Formulation	Mixing Directions	Amount Per Bird of Area if Appropriate	Days to Slaughter	Application and Remarks
	tetrachlorvinphos (Rabon) 50% WP 3% D	Ready to Use	2.5 fl. oz. 50% WP or 2 lb. 3% D per 100 sq. ft.	0	Treat litter thoroughly and evenly.
Roost Paints					
	tetrachlorvinphos and dichlorvos (Ravap) 28.7% EC	1 gal. per 25 gals. water	1 pt. per 100 ft. of roost	0	Spray or treat by brush (thoroughly), especially cracks and crevices.
	tetrachlorvinphos (Rabon) 50% WP	4 lbs. per 25 gals. water	1 pt. per 100 ft. of roost	0	Treat by brush (thoroughly), especially cracks and crevices.
Sprays					
Northern Fowl Mites Cockroaches Mosquitoes (House and Litter Treatment)	Permethrin (Insectrin X, Permethrin II) 10%	1 qt. per 25 to 50 gals. water	1 gal. Per 1,000 sq. ft.	0	Spray to the point of run-off. Cover birds, feed and water. Do not treat more often than once every 2 weeks.
Sprays					
Chicken Mites	carbaryl (Sevin) 50% WP	2 lbs. per 25 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	Repeat treatment in four weeks as needed. Ventilate while spraying. Treat walls, bedding, litter and roost surfaces. Force spray into cracks and crevices.
	80% S	1 lbs. per 25 gals. water		7	
	4F (43% suspension)	1 qt. per 25 gals. water		7	
	tetrachlorvinphos and (Ravap) 28.7% EC	2 qts. per 24 gals. water	1 gal. per 100 birds or 1 oz.	0	
	tetrachlorvinphos (Rabon) 50% WP	2 lbs. per 25 gals. water	1 gal. per 100 birds or 1 oz. per bird	0	
Sprays					
Bed Bugs	carbaryl (Sevin) 50% WP	2 lbs. per 25 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	Thoroughly spray walls bedding, litter and roost surfaces. Force spray into cracks and crevices. Ventilate while spraying. Do not apply directly to poultry, nests or eggs. Repeat as needed.
	80% S	1 lbs. per 25 gals. water		7	



Pests	Material and Formulation	Mixing Directions	Amount Per Bird of Area if Appropriate	Days to Slaughter	Application and Remarks
Bed Bugs (continued)	Sprays				
	4F (43% suspension)	4 qts. per 100 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	Ventilate while spraying litter surface. Repeat as needed.
	XLR (56.6% suspension)	4 qts. per 100 gals. water	1 to 2 gals. per 1,000 sq. ft.	7	Ventilate while spraying litter surface. Repeat as needed.
Dusts					
	carbaryl (Sevin) 5% Dust	Ready to use	1 lb. per 40 sq. ft.	7	Apply evenly to litter and repeat treatment in 28 days if needed. Do not treat feed, water, nests, or eggs.
Darkling Beetle (Lesser Mealworm)	Sprays				
	carbaryl (Sevin) 4F (43% suspension)	50 qts. per 100 gals. water	2 gals. per 1,000 sq. ft.	7	Ventilate while spraying litter surface. Repeat as needed.
	XLR (56.6% suspension)	50 qts. per 100 gals. water	2 gals. per 1,000 sq. ft.	7	Ventilate while spraying litter surface. Repeat as needed.
	tetrachlorvinphos (Rabon) 50% WP	2 lbs. per 25 gals. water	1 to 2 gals. per 100 sq. ft.	0	Apply thoroughly to litter, walls, roosts, cracks, crevices and interiors.
	Dusts				
		carbaryl (Sevin) 5% Dust	Ready to use	1 lb. per 40 sq. ft.	7
	cyfluthrin (Tempo) 20% WP	Ready to use	19 grams per 1,000 sq. ft.	0	Apply Tempo 20 WP to litter, walls and center posts inside the house. Best control will be obtained when application is made shortly after bird removal because larvae and adults begin to burrow deeper into the litter as surface temperatures begin to cool, making control more difficult. Use a properly calibrated air blast, boom or power handgun sprayer to achieve full coverage. Treat only when no birds are present.
	tetrachlorvinphos (Rabon) 50% WP	Ready to use	0.75 fl. oz. per 100 sq. ft.	0	Treat litter evenly and thoroughly.



Pests	Material and Formulation	Mixing Directions	Amount Per Bird of Area if Appropriate	Days to Slaughter	Application and Remarks
Darkling Beetle (continued) (Lesser Mealworm)	carbaryl (Sevin)	Ready to use	Baits 24 oz. per 1,000 sq. ft.	0	Spread evenly before new litter is applied or on top of built-up litter. Birds do not have to be removed during application. Optimum treatment is 10 to 14 days after birds are placed in the house. Repeat treatment two weeks later if needed. Follow label directions.
Fleas 	carbaryl (Sevin) 5%	Ready to use	1 lb. per 100 birds	7	Do not treat birds more often than once every four weeks. Do not treat eggs, feed or water.
	5%	Ready to use	1 lb. per 40 sq. ft.	7	Apply evenly to litter and repeat treatment in 28 days if needed. Do not treat feed, water, nests or eggs.
	10%	Ready to use	1/2 lb. per 40 sq. ft.	7	

## Controlling Rodents

It is unusual to find a poultry farm that does not have at least a few rats or mice, and, more often than not, the population is much larger than suspected. In addition to eating and contaminating a great deal of food, rodents do considerable damage to buildings. They undermine foundations, destroy curtains and insulation, damage equipment, and cause fires by gnawing electrical wiring. In rare cases, rats have been known to kill poult and young chickens. Finally, since they are able to carry a variety of diseases and ectoparasites, rodents can affect flock health and performance.

### Identification

Two species of rodent, the Norway rat and the house mouse, are common pests on most poultry farms (Figure 1). The following descriptions provide information on their biology and behavior that is useful in their managing these pests:

### Norway Rat (*Rattus norvegicus*)

Adults are up to 46 cm (18 inches) long from head to tail. The tail is hairless and shorter than the body; the fur is reddish, grayish brown, or black with the underside gray or yellowish white. (Varicolored forms may occur.) Common names are brown rat, house rat, barn rat, sewer rat, and wharf rat.

- Rats burrow under and along foundations and feed bins, and in secluded spots near poultry houses (fields, trash piles, and banks of ditches and lagoons). They may also burrow into manure under slats or cages. Their burrows are large, often with conspicuous piles of dirt nearby.
- They are active at night. If they are seen above ground during the daytime, it indicates a large population.
- Capsule-shaped droppings about 13 mm (1/2 inch) long may be seen along walls and areas where rats move or congregate.

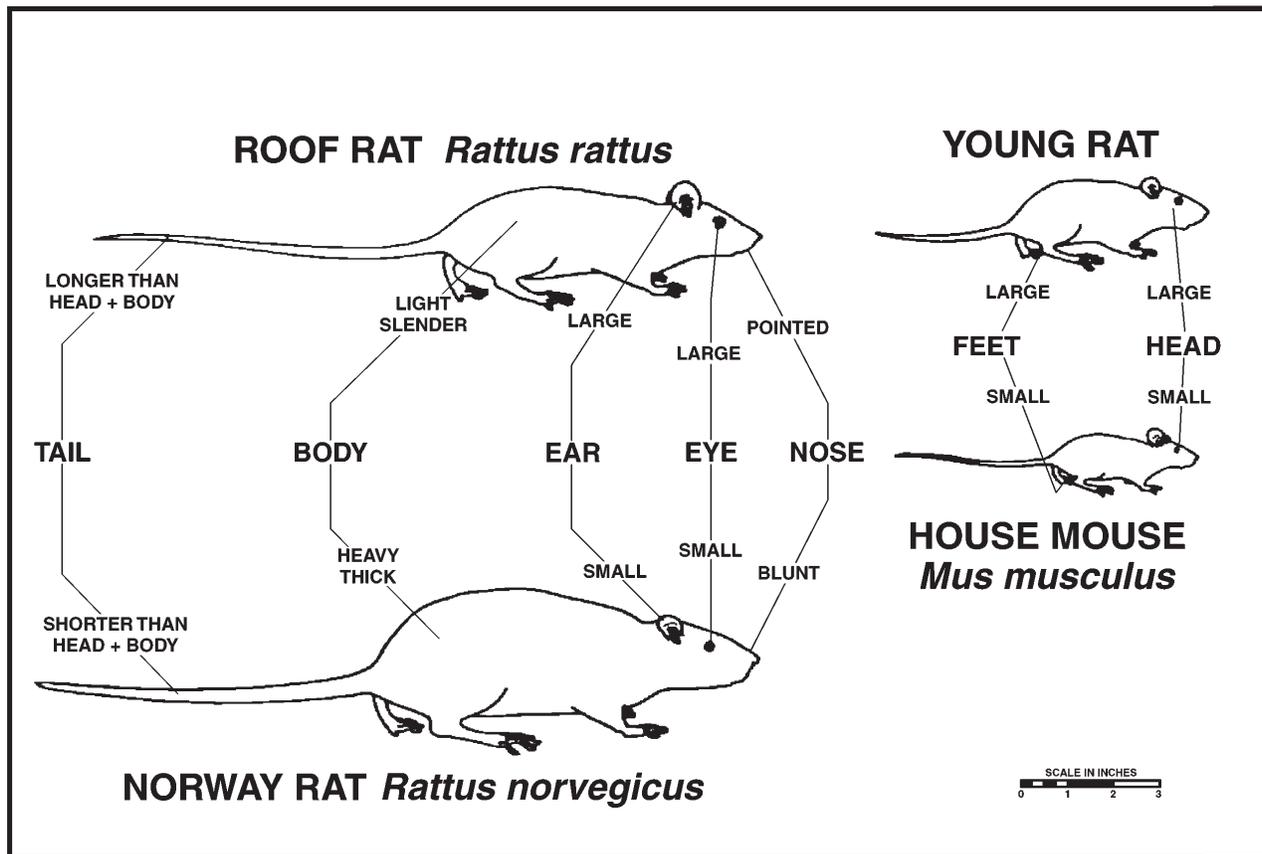


Figure 1. Norway rat, roof rat, young rat, and house mouse.

- Rats prefer fresh food when available.
- They are cautious. They may not take baits immediately unless placed directly in their path. They may pass up baits even when correctly placed if a better food source is readily available.
- They are excellent climbers, able to enter buildings by a variety of routes.

- Droppings are smooth and about 6 mm (1/4 inch) long. They may be seen along interior walls, on sills, and in secluded areas where mice move and congregate.
- Mice are very curious and will investigate bait stations and bait placed in their path.
- They are excellent climbers, able to enter buildings by a variety of routes.

### House Mouse (*Mus musculus*)

Adults are between 13 and 18 cm (5 and 7 inches) long from nose to tail. Their hairless tail is as long as their body. They have light brown to black fur with a white underside.

- Mouse burrows are small, ranging from 6 to 13 mm (1/4 to 1/2 inch) in diameter. They are found along foundations, under boards, near feed bins, in manure under slats and cages, and in other similar areas. They also nest in walls, ceilings, and curtains left down for extended periods.
- Mice feed throughout the day, with greatest activity at dawn and sunset.

### Rodent Biology

In general, rodents have three basic requirements: **food** (Figure 2), **water**, and **harborage** (places to hide and nest; Figure 3). If one or more of these items is missing from the area, rodent populations will remain low. Unfortunately, all three are usually abundant in and around poultry houses.

An adult rat eats about 1 to 2 ounces of food each day, whereas a mouse will eat far less, about 0.1 ounce per day. Individually, this is not a lot of feed, but a large population can account for several tons of food each year.

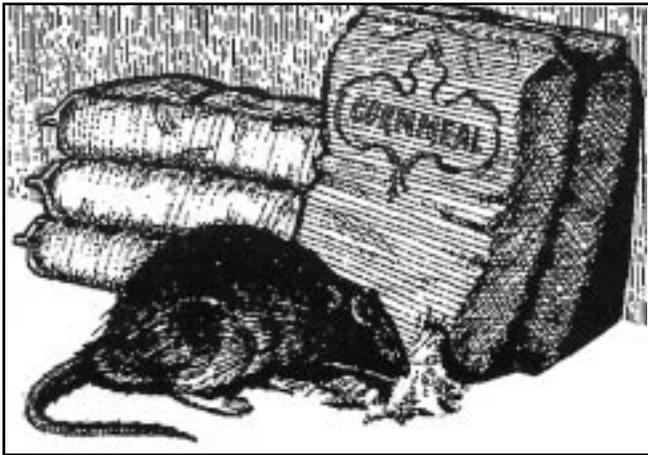


Figure 2. Rodent food.

Although both rats and mice need water to survive, mice are often able to get what little moisture they need from the food they eat. This ability allows them to nest and feed in locations where water is not abundant. Rats are not so adaptable. They cannot extract enough moisture from their food and must be relatively close to a source of water.

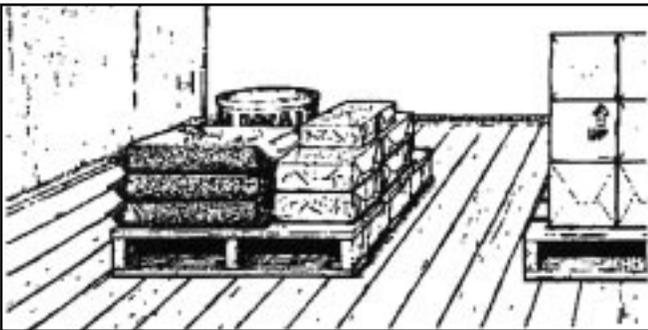


Figure 3. Rodent harborage.

Rats and mice are both burrowing animals, but mice also build nests above ground in hidden, secluded areas such as walls and ceilings. Rats, on the other hand, generally nest almost exclusively underground and come out only to find food or water.

The reproductive capacity of rats and mice is quite high. Both breed throughout the year, producing 4 to 8 litters annually. Rats are sexually mature at 3 to 5 months of age and have 6 to 12 young per litter. Mice reproduce when younger (1 to 2 months) and deliver 5 to 6 young per litter. Based on reproductive potential alone, a single pair of rats could produce 1,500 offspring in a single year. Fortunately, other factors such as predation, food availability, and population den-

sity limit reproduction and survival in nature. Even so, rat and mouse numbers can rise quickly if ignored.

## Control

Three elements make up a good rodent management program: **sanitation**, **rodent proofing**, and **rodent killing** (Figure 4). Sanitation and rodent proofing, the first lines of defense, include a number of cultural practices easily incorporated into the overall management of the poultry farm.

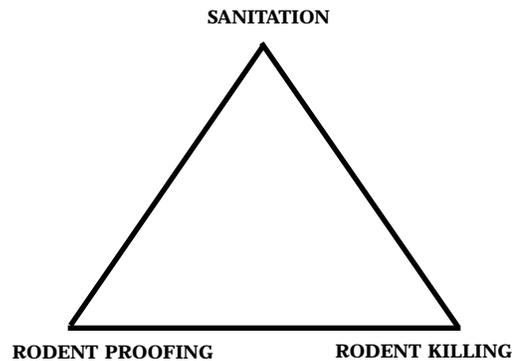


Figure 4. Three aspects of rodent control.

Successful management of rodent infestations also involves some method of killing rats and mice. Rodenticides (baits, concentrates, tracking powders, and fumigants) are the most efficient method of rodent control but should be selected and used carefully to be effective.

## Sanitation

Sanitation is nothing more than a combination of cultural practices that deny rodents harborage and food. Rats and mice are most troublesome where there is a good cover to hide their movements and provide sites in which to nest. A well-maintained poultry facility not only exposes them to predators but also makes it easier to spot any burrowing activity. This last point is a big help when using rodenticide.

The following items are important to the success of a good sanitation program:

- Keep the area around poultry houses mowed. Maintain a clear zone of not less than 50 feet from field borders and fence or tree lines.

- Remove old equipment, lumber, and trash from around buildings. Lumber may be stacked near buildings if it is elevated 1 or 2 feet above the ground.
- If side curtains are dropped for the summer, raise and lower them twice a week to stop mice from nesting in the folds.
- Clean up feed spills inside poultry houses and at feed bins.

## Rodent-Proofing

Completely rodent-proofing a poultry house is impractical, if not impossible. However, sealing up obvious entry points makes it a little more difficult for rodents. Even small cracks and holes in walls, foundations, and screens should be patched. Mice need only a 1/4-inch hole to gain entry into a building.

- Seal openings around water pipes, drain spouts, and vents with concrete or heavy mesh (Figure 5).
- Cover openings and floor drains with mesh.
- In new structures with corrugated siding, use flashing to seal both top and bottom of the siding. Be sure that corner seams are tight.

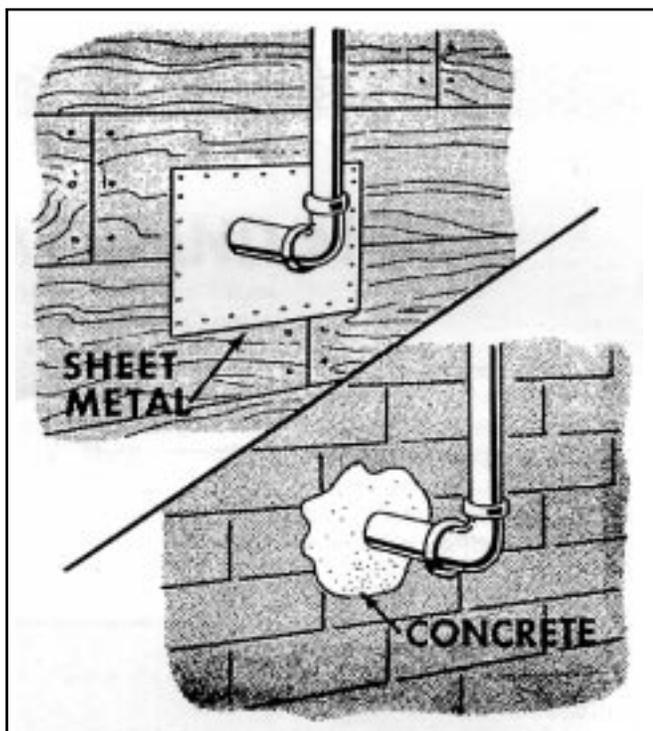


Figure 5. Rodent proofing.

## Killing Rodents (Using Rodenticide)

Glue-boards and traps are devices that can be used to control rodent populations. In small areas, these devices can be efficient; in a 12,000- to 20,000-square-foot house, however, baits are often more practical.

### Rodenticides

A wide variety of rodenticidal compounds and formulations are available. The selection of the right material for a specific situation is important. (See listings under multiple-dose and single-dose rodenticide later in this section.) An understanding of the basics is necessary to know how to use a particular compound and formulation most effectively.

Rodenticides are formulated as pellets, bar baits, tracking powders, and concentrates.

**Pellets** are formulations of poisons mixed with grain products and a binder. They may be packaged loose or in individual pitch packs. **Bar baits** are formulated with rodenticide, grain products, and a binder with a high wax content to withstand moisture for long periods.

**Tracking powders** are compounds formulated with talc or other inert material. They are intended for use along rodent runways. Rodents pick up the poison on their fur, tails, and feet and ingest it during grooming. **Concentrates** are designed to be mixed with feed or water.

The most important thing to know about a rodenticide is that the type of active ingredient determines how the material is to be used. Failure to use a particular rodenticide correctly will result in poor control and may present a hazard to nontarget animals.

In general, rodenticides can be classified as either multiple- or single-dose poisons. All of the multiple-dose and two of the single-dose products affect the rodent's nervous system or other bodily functions.

**Multiple-dose** poisons must be eaten every day for 7 to 21 days in order for the rodent to accumulate a lethal dose. Any interruption of exposure breaks the cycle, and, although rodents may become ill, they will not die. In such cases rodents may learn to avoid the bait.

### Active Ingredients in Multiple-Dose Rodenticide

Warfarin  
Fumarin  
Chlorophacinone  
Diphacinone

**Single-dose** poisons have a decided advantage over multiple-dose rodenticides in that rats and mice receive a lethal dose after only one or two feedings.

### Active Ingredients in Single-Dose Rodenticide

Brodifacoum  
Bromadiolone  
Bromethalin  
Cholecalciferol  
Zinc phosphide

Once a rodenticide has been selected, it must be used properly to be effective. Random placement of bait or tracking powder around a poultry facility is rarely successful. Always remember that rodents will not go out of their way to eat poison bait if they have other food readily available. Similarly, tracking powders will not work as intended if rodents do not run through the material on their way to and from their feeding or nesting areas.

Since baits are the most efficient and economical way to deliver rodenticide, we will limit our discussion to the proper use of baits to control rats and mice. Because baiting methods differ for rats and mice, they will be discussed separately.

### Rat Baiting

Rats are much easier to bait than mice. Their burrows are conspicuous and, once located, can be baited by placing the rodenticide directly in the burrow. The following method is called **pulse baiting** and is an effective way to kill rats.

1. Locate and mark all burrows.
2. Seal all burrows with newspaper or soil.
3. Inspect burrows the next day and place a packet of bait well inside each open burrow. It is not necessary to open the packets.

4. Bait all open burrows for 2 consecutive days if using a single-dose product and 10 to 14 days if using a multiple-dose rodenticide.
5. Close all burrows and wait 1 week.
6. Repeat step 4.
7. Close all burrows and monitor for activity. Bait all new burrows when they first appear.

Where rat burrows are located in inaccessible areas such as the manure under slats and along steep banks, bait stations should be used (Figure 6). Place stations against walls or on rodent runways with the first station as close to the burrows as practical. Orient the entry holes along the wall or path. Well-used runways are easy to spot (by the large amounts of droppings, rodent tracks, greasy looking rub marks, etc.) and are the best place to locate bait stations. Position stations at 15- to 10-foot intervals to cover a large area and give rats ample opportunity to find the bait before reaching their normal feeding sites. Put one or two stations around feed bins as well. Inspect the stations every few days and add 1 ounce of fresh, loose bait as needed. If the bait has not been taken within several days, place the station at a new location.

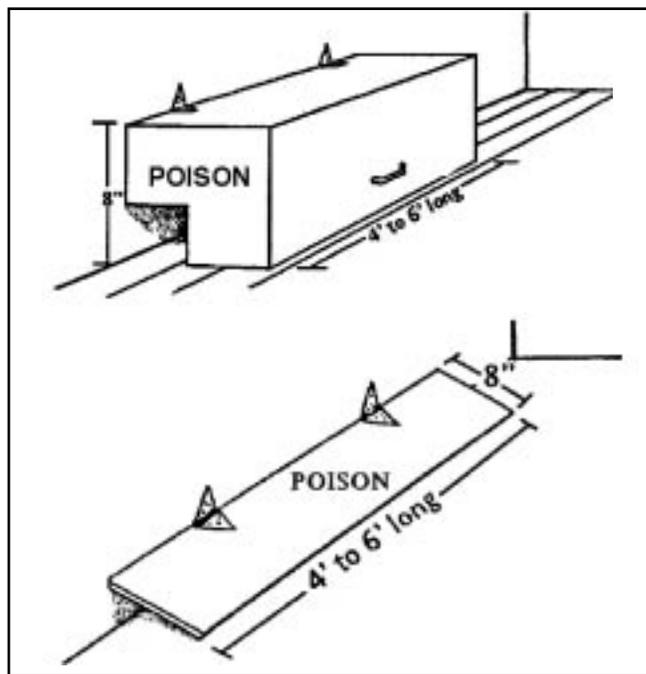


Figure 6. Bait station.

## Mouse Baiting

Large numbers of mice will often nest in the walls and ceilings of poultry houses. Consequently, mouse baiting is a matter of quantity and persistence. Bait bars or stations baited with an ounce of loose bait should be placed at 5- to 10-foot intervals throughout the house. Sill plates and horizontal wall braces are often good locations to place bait in breeder, turkey, and other open-floor houses. Bait stations may also be placed along alleyways in facilities where birds are caged or penned. Egg rooms, offices, and attic spaces should also be baited.

As with rat baiting, placement is important. Bait stations and bar baits should be placed next to walls or on the horizontal surface of sills and braces. Corners are good locations, as are cool cells and housings for exhaust fans. In all cases, care should be taken to attach stations firmly and in such a way that birds cannot reach the bait.

Once bait has been placed, inspect the locations frequently and replenish the bait as needed. Inspection intervals depend on the severity of the mouse infestation and type of bait used. Where multiple-dose baits are used or the infestation is heavy, check locations daily for the first week. Try increasing the amount of bait placed in each station if mice have eaten it all. This will allow for less-frequent inspections. In time, it will be necessary to inspect stations only once a week. **Bar baits** are partially useful in locations such as sill plates that are near the ceiling. Most bars have a hole in the center that allows the bait to be nailed in place (Figure 7). Bar baits generally last much longer than loose baits because mice cannot carry them to their nests.

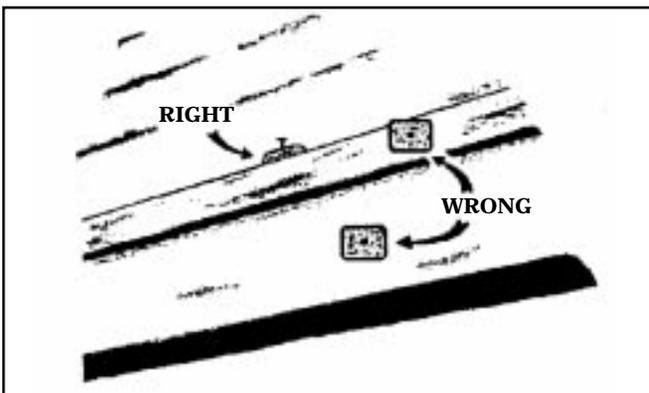


Figure 7. Bait bar placement.

It is not uncommon for bar baits to last several months. Evidence of feeding is also easier to gauge by noting the condition of the bar bait.

Bait stations are easily made from a variety of materials. One of the simplest consists of an 18- to 24-inch section of 1-inch polyvinyl chloride (PVC) pipe (use 2- or 3-inch for a rat station) or plastic drain tile (Figure 8). More elaborate stations that fit nicely into corners or behind materials in storage can be made with PVC pipe and a variety of T-U joints. Plastic pails with lids also make good bait stations (Figure 9). Cut 3- or 4-inch-diameter holes (use 2-inch holes for rats) at the base of the pail.

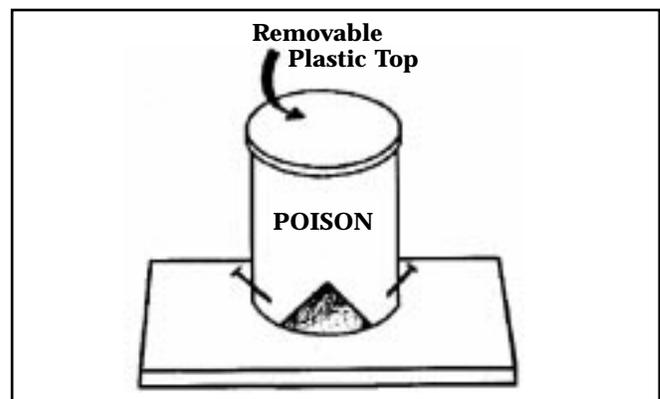


Figure 9. Bait station made from a pail.

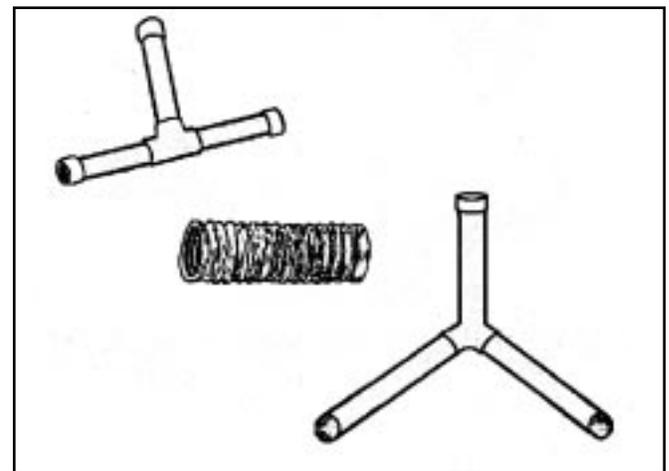


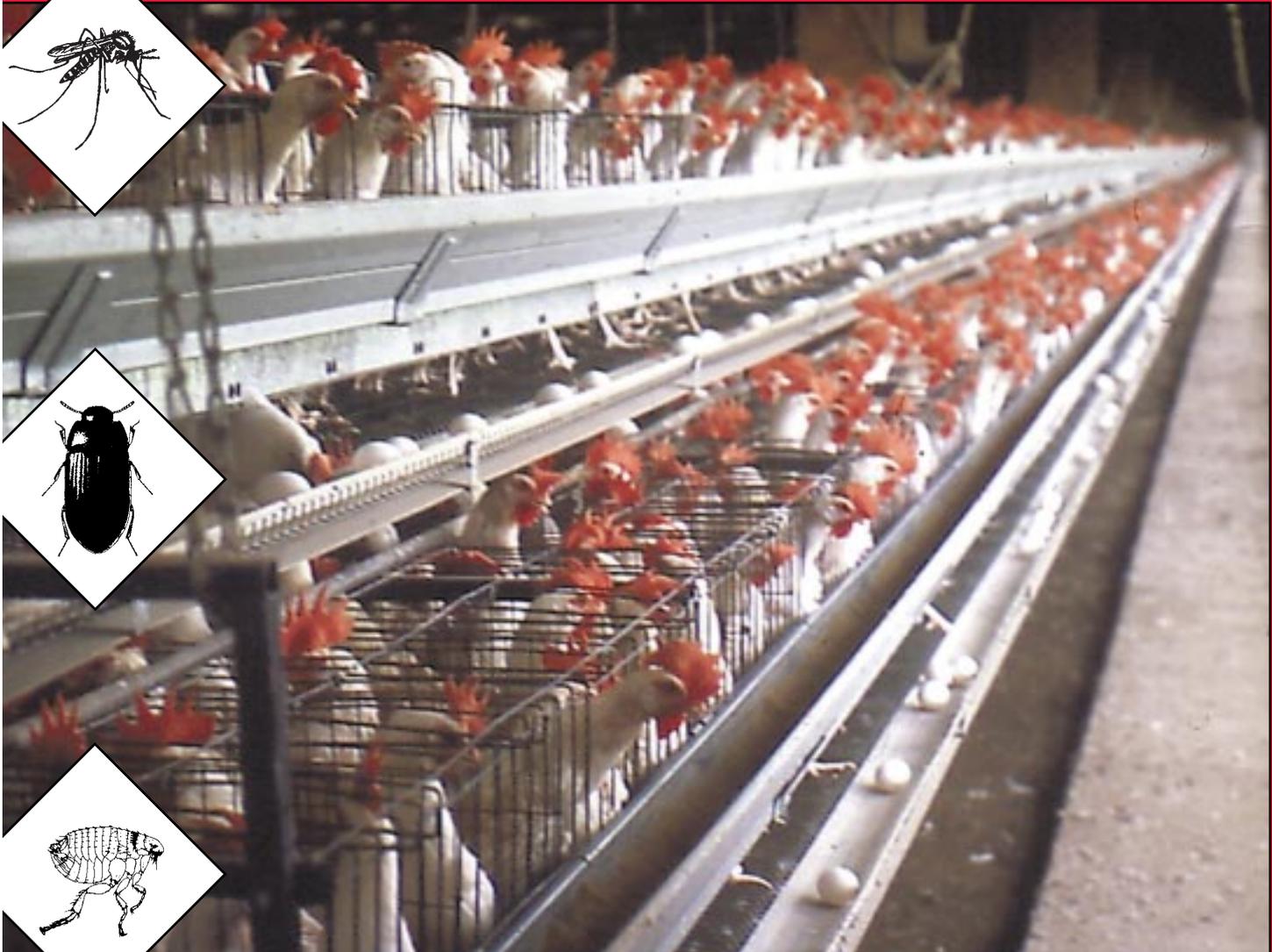
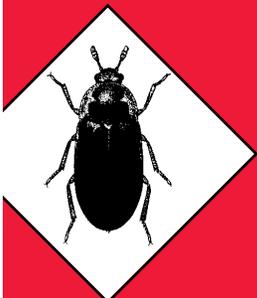
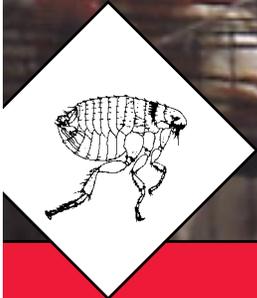
Figure 8. Bait stations made from drain tile and PVC pipe.

# Poison Control Office in Texas

The Texas State Poison Control Center can be reached by calling 1-800-764-7661. The Austin office works as a dispatcher system as calls come in.

Be sure your doctor has this number and the “note to physicians” printed on dangerous pesticide labels. If you plan to use a hazardous pesticide, it is a good idea to notify your physician in advance so he or she can relay the right chemical name to the poison information center in case of emergency. Treatment for pesticide poisoning is exacting.

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