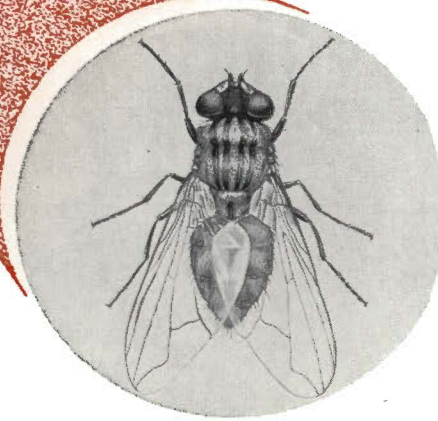

Fly Control In Oklahoma

By

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Fly Control in A Nutshell . . . .

Many kinds of flies are found on Oklahoma farms, but only house flies, stable flies, horn flies, and horse flies are major pests each year.

Prevention of breeding is the best fly control measure. This can best be done by regular removal of larval breeding places. These places are manures, garbage wastes, decaying straw, grain, and silage, and weeds. When they cannot be removed, treatment with calcium cyanamid and superphosphate is recommended.

Additional control is almost always necessary. In dairy barns, spraying with methoxychlor is suggested for spring and fall, and lindane for the hot summer months. In other barns, dieldrin, BHC chlordane, or DDT in some areas will provide more economical control. Use in dairy barns is restricted for this latter group of insecticides.

Topline spraying only is needed where horn flies are present. Overall spraying is essential for the control of other flies.

Rubbing posts "charged" with 5.0 percent DDT in motor oil provide excellent economical control of horn flies if the posts are properly located.

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Fly control is an important part of good farming that contributes to the health and well-being of animals and man. Flies increase infectious keratitis ("pink eye"), mastitis, anaplasmosis, and other diseases of farm animals, and are well known as carriers of typhoid fever, diarrhea, and dysentery to humans. Grade A milk production is difficult without adequate fly control.

To develop recommendations given in this bulletin, Oklahoma Agricultural Experiment Station workers conducted tests over a five-year period, using more than 20,000 head of cattle and 300 barns.

This bulletin summarizes the recommendations for fly control in Oklahoma, as determined by these tests. It also includes fly identifi-

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Precautions for Using Insecticides . . .

Fly control recommendations presented in this bulletin include the use of insecticides. Most insecticides are poisonous and must be handled and stored with care. However, they may be handled and used successfully when precautions are taken. The following list may serve as a safety reminder:

1. Use as directed. Excessive amounts may be dangerous, particularly to young animals.

2. Do not let insecticide sprays get on food, food utensils, water, or any surface where food will be placed.

3. Spray solutions should never be left where they may be drunk by animals.

4. Turn off the power before spraying electric wires or outlets.

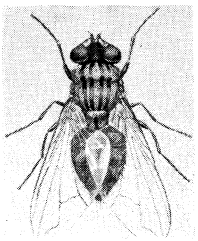
5. Do not let spray solutions get into streams or ponds. Very small amounts of some insecticides kill fish.

cation of types common in the state, an important aid in knowing which kind of control to apply. In addition, there are tables showing spray mixes, sanitation and use of chemicals, and other control methods.

Kinds of Flies

Many kinds of flies are found in Oklahoma, but only four—house flies, stable flies, horn flies, and horse flies—are serious pests. It is necessary to know how to recognize them and where they breed, because each must be controlled in a different way.

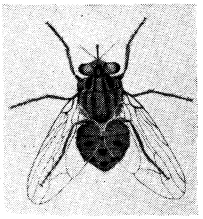
House flies.—This type is familiar to almost everyone, but still may be confused with its near relatives. The house fly has four easily-seen dark stripes on its gray back, and sponge-like mouthparts which may be folded and partially drawn into the head. These flies are commonly found indoors and outdoors, where they feed and rest on food and filth. House flies cannot bite, despite popular opinion. They are a nuisance and a disease spreader. They eat only liquid food. Solid foods such as sugar are first dissolved in their saliva and then swallowed.



House fly. — About 2½ times actual size.

House flies can develop in a wide variety of places. Favored spots are manure, garbage, and decaying vegetable matter such as straw, weeds, or fruit wastes. Their small white eggs deposited in breeding places soon hatch into long white larvae or maggots. In five to 15 days, they reach full size and move to a drier place before changing into the familiar chocolate brown, barrel-shaped pupae. Adults emerge from these pupae in three to 10 days. The adults may live two to three weeks in summer, or several months during cooler periods. Each female adult may lay from 400 to 1,000 eggs.

Stable flies.—These common pests resemble house flies in size and color. Distinguishing marks are the seven rounded spots under the wings, and stiff pointed, bristle-like mouthparts which point forward or down and cannot be folded. Stable flies are serious livestock pests because of their blood-sucking habits. Humans may even be bitten, particularly during warm, humid weather. Livestock sustain loss of blood, annoyance, and possible disease transmission caused by stable flies. Consequently, these flies are the most important livestock pest in many parts of Oklahoma.



Stable fly. — About 2½ times actual size.

Stable fly breeding is much more restricted than that of house flies. Favored places are in decaying matter such as straw, grain, or weeds. Stable flies develop in manure only when considerable straw is present. The eggs, maggots, and pupae closely resemble those of the house fly, but usually require two or three times as long to mature. Unlike house flies, they prefer to remain outdoors unless the building is well lighted. They rest on fences, sides of barns, or vegetation. The head usually is pointed up when resting.

Horn flies.—These flies are one-half to two-thirds the size of house flies, and often are seen clustered in large numbers on the backs of cattle. Sheep, goats, and horses may also be attacked. During most of the day, horn flies prefer the backs of animals, but during rains or hot weather they appear elsewhere on the body. Although they remain on the animals almost all of the time, they usually feed but once a day.

Horn fly.—About 2½ times actual size.

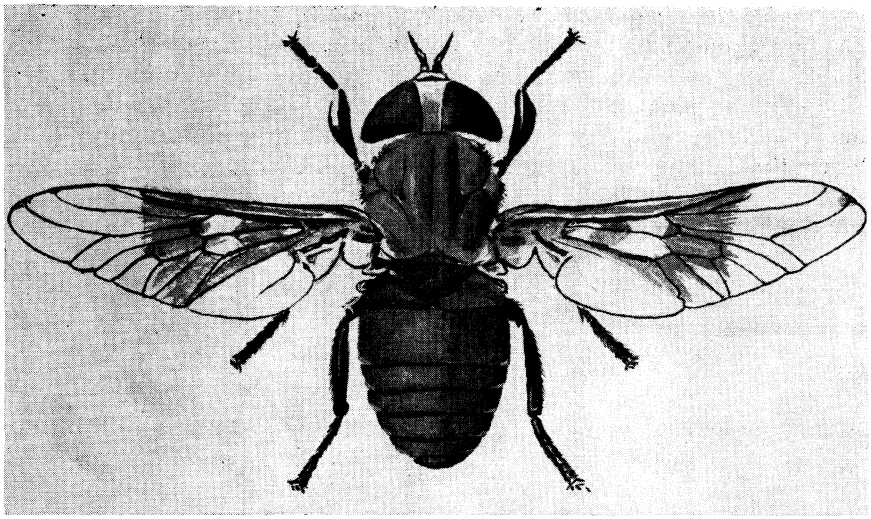
Eggs are laid in droppings less than three hours old. A new generation may be completed every 10 to 14 days during favorable periods. In contrast to house flies and stable flies, horn flies develop and are as common in the pasture as around farm buildings.

Extensive tests in Oklahoma indicated that beef cattle protected from horn flies gained 15 to 30 pounds more than unprotected cattle during grazing season (Table 1). Tests in neighboring states showed even greater gains.

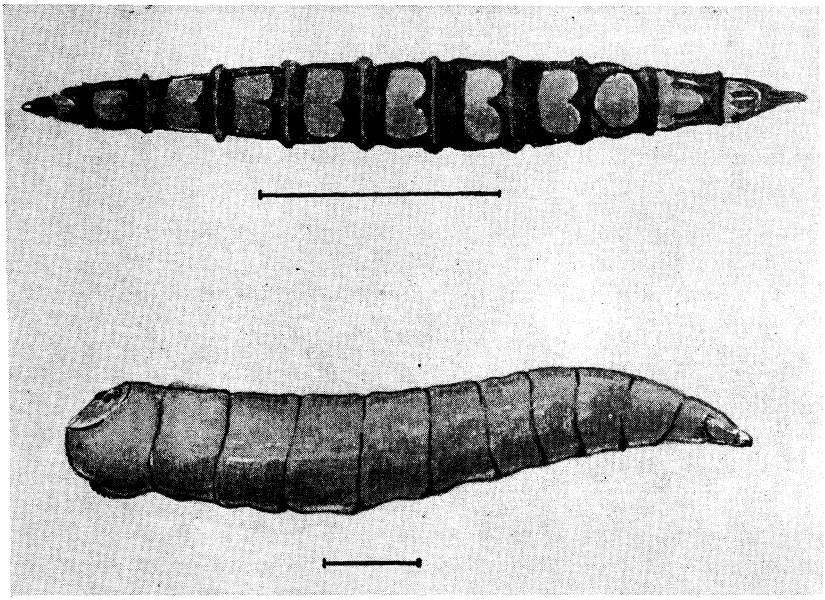
Horse flies.—There are many species of horse flies in Oklahoma. They vary in size from the large blue-black fly that is more than an inch long to the small size only slightly larger than a house fly. Horse flies are easily distinguished from other types by their larger size and

Table 1.—The Influence of Horn fly Control on Weight Gains of Cattle.

Year	Average number flies on unsprayed animals	Average number flies on sprayed animals after 30 days	Increased weight gains during fly season
			(pounds)
1946	645	20	27
1947	412	130	13
1950	600	64	16
1951	650	80	18



Horse fly.—About 2½ times actual size.



Larva of the horse fly (above) and the house fly. Lines represent the actual length of each larva. In general appearance, the larvae of horn and stable flies are similar to that of the house fly, except the horn fly larva is smaller.

well-developed mouthparts. The mouthparts consist of six sword-like parts to cut through skin of animals, and a sponge-like part to absorb blood from the cut. These vicious biters make many pastures almost worthless during summer months by driving livestock out of them, or seriously interfering with their grazing. Cattle suffer large losses in weight and milk production when numerous horse flies attack them. In addition, these flies can be carriers of anaplasmosis and anthrax.

Breeding plates for horse flies are close to water, or in low spots where water may collect for short periods. The eggs, laid on vegetation over the breeding area, hatch into active, pointed larvae, which drop to the ground. The larvae may feed for months or even years on food in the soil. Some horse flies have two generations a year, while others may require three years for a complete cycle. The adults usually rest in trees and shrubbery and seldom are numerous around barns, except as they follow animals in from the field.

Control

SANITATION

Prevention of breeding is the best fly control measure, but other methods such as the use of chemicals, screening, trapping, or electrocuting may be necessary. The methods used will depend upon the kind of fly, and local conditions.

Sanitation must be widespread. Flies may travel five to 15 miles, but the average range is less than one mile. Regular removal and disposal of manure and other organic wastes are essential at least twice each week. Manure should be spread thinly in fields so fly eggs and larvae will be killed by exposure to drying, heat, or cold.

If manure must be stored, fly-tight pits or boxes are preferable. When this is not possible, it should be stacked in compact piles. The material added each day should be sprinkled with equal quantities of calcium cyanamid and superphosphate at the rate of one pound of the mixture to each bushel of manure, scattered over the surface Watering following treatment spreads the chemicals more thoroughly and provides better control. Value of manure is greatly increased by addition of these fertilizers, and fly breeding is prevented.

Disposal of kitchen wastes frequently creates a fly problem. Fly breeding is probable when organic matter starts to decay. Fruit wastes, vegetable peelings, entrails, and other forms of garbage are breeding grounds for large numbers of flies. Many stable flies may develop in piles of weeds or straw that have been soaked and have started to decay.

A typical scene in a barn with poor fly control. House flies spread disease by crawling over food and animals.

Watchfulness is necessary if fly breeding is to be prevented, and most of it can be stopped by spreading organic material so that it will dry before flies can complete their development.

USE OF CHEMICALS

Supplementary chemical control often is needed with good sanitation. During 1945-1948, when DDT was effective and relatively cheap, chemical control was relied upon almost exclusively. Table 2 shows results in barns near Stillwater that had excellent sanitation and chemical treatment, and those that had poor sanitation. Each group of barns was sprayed with 2.0 percent DDT, until mid-summer of 1949 when it was necessary to change to 0.4 percent lindane for satisfactory control. Lindane was fairly effective in 1950 in barns with excellent sanitation, but lasted less than a week in those with poor sanitation. During 1951, lindane could not be used economically in either group.

During 1945 to 1949, resistant flies survived DDT treatments and reproduced resistant offspring. Non-resistant flies were killed much

Table 2.—Average Duration of Fly Control in Barns with Good and Poor Sanitation.

(Days)

	1946	1947	1948	1949	1949*	1950	1951
Excellent sanitation	36	38	16	10	22	16	10
Poor sanitation	33	25	5	3	18	5	3

* These barns were sprayed with a 2.0 percent DDT until July of 1949, then with 0.4 percent lindane.

more readily and did not produce as many flies, so the sprays became progressively less effective. This occurred in both groups, but proceeded at a much faster rate under poor sanitation.

In 1949, when lindane was substituted, the same process occurred except resistance developed more rapidly. Flies resistant to one insecticide usually develop resistance quickly to a related insecticide, and only by trial and error can one tell what material is best. This is further complicated by the localized nature of fly resistance, since one insecticide may work on one farm but is ineffective on a neighboring location.

Mixing insecticides such as DDT and chlordane may provide better control for a time, but resistance may be built up to both in a much shorter time than if they were used separately. The practice of spraying breeding areas with the same material used on the barns increases the opportunities for rapid development of fly resistance. If it is necessary to treat breeding areas rather than removing them, calcium cyanamid and superphosphate is recommended.

Extensive spraying tests by state and federal agencies have shown that small amounts of DDT or related insecticides may appear in the milk and meat of animals. Until the possible harmful effects have been evaluated, the Pure Food and Drug Administration has ruled that only the least toxic materials—methoxychlor, pyrethrins, and organic thiocyanates—may be put on dairy cows. Only these materials and lindane may be used inside dairy buildings. These regulations do not apply to beef animals.

Sprayers.—The type needed will depend mainly upon the amount of spraying to be done, the other purposes for which the sprayer will be used, and the kind of materials to be used in the sprayer. Small buildings or herds may be satisfactorily sprayed with hand equipment, but even here power equipment is faster and more thorough. Low-volume weed sprayers may be used, but the high-volume piston pumps

are preferable, particularly with sprays made from wettable powders (see Okla. Agri. Exp. Sta. Bul. No. B-375). Frequent agitation is essential with wettable powders, but pressures above 200 pounds are seldom needed with any spray. When only small amounts are needed, hand sprayers are adequate except with wettable powders. These sprays quickly clog the small openings, which must be cleaned frequently.

Nozzles.—Fan nozzles are best where uniform coverage is necessary and when well-finished surfaces must be sprayed. Coarse spray nozzles usually are most desirable, but mist nozzles work better in applying pyrethrum sprays to animals when only the outer portion should be wet.

Spray guns.—Rapid and complete shut-off guns, and those that can be shut off without changing the pattern, are recommended for barn or cattle spraying. Guns equipped with several types of nozzles are much more useful and usually worth the extra cost.

INSECTICIDE FORMULATIONS

Only a few insecticides used in fly sprays can be diluted with water without first mixing with other materials. The other insecticides must be adsorbed on fine dust, which can then be suspended in water to provide a uniform spray, or be dissolved in a solvent such as toluene or xylene and then mixed with water. Insecticides on dusts that can

Table 3.—Wettable Powder Amounts To Be Added to Water for a Desired Spray Concentration.

(Pounds)

	If the percent of wettable powder is:							
	6	10	12	20	25	40	50	75
To make 100 gallons of spray use:								
For 0.05% spray	7	4	3.5	2	1.67	1	.83	.56
For 0.5% spray	70	40	35	20	16.7	11	8.3	5.6
For 2.0% spray	280	160	140	84	67	42	33	22
To make 25 gallons of spray use:								
For 0.05% spray	1.75	1	.9	.5	.42	.26	.21	.14
For 0.5% spray	17.5	10	8.75	5.2	4.2	2.6	2.1	1.4
For 2.0% spray	70	40	35	20	16.7	11	8.3	5.6
To make 5 gallons of spray use:								
For 0.05% spray	.33	.20	.18	.1	.08	.05	.04	.03
For 0.5% spray	3.5	2	1.75	1	.8	.5	.4	.3
For 2.0% spray	14	8	7	4.1	3.3	2.1	1.6	1.1

be mixed with water are wettable powders; those dissolved in a liquid, which when added to water will form many fine droplets, are emulsifiable concentrates. Insecticides also may be sold for use without dilution, such as DDT in kerosene. This type is often called an oil solution.

Wettable powders.—This formulation is safe, cost is usually somewhat less, may be stored and shipped easily, and does not carry into porous surfaces where it cannot affect flies. Disadvantages are a tendency to clog nozzles, leaving an apparent residue on sprayed surfaces, settling unless constantly agitated, wearing out sprayers more rapidly by abrasive action, and requiring good scales for small quantities. (See Table 3.)

Emulsions.—Emulsifiable concentrates may be easily mixed and kept suspended, small quantities may be measured with inexpensive equipment, nozzles are seldom clogged, abrasive action is slight, and little apparent residue is left. Disadvantages include somewhat greater cost, loss due to container breakage, penetration into porous surfaces, and the possibility of injury to animals if excessive amounts are applied. (See Table 4.)

Oil solutions.—These sprays need no diluting, are always mixed, do not clog nozzles, or cause unsightly residue. They may be used in any type sprayer, and frequently the oil increases the killing power. Disadvantages are greater cost, penetration in porous surfaces may be excessive, possible injury to rubber gaskets and hose, floors may be made slippery, and harmful effects on animals by excessive quantities.

The most important factor in any spray material is concentration of the active ingredient. This must be shown on the label of any insecticide sold in Oklahoma or shipped interstate. Recommendations presented herein are given as percentage of active ingredients in the finished spray. Tables 3 and 4 aid in calculating the amount of wettable powder or emulsifiable concentrate needed for various spray quantities.

INSECTICIDES FOR DAIRIES

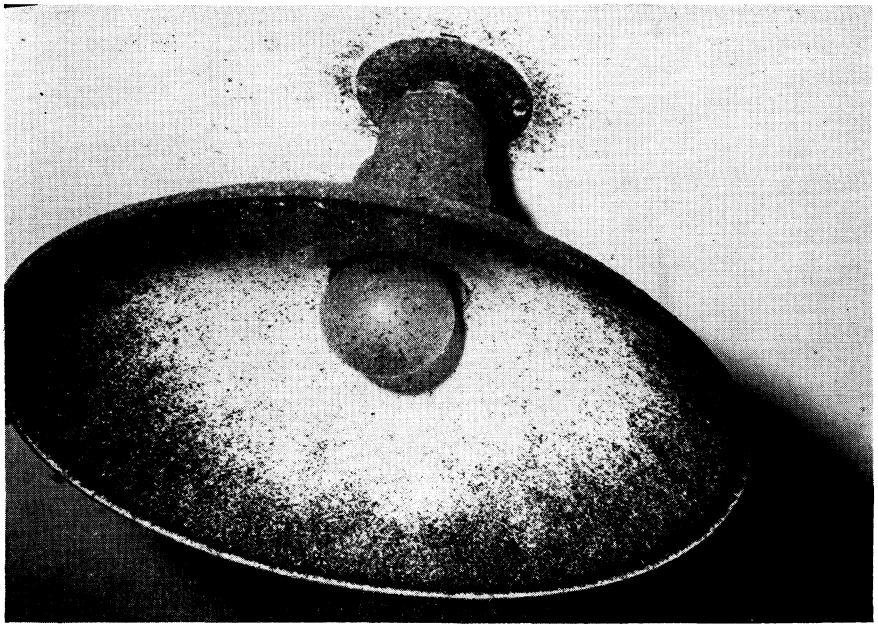
The Pure Food and Drug Administration limits insecticides for dairy barns or dairy cattle. Therefore recommendations for fly control may differ from those for other buildings and animals.

When small numbers of house or stable flies first appear in the spring, inside building walls should be carefully sprayed with 2.0 percent methoxychlor. If stable flies are numerous around doors, sunny walls, board fences, or similar areas, they also should be sprayed. In warmer summer weather, change to 0.5 percent lindane and continue spraying.

Table 4.—Amount of Emulsifiable Concentrate Insecticides To Be Added to Water to Make Diluted Sprays for Fly Control.

	If percent of concentrated emulsion is:						
	18	20	25	40	50	60	75
To make 100 gallons of spray use:*							
For 0.05 % spray	1.1 qt.	1 qt.	1.6 pt.	1 pt.	13 oz.	10½ oz.	8½ oz.
For 0.5% spray	2-3/4 gal.	2½ gal.	2 gal.	10 pt.	1 gal.	6.6 pt.	5.3 pt.
For 2.0% spray	11 gal.	10 gal.	8 gal.	5 gal.	4 gal.	3.3 gal	2.6 gal.
To make 25 gallons of spray use:							
For 0.05 % spray	9 .oz	8 oz.	6.4 oz.	4 oz.	3.2 oz.	2.66 oz.	2.1 oz.
For 0.5% spray	2-3/4 qt.	2½ qt.	2 qt.	2½ pt.	1 qt.	1.6 pt.	1.3 pint
For 2.0% spray	2-3/4 gal.	2½ gal.	2 gal.	1¼ gal.	1 gal.	3-1/3 qt.	2-3/4 qt.
To make 5 gallons of spray use:							
For 0.05 % spray	1-3/4 oz.	1-3/5 oz.	1¼ oz.	5 tsp.	3-4/5 tsp.	3¼ tsp.	2.5 tsp.
For 0.5% spray	1.1 pt.	1 pt.	.8 pt.	½ pt.	4 pt.	1/3 pt.	¼ pt.
For 2.0% spray	4.4 pt.	4 pt.	3.2 pt.	2 pt.	1.6 pt.	1.3 pt.	1 pt.
To make 1 gallon of spray use:							
For 0.05 % spray	2 tsp.	1-3/4 tsp.	1½ tsp.	1-1/3 tsp.	1 tsp.	.6 tsp.	½ tsp.
For 0.5% spray	3-1/3 oz.	3 oz.	2½ oz.	2 oz.	1-2/3 oz.	1 oz.	5 tsp.
For 2.0% spray	13-1/3 oz.	12 oz.	10 oz.	8 oz.	6-2/3 oz.	4 oz.	3-1/3 oz.

NOTE: Abbreviations used: pt.—pint; qt.—quart; gal.—gallon; tsp.—teaspoon; and oz.—fluid ounce. Standard measuring cup holds 8 fluid ounces.
* For example, if percent of concentrated emulsion is 18 percent: to make 100 gallons of 2.0 percent spray, between 70 and 75 gallons of water would be used.



This light fixture was in a dairy barn which received no fly control treatment. The picture was taken at the end of three weeks of fly infestation.

Lindane provides better control in barns when temperatures exceed 90 degrees F. When cooler weather returns, change to methoxychlor. Under normal conditions, each treatment should last from two to four weeks. When fly resistance is a serious problem, it may be necessary to spray two or three times a week with a space spray such as pyrethrum or lethane.

Horn flies usually appear in late March or early April, several weeks before control measures are needed for other flies. Spraying the animals with 0.5 percent methoxychlor is recommended. When house flies or stable flies are numerous, overall spraying is recommended because these flies do not feed mainly on the topline. Even during the warmest part of the year, methoxychlor on animals provides protection longer than lindane and should be used during the entire season.

Numerous horse flies may require control during summer months. The most successful spray is a combination of piperonyl butoxide and pyrethrum. It is sold in many different preparations and should be used as directed on the label. Daily spraying with one-half to four

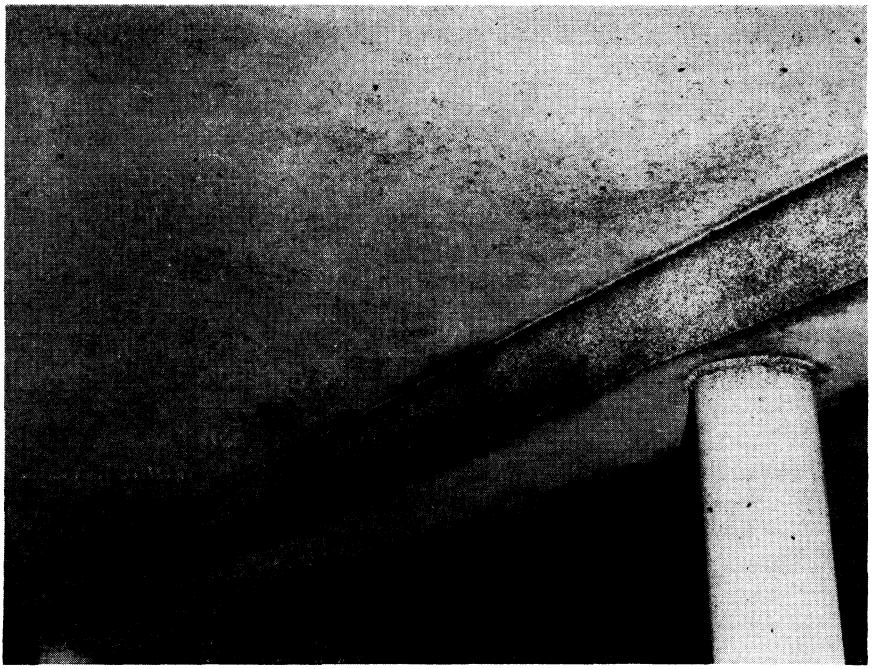
ounces per animal provides good control. The entire body should be covered with a mist, but it is not necessary to wet the hairs to the hide.

INSECTICIDES FOR OTHER FARMS

During 1951, 0.5 percent dieldrin provided the best control of house flies and stable flies in buildings in most sections of Oklahoma. Benzene hexachloride at 0.5 percent gamma isomer concentration was next in effectiveness and somewhat less expensive. However, its use was limited by the offensive odor. Where fly resistance had not developed, 2.0 percent DDT provided the best control. Two percent chlordane or toxaphene was very useful in limited areas. All were more effective than lindane or methoxychlor on a cost basis.

Only inside walls of barns need to be treated if only house flies are present. When stable flies appear, favored resting places outside should also be sprayed.

Horn flies have developed little resistance to insecticides, therefore



The condition of this barn ceiling indicates a high degree of fly infestation. Good sanitation and use of proper insecticides will control flies in barns.

Table 5.—Comparison of Overall and Topline Spraying for Horn Flies Using Common Insecticides.

Type of Spray	Coverage	Number head sprayed	Number flies after 30 days
DDT	Topline	380	27
DDT	Overall	240	21
Toxaphene	Topline	290	31
Toxaphene	Overall	292	22
Methoxychlor	Topline	144	89
Methoxychlor	Overall	36	118

the choice of material will depend upon availability and relative cost. DDT or toxaphene at 0.5 percent and dieldrin at 0.05 percent gave best results during the past five years. Chlordane and DDD were about as effective but more expensive. Methoxychlor does not last quite as long, while lindane or benzene hexachloride protect for four to 14 days as compared to the three to four weeks provided by other materials.

If only horn flies are present, extensive tests showed topline spraying is almost as effective as overall spraying, yet costs much less in labor and materials (Table 5). A single treatment usually lasts three to four weeks. The additional cost of overall spraying is merited when house flies and stable flies are numerous.

When the cost is justified, range animals should be protected against horse flies by spraying three or four times a week with approximately one quart of spray containing 0.05 percent pyrethrum and 0.5 percent piperonyl butoxide. Daily misting is suggested for dairy animals. Herds were economically protected by a treadle-operated sprayer where animals treated themselves. The sprayer should be enclosed for wind protection. These automatic sprayers were successful against horse flies, which feed almost exclusively on the back. They were not as successful against species that normally feed on the nose, legs, or stomach.

RUBBING POSTS

Animals desire to rub or scratch, and this may be useful for horn fly control. Rubbing posts may be purchased ready-made or easily built on the farm to give off small amounts of insecticides. Framework con-

sists of one or two strong wires or chains crossed and loosely stretched over a sturdy six-foot post, with the ends fastened to stakes at the ground level to form a cross. The wires or chains may then be wrapped with several thicknesses of old sacks or similar material, and saturated with 5.0 percent DDT in motor oil. The oil should be replaced every two to four weeks, depending upon the amount of use.

Rubbing posts are not successful in wooded areas unless placed where animals frequently rest. Also, they have not adequately protected against house flies, stable flies, or horse flies.

THERMAL GENERATORS

Electrical units that automatically dispense insecticide vapors for fly control are available on the market. If used properly, they are considered safe in all but homes and sleeping quarters. When used in tightly-closed rooms, they are quite effective. In the average Oklahoma home, however, they are of little value, because the vapors are carried away before they can kill flies.

OTHER CONTROL METHODS

All available methods of controlling flies are needed, particularly to combat those that may have developed in spite of good sanitation and an adequate spraying program. Screening is needed to protect homes, restaurants, sickrooms, and buildings where food is produced or processed. All screens should fit well, and screen doors are more effective if they swing outward. Fly traps are helpful if set where flies naturally gather, and are baited with molasses, milk, fruit wastes, or other materials attractive to flies.

If carefully used, poison fly baits may be placed indoors. A satisfactory bait may be made by adding three tablespoons of commercial 40 percent formalin to a pint of milk. The addition of a small amount of molasses or brown sugar will increase its attractiveness to flies. Electrocuting devices, fly swatters, and fly papers may be useful in some circumstances.

SCIENTIFIC NAMES OF FLY SPECIES

The scientific names of fly species discussed in this bulletin are:
House fly—*Musca domestica.*
Horn fly—*Siphona irritans.*
Stable fly—*Stomxys calcitrans.*
Horse flies—*Tabanus spp.*