

CHAPTER 11

FLIES

LEARNING OBJECTIVES

After you complete your study of this chapter, you should be able to:

- Understand the general life cycle of flies.
- List the three groups of biting and nuisance flies.
- Explain how various flies are pests of animals.
- Describe the three components of a biting-fly management program.
- Explain why house fly populations can quickly build to enormous levels.
- Understand the need for an integrated management program for filth flies and animal waste management.
- Describe the options available for managing flies on and around animals.

Flies are insects with only one pair of wings. They belong to the insect order Diptera (meaning “two wings”). Though most kinds of flies are harmless to animals, several families of flies are major pests of animals and often require management. Some flies are vectors of disease agents of animals.

The fly pests of animals fall into three groups:

- **Blood-feeding flies** not associated with manure or animal waste.
- **Filth flies** associated with animal waste or manure.
- **Parasitic bot flies.** Bot flies are not considered as common pests of small animals so we will not discuss them in this manual.

All flies have a true metamorphosis life cycle (the immature stages or larvae appear worm-like and may sometimes be true maggots). Some filth flies, especially the stable fly, are also blood feeders.

BITING FLIES

Blood-feeding flies: Mosquitoes, black flies, biting midges, deer flies and horse flies are blood-feeding flies. Only the female flies take blood. They use it for egg yolk development inside the abdomen. The females have piercing mouthparts that are either blade-like and cut the skin or needle-like and pierce the skin. The mouthparts taken together are called the

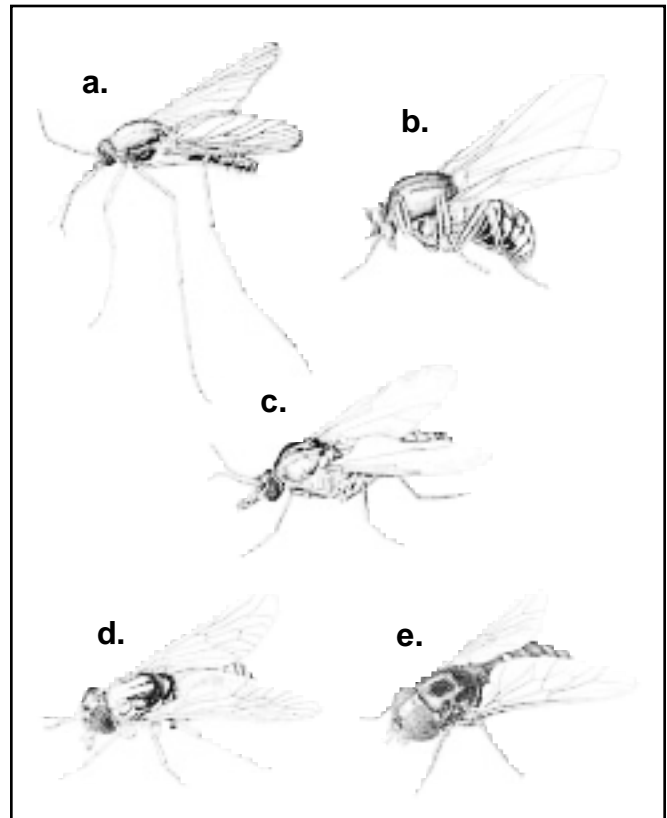


Figure 11.1 Blood-feeding flies: a. Mosquito b. Black fly c. Biting midge d. Deer fly e. Horse fly.

proboscis. Male flies in these groups feed on nectar or other sugar sources. Table 11.1 lists the groups of blood-feeding flies. Various blood-feeding flies are shown in Figure 11.1.

Table 11.1 Blood-feeding flies affecting domesticated animals in the United States.

Common Name	Scientific Family
Mosquito	Culicidae
Black fly	Simuliidae
Biting midge	Ceratopogonidae
Deer fly	Tabanidae
Horse fly	Tabanidae

Mosquitos' developmental cycle includes an aquatic larval stage. Mosquito eggs are laid singly or in clusters on or near water. Larvae hatch from the eggs and develop in the water. The larvae feed on a variety of microorganisms and organic matter in the water and develop through four larval stages or instars to the pupal stage. Adult mosquitoes emerge from the pupae and fly away. Female mosquitoes seek out animal hosts, using cues such as carbon dioxide and moisture in exhaled breath to find them. Most mosquitoes seek hosts in the evening or at night, though some will bite in the daytime. Once they have found an animal host, mosquitoes will forage over its body until they find a bare patch of skin. Then the mosquito probes the skin with its needle-like mouthparts, finds a blood vessel and sucks blood. Usually only a few minutes are required for blood feeding. Some large animals may experience hundreds to thousands of mosquito bites per night if left unprotected. After blood feeding, the engorged female mosquito leaves the animal and rests in the environment while the eggs develop. She then lays eggs and seeks a host for blood again. A single mosquito may bite several times in its lifetime.



Many mosquitoes will bite domestic animals, causing injury by blood loss and creating wounds where bacteria may invade and cause infection. Some animals may develop allergies to mosquito bites. In addition, mosquitoes transmit disease agents to animals. Dog heartworm is caused by a

nematode. Infected dogs have adult worms in their hearts. The adult worms shed tiny, immature worms called microfilariae into the bloodstream. When mosquitoes bite an infected dog, the microfilariae enter the body of the mosquito with the blood. Days to weeks later, when the mosquito locates another dog, it transmits the worms during blood feeding. A single infected dog in an area can be an infective source for uninfected dogs for miles around. Thus, it is important to protect dogs from heartworm through preventive drugs and to keep them safe from mosquito bites. If left untreated, heartworms in dogs are deadly.

Black flies may be severe seasonal parasites of large animals in Michigan. The larvae occur in slow- or fast-moving streams and rivers, where they cling to rocks and filter out food particles from the passing water. The larvae pupate on the rocks, then the adult black flies emerge, swim to the water surface and fly away. Female black flies swarm around and onto the bodies of animals. The bites are very irritating, and large numbers of bites can cause severe reactions such as toxemia or anaphylactic shock (allergic reaction). In some instances, high numbers of black flies caused blood loss so extreme that cattle died of anemia. Black flies can transmit a malaria-like disease to waterfowl.

Biting midges—also called “punkies,” “no-see-ums” or “sand flies”—are tiny biting flies with speckled wings. The larvae occur in still or moving water, where they live in the mud, sand or debris at the bottom. Though these flies are very small, their bite is very irritating. Bites may swell and form bloody, weeping lesions similar to black fly bites.

Deer flies and horse flies are large-bodied flies and strong fliers. They live as long as 6 weeks. The larvae are found in a variety of aquatic and semi-aquatic conditions and in moist soil, where they live in the mud and sediments and prey on worms and insects. Most horse and deer flies have only one generation per year. The adults emerge in early to midsummer. Adult females obtain a blood meal and later lay eggs on vegetation above still water or moist soil. After hatching, larvae drop into the water, develop and crawl to drier areas to become pupae. This insect overwinters as a mature larva.

Deer and horse fly bites are painful and injurious. The flies bite by a scissors-like action of their bladed mouthparts that causes a pool of blood to form, which they then suck up. The flies bite during daytime hours. Animals can injure themselves by attempting to drive off or escape from

these flies. Deer and horse flies are important vectors of the virus that causes **equine infectious anemia** or **swamp fever** of horses.

MANAGEMENT OF BLOOD-FEEDING FLIES

Management of biting flies to prevent bites is an important part of animal health care, for both companion animals and livestock. There are three components to biting fly management. First is modification of the habitat and environment. For mosquitoes, this means eliminating local sources of standing water around the animals. Most mosquitoes come from true wetlands, however, so draining larval breeding sites is usually not possible nor desirable and must be done with the approval and collaboration of natural resources authorities. Control of larval mosquitoes with insecticides is feasible but this is a specialized discipline requiring training and expertise. The best approach to mosquito control is a regional (e.g., township or county) system utilizing multiple strategies for control of larval and adult mosquitoes. Extension bulletin E-2180, "Mosquito Pest Management," is a training manual for mosquito control and pesticide applicators' certification.

Little can be done about the immature stages of black flies, biting midges, deer and horse flies. Black fly larvae can be controlled in streams with insecticidal bacteria, but this strategy requires permits and consultation with experts.

The second component to biting fly management is to separate the animals from the flies through physical means. Animals can be kept indoors when the flies are biting.

The third component to biting fly management is the use of repellents on the bodies of animals and insecticides applied to the animals directly or in their immediate environment. For mosquito control, residual premise sprays of insecticides are effective applied to areas where mosquitoes rest, including barns or animal dwellings, sheds and vegetation. Ultra-low volume application of insecticides is an effective way to control mosquitoes and other small biting flies both inside and outside premises. Thermal fogs can also be used inside and outside dwellings for mosquito control.

In general, insecticide use for control of biting midges, black flies, deer and horse flies is limited to topical applications on animals directly. Black flies often attack the ears of animals, so applications of mineral oil or mild insecticides to the ears can provide relief to an animal. Follow all label directions.

NUISANCE FLIES

Filth flies associated with animal waste. Filth flies often constitute a problem for animal facilities. Filth flies affect animals by their annoying or blood-feeding activity. Some filth flies are vectors of disease agents to animals and humans.

Additionally, the close proximity between animal care facilities and human settlements has created situations where filth flies become a source of annoyance and concern for neighbors. On the other hand, maggots of filth flies play an important ecological role—they degrade manure to simpler constituents and reduce the volume of waste material. As pests and disease vectors, filth flies often must be managed. Table 11.2 lists the filth flies and Figure 11.2 shows certain adult filth flies.

Table 11.2 Filth flies affecting domesticated animals in the United States.

Common Name	Scientific Name
House fly	<i>Musca domestica</i>
Stable fly	<i>Stomoxys calcitrans</i>
Face fly	<i>Musca autumnalis</i>

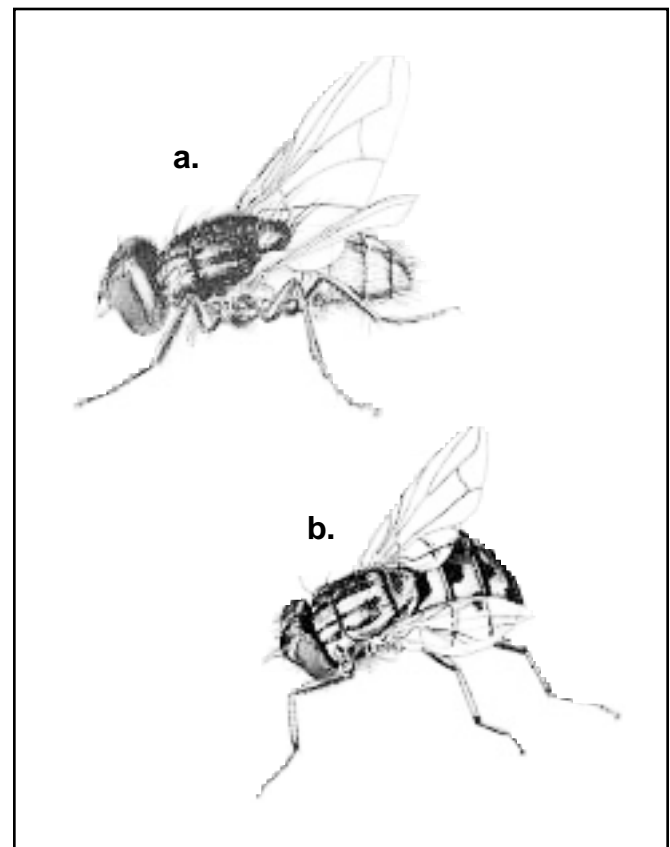


Figure 11.2 Adult filth flies: a. House fly b. Stable fly.

Fly bite dermatitis (Fly bite ears) is caused by the rasping teeth and mouthparts of stable flies. Stable flies inflict a very painful bite, irritating to the host. These flies lay their eggs in moist manure or compost. The adult flies prefer strong light and are more abundant in summer and autumn. These flies affect the faces and ears of dogs. Lesions are seen on tips of ears or at the folded edge of flop-eared breeds. The lesions may have dark crusts and be oozing blood and serum.

Animals should be protected from stable fly attacks with the use of repellents such as sprays or pastes. Keep the animal indoors or in a shelter when fly populations are high. Proper handling and disposal of manure and compost are essential and may require insecticide treatments.

Filth flies, like other true flies of the insect order Diptera, have four life stages: egg, larva (or maggot), pupa and adult. Perhaps the most important filth fly with widespread distribution in Michigan is the **house fly**. Larvae of this fly develop in a wide range of materials, including fresh manure, animal waste mixtures of manure and straw, hay or feed and garbage. The adult flies are gray/black with yellowish sides and are 6 to 7 millimeters long. They have sponging mouthparts and lap up materials from animal wastes and liquefying organic matter. Under typical summer conditions, house flies can achieve 10 to 12 generations per year (with 8 to 22 days required for a full development cycle from egg to adult), so these flies increase in number as the summer progresses. The adult flies commonly migrate 1 to 3 miles, and movement up to 13 miles within 24 hours has been documented. House flies can serve as intermediate hosts for a roundworm parasite of horses.

House fly populations can build to enormous numbers in animal containment settings. They have several generations per year. The annoyance factor for companion animals is difficult to assess, but the buzzing sound of the flies and their aggregation at sores and mucous membranes to feed may cause undesirable behavioral changes. Annoyance of humans by house flies is well known.

MANAGEMENT OF FILTH FLIES

Management of filth flies must be integrated with animal waste management practices. The overall aim is to remove manure. If it cannot be removed, manure must be dried out so maggots cannot develop. Good kennel sanitation, such as regular removal of manure from confinement settings, is critical in a successful pest management program.

Basic Daily Kennel Maintenance Program

1. Observe each animal for signs of distress or illness.
2. Remove any animal exhibiting distress or illness to an isolation area. Report condition to manager and obtain assistance from veterinarian.
3. Complete feces chart.
4. Remove bedding material, examine feces and urine for any abnormalities, and place in plastic trash bag. Replace bedding materials. If trays are used, sanitize and replace.
5. Check food container to determine consumption rate and possible contamination. Record on health record any eating abnormalities.
6. Remove food containers, sanitize and refill as appropriate.
7. Check water containers to determine water supply and cleanliness. Note on health records if it appears that water is not being consumed.
8. Remove open water containers, wash, disinfect, rinse and refill. Examine sipper-type water bottles to determine if cleaning and/or refilling is required.
9. Clean each cage, wash thoroughly with cleaning solution of warm water and detergent, and make sure all fecal material is removed. Then wipe down with hypochlorite (bleach) and water solution. Mix solution: 1 part hypochlorite to 28 parts water. Recommend using 32-ounce bottle with one-ounce markings on side.
CAUTION: Do NOT mix ammonia and hypochlorite. This mixture creates intense heat and toxic fumes that are dangerous to humans and animals.
10. Wash kennel floor, walls and windows.
11. Soak kennel grids and doors in sink if needed.
12. Towel dry kennels.
13. Replace bedding materials, food and water supply.
14. Check collars or other identification devices for each animal before replacing in cage.
15. WEEKLY: Inspect and wipe clean ventilation intake and exhaust vents in kennel area. Test kennel doors for security and check all cage surfaces for smoothness and overall condition.

Insecticides can be used effectively for adult fly control as space sprays, residual sprays or direct application to animals as dusts, gels or wipes.

Space or area sprays applied as mist, fog or ultra-low volume applications, typically control flies only at the time of application and within a limited area. A mist blower, fogger, ultra-low volume sprayer or hydraulic sprayer type equipment is required. Area sprays are usually mixed with water to dilute them from high concentrations (25-50 percent) to low concentrations (0.15-1.0 percent) before application. The insecticide label gives instructions on proper dilutions.

Residual sprays for filth flies are typically emulsifiable concentrates or wettable powders (both mixed with water, as indicated on the label, before use). They are applied as a wet spray to surfaces or vegetation where flies rest. In contrast with area sprays, which offer no residual activity, this approach offers some residual activity.

Larvicides have had limited success in killing maggots in manure or animal waste, so this control measure is not generally recommended. In cases where the use of larvicides is the only option, then application of labeled rates as a coarse spray is appropriate.

Insecticide-laden baits can be used for house fly management. Baits can be purchased ready to use or prepared as bait stations with residual insecticides mixed with sugar and put in burlap or paper bags. Baits are useful in indoor settings. When baits are used, they should be placed where animals or children cannot come into contact with them. Besides baits, certain traps can be used for fly control. Jars baited with fish heads or other smelly materials typically attract green blow flies and do not control house flies or stable

flies. Sticky traps made of stiff paper or a fiberglass panel coated with either insecticide or a sticky glue will attract some flies and offer localized control.

Certain insecticides can be **directly applied onto animals** according to label directions to protect them from flies. The insecticide applications are dips, wet sprays or dusts applied directly onto the animal. In each case, the specific application depends on the target insect pest and the species and condition of the animal. Many restrictions apply to insecticide applications on young animals and lactating mothers. Read and follow all label precautions and directions carefully.

If an animal is infested with fly maggots or wounds and areas of moist dermatitis, consult a veterinarian for treatment. Maggots may be associated with fecal deposits that accumulate around the animal's anal area.

Indoor areas that animals frequent or where they are stalled must be kept clean of accumulating waste. House fly and stable fly development requires wet or moist conditions, so control of standing water and good drainage are very important. Maintain a clutter-free environment in and around kennels, exercise areas, grooming areas and the entire facility. This will enhance safety and make cleaning easier.

Certain biological control agents, such as predators, parasites and pathogens of the immature stages of filth flies can be integrated with other control methods. These agents work best in warmer southern states or indoors where they can overwinter. In northern states, these agents are mainly experimental. Obviously, any use of biological control agents such as parasites of the fly pupae will be useful when combined with other physical, cultural and insecticidal methods.

Chapter 11 – Review Questions

Write the answers to the following questions and then check your answers with those in the back of this manual.

1. How many pairs of wings do flies have?
2. What are the three groups of fly pests of animals?
3. What do the immature stages or larvae of flies look like?
4. Name three of the blood-feeding flies.
 - 1.
 - 2.
 - 3.
5. Which of the blood-feeding flies has a developmental cycle involving water or aquatic habitats?
6. Dog heartworm is caused by a nematode and is transmitted between dogs by mosquitoes. True or False?
7. What are the three components to biting fly management?
8. What important ecological role do filth flies fulfill?
9. Some filth flies are vectors of disease agents to animals and humans. True or False?
10. What is the difference between a space or area spray and a residual spray?