Stable Fly
(*Stomoxys calcitrans* L.)

General Information

The stable fly is one of the most serious pests of confined livestock. In many areas it is becoming a more serious pest of pastured cattle as well, associated with hay waste residues from the large, round hay bales fed in pastures. Adult stable flies of both sexes require frequent blood meals (often daily) and feed preferentially on the lower body and legs of cattle. Stable flies have long bayonet-type mouthparts called a proboscis, which they use to tear through the skin causing blood to pool at the skin surface. These bites can be quite painful.

Stable flies have very poor survival at temperatures above 86 ºF (30 ºC), thus limiting their activity during hotter summer periods in geographic locations where mid-summer mean maximum temperatures substantially exceed this threshold. Stable flies are considered to be more abundant during high rainfall years, presumably due to the widespread increase in available immature habitat. Recent studies in California have shown that stable fly biting intensity during late spring and early summer was related to March rainfall, with greater rainfall in March resulting in greater abundance of stable flies during the peak abundance period in late spring and early summer (late April-June).

Identification and Life History

Stable flies are about the size of a house fly (6-10mm in body length). Both are common on dairies. However, the bodies (especially mouthparts), behavior, and posture of the two flies differ. Both flies rest on walls, hay bales, and other vertical surfaces, and may be especially prominent when they are warming up in the morning in an area lit by the early sunlight. Stable flies have a long, bayonet-type proboscis (mouthparts) that sticks out in front of the head (Fig. 1). The proboscis has rasping teeth at the tip that the fly uses to abrade the skin and create a pool of blood on which it feeds over a period of about 2-4 minutes. At rest, a stable fly will hold its' bodies at an angle to the surface on which it is resting, with the head higher than the rear (abdomen). In contrast, house flies have sponging-lapping mouthparts directed downward (not forward), and which cannot create a bleeding wound; although they will feed on available blood if they can get it. Also, stable flies have black spots on a gray abdomen (Fig. 2) while the abdomen of house flies is checkered black and gray with some yellowing on the sides of the abdomen.

Figure 1: Blood fed female stable fly in common resting position. Photo by Brad Mullens, UC Riverside.

Stable flies typically feed on the lower body, particularly the front legs of a cow (Fig. 3). The presence of numerous flies in this location, coupled with leg stamping and bunching together in tight groups, is diagnostic for this species of fly. Stable flies feed with the head pointing directly up (away from the ground) and parallel with the direction of the hair of the legs.

Figure 2: Stable fly showing abdominal coloration. Photo by Alec Gerry, UC Riverside.

Immature stable flies seldom develop in fresh cow manure, but can be abundant in wetted old manure, decaying feed, and rotting or composting vegetation (straw, haylage, silage, green waste), especially if mixed with urine or feces. At dairy facilities, stable fly development very commonly occurs in wetted old manure located in areas of a cattle pen protected from compaction by animals; such as beneath fence lines and along the edges of flush lanes. All flies undergo complete metamorphosis with egg, larva, pupa, and adult stages in their development. Young larvae respond negatively to light and will burrow into the organic material in which they are developing. Older larvae respond positively to light and will emerge from their organic habitat to seek drier and cooler areas in which they will transform into a pupa. The pupa develops within a puparium which is the hardened outer skeleton ("skin") of the last larval instar. This puparium looks superficially like rodent feces, but the ends are rounded rather than tapered as for most rodent feces. Within the puparium, the pupa transforms into an adult fly. The rate of fly development is dependent upon external temperatures; under optimal summertime conditions, house flies can complete their development from egg to adult in as little as 12 days.

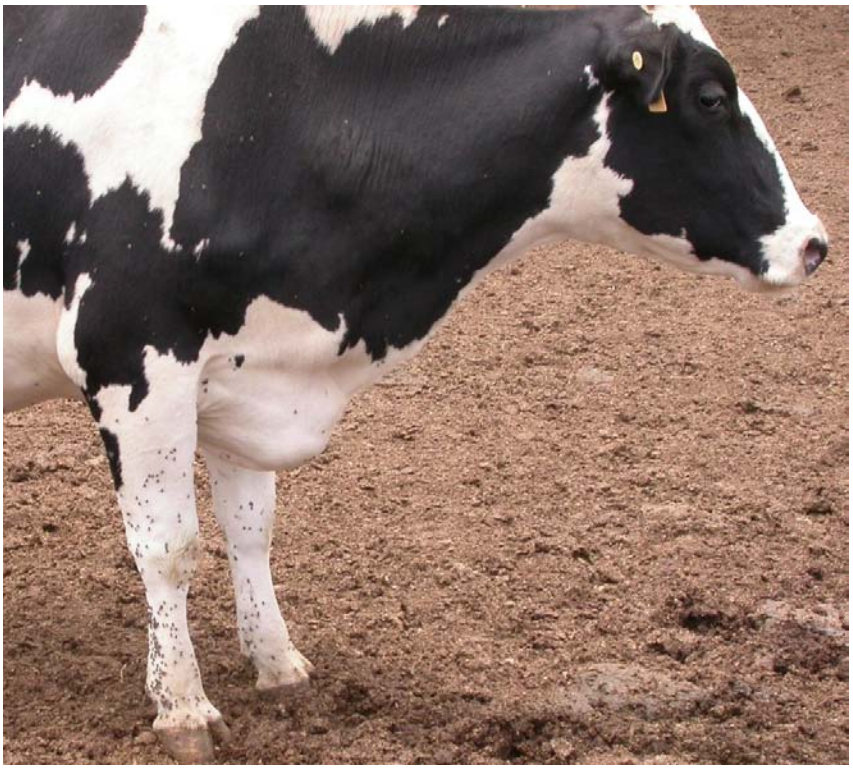

Figure 3: Stable flies feeding on the lower leg of a dairy cow. Photo by Brad Mullens, UC Riverside.

Damage

When stable fly numbers are high, they have been shown to reduce weight gains and feed efficiency in confined and grazing beef cattle, and may similarly affect milk production in dairy cows. It is estimated that significant economic losses can be expected when the number of stable flies on cattle exceeds 5 flies per leg. The overall economic loss to North American livestock producers due to stable flies is estimated to be over $2 billion annually. Stable flies are also known to disperse from their developmental sites into the surrounding environment where they can be significant pests of humans.

Integrated Pest Management

Monitoring: In any pest management approach, pest population information guides management decisions such as when and how to control the pest. Pest population abundance must be regularly assessed or monitored so that changes in abundance over time can be readily determined. Pest monitoring methods typically provide a relative assessment of the pest population rather than an actual count of the number of pests in a given area. For this reason, it is important to use the same monitoring method consistently so that direct measurements can be made between different assessment periods. Monitoring results should be recorded and kept for several years in order to evaluate seasonal and long-term trends in pest population abundance. Understanding these trends will help to develop a proactive program for pest control.

When pest abundance is low, the economic and health costs associated with the pest are typically also low. However, as the pest population increases in number it will pass an abundance value above which the pests will cause unacceptable economic or health costs, and control efforts directed against the pest will be warranted. A pest abundance value over which economic or health costs caused by the pests would exceed the cost of controlling the pest is called the “economic injury threshold”. The goal of every pest management program is to keep pest population levels below this threshold thereby reducing operating costs.

Monitoring stable fly abundance is done in three basic ways - counting flies on the animals, assessing frequency of fly repellent behaviors of the animals, and using stable fly traps to assess relative activity. For more specific information on methods to monitor stable flies, read the publication (Gerry et al. 2007) referenced below.

Management: Control efforts should be initiated following spring rains before stable flies begin to increase in number. While animals are most commonly bothered by adult flies, the larval stage should be the prime target for control efforts. Elimination of larval habitat is the preferred method of fly suppression. By removing material in which the larvae develop, the life cycle of the fly can be broken, preventing subsequent production of adult flies. While chemical pesticides may be necessary for suppressing adult fly populations in some situations, they are not a substitute for proper sanitation and aggressive elimination of fly developmental habitat.

Because flies can quickly develop resistance to insecticides, use them only as a last resort to obtain immediate control of adult flies.

Manure buildup at protected areas associated with cattle pens must be removed and thin spread to dry within the cattle pen, composted, or trucked off-site. The presence of animals in the pen will ensure disturbance and compaction of manure placed within the pens to kill already developing fly larvae. After drying, the manure can be scraped up and stacked within the pen. Manure and green waste may also be incorporated into windrows for composting. Manure buildup in flush lanes is typically caused by incomplete flushing or improper grading of the flush lanes. All manure buildup within the flush lane should be removed by increasing water flow through the flush lane system or by mechanical and/or manual scraping of the flush lane each week.

Cattle pens must be appropriately graded such that runoff and water trough overflow drains immediately off the pen and into an appropriate drainage system. This will allow manure in the pen to dry more quickly reducing fly development in the weeks following a rain or overflow event. If pens are improperly graded, or have developed low spots over the years, the addition of new soil, followed by grading and compaction of these pens should be accomplished during the drier summer months.

Any organic material outside the pen that is wetted should be immediately removed and either thin spread to dry within the cattle pen or composted. Special attention should be directed at the manure and feed buildup surrounding or under calf hutches and against feed bunks. The use of any organic material as bedding (especially old manure and straw or hay) may result in the production of large numbers of stable flies as cattle wet this area with urine and water. To prevent stable fly development, bedding material should be entirely removed every other week and replaced with new material. To kill developing larvae, the old bedding material should be thin spread to dry in a cattle pen, composted, or removed off site to a waste treatment facility.

By proactively addressing these sanitation concerns and removing potential stable fly breeding sites on the dairy, adult stable fly numbers should remain low. Continued sanitation of this breeding habitat throughout summer will also help to reduce the abundance of house flies which also breed in wet manure and spilled feed.

In terms of time and money spent on control, sanitation of larval development sites is the most cost effective means to control stable flies. However, there may be times when sanitation efforts alone may not be enough to keep adult stable fly numbers below the economic injury threshold and adult fly control should be initiated to reduce economic loss. Although complete control of stable flies is unrealistic, the number of stable flies attacking cows may be reduced through three mechanisms: 1) use of target traps such as the Alsynite or similar traps, 2) use of insecticides applied to treated cloth targets or stable fly resting sites, and 3) use of insecticides and repellents applied directly to cattle.

Target traps have proven effective at achieving some reduction in adult fly numbers in limited situations such as smaller dairies, zoo pens or dog kennels. Larger dairies probably have too many flies to control efficiently using these traps as the only means of control. Treated cloth targets are also capable of attracting and killing large numbers of stable flies. These targets are 1 square yard (square meter) pieces of dark black or blue cloth, fixed to stakes that are soaked with a premise spray insecticide. These are not yet available commercially, but they can be easily constructed and treated with insecticide by those authorized to apply pesticides at your facility.

While typically the least desirable method in an integrated pest management program, insecticides can be used to achieve some reduction in total numbers of adult stable flies at the dairy. With any insecticide it is important, and legally necessary, to follow label directions regarding site of application, dilution, and application frequency. There are two broad categories of insecticides that may be used to reduce adult stable flies - knockdown insecticides and residual sprays. Knockdown insecticides are non-persistent or short-lived insecticides (e.g. synergized pyrethrin) applied using foggers or mist blowers to areas where stable flies are concentrated. Knockdown insecticides should be applied during early morning hours when stable flies are less active and are concentrated in overnight resting locations such as barns, tree lines, and shade structures. Treatments may need to be repeated every few days as these insecticides will not persist more than a day or two. Residual sprays are persistent insecticides (e.g. synthetic pyrethroids such as permethrin) applied to structures on which stable flies tend to rest. Residual sprays should be applied to building walls, fence lines, shade structures, surrounding vegetation, or any other location where stable flies have been observed resting. To slow the development of insecticide resistance, the use of residual sprays should be limited and rotation of chemical classes should be practiced. For example, alternate the use of pyrethroids with organophosphate insecticides.

Biological control through releases of commercially available “natural enemies” that attack stable fly pupae is an appealing prospect. On California confinement dairies, most natural parasitism is done by wasps in the genus *Spalangia.* Fly natural enemy activity is something to be encouraged, and care must be taken to apply pesticides in such a manner as not to harm these natural enemy populations. Spraying a broad-spectrum pesticide directly onto a fly development site may cause substantial detrimental impact to natural enemy populations which tend to be present on the surface of the developmental site, while resulting in poor to mediocre fly control as fly larvae are somewhat protected beneath the surface at the developmental site. Thus, application of pesticides to widespread larval development sites is discouraged. Parasitoid releases in some U.S. regions (and Europe) have met with success, especially in areas that are somewhat confined (e.g. calf barns). To date trials releasing parasitoids on large confinement dairies in southern and central California have not resulted in a substantial reduction in fly activity, but the concept is constantly under review and subject to further experimentation as better natural enemies or techniques are developed.

References for more information:

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