Project Aims To Clean House on Filth Flies

PEGGY GREB (K10823-1)

Holstein heifers bunching in response to feeding stable flies. Bunching damages pasture vegetation, causes heat stress to the cattle, and increases injuries, especially to calves.

Once considered mainly a feedlot pest, the stable fly has extended its reign of terror to the open pasture and rangeland, areas where cattle once grazed virtually unharried by the bloodsucking insect. Its expansion into new territory has added to an already expensive tab—nearly $1 billion in annual production losses to the U.S. dairy and beef industries.

In Mead, Nebraska, ARS and university scientists are collaborating on an areawide project to find out how this problem came about and what can be done to resolve it.

"In the last 10 years, stable flies have become as important a pest of pastured cattle as they once were for confined beef," says entomologist Phil Scholl, who heads the ARS Midwest Livestock Insects Research Unit, Lincoln, Nebraska. "The most logical explanation for this increase is the almost ubiquitous use of round bales as a feed supplement for winter-pastured cattle."

The flies may be breeding in hay bale litter that has mixed with mud, water, and manure. There are other possibilities, too. One is that stable flies are migrating to pasture from breeding sites at nearby farms, such as feedlots and silage piles. It's also possible that midwestern grazing lands are being repopulated each spring by windborne flies from the South.

In May, Scholl and colleagues began a 5-year field project near Mead to monitor the fly's population dynamics, breeding habitat, and dispersal patterns within a 25-square-mile tract of land owned by the University of Nebraska's Agricultural Research and Extension Center, Ithaca, Nebraska. His collaborators are Jack Campbell, with UNL's West Central Agricultural and Research Development Center, North Platte, Nebraska; Alberto Broce, with Kansas State University's Department of Entomology; David Taylor, with ARS's Lincoln unit; and Jerry Hogsette, with the ARS Mosquito and Fly Research Unit, Gainesville, Florida.

Scholl says the university site "offers a unique opportunity" to collect fly data across a broad range of environments. These include 4,500 acres of pasture, an onsite dairy, feedlots, a calf weaning area, a composting site, and a turfgrass area and nearly 5,000 cattle.

Every square mile of the site is crisscrossed by a virtual grid of squares in which the scientists have placed their most important monitoring tool—Alsynite cylinder traps with a sticky outer covering. With these, the researchers can correlate fly numbers with breeding sites and meteorological conditions.

"The objective," says Scholl of the study, "is to better understand the fly's biology, ecology, and breeding habitat so we can devise control strategies that can be used in an integrated approach for managing the pest."

Of special interest is fly activity close to round bale feeding sites. The problem begins when hay from the bales is pulled loose by cattle and falls to the ground. There it is trampled and mixed with urine and manure, creating an ideal habitat that female stable flies can lay eggs in. In late spring, young flies emerge from the sites hungry for blood. Their attacks cause cattle to bunch together, lie down, or wade in water to protect their forelegs.

"Bunching is a big problem," Scholl says, "because if they're doing that,

PEGGY GREB (K10816-1)

Entomologist Philip Scholl examines an Alsynite sticky trap used to monitor adult stable fly populations.

they're not grazing and gaining weight." It also leads to heat stress. By one study's estimation, stable fly attacks on yearling beef steers cut the animal's daily weight gain by nearly half a pound.

Spraying hay bale sites isn't really an option, Scholl notes, because the insecticides now used break down after only a few days, necessitating re-application. The flies' preference for attacking cattle's forelegs can also render ineffective such animal treatments as back rubs and ear tags. The flies' hit-and-run tactics also protect them from lethal exposure to cattle sprays or systemic insecticides.

Most likely, combining insecticides with other measures, such as cultural and biological control, will prove most successful.

ARS entomologist David Taylor, for example, is conducting a trial in which he has treated the soil around a hay bale site with a *Steinernema* nematode that kills stable fly larvae. He'll assess the nematode's effectiveness by comparing treated and control plots and monitor its longevity in a manure-rich environment. Other control strategies may include moving hay bale locations in pastures and spreading or disking hay litter mixed with manure.

Taylor and Scholl are also investigating use of DNA markers to study genetic variation among stable fly populations from around the world, as well as using rare-earth elements such as selenium to trace long-range fly migrations back to the geographic points of origin. "For example," says Scholl, "if we could find some element that's found only in Arizona and is picked up by flies there, and we captured some specimens in a midwestern pasture that contained that element, we'd have good proof of long-range migration."

Though still conceptual, this approach may prove useful in determining the role that seasonal winds play in carrying stable flies to new territories—an endeavor of particular interest to Hogsette, Scholl's ARS Gainesville, Florida, collaborator.

Settling Into the Suburbs

Hogsette says flies are known to appear from out of nowhere in different regions of the country. As frontal systems move through, bringing changing weather conditions, flies and other insects get sucked up into the atmosphere. In West Florida, for example, the winds deposit the stable flies onto the beach. What's more, a new generation can arrive and become established in urban and rural areas overnight—even if there aren't any overwintering adult flies already present.

Hogsette is examining not only the consequences of flies being

Stable flies caught on an Alsynite sticky trap.

attracted to humans and their actions, but of humans coming to the flies. For example, as suburban sprawl encroaches on farmland, people have more contact with both stable flies and house flies *(Musca domestica)*, creating conflict with livestock producers. House flies don't bite, but they can transmit many diseases of humans and other animals. They pick up disease-causing organisms from garbage, sewage, and other sources of filth and can transfer these organisms from their mouthparts and other body parts to other animals, including humans.

PEGGY GREB (K10818-1)

Entomologist Philip Scholl prepares to dissect a female adult stable fly to determine its physiological age.

PEGGY GREB (K10823-1)

Entomologist David Taylor and technician Corinne Kolm look for stable fly larvae in residue from a feeding area near a large round bale of hay. Residue produced during winter feeding provides perfect conditions for stable fly larval development in the spring.

Because pesticides alone can't control the two fly pests, proper animal manure management and sanitation are crucial to a successful fly control program. Hogsette proved that house flies, like stable flies, can reproduce in small residues of manure trampled into pastures.

But suburban residents can't entirely fault their rural neighbors for all their fly problems. Hogsette says conditions associated with the suburbs also lend themselves to fly development. For example, besides grass clippings from mowed lawns, golf courses, and compost piles, the flies can also breed in dumpsters behind grocery stores and restaurants. And instead of pestering cattle in the pasture, they may target the family dog or even "Henry Homeowner" manning the barbecue grill.—By **Jan Suszkiw** and **Jim Core,** ARS.

This research is part of Veterinary, Medical, and Urban Entomology, an ARS National Program (#104) described on the World Wide Web at www.nps.ars.usda.gov.

To reach scientists featured in this story, contact Jan Suszkiw, USDA-ARS Information Staff, 5601 Sunnyside Ave., Beltsville, MD 20705-5129; phone (301) 504-1630, fax (301) 504-1641, e-mail jsuszkiw@ars.usda.gov. ★