Dairy Herd Management Update—Pest Management: An Integrated Program for Insect Control

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Overview

Integrated pest management simply defined is the use of all potential control strategies to reduce pest populations below economic levels while minimizing undesirable effects to animals and the environment. Think of it as minimizing costs (both reduced animal production and environmental damage) while maximizing productivity (i.e. increased milk). As entomologists, we have generalized control strategies available. These are legal, mechanical, cultural, biological and chemical. Also, it must be remembered that these controls work on two hierarchies, i.e. federal and state vs on-farm protection by the producer. For example, legal, i.e. quarantine laws and biological work primarily on the state and federal level, whereas chemical relates more particularly to the farm level.

The key words in our pest management definition are:
1. All potential strategies (if applicable).
2. Economic levels.
3. Minimal effect to the environment.

In order to do so we must identify the pest, know its economic thresholds, integrate control strategies and understand the impact of these strategies especially when using insecticides.

In my presentation I have dealt with five pests common to the dairy producer; 1) house fly, 2) horn fly, 3) face fly, 4) lice, and 5) cattle grubs. These constitute summertime pasture and stable problems and wintertime parasites. For each pest I will cover their biology (briefly and only as it relates to control), the economic threshold and finally the best control options available to us.

Let us begin with the **"house fly"** the pest ubiquitous to all livestock facilities in the summer months. The key aspects of the biology to understand are; 1) tremendous reproductive potential, 2) fast development time (<10 days), 3) fairly long-lived adults, and 4) maggots that develop in the bedding and manure.

If we look at the economic threshold I would first emphasize that there really is not one other than what the producer can tolerate. Jack Campbell, working in Nebraska with beef calves, failed to show differences in weight gains or feed efficiency with calves caged with over 10,000 house flies vs calves caged in the absence of flies. We simply do not see 5% more milk from cows in fly-free environments. The major concern is what the producer can tolerate. Having milked a few cows, tail flicking aggrevated by flies and flies landing on your nose, can be a problem.

The basic control option is centered on sanitation. Large numbers of maggots breeding in bedding **MUST** be destroyed. Start control against larvae not adults. This means cleaning out calf pens weekly if flies are a problem. Our studies indicate the major source of flies are the calf pens followed by heifer pens and finally the manure pile out back. Control CANNOT be accomplished by chemicals, biologicals, electrocutors, etc., UNLESS clean-out is done. This represents about 1-2 hours each week if we are talking 6-10 calf pens at $5.00/hour for a high school student; this represents control for ca. $170.00 over a 17-week fly season in New York State. Farmers will give you a lot of excuses, many legitimate about (I don't have time). My answer is that you do not have a fly problem, but rather a time management problem.

Although clean-out is the basis of control other options are available including the use of commercial parasites. These sell for ca. $23.00 for 10,000 parasites and the concept is to release them in the barn at weekly intervals and these will take care of the fly problem. A good idea, but from my own and other studies, not yet feasible as parasites are not sufficiently competitive.

As a last resort, insecticides can be used to control adults. I stress this only in conjunction with clean-out. In Ontario, we strongly recommend changing classes of insecticide after every treatment, i.e. organophosphate, then pyrethroid etc. Resistance by flies develops rapidly if the same product is used consistently. We practice resistance management. Floor baits and cards placed in areas of high fly numbers (i.e. windows) provide good control for low to moderate populations. The house fly, because it breeds in the barn, is our best candidate for integrated pest management.

The **horn fly** is about half the size of the house fly and found on backs, sides and bellies of pastured animals throughout the summer months. Key factors about the

biology are that flies essentially live all their lives on animals, males and females suck blood from animals, eggs are laid in fresh cowpats. Up to three generations occur here in the north but 5-7 in southern areas, i.e. Texas. Flies overwinter as pupae in the soil next to cowpats. Adult flies are NOT dispersive.

Economics are well defined for beef cattle where up to 17% improved gains and larger calves (8 kg) are found in animals not affected by horn flies. In dairy cattle the economics are less well defined but improved milk production of 1-2% and heifer growth of 3% have been shown in one large study. I would emphasize though that the gains were not statistically different. I do believe that it definitely pays to control the horn fly.

Much has been done in the area of biological control by the government, i.e. beetles that breakdown cowpats so maggots cannot develop, parasitic insects and nematodes have been released. However, to the farmer, the control option available is insecticides either as ear tags, dust bags, oilers or sprays.

Currently, the most popular method is control by ear tags impregnated with about 10% insecticide. Chemicals are locked in the oil of hair and spread by grooming and herd action. Ear tags release less than 2 mg of insecticide per day and provide >99% horn fly control. I would indicate that in Texas and the Gulf States resistance to chemicals is a problem. Other methods use dust bags, oilers, actual sprays and tail tapes to provide horn fly control.

The *face fly* is essentially identical to the house fly. One finds it on cattle during the summer feeding on nasal and eye secretions. Larvae develop in fresh cow flaps (<5 hours old) and adult flies feed only in the daytime and will not enter the barn in summer although they overwinter in barns and houses as adults. One last point is that face flies are highly dispersive moving from herd to herd.

The economics of the face fly are questionable. At least one major study has failed to show any significant increase in milk production associated with face flies. It seems cattle quit feeding under high fly pressure but simply compensate by increased grazing at night. Face flies, however, are the vector of *Thelazia* eyeworm and *Moraxella bovis,* the pathogen of pink eye. In this regard, reduced face flies reduce the probability of pink eye. For this reason, I recommend to my producers that they control as an insurance policy. If you did get a bad incidence of pink eye in your herd it can cost you considerable money.

Because horn flies and face flies have similar breeding habits and attack animals on pasture, control for face flies is the same as for horn flies. You do need more insecticide because the face fly is larger and is not on the animals as long as the horn flies; consequently, two ear tags are recommended. Also, because face flies are so dispersive, the best controls we have achieved are 60-80% reductions (never 100%).

We should now turn to winter problems. The first I will deal with are **"lice"** of which there are two types of biting and sucking. The biting feed on skin debris and are a cream color, the sucking feed on blood and are grey-blue in color. Lice are host specific, spend their complete life on animals, are spread by direct contact and reach maximum numbers in the winter. Well fed animals on a high nutritional plane can limit louse numbers. We used to think lice caused sick animals (i.e. anemia); the opinion now is that sick animals allow high louse populations to develop. One last point is that from my experience in eastern Canada, essentially all lice on dairy cattle are biting lice.

The economics of lice on beef cattle is different from dairy cattle. Since dairy cows and heifers are well fed and usually housed indoors during the winter we do not see high populations except occasionally with biting lice. In beef animals we see reduced weight gains on animals with low nutritional planes and high sucking louse populations. In dairy cattle the rubbing and scratching does not cause measurable reduced milk production.

Insecticides are our only treatment for infested animals and because of potential milk residues differ between milking cows and heifers or dry cows. For cows a number of dust formulations are available, whereas systemic insecticides can be used for non-lactating animals. Retreatment after 10-14 days is recommended to eliminate louse populations. Once a herd is louse-free any animal making contact with that herd should be treated to prevent reintroduction of lice.

The last insect I will cover is the **cattle grub** of which there are two species. Adult flies attack animals throughout the summer depositing eggs on the hair. Larvae move into the skin and migrate in subcutaneous tissue for about 6-9 months as first-instar larvae before emerging and increasing rapidly in size along the back. Older animals are resistant to migratory larvae, i.e. 200 eggs on heifer may allow 120 larvae to develop in the back but 200 eggs on a previously exposed cow may result in only 1-2 mature grubs.

Economics on beef cattle are well defined in terms of reduced value for grubby carcasses, hide damage, 3-5% reduced weight gains. Many of these costs relate to slaughter and do not pertain to dairy. A recent study in Ontario, however, showed that treating replacement heifers in the fall resulted in a $48.00 increased value by the following spring. This was determined on the basis of increased size of the heifers and time to first lactation.

Again, insecticides are our only real choice for control although the US-Canadian governments have recently initiated a sterile male program in Montana-Alberta. This is similar to the screwworm program in Mexico. Control should be directed to the heifers not to the cows because the heifers have the highest populations and systemic insecticides cannot be used on milking cows because of milk residues.

Insecticides can include pour-ons, spottons or injections with a number of safe effective products available. The failure by producers to treat replacement heifers is probably where they are loosing their greatest dollar. Also, treatment

of dairy heifers are our greatest source of infestation in eastern North America as most beef producers do treat.

In conclusion, pest management means identifying your pest, understanding its biology to know why you have a problem. You must know your control options and integrate these for maximum profit at minimal costs. With current techniques, controls are available which are effective, safe to animals and the environment and make a profit for the producer.

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