

Pest Management Strategic Plan

for

Beef Cattle and Non-lactating Dairy Cattle

For lactating dairy cattle see the PMSP for dairy cattle.

North Central Region

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Submitted by

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Executive Summary:

The purpose of a Pest Management Strategic Plan is to provide a document that communicates the role of pesticides and pest management strategies in control of crop or animal pests from an industry perspective, with cooperation and verification from livestock pest management specialists. While this information is primarily used by the Environmental Protection Agency (EPA), it also provides to the USDA, Land Grant Universities, and pest management stakeholders a “to do” list of research, education, and regulatory issues. Strategic Plans may also be helpful to the livestock industry as a means of evaluating progress on those issues.

This document has been prepared to convey to the reader the pest management challenges confronting Midwestern livestock producers. Though it is not all-inclusive, it is meant to be generally representative of livestock pest management in the North Central Region.

This initial version of the Beef and non-lactating Dairy Animal Pest Management Strategic Plan is based on information assimilated from production documents from various states in the region. The document was further developed from input gathered from producers and extension specialists attending the workshops. Workshops were held at Harmony, Minnesota on 21 November, 2003, at Greenville, Illinois on 16 January, 2004, and at Charlestown, Indiana on 30 January, 2003. Although only dairy producers attended the meeting at Greenville, Illinois some useful comments were offered by those individuals for insect control on non-lactating dairy animals. In addition to providing input on pests and pest control methodologies, attendees identified research, education and regulatory issues that impact producer profitability and environmental quality.

Data completeness and accuracy:

The intent of this report is to provide the EPA with the pest management perspectives of livestock producers. As such, it primarily reflects the comments and inputs of those individuals who attended the workshops. As with any group of individuals, the scope of knowledge as well as opinions of participants vary greatly, and in its current form this document captures that scope and diversity.

The editor has taken care to excise faulty or misleading information, but it has not been our intent to remove or alter information which was provided at the workshops that does not harmonize with “conventional wisdom”. This Strategic Plan should be viewed as a work in progress; future versions will undoubtedly result in an improved product.

Regional differences:

Although particular attention was paid to obtaining broad geographic representation for input into this document there were no significant differences that, to date, were worthy of separate notation.

Efficacy ratings for pesticides:

Pest control ratings for insecticides are difficult to determine due to few direct comparisons being available. Those practices that are listed as being ‘common’ could be interpreted as having a ‘good’ or ‘fair’ level of control. Products with no indication of relative use may have good or fair levels of control but may be seldom used due to problems with treatment convenience, cost, or other non-efficacy related issues.

Priorities growers would like to have addressed:

RESEARCH

Please list items of information you would like to know about any livestock insect or insect control that you don't know and that could be addressed through research programs.

1. What is the connection between face flies and pink eye in cattle?
2. What is the best treatment for face flies and does it reduce pink eye incidence?
3. What is the toxicity of insecticides to the human applicator? How concerned should I be? (Several comments like this)
4. What is the impact of ticks on cattle?
5. An effective product is needed for horn and face flies. Current products are too short lived.
6. Why do bulls attract more flies than heifers? Is there some hormone here that can be applied to a trap to draw flies away from the herd?
7. A broader spectrum insecticide would be very useful, particularly something that could be fed to cattle and would repel all insects.

REGULATORY

List here any pipeline pesticides you would like to see registered or any current products you would like to see have their label expanded. Also list any other actions you would like to see the EPA take with regards to product registration or use.

8.

9.

Education

Please list items of information you would like to know about any livestock insect or insect control that you don't know and that could be addressed through education or extension programs. (I.e. the information probably already exists, you just don't have ready access to it.)

10. We need a comprehensive, up-to-date, searchable web site database of currently registered products for use on lactating and non-lactating cattle.

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General Production Information

Background:

The North Central States are a major beef producing region. Seven states rank in the nations' top ten for number of beef animals produced (see Table 1). In 2003 this region produced 38% of all US beef cattle and calves and 41% of the US meat production. Meat, tallow, and bloodmeal are some of the consumable animal products sold, while other products include leather and animal by-products.

The principal reason for such a large number of beef operations being located in the upper Midwest is the readily available supply of feed grains and forage. Not only do beef cattle provide the Midwestern farmer with a means of adding value to corn and alfalfa produced on the farm, but it also means that feedlot operations have few trucking or transportation fees to pay to access high protein feed.

Herd sizes in the Midwest range from 35 to 184 head with a mean herd size of 87 (1997 Census of Agriculture). This number will include both cows and calves. Larger herds are predominantly found west of the Mississippi while smaller herds are more typical of production facilities east of the Mississippi.

Beyond the size of the herd, there are also differences in some production practices between these regions. East of the Mississippi, producers more commonly utilize beef as part of a diversified production practice with other livestock and commodities. These smaller herds are maintained more often on improved pastures during the summer and in enclosed buildings during cold weather. West of the Mississippi, beef production is a more fundamental part of the operation and calves are more likely to have been started on open range and finished at feedlots prior to slaughter. Nationally, about 75 percent of the market beef is from feedlot-fed cattle.

General Production:

Beef cattle for slaughter are produced either as yearlings started on pasture and finished on feedlots or as calves fed on lots from time of weaning. At the time of this writing feed lot production was evenly divided between these methods when evaluated over the entire North Central Region. Feed grains are fed prior to slaughter to increase the rate of gain and to make the beef more palatable. Feed grains also help producers to provide top grade beef to the market throughout the year without the market gluts or shortages that would occur from range or forage fed beef alone. Typically, grains are fed to yearling cattle as the predominant feed for about four months, while calves may be fed for about seven months from time of weaning. However, the current trend is for more calf fed production. The estimates which follow offer a general starting point for understanding feed consumption.

The average beef animal on a feed lot consumes 2500 pounds of feed grain (high carbohydrate sources) during its life. Of all cattle finished on feedlots about 35 percent of their final weight can be attributed to feed grains. However, some producers will find other sources for carbohydrates. For the largest feedlots, almost all feed by-products such as (potato residue, corn cannery residue, sugar beet pulp, grain screenings, oil seed residues, brewers "grains" and millers residues). For feed lots feeding by-products, these sources may make up to 50 percent of the daily intake of carbohydrates. In addition to feed grains, baled hay or ensiled alfalfa and mineral supplements are usually fed to maintain herd health. Calves fed from weaning will consume up to 600 pounds of alfalfa or other hays during their life. It is difficult to predict the amount of forage eaten by yearlings but estimates may go up to 2000 pounds for cattle produced as winter stockers (not on feed lots). Beef animals also consume approximately 20,000 gallons of water during their life.

Excessively cold weather will cause beef cattle to use stored energy to keep warm. Depending on the availability of natural windbreaks, barns and pole sheds may be provided to alleviate some of winter's stress on animals and reduce the need for excessive amounts of feed.

<http://www.beef.org/library/handbook/environment.htm>

Table 1. 2002 Production Statistics:

Cattle and Calves (head)			Total Number of Operations	Average Herd Size
Rank	State	Inventory		
2	Kansas	3,141,000	29,446	107
3	Nebraska	4,201,000	23,881	176
5	Missouri	3,702,000	57,935	64
6	S. Dakota	3,210,000	17,428	184
7	Iowa	2,275,000	27,452	83
8	Wisconsin	679,000	11,642	58
10	Minnesota	922,000	15,745	59
12	N.Dakota	1,677,000	12,744	132
20	Illinois	931,000	17,682	53
23	Ohio	591,000	17,060	35
26	Michigan	278,000	7,566	37
29	Indiana	547,000	15,164	36
	NC Region	22,154,000		
United	States	96,106,000		

Source: <http://usda.mannlib.cornell.edu/reports/nassr/livestock/pct-bb/catl0103.txt>

General Pest Control Information:

As mentioned above, production practices are often different between the eastern and western portions of the North Central Region. As would be expected with animals in larger herds, cattle from the western portion of the region will self-administer insecticides to a greater degree via back scratchers, oilers, and through feed additives. Whereas, in the eastern portion of the North Central Region, pesticides are applied more often by direct human intervention, through the use of pour-ons and sprays.

Insecticide formulations:

Many different formulations of active ingredients are available for use against lice, mites, internal parasites and flies. Some formulations are restricted to immature animals or to lots or premises. Widely used formulations include topical pour-ons and sprays, slow-release ear tags, residual premise sprays, and knockdown aerosols. Some ingredients can also be delivered internally through injection or as feed additives.

The most widely used barn and space sprays contain short lived pyrethrins, organophosphates (stirophos, dichlorvos) , and synergists (PBO). Some organophosphates (coumaphos, dichlorvos) and one of the pyrethroids (permethrin) are formulated for topical use, whereas others are used as premise sprays (stirophos, cyfluthrin). The most recently developed class of compounds is the avermectins (ivermectin, doramectin, eprinomectin), which have a broad spectrum of activity against lice, mites and internal parasites.

Ear tags are mostly impregnated with pyrethroids and organophosphates. Permethrins have been used for over fifty years and several pyrethrin-based pesticides are becoming ineffective due to tolerance. Flies are also obtaining higher levels of tolerance, or resistance, to organophosphates. Many dusts and oils are used on the cattle through rubbers and oilers where the animals may scratch. Feed additives help in curbing larval growth. Injectables may be used to combat internal worms without affecting meat production or flavor.

Insecticide Applications:

A survey of pesticide use on beef cattle in the North Central Region was conducted in 1998. Responses were received from 2,474 producers with over 780,000 head of beef. Survey data is found in tables 2 through 7. The results indicated that avermectins were the most widely used insecticides¹. Approximately 56 % of all beef animals were treated with this class of compounds, the majority of which (39% of all treatments) were applied as pour-ons. The remaining amounts were applied through injection. The next most widely used class of compounds was the organophosphates. A total of 36% of all beef animals received treatments from this group of compounds. The greatest use of a single compound within this class was famphur pour-on treatment of 17% of all animals. Except for fenthion use on 6% of the animals all other organophosphate uses remained under 3%. The use of pyrethroids totaled approximately 15 percent of all animals. Of all pyrethroids, permethrin was used most widely (7.8% of all animals) in body sprays and as pour-ons.

Selection of a pesticide for a given pest problem is not always a simple choice. Where comparable, effective products are available, a beef producer is probably more likely to choose an avermectin than an organophosphate product because of lower product toxicity. Ease of application is probably more important in beef operations than dairy, since the animals are frequently not confined. However, famphur seems to be a favorite because of the wide spectrum of pests it is effective against and its persistence (plus, as a pour-on, it is also easy to apply). Dust bags have the advantage of ease of application since the animals "treat" themselves as they walk under the bag at the exit of a pasture. However, in the western "range" states, such use is not very likely. Pyrethrin sprays are probably little used on beef herds due to the fact that the daily application of such sprays or aerosols is labor intensive and requires that the cattle be gathered in on frequent basis.

Table 2. 1998 Beef Animal Pesticide Use by Class as Reported by a North Central Region Survey:

Pesticide Class	% of Animals Treated
Avermectins(AV)	55.6
Organophosphates(OP)	36.1
Multiple Products	30.0
Pyrethroids(PY)	15.1
Benzimidazoles(BZ)	2.7
Other	2.2
Growth Regulators(GR)	1.4
Chlorinated Hydrocarbons(CH)	1.1
Acetylcholine mimics Imidothiazoles, Pyrimidines	0.5
No Pesticide Applications	6.5

Table 3. Top five active ingredients used on beef in the North Central Region as reported by survey for 1998:

Rank	Active Ingredient	% of Animals	Classification of Active Ingredients
1	ivermectin	34.4 %	Avermectin
2	famphur	17.2 %	Organophosphate
3	doramectin	16.8 %	Avermectin
4	permethrin	7.8 %	Natural Botanicals
5	fenthion	6.8 %	Organophosphate

Table 4. Beef Herd Pesticide Application Method Summary for the North Central Region for 1998:

Application Method	% of Animals treated
Pour-ons	73.0
Injections	18.1
Ear tags	7.1
Oilers / Scratchers	4.9
Sprays and Aerosols	3.4
Oral	2.8
Feed / Mineral Additives	2.7
Dusts and Dust bags	1.5
Bolus	0.1
Dip	0.1

Pest resistance issues:

House flies developed resistance to DDT within the first five years of commercial use in the late 1940s, and this species is known to have developed resistance to organophosphates and more recently, the pyrethroids. Horn fly shows spotty resistance to pyrethroids, primarily due to ear tag use.

Synthetic chemical free production:

Although small herd beef production without pesticides is possible it can raise issues of sanitation, animal health, and humane treatment. Beyond this, the challenge to producers who wish to maintain large herds without pesticides can be considerable. As the size of the herd increases pest problems can multiply and the simple sanitation methods employed for smaller herds become less effective.

Worker exposure issues:

Of all application methods, pour-ons were the most widely used with over 73% of all animals receiving such a treatment. Injections were the next most used method of application at about 18 percent of all animals so treated. Sprays and aerosols made up only 3.4 percent of all applications to beef. Insecticides are typically applied to animals as they pass through a chute or confined access-way. Pour-on insecticides are applied to the back of the animals with the use of a dipper provided by the product manufacturer. Most workers will wear rubber gloves, aprons and eye protection when treating cattle with pour-ons and in dips. In spite of such protective equipment some incidental exposure to the face and exposed flesh of the arms remains likely.

Handlers:

Dehorning, castration, and pharmaceutical injections are a few of the activities that can bring handlers in contact with treated cattle. These activities are typically one-time events during a year and

seldom would extend handler exposure to treated animals beyond 8 to 16 hours within a year. These operations also tend to take place during the spring or fall when insect populations are low and insecticide use is minimal.

Environmental exposure issues:

There are few environmental issues associated with insecticide applications on beef cattle. One possible concern might be localized areas of contamination near sites where pour-ons, whole body sprays, or animal dips are used and around dust bags. These sites can be of particular concern if wells are nearby or if the runoff from these sites wash into ponds or streams that provide a source of drinking water for cattle.

Registration and Critical Alternative issues:

Consistent pest control for beef animals rests on three classes of compounds: avermectins, pyrethroids, and organophosphates. However, in the absence of a specific pest resistance problem or invasive insect, organophosphate insecticides are considered of Level C significance to production. Permethrins and avermectins as independent groups of insecticides could be considered of Level B significance. Their loss at this point in time, would cause significant shifts in production practices, probably with an increase in the use of organophosphates for coat sprays. No single compound can be classified as of Level A significance, and with the exception of pyrethrin, which is a Level B, most are Level C.

Issues regarding retention of a specific pesticide or group of pesticides are given a rating of A, B, or C according to their level of significance to the commodity. It is recognized that for some commodities, non-chemical or organic methods of pest management may be employed. However, our intent is to focus on commercial agriculture, which generally involves conventional pesticides.

Level A: product critical, no acceptable alternatives, loss of product would cause regular and drastic changes in production, safety, or commodity price.

Level B: product essential, alternatives limited in application, loss of product would cause significant changes in production, safety or commodity price.

Level C: product fundamental, alternatives exist, loss of product would cause few changes in production, safety, or commodity price.

Pipeline products:

No new pipeline products are known at the time of this writing.

Co-occurrence:

There are no detailed records indicating what insecticides are used in combination or in sequential applications. However, the greatest opportunity for sequential uses would be with the aerosols and sprays and the pour-ons. This suggests that sequential uses are primarily those occurring with some formulation of a pyrethrin being used followed by other pyrethrins (of the same or different formulation). Although dichlorvos is also used as an aerosol the few cattle treated would not indicate much use preceding or following an insecticidal compound from another class.

NOTE: An organophosphate insecticide with the common name of stirofos in the United States is more commonly known as tetrachlorvinphos in Europe and some other countries.

Insect Pests

General Comments from Producers

Producers indicated that the most convenient treatments were those with long residual activity. Since cattle are difficult to corral the best times for treatments to the animals are during the spring or fall as the animals are moved to or from pasture.

Although the concept of back rubbers, face oilers, and other self application devices is good, seldom to all animals utilize these devices, and some have a distinct aversion to them. Producers indicated that for these devices to be most effective the animals have to be familiarized with them and 'trained' to use them.

A significant number of producers indicated that they relied on their veterinarian for insecticide recommendations and sometimes could not remember the exact product purchased.

A common complaint among producers was that ear tags were very ineffective in controlling insect pests.

All producers generally agreed that **synthetic pyrethroids are critical** to effective control of insects on livestock. Some producers indicated that this was often as much for reducing fly movement to nearby

residential areas as it was for reducing nuisance activity on the cattle.

Lice and Mites

Life cycle and biology

- Prominent wintertime pests.
- Lice include three blood sucking species and one chewing species.

Distribution and Importance

- -Indicated as a common problem by most producers and considered second in importance to horn and face flies.
- Moderate densities of lice cause their hosts to scratch and rub, which leads to dermatitis, hair loss, and decline in animal production efficiency. Dermatitis can also be caused by three species of skin inhabiting mites that stimulate dermal hypersensitivity.
- Weight loss may result from animal irritation due to high populations.
- Both lice and mites are permanent ectoparasites that spread solely through contact between infested and naive animals; lice and mites do not fly or jump, and off-host reservoirs such as bedding in vacant pens are of minor epidemiological consequence.
- The problematic species on beef cattle (and dairy cattle) do not occur on other domesticated animals, wildlife, or birds. Consequently, if a herd is closed to contact with other dairy or beef herds, it is feasible to eradicate lice and mites from the subject herd, and to maintain parasite-free status if bio-security is adequate.

Chemical Control (General)

- A variety of formulations of insecticides and acaricides are available to combat lice and mites, and pesticide resistance is not yet widespread.
- No vaccines or other biological methods are available to control lice and mites, and there are no cultural methods that are practical and effective on a commercial scale.

Self treatment devices for Lice

Back or face rubber (typically diluted in diesel fuel or mineral oil)

Organophosphates

Some producers specifically avoid organophosphates due to toxicity

Coumaphos (Co-Ral 11.6% EC)

- 0 days preslaughter interval
- Do not apply with other internal medications
- Do not apply with synthetic pyrethroids, synergists or organophosphates.

Malathion 57% EC

- 0 days preslaughter interval
- This product is used with regularity and is considered by producers as very effective

Phosmet (DelPhos 11.6%EC)

- 0 days preslaughter interval

Pyrethroids

Permethrin (Atroban, Expar)

- 0 days preslaughter interval

Dust Bag

Although dust bags are commonly used they are not considered particularly effective by producers. They are easy to deploy but cattle success with dust bags is variable at best.

Organophosphates

Coumaphos (Co-Ral 1%D)

- 0 days preslaughter interval

Stirofos (Rabon 3%D)

- 0 days preslaughter interval

Pyrethroids

Permethrin (Ectiban or Permethrin 0.25%D, Boss)

- 0 days preslaughter interval
- Some use by producers

Sprays for Lice:

Triazapentadienes

Amitraz (Taktic)

- Use rate: 1 qt 12.5% EC/100 gal water, use 2 gal/fully grown animal.
- No pre-slaughter waiting interval.

Organophosphates

Coumaphos (Co-Ral)

- Use rate: 4 qt 5.8% Livestock Insecticide Spray;
- 1 to 2 lb 25% WP, or
- 1 to 2 qt 11.6% EIL, or
- 1 pint 42% F/100 gal water.
- Co-Ral products are not used on animals under 3 months of age.
- No pre-slaughter waiting interval.

Dioxathion (Delnav 15%EC 1qt/25 gal or 30%EC 1pt/25gal water)

- 0 days preslaughter interval
- DO NOT USE ON DIARY CATTLE OR IN DAIRY BARNs.
- Cannot be used more often than every 14 days.

Malathion 57%EC 1g/100gal water)

- 0 days preslaughter
- Do not apply to lactating dairy cattle or within 14 days of freshening.
- Do not treat calves less than 1 month old.

Chlorinated Hydrocarbon

Methoxychlor (Marlate)

- Use rate: 8 lb 50%WP or
- 2 gal 2EC (25%)/100 gal water.
- No pre-slaughter waiting interval.

Pyrethroid

Permethrin (Atroban; Ectiban; Expar; Insectaban; Insectrin; Permethrin; others)

- Use rate: 1 qt Ectiban 5.7% EC, or
- 1 pint Permethrin II 10% E, or
- 2 lb Permethrin 25% WP/100 gal water;
- 1 pint Atroban 11% EC or
- 1 qt Insectaban 5.7% EC/25 gal water.
- No pre-slaughter waiting interval.

Permethrin Synergized Pour-On 1% and 7.4% (Atroban; Back Side Plus; Expar; Permethrin)

- Use rate: undiluted, applied as low-pressure sprays.
- Not applied more often than once every 2 weeks.
- No pre-slaughter waiting interval.

Organophosphates

Phosmet (Prolate; GX-118; Del-Phos; Lintox-HD)

- Use rate: 1 gal Prolate, Del-Phos, or
- Lintox-HD 11.6%/150 gal water; or
- 1 gal GX-118 11.6%/49 gal water.
- Not used on animals under 3 months of age.
- The GX-118 mixtures require a 32-day pre-slaughter waiting interval, while Prolate, Del-Phos, or Lintox-HD mixtures require only 3-day pre-slaughter waiting intervals.

Stirofos (Rabon)

- Use rate: 4 lb 50 WP/75 gal water.
- No pre-slaughter waiting interval.

Stirofos/Dichlorvos (Ravap) 1 gal 28.7% EC/75 gal water.

- No pre-slaughter waiting interval.
- Do not use with other organophosphates or trichlorfon.

Pour-on's for Lice:

Pour-ons are commonly used due to convenience, done in fall and spring (minimal applications reduce stress on animals)

Macrocyclic lactone

-Ivomec, although not specifically listed for control of lice, is considered by producers as sufficiently effective enough for lice so that if it is applied for parasites other products are not necessary.

Moxidectin (Cydectin Pour-On)

- Use rate: RTU, apply 1 ml/22 lb body weight along backline from withers to tailhead.
- No pre-slaughter waiting period.
- Not used on calves to be processed for veal.
- Moxidectin is an endectocide.
- Producers like it because it has a purple dye formulation which helps identify treated animals
- Producers commonly use this product

Avermectin

Doramectin (Dectomax 0.5% Pour-On)

- Use rate: RTU, apply 1 ml/22 lb body weight along backline from withers to tailhead.
- Not used on calves to be processed for veal.
- Forty-five- day pre-slaughter waiting period.
- Doramectin is an endectocide.

Organophosphates

Fenthion (Lysoff; Lice-Chek)

- Use rate: 1 qt 7.6%/8 parts water, add 1 oz of mixture/100 lb body weight.
- Not used on animals under 3 months of age.
- A 21-day or 35-day pre-slaughter waiting intervals after one or two treatments, respectively.

Chlorpyrifos (Dursban 44) 2 cc/100lb body weight.

- Used as a spot treatment on BEEF CATTLE ONLY.
- Do not retreat within 30 days.
- Do not use on cows with 21 days prior to or 14 days after calving.

Pyrethroids

Permethrin Pour-On (Back Side; DeLice; Durasect; Expar; Ectiban; Hard-Hitter; Permectrin all in 1%; Boss 5%; Permectrin CDS 7.4% and Permectrin CD 10%; Brute 10%)

- Use rate: for 1% formulation, apply ½ ml/100 lb animal weight and not more than 5 fl.oz./animal along back and down face, except for Durasect, apply in two strips along each side of midline from shoulders to tailhead. Boss 5%, 3 ml/100 lb body weight;
- Permectrin CDS 7.4% , 2 ml/100 lb body weight;
- Brute 10 % or Permectrin CD 10%, 1.5 ml/100 lb body weight.
- Not more often than once every 2 weeks.
- No pre-slaughter waiting interval.
- Good due to broad spectrum..also control face flies

Cyfluthrin (Cylence (1%) Ready to use.

- 0 days preslaughter interval.

Lambda-cyhalothrin (Saber 1%) Ready to use 10 to 15ml/animal

- 0 days preslaughter interval

Premise and Feedlot (Stable and House flies)

Life cycle and biology

- Many kinds of free living flies attack beef cattle in the North Central region. The most common ones are the stable fly and the house fly, both of which develop as larvae in decomposing organic debris such as rotting feed, soiled bedding and accumulated animal manure. Accordingly, stable flies and house flies are most abundant around confined cattle.
- Stable flies will disperse readily from confinement breeding sites to surrounding areas, so they occur on pastured stock, too.
- Stable flies visit their hosts just long enough to obtain a blood meal; nonfeeding and fed ones are on adjacent "resting" sites.

Distribution and Importance

- Stable fly attacks cause noticeable irritation (leg stamping, tail switching and bunching) and measurable reductions in growth rate and feed conversion.
- Financial loss due to flies is not easily measured, but a rough estimate can be determined by counting the number of stable flies, for instance, on the front legs of five cows. If there are five per front leg, every year the operation may be losing about \$9.80 per animal.
- House flies, in contrast, are known to annoy workers and nearby residents, but they have not

been shown to affect animal performance.

- House and stable flies are considered major problems for production facilities located near urban residences. A number of lawsuits have been filed due to fly annoyance.

Non Chemical Control

- Sanitation practices such as manure removal are effective for stable and house flies
- Producers recognize the value of sanitation and use it to obtain some level of control

Chemical Control (General)

- **Residual premise** sprays and space fogs can be useful, but are a supplement to, and not a substitute for, breeding site (debris) management.
- Resistance to pesticides in stable flies has yet to be detected, but resistance in house flies to some organophosphate and pyrethroid insecticides is common.

Pasture (horn and face flies)

Life cycle and biology

- Two kinds of flies that occur mainly on pastured cattle are the horn fly and the face fly. Both of these flies develop in isolated dung pats on pastures, and not in accumulated debris. Horn flies reside continuously on their host animals and feed on blood.

Distribution and Importance

- Considered the number one problem in IN, IL, and MN.
- Their frequent biting reduces comfort and growth rate of growing stock.
- Horn flies of 50 or more per animal is consider an economic threshold.
- Face flies are physically on their hosts just long enough to feed on facial secretions.
- They do cause irritation, but effects of moderate numbers of flies on growth and production have been too weak to measure.
- Face flies are, however, important as vectors of bacteria and worms that cause eye diseases.

Non-Chemical controls:

- "Walk through" fly traps using the "inverted cone principle" for trapping flies are effective for horn flies in pastures when properly placed. Some training of animals to walk through the trap may be necessary.

Chemical Control (General)

- **Topical** insecticides are generally effective against horn flies, although resistance to pyrethroids (delivered widely with ear tags) is widespread in the North Central region.
- None of the available control methods are very effective against face flies. **Feed-through** insecticides (aimed at the dung feeding larvae) are partially effective at controlling both of the pasture flies, as are non-chemical walk-through traps that trap flies that are physically on animals as they walk through such traps.

Self treatment devices for horn and face flies and stable and house flies.

Back or face Oilers and Dust Bags

-The application of pyrethroids via fuel oil in a wick applicator can be effective but the applicator must be positioned to come in contact with the animals or cattle will avoid.

Coumaphos (Co-Ral 11.6% EC) for oilers and Co-Ral (1%D for Dust Bag.)

- 0 days preslaughter

Malathion 4% plus methoxychlor 5%D (Dust bag only)

- Ready to use.
- BEEF CATTLE ONLY.

Dioxathion (Delnav 15%EC for oilers only)

- 0 days preslaughter.
- BEEF CATTLE ONLY.

Stirofos plus dichlorvos (Ravap 2.7% EC for oilers only)

- 0 days preslaughter

Stirofos (Rabon 3%D for Dust Bag only)

Pyrethroids

Permethrin (Ectiban, Hard Hitter, Insectaban, Insectrin 5.7% EC, Permethrin II10%EC for oilers and 0.25%D for Dust Bags)

- 0 days preslaughter

Zeta-cypermethrin (Python 0.75%D plus 0.1% PBO for Dust Bag only)

- 0 days preslaughter

- Ready to use.

Topical “knockdown” insecticide sprays for horn and face flies and stable and house flies:

Organophosphates

Dichlorvos (Vapona)

- Use rate: 1 gal 43.2%/100 gal water.
- No pre-slaughter waiting period.

Naled (Dibrom)

- Use rate: 3 to 5 qt 36%/50 gal water,
- apply 0.1 to 0.25 lb technical Naled/ acre;
- 1 qt Dibrom 58% EC/40 gal water, apply 5 gal of the mixture/acre.
- No pre-slaughter waiting period.

Topical “residual” insecticide sprays for horn and face flies and stable and house flies:

Chlorpyrifos (Double Shift MEC)

- Use rate: 3 fl.oz. Durvet Double Shift MEC/gal water, mixture can cover 750 to 1,000 sq.ft. of surface.
- Applications: repeated as needed.
- Not sprayed or spray drift is allowed on animals, feed or water.

Pyrethroids

Cyfluthrin (Countdown)

- Use rate: mix two 9.5 gm packets of Countdown 20% WP or 16 ml 24.3% EC/gal water, mixture can cover 1,000 sq.ft. of surface.

Organophosphates

Diazinon (Diazinon; Dryzon)

- Use rate: 2 lb of Diazinon 50 W or 50 WP, or
- Dryzon WP/25 gal water, one gallon covers 350 to 750 sq.ft. of surface.
- Applications: repeated as needed.
- Spray drift is not allowed on animals, feed or water.
- Animals are kept away from treated areas for at least 4 hr.

Dimethoate (Cygon 2-E)

- Use rate: 1 gal Cygon 2-E/25 gal water, one gallon covers 500 to 1,000 sq.ft. of surface.
- Applications: repeated as needed.
- Animals are removed from buildings before treatments.

Pyrethroids

Lambda-cyhalothrin (Grenade)

- Use rate: 6 to 12 ml/gal water.
- Animals are kept away from treated areas until surfaces are dry.
- Spray is not allowed to contact animals, feed, or water.

Chlorinated Hydrocarbon

Methoxychlor (Marlate)

- Use rate: 4 lb 50% WP/10 gal water, one gal mixture covers 500 sq.ft. of surface.
- Repeat application as needed.

Pyrethroids

Permethrin (Atroban; Ectiban; Expar; Gardstar; Hard Hitter; Permethrin; Pounce)

- Use rate: for 0.1% residual spray, mix 1qt Ectiban or Hard Hitter, 5.7% EC/12.5 gal water; 6 oz Ectiban or Hard hitter, or Pounce 25% WP/11 gal water; 1 qt Permethrin II 10% EIL or Permethrin-10/25 gal water; 1 pint Pounce 3.2 EC/50 gal water. For 0.125%, mix 6.67 oz Atroban or Expar 25% WP/10 gal water. For 0.14%, mix 1 qt Insectaban 5.7% EC/10 gal water. For 0.25%, mix 1 pint Atroban or Expar 11% EC/10 gal water, or 6.67 oz Atroban or Expar 25% WP/5 gal water. All mixtures treats 750 to 1,000 sq.ft. of surface.
- Apply no more often than once every two weeks.

Permethrin Synergized Pour-On (Atroban; Back Side Plus; Expar; Permethrin)

- Use rate: undiluted of 1% permethrin plus Permethrin CDS Pour-On may be used in a mist spray applied to structural surfaces. One gallon treats 7,300 sq. ft. of surface.

Organophosphate

Tetrachlorvinphos/Dichlorvos (Ravap)

- Use rate: 1 gal (23% + 5.7%) EC/25 gal water, one gallon mixture covers 500 to 1,000 sq.ft. of surface.

- Applications repeated as needed.
- Trichlorfon (Dylox; Dipterex)
- Use rate: 5 lb 80 SP/40 gal water, one gallon covers 500 sq.ft. of surface.
 - Applications: repeated as needed.
 - Animals are removed before spraying either inside barns or an outside pen surface.

Feed Additive for horn and face flies and stable and house flies

Growth Regulator

-Feed additives are not always effective because if your neighboring livestock herds do not use also, then flies from those herds come to your herd and no gain is perceived.

Methoprene (Altosid or Moorman's IGR)

- 0 days preslaughter.
- Feed mineral mix or block from May through August
- An expensive treatment and not always convenient

Stirofos (Rabon 7.76% Oral) 70 mb ai/100 lb/body wt/day.

- 0 days preslaughter
- Use from May through September.
- Mix with complete feeds, concentrates, or protein supplements.

Bolus for horn and face flies and stable and house flies.

Growth Regulators

Diflubenzuron (Vigilante 9.7%)

- 0.5 to 2 boluses per animal depending on wt.
- 0 days preslaughter interval.
- Don not give to animals less than 300 lbs.

Methoprene (3%) 0.5 to 1 bolus per animal depending on wt.

- 0 days pre-slaughter interval.

Ear tags or tape for horn and face flies and house and stable flies.

All have 0 day pre-slaughter interval.

Cyfluthrin 10% (Cutter Gold or Cylence)

Beta-cyfluthrin 8% (Cylence Ultra)

Lambda-cyhalothrin 10% plus PBO 13% (Excalibur or Saber Extra)

Coumaphos 20% plus diazinon 20% (Co-Ral Plus)

Lambda-cyhalothrin 6.8% plus pirimiphos-methyl 14%

Cypermethrin or Zeta cypermethrin 10% plus 20% PBO (Python, Phthon Magnum or ZetaGard)

Diazinon 20% (Bovagard, Optimizer, or Terminator)

Diazinon 20% calf tag (Optimizer-calf)

Diazinon 30% plus chlorpyrifos 10% (Diaphons, Warrior)

Diazinon 40% (Patriot)

Ethion 36% (Commando)

Fenthion 20% (Cutter Blue)

Pirimiphos-methyl 20% (Dominator, Rotator, Tomahawk)

Pasture (Biting flies: horse, deer, black, also midges and mosquitoes)

Life cycle and biology

- Beef cattle are also exposed to attack by a wide variety of blood feeding, aquatic biting flies. These biting flies include many species of horse flies and deer flies (Tabanidae), biting midges (Ceratopogonidae), mosquitoes (Culicidae), and blackflies (Simuliidae).

Distribution and Importance

- Can be an important pest at times and difficult to control.

Non Chemical Controls:

- An Epps trap is useful for reducing the number of biting flies in pastures. Most recommendations call for one trap for every 40 acres of pasture.
- The tabanids and blackflies are reluctant to enter buildings, so cattle can be protected if given access to shelter.
- Flies in the first three families develop as larvae in mud or shallow, still water, whereas the blackflies develop in flowing water (creeks, streams and rivers). Source reduction is generally impractical.

Chemical Control (General)

- Topical insecticides and repellents can provide temporary relief, but are impractical on a commercial scale.
- Where bodies of water (ponds, etc) exist animals will submerge themselves and wash off the spray insecticides.
- Producers see some control from products used for horn and face flies. That level of control is usually sufficient for this minor problem.

Spray treatments

Pyrethroids for all biting flies.

Permethrin (Ectiban 5.7% 1qt/100gal water)

- 0 days preslaughter interval
- Do not apply more than every 14 days.
- Considered somewhat effective by producers

Organophosphate for mosquitoes only

Dichlorvos (Vapona 40.2% EC)

- 1 day preslaughter interval
- Do not use with trichlorfon or other organophosphates.

Grubs (heel flies)

Life cycle and biology

- Cattle grubs were once common in growing stock housed outdoors during summer.
- Adult grubs lay eggs on outdoor cattle during the heel fly season (early summer), and then the larvae burrow sub-dermally for the next 9-10 months, eventually erupting from the animals' backlines the next spring.

Distribution and Importance

- Cattle grubs once caused substantial losses due to slaughter condemnation and hide injury. However, their prevalence has been greatly reduced through use of systemic insecticides administered in the fall. Should these systemic insecticides be lost cattle grubs would once again be classified as a severe pest.
- Without insecticides damage and economic loss can be considerable, as animals are severely irritated by the flies and burrowing larvae.

Insecticides:

- **Topical Sprays:** High-pressure spray is used to apply insecticides until skin is thoroughly wet. Unless otherwise stated, the normal rate of application of insecticides is approximately 1 gal per cow or 0.75 gal per calf of the mixture.

Topical Applications for Grubs:

Organophosphate sprays:

Coumaphos (Co-Ral)

- Use rate: 8 or 12 lb 25% WP or
- 6 gal 5.8% Livestock Insecticide Spray/100 gal water, or
- 3 gal 11.6% ELI / 100 gal water.
- No pre-slaughter waiting period.

Phosmet (Prolate GX-118)

- Use rate: 1 gal 11.6% emulsifiable/49 gal water.
- 21-day pre-slaughter waiting intervals.
- BEEF CATTLE ONLY.

Organophosphate dip treatments:

Phosmet (Prolate GX-118)

- Use rate: 1 gal 11.6% emulsifiable / 60 gal water. To control the pH and ensure vat stability, add 100 lb triple superphosphate /1,000 gal vat solution.
- 21-day pre-slaughter waiting intervals.
- DO NOT APPLY TO DAIRY ANIMALS.

Pour-on's and Spot-on's for Grubs

Macrocyclic lactone

Moxidectin (Cydectin Pour-On)

- Use rate: RTU, apply 1 ml/22 lb body weight along backline from withers to tailhead.
- No pre-slaughter waiting period.
- Not used on calves to be processed for veal.

- Moxidectin is an endectocide.
- Used by producers somewhat, although primarily for lice.

Avermectins

Ivermectin (Ivomec Pour-On)

- Use rate: RTU, apply 1 ml/22 lb animal weight along topline from withers to tailhead.
- Comments: 48-day pre-slaughter waiting intervals.
- Ivermectin is an endectocide.
- Commonly used by producers

Eprinomectin (Eprinex Pour-On)

- Use rate: RTU, apply 1 ml/22 lb body weight along backline from withers to tailhead.
- No pre-slaughter waiting period.
- Not used on calves under 8 weeks of age.
- Eprinomectin is an endectocide.
- Favored by producers because it is perceived as being more rainproof and hence, longer lasting than Ivermectin or Cydectin.
- Applied in spring and fall.

Doramectin (Dectomax 0.5% Pour-On)

- Use rate: RTU, apply 1 ml/22 lb body weight along backline from withers to tailhead.
- Not used on calves to be processed for veal.
- Forty-five- day pre-slaughter waiting period.
- Doramectin is an endectocide.

Organophosphates

Famphur 13.2% (Warbex pour-on)

- Use rate: RTU, apply ½ fluid ounces/100 lb weight
- Only 4 oz is used per animal larger than 800 lb. Thirty-five -day pre-slaughter waiting intervals.
- Producers do not like its smell

Fenthion 20% (Spotton)

- Use rate: RTU, apply 8 cc/300 to 600 lb animal, or 12 cc/600 to 900 lb animal.
- 45-day pre-slaughter waiting intervals.
- Do not apply within 28 days of freshening of dairy animals.

Fenthion 3% (Tiguvon)

- Use rate: RTU, apply ½ fluid oz / 100 lb animal weight.
- 35-day pre-slaughter waiting intervals.
- Do not treat dairy cattle of breeding age.

Phosmet 4% (GX-118)

- Use rate: one part 11.6%: two parts water, apply 1 oz/100 lb animal weight, but not more than 8 oz/animal.
- 21-day pre-slaughter waiting intervals.

Trichlorfon (Neguvon 8%) 0.5 fl oz/100 lb body weight

- Do not exceed 4 fl oz/animal.
- Ready to use.
- 21 day preslaughter interval
- Do not apply within 7 days of freshening dairy animals.

Injection for Grubs

Avermectin:

Doramectin (Dectomax 1%)

- Use rate: 1 cc/110 lb animal weight.
- 35-day pre-slaughter waiting intervals.
- Doramectin is an endectocide.

Ivermectin (Ivomec 1% injection)

- Use rate: 1 cc 1%/110 lb animal weight.
- 35-day pre-slaughter waiting intervals.
- Ivermectin is an endectocide.
- Do not use on dairy cattle of breeding age.

Bolus for Grubs

Avermectin:

Ivermectin (Ivomec 1.72 gm/bolus)

- Only used on calves between 275 and 660 lb.
- Treated calves should not be slaughtered within 180 days after bolus treatment
- Ivermectin is an endectocide.

Ticks

Life cycle and Biology

- Beef cattle in the southern tier of the North Central region can be attacked by ticks. Important species are the lone star tick, the American dog tick, and the black legged tick.

Distribution and Importance

- Lone star ticks can reduce rate of gain in growing stock, and all are potential vectors of blood-borne pathogens. These three species are 3-host ticks that first feed on rodents. Consequently, exposure to ticks can be minimized by restricting grazing to cleared, brush free pastures, which are less suitable as habitat for the ticks' rodent hosts.
- Minor insect in Indiana, Illinois, and Minnesota. No comments provided by producers in those states.

Chemical Control (General)

- Area-wide or topical applications of acaricides can provide temporary reductions in tick infested habitats, but it is unclear if these practices would be economical for dairy producers

Sprays for ticks.

Triazapentadienes

Amitraz (Tactic)

- Use rate: 1 qt 12.5% EC/100 gal water, use 2 gal/fully grown animal.
- No pre-slaughter waiting interval.

Organophosphates

Coumaphos (Co-Ral)

- Use rate: 4 qt 5.8% Livestock Insecticide Spray ;
- 1 to 2 lb 25% WP, or
- 1 to 2 qt 11.6% EIL, or
- 1 pint 42% F/100 gal water.
- Co-Ral products are not used on animals under 3 months of age.
- No pre-slaughter waiting interval.

Malathion 57%EC. 1 to 2 gal/100 gal water

- 0 days preslaughter interval
- Do not apply within 14 days on freshening dairy cattle.
- Do not treat calves less than 1 month old.
- USE ONLY ON BEEF CATTLE.

Pyrethroids

Permethrin (Atroban; Ectiban; Expar; Gardstar; Hard Hitter; Permethrin; Permethrin; Pounce)

- Use rate: for 0.1% residual spray, mix 1 qt Ectiban or Hard Hitter, 5.7% EC/12.5 gal water; 6 oz Ectiban or Hard Hitter, or Pounce 25% WP/11 gal water; 1 qt Permethrin II 10% EIL or Permethrin-10/25 gal water; 1 pint Pounce 3.2 EC/50 gal water. For 0.125%, mix 6.67 oz Atroban or Expar 25% WP/10 gal water. For 0.14%, mix 1 qt Insectaban 5.7% EC/10 gal water. For 0.25%, mix 1 pint Atroban or Expar 11% EC/10 gal water, or 6.67 oz Atroban or Expar 25% WP/5 gal water. All mixtures treats 750 to 1,000 sq.ft. of surface.
- Apply no more often than once every two weeks.

Permethrin Synergized Pour-On (Atroban; Back Side Plus; Expar; Permethrin)

- Use rate: undiluted of 1% permethrin plus Permethrin CDS Pour-On may be used in a mist spray applied to structural surfaces. One gallon treats 7,300 sq. ft. of surface.

“TO DO” list

List here the important research, education, or regulatory needs for the above insects and/or pesticide controls.

RESEARCH

Please list items of information you would like to know about any livestock insect or insect control that you don't know and that could be addressed through research programs.

- What is the connection between face flies and pink eye in cattle?

- What is the best treatment for face flies and does it reduce pink eye incidence?
- What is the toxicity of insecticides to the human applicator? How concerned should I be? (Several comments like this)
- What is the impact of ticks on cattle?
- An effective product is needed for horn and face flies. Current products are too short lived.
- Why do bulls attract more flies than heifers? Is there some hormone here that can be applied to a trap to draw flies away from the herd?
- A broader spectrum insecticide would be very useful, particularly something that could be fed to cattle and would repel all insects.

REGULATORY

List here any pipeline pesticides you would like to see registered or any current products you would like to see have their label expanded. Also list any other actions you would like to see the EPA take with regards to product registration or use.

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Education

Please list items of information you would like to know about any livestock insect or insect control that you don't know and that could be addressed through education or extension programs. (I.e. the information probably already exists, you just don't have ready access to it.)

- We need a comprehensive, up-to-date, searchable web site database of currently registered products for use on lactating and non-lactating cattle.

Table 5. Insect Pests Reported as Problems on Beef Animals (data from 1998 North Central Region)

Pest	% of farms reporting
Lice	67.3
Horn fly	31.1
Flies (unspecified)	13.8
Blowflies	11.4
Ticks	10.5
House fly	9.6
Mites	9.6
Stable fly	9.0
Horse fly	8.3
Worms (Internal parasites)	6.2
Deer fly	6.1
Grubs	4.7
Other	7.1

Table 6. Pesticide Products Applied to Beef Herd Animals (data from 1998 North Central Region)

Class	Active Ingredient	Products	Method	A.I Rate (Total g/head)	# Uses per season	% Animals Treated
Growth Regulators		ALL				1.4
	methoprene	Total				1.4
		Moorman's IGR	Feed additive	1.18	4.1 mo	0.9
Avermectins		ALL				55.7
	doramectin	Total				16.8
		Dectomax	Pour-on	0.17	1.0	13.9
			Injection	0.07	1.1	2.9
	eprinomectin	Eprinex	Pour-on	0.29	1.0	3.3
	ivermectin	Total				34.4
		Ivomec	Pour-on	0.18	1.1	20.1
			Injection	0.04	1.2	14.1
	moxidectin	Cydectin	Pour-on	0.18	1.0	1.2
Benzimidazoles		ALL				2.7
	albendazole	Valbazen	Oral	4.34	1.2	1.8
	fenbendazole	Panacur Safeguard	Oral	2.11	1.1	0.5
	oxfendazole	Synanthic	Oral	1.12	1.0	0.3
Acetylcholine mimics		ALL				0.7
	levamisole	Levasole Tramisol	Injection	1.55	1.0	0.6
Pyrethroids		ALL				14.7
	cyfluthrin	Total				3.7
		Cylence	Pour-on	0.18	1.3	3.1
	cypermethrin	Max-Con	Ear tag			
	fenvalerate	Ectrin	Ear tag	1.05	1.0	0.4
	lambda-cyhalothrin	Total				2.6
		Saber	Pour-on	0.13	1.3	1.5
		Double Barrel Excalibur Saber Extra	Ear tag	1.09	1.0	1.1
	permethrin	Total				7.8

		Atroban Backside Durasect Ectiban Gardstar Hard Hitter Insectrin Insectrin X Permaban Permethrin Permethrin II Synergized Delice	Body Spray	2.38	3.0	1.2
		ALL Pour-ons		1.29	1.4	5.0
		Boss	Pour-on	1.78	1.1	0.4
		DeLice	Pour-on	1.13	1.4	1.2
		Durasect	Pour-on	1.26	1.4	1.0
		Expar	Pour-on	1.37	1.4	0.5
		Permethrin	Pour-on	1.18	1.3	0.5
		Permethrin CD	Pour-on	1.34	1.3	0.3
		Permethrin	Pour-on	1.18	1.3	0.5
		Synergized Delice	Pour-on	1.42	1.4	1.2
		Total	Ear tag	1.27	1.0	0.1
		Total	Oiler/scratcher	3.56	2.9	1.3
		Permethrin II	Oiler/scratcher	2.39	2.7	0.9
		Atroban Brute DeLice Ectiban Expar Insectaban Insectrin Permaban Permethrin CD Synergized Delice	Oiler/scratcher			0.3
	pyrethrins (synergized)	Various	Aqueous Coat Sprays and Aerosols	0.61	10.1	0.1
Organophosphates		ALL				36.1

	chlorpyrifos	Dursban 44	Pour-on	19.61	1.1	0.2
		Diaphos Rx Max-Con Warrior	Ear tag	1.48	1.0	0.2
	clorsulon	Ivomec Plus	Injection	0.40	1.0	0.4
	coumaphos	Total				2.5
		Co-Ral	Body spray	7.44	1.8	0.8
		Co-Ral Zipcide	Dust	1.94	2.7	0.3
		Co-Ral Zipcide	Dust bag	1.31	2.4	0.8
		Co-Ral	Pour-on	3.89	1.2	0.1
		Co-Ral	Oiler/scratcher	3.76	3.5	0.6
	diazinon	Total	Ear tags	4.30	1.0	1.2
		Terminator	Ear tag	3.38	1.0	0.6
	dichlorvos	Ravap Vapona	Coat Sprays and Aerosols	5.49	7.4	0.3
		Ravap	Oiler/scratcher	0.64	4.9	1.0
	ethion	Commando	Ear tag	3.74	1.0	0.3
	famphur	Warbex	Pour-on	14.0	1.1	17.2
	fenthion	Total	Pour-ons	2.46	1.2	6.3
		Lysoff	Pour-on	1.87	1.2	2.6
		Spotton	Pour-on	2.37	1.0	2.8
		Tiguvon	Pour-on	4.62	1.4	0.8
		Cutter Blue	Ear tag	3.35	1.0	0.6
	malathion	Total	Sprays Dusts Oiler			1.0
		Malathion	Oiler/Scratcher	19.9	2.5	0.6
	phosmet	Total				0.7
		Del-Phos Prolate	Body Spray	1.90	2.6	0.5
		Del-Phos Lintox HD	Oiler/Scratcher	3.98	4.0	0.2

		Prolate				
	pirimiphos methyl	Total	Ear tags	2.10	1.0	1.3
		Dominator	Ear tag	2.36	1.0	0.6
		Double Barrel	Ear tag	1.89	1.0	0.7
	stiropho (tetrachlor-vinphos)	Total				2.6
		Ravap	Body Spray	5.23	3.0	0.2
		Rabon	Dust Dust Bag	1.64	2.0	0.2
		Ravap	Oiler/Scratcher	0.64	4.9	1.0
		Rabon Minerals Rabon Cattle Mix	Oral /Feed Additive	191.7	4.0 mo	1.2
	trichlorfon	Neguvon	Pour-on	8.85	1.1	0.6

Table 7. Summary of Application Methods for Pesticides Applied to Beef Animals (data from 1998 North Central Region) (% of total active ingredient applied ; * = <0.1%)

Active Ingredient	External								Internal					
	Spray	Powder	Aerosol	Pour on	Dust Bag	Dip	Ear tag	Oil er/s crat cher	Liquid	Powder	Paste	Feed Add	Bolus	Injection
growth regulators														
methoprene												100		
diflubenzuron													100	
avermectins														
doramectin				83										17
eprinomectin				100										
ivermectin				59									*	41
moxidectin				100										
benzimidazoles														
albendazole									42		58			
fenbendazole									59	10	19	11		
oxfendazole									66		34			
thiabendazole												100		
acetylcholine mimics														
levamisole				24					2		1		10	63
pyrethroids														
cyfluthrin				85			15							
fenvalerate							100							
flucythrinate							100							
lambdacyhalothrin				58			42							
permethrin	13			54	1	1	2	28						
pyrethrins			100											
zeta-cypermethrin							100							
organophosphates														
chlorpyrifos				46			54							
clorsulon														100
coumaphos	16	10		2	45			28						
diazinon							100							

dichlorvos	17		1				83						
dioxathion	100												
ethion							100						
famphur				100									
fenthion				91			9						
malathion	25	1			2			72					
phosmet	30			1				69					
pirimiphos-methyl								100					
stirophos	7	5		7			*					44	
trichlorfon				100									
other													
amitraz	100												
methoxychlor	100												
Unknown	3	1		19	10		42	13	5		1	3	3

Weeds

Weeds affect livestock by reducing production efficiency and causing health problems. Although herbicides are neither directly nor indirectly applied to livestock, the loss of herbicides for weed control in forages or pastures may have significant implications for beef production. A thorough treatment of the role of herbicides in pastures, forages and rangeland is saved for crop profiles of those commodities. We present below only a summary of some of the weeds which are the more important causative factors in poor herd health or production efficiency.

The effects of weeds fall into three general categories; those which are poisonous or cause photosensitization, those which reduce feed consumption and forage quality, and those which impart an off-flavor to the meat. Included among plants which are poisonous or result in photosensitization of livestock are; **corn cockle** (*Agrostemma githago*), **pigweeds** (*Amaranthus* spp), **hemp dogbane** (*Apocynum cannabinum*), **marijuana** (*Cannabis sativa*), **water hemlock** (*Cicuta maculata*), **jimsonweed** (*Datura stramonium*), **horsetail** (*Equisetum arvense*), **white snakeroot** (*Eupatorium rugosum*), **white sweet clover** (*Melilotus alba*), **yellow sweet clover** (*Melilotus officinalis*), **pokeweed** (*Phytolacca americana*), **buttercups** (*Ranunculus* spp), **nightshades** and **bull nettles** (*Solanum* spp), **Johnsongrass** and **sorghums** (*Sorghum* spp), **cocklebur** (*Xanthium* spp), and **red, white and alsike clovers** (*Trifolium* spp). The toxic principals of these weeds includes production of hydroquinones, alkaloids, thiaminase, and glucosides. For some weeds the toxic principal is accumulation of nitrates (pigweeds) or the formation of prussic acid (sorghum spp). Depending on the amount consumed and other stress factors the livestock may experience the effects may range from minor to fatal.

All weeds reduce forage quality to some extent. By their very nature most weeds grow faster than the grass, legume, or grain crop and will mature before the crop, resulting in coarse and less palatable forage at the time of harvest. Although some weeds, such as **pigweeds** and **dandelions** (*Taraxacum* spp), are touted as very palatable forage, their protein content is considerably less than that of a clover or alfalfa stand. Such weeds, when found in great numbers, will reduce the production efficiency of livestock fed such forage. One weed that is particularly onerous is **leafy spurge** (*Euphorbia esula*). This weed is very aggressive in taking over pasture and rangeland and is unpalatable to cattle. Weeds can also reduce feed consumption through other means. Thistles including **Canada thistle** (*Cirsium arvense*), **musk thistle** (*Carduus nutans*), **bull thistle** (*Cirsium vulgare*) and other weeds which produce sharp spines or burs significantly reduce the palatability of hay and fodder fed to the animals and may reduce uptake of forage by injuring their tongue and mouth.

A number of weeds, when eaten by livestock, can cause off-flavors to be imparted to meat. Most notable among such plants are **wild garlic**, (*Allium vineale*), **wormwood** (*Artemisia* spp), and **yarrow** (*Achillea millefolium*). Although cattle will typically avoid such plants when grazing adequate pasture, they may very well consume these plants when other forage species are limited. This is also true of contaminated ensiled or baled forage when fed to cattle without alternatives. Although the source of meat which has an off-flavor may be difficult to trace, once identified it may tarnish the reputation of the producer for some time and greatly restrict his ability to market animals.

Herbicide applications:

The herbicides most commonly used on pasture and rangeland in the Midwest include 2,4-D, dicamba, and clopyralid. Glyphosate is widely used across the region but its use is often relegated to spot applications or to pasture areas being renovated far in advance of cattle being exposed to such areas. Herbicide use on alfalfa and other hays is documented in the profiles for those crops.

References

1. Pike, D. R., J. L. Hill, and S. M. Oakes. North Central States Pesticide Usage on Beef and Dairy Animals, 1997-1998. Univ of Ill. Spec. Rpt. 2000-02.
2. National Cattlemen's Beef Association Website. <http://www.beef.org/library/handbook/environment.htm>
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