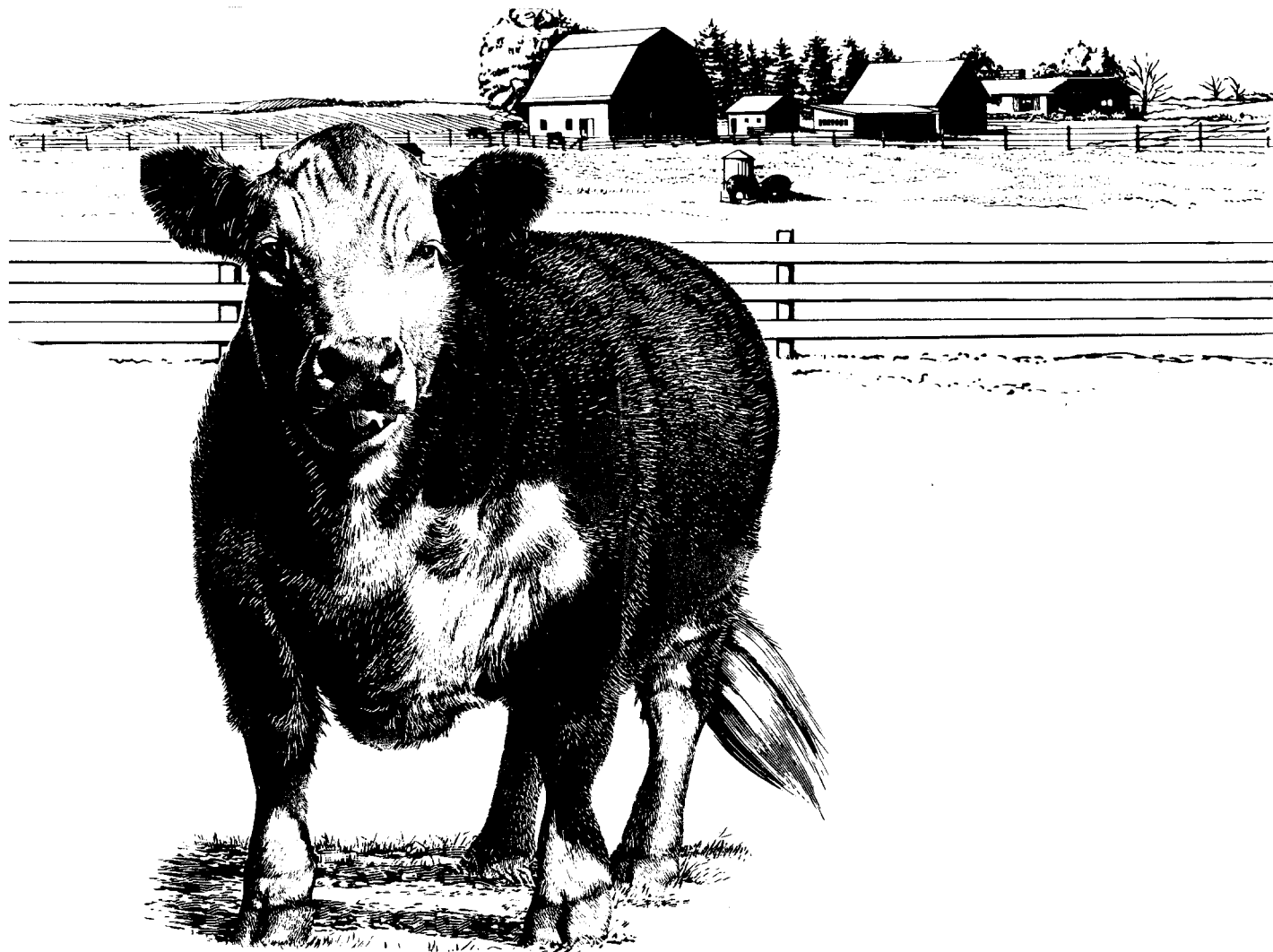


Management Strategies for Pyrethroid Insecticide Resistant Horn Flies

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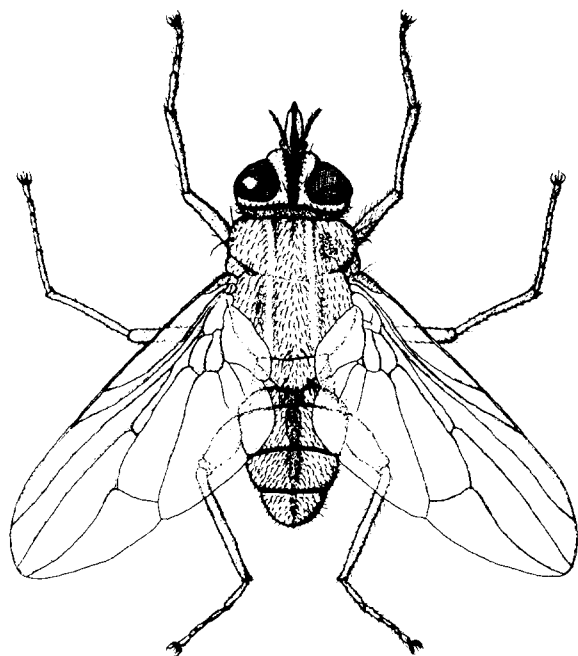
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Insecticide impregnated ear tags have been the method of choice for horn fly control by many North Dakota cattlemen since the early 1980s. Pyrethroid insecticide resistance in populations of North Dakota horn flies was documented first in 1985. Today many cattlemen in the state face inadequate horn fly control due to increased fly resistance to insecticides.

What is resistance and how does it develop?

When an interbreeding population of insects is exposed to the same pesticide over a number of generations, the chances are good that resistance will develop. The development of resistance is based on the genetic variability of the pest. Heritable characteristics are governed by a large array of genetic elements called genes. For any given population the array of genes in each individual is similar, but not identical, to the array of genes in any other individual. When a pesticide is used to control the pest population, individuals which are killed are susceptible to the treatment. Those few individuals which have something in their genetic array which protects them from the effect of the pesticide are resistant. When the generation time of the pest is short, as for the horn fly, susceptible individuals disappear from the population rapidly and individuals carrying the genetic characteristics which provide resistance to the pesticide become abundant. The relative abundance of the resistant strain and absence of the susceptible strain speeds the development of a pest population consisting primarily of resistant individuals. Once the frequency of the resistance gene(s) becomes high, resistant pest populations may persist for long periods of time.



Summary of control strategies for managing resistance

Excessive use of pesticides for short-term gains (e.g., minor weight increase) may be an undesirable practice in the long term because it can lead to long-term ineffectiveness of valuable, efficient, and often irreplaceable pesticides and convenient delivery systems. Catastrophic events, such as the failure of an entire pesticide class against a target species, may dictate dramatic changes in pest-control practices. With the widespread resistance of horn flies to pyrethroids, changes in control practices are inevitable. The elimination of or reduced use of pyrethroids in all areas where pyrethroid resistance has occurred is encouraged. The lists below are options to consider in changing your control methods to preserve uses of the chemicals we now have for the future. **NOT ALL OPTIONS WILL FIT EVERY ANIMAL MANAGEMENT SYSTEM.**

Control strategies to delay resistance

1. Do not treat for horn fly control continuously throughout the season; treat only when fly numbers exceed 100 per side.
2. Eliminate early season fly control.
3. Delay start of treatment for horn flies until counts exceed acceptable levels of an estimated 100 per side.
4. If pyrethroid resistance exists, do not treat with **any pyrethroid at any concentration in any formulation.**
5. Treat with dust bags, oilers, etc., which have organophosphate or carbamate classes of insecticides as active ingredients as a substitute for pyrethroids.
6. Apply periodic spray or dust treatments to hold counts at acceptable levels (100 or less per side).
7. Treat only young weight-gaining animals.
8. Treat with IGR (insect growth regulator) boluses.
9. Apply late season control to reduce the overwintering (diapause) stage of the horn fly using different classes of insecticides (organophosphate, carbamate, ivermectin) from that used in peak season or eliminate late season control.
10. Treat with ear tags.
 - a. Pyrethroid tags where resistance is not a problem.
 - b. Organophosphate tags where pyrethroid resistance is a problem.
11. Use a non-chemical walk-through fly trap during the fly season.
12. Any combination of the above. **Note:** (Use slow release devices only during times of peak fly activity.)

Control strategies for pyrethroid resistant area

1. Do not treat for horn flies.

This is the most harsh of all strategies but the one which would have the greatest influence in reducing resistance levels. Several of the other strategies listed below will allow periodic treatment to provide relief to and increase weight gain of cattle.

(Strategies can be used singly or in combination with other strategies.)

2. Use a non-chemical walk-through trap for horn fly control.

This method of control can provide about a 70 percent reduction of horn flies if the cattle are forced to walk through the trap on a daily basis. Because this method uses no pesticide the influence on resistance levels would be the same as if no control (option 1) was being used.

3. Separate mature animals from growing animals if possible.

Evidence indicates that horn flies do not significantly affect the mature animal unless it is producing milk for a calf. Flies are a nuisance and may cause the animal to lose some condition but it will be regained quickly when the fly season is over. No data are available on the effects of heavy fly populations on breeding performance of dam or sire. An animal in a "weight gain" mode should be treated to obtain the most efficient weight gain.

4. Do not treat mature animals without calves.

(Note comments in 1).

5. Delay control tactics until flies exceed an economic level.

No sound published data are available to define acceptable economic thresholds for most areas of the country. In North Dakota, population levels of 200 per head generally have been considered as the action level. This number may have to be reduced in northern counties of North Dakota and Canada. Purebred producers or producers with animals maintained for "show" may require absolute control for short periods of time. Two hundred flies per head is acceptable on mature range animals not requiring special cosmetic considerations.

6. Treat periodically with organophosphate sprays or dusts to reduce early fly population build-ups.

Any periodic treatment providing high initial control and then a period of no control during build-up of the population would help to delay or reduce resistance. One or two of these treatments can significantly delay the time until more sustained control procedures are initiated.

7. Continue with periodic treatments or utilize organophosphate (OP) ear tags, dust bags, or oilers.

If possible, periodic spray treatments or the use of dust bags or oilers using OPs would be best, but if management practices require it, OP ear tags can be applied. If OP tags have been used two consecutive years, the bolus treatment is a possible alternative control for "height of season" fly control — 90 days. This treatment would provide control of any OP resistant flies which might be occurring in the population. Also, this treatment does not interfere with indigenous or immigrant susceptible flies on the host.

8. Remove tags in late season before the onset of overwintering (diapause).

Removal of the spent tags will assure that late season fly populations are not receiving suboptimal doses which increase the chance of resistance. Diapause date will vary from mid- to late-August.

9. Peak season bolus or ivermectin pour on treatment.

The bolus or ivermectin pour on treatment delivers a pesticide that has a mode of action different from the pyrethroids or OPs. Also, both are active against the immature (maggot) stages. The ivermectin pour on also controls adult horn flies. Both treatments would provide control of resistant populations. These treatments provide additional chemistries that could be used effectively in a resistance management program.

10. Late season bolus or ivermectin pour on treatment.

Late season treatment could be initiated before the onset of diapause to reduce overwintering populations. If control is required after early September, treat periodically with carbamate or OP sprays or dust, or provide alternative bolus or ivermectin pour on treatment (if not used in early season). If pyrethroid and/or OP resistance is present, these bolus or pour on treatments will not reduce the percentage of resistance genes but will reduce the number of resistant flies going into diapause overwintering development. The overwintering fitness of resistant flies is unknown, but a reduction in overwintering numbers could delay the need for treatment next spring.

11. Late season diapause (overwintering stage) control.

A successful diapause program will reduce populations next spring and can delay the time that first application is needed the next season. It will not reduce the percentage of surviving flies with resistant genes.

12. Eliminate late season control.

If horn flies have been reduced below the action level (100 flies per side) during the peak fly season, do not apply any late season treatment.

Pesticide Safety Tips

- Always read the label before buying or using pesticides. Use pesticides only for the purpose(s) listed and in the manner directed.
- Pesticides that require special protective clothing or equipment should be used only by trained, experienced applicators.
- Do not apply more than the specified amount of pesticide. Overdoses can harm you and the environment.
- Keep pesticides away from food and dishes.
- Keep children and pets away from pesticides and sprayed areas.
- Do not smoke or eat while applying pesticides.
- Avoid inhalation of pesticides.
- Never spray outdoors on a windy day.
- When you mix pesticides, do it carefully to avoid splashing.
- Avoid breaks or spills of pesticide containers.
- If you spill a pesticide on your skin or on your clothing, wash with soap and water and change your clothing immediately.
- Store pesticides under lock in the original containers with proper labels. Never transfer a pesticide to a container that would attract children, such as a soft drink bottle.
- Dispose of empty containers safely. Wrap single containers of home use products in several layers of newspaper, tie securely and placed in a covered trash can. Never burn boxes or sacks. In the case of farm or ranch use, single containers may be buried where water supplies will not be contaminated. Dispose of large quantities in special incinerators or special landfills.
- Wash with soap and water after using pesticides, and launder clothes before wearing again.
- If someone swallows a pesticide, check the label for first aid treatment. Call or go to the doctor or the hospital immediately and keep the pesticide label with you.

Important Resources For Pesticide Information

For information regarding proper cholinesterase testing, have your doctor contact:

State Toxicology Laboratory
P.O. Box 5195
Fargo, North Dakota 58105
Telephone: Dr. N.G. Rao
(701) 237-7876

For information regarding pesticide disposal or what to do in the event of contamination by pesticides such as an accidental spill or fire, contact:

North Dakota State Health Department
Environmental Waste Management & Research
1220 Missouri Avenue
Bismarck, North Dakota 58501
Telephone: (701) 224-2382

In the event of an accident involving pesticides (or any chemicals) on the highway, railway or waterway, contact:

CHEMTREC
24 hours a day — 7 days a week
Telephone: (800) 424-9300

Remember

ALWAYS READ THE LABEL *BEFORE* USING ANY PESTICIDE. DO NOT WAIT UNTIL SYMPTOMS APPEAR TO GET MEDICAL CARE.

Acknowledgements

These management strategies were the collective effort of livestock entomologists representing University Experiment Stations, the USDA and the Animal Health Industry. This circular was developed from a report prepared for the NCR-99 regional project. Dr. Rick Meyer is the North Dakota representative on this committee.

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