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The commercial use of insecticide ear tags in cattle began as early as 1977 with the introduction of the Rabon® insecticide ear tag. In 1980 the first synthetic pyrethroid tag, Ectrin® (fenvalerate), was introduced. The synthetic pyrethroid tags were highly effective against a number of species of flies and ticks.

By 1982 the pyrethroid tags were no longer giving satisfactory control of horn flies in Florida. Pyrethroid resistance in horn flies spread over most of the United States within just a few years.

This resistance occurred

because insecticide ear tags are designed to release controlled amounts of insecticide over a sustained period of several months. Late in the season, as insecticide levels begin to decline, the surviving flies are exposed to sublethal doses, which helps select for those flies that are resistant.

This continual selective pressure, combined with mismanagement of fly tags and the relatively short life cycle of horn flies (a new generation every 10-14 days under optimal conditions), has led to the development of resistance, especially pyrethroid resistance.

New tags with organophosphate insecticides, advanced pyrethroids and synergists have been developed to address pyrethroid resistance. From 1980 to 1995, more than 25 different trade names of tags were marketed.

The selection of active ingredients has been limited even though many different tags have been offered in the marketplace. In 1996 a new organophosphate insecticide, ethion, which had not been used in the United States, was introduced into the insecticide-tag market.

Proper use vital

Proper tag application affects performance — now and in subsequent years. Adherence to the manufacturer's recommendations is essential for success. Applying tags too early in the season, inadequate numbers of tags and improper placement can all have adverse effects.

Most tags are designed to release insecticide over a 4- to 5-month life span. Producers should avoid tagging too early (February or March), because by peak fly season (July or August) the tags will no longer be effective.

It also is important to remove the tags after the season so sublethal amounts of insecticide aren't released, leading to more resistance.

Proper application is crucial to achieve season-long retention and control. The ear tag should be placed in the center of the flat part of the ear between the cartilage ridges so approximately one-half of the tag is exposed below the bottom edge of the ear. This exposes sufficient surface area of the tag for good chemical release and rub-off onto the hair coat.

Insecticidal ear tags are most beneficial when used on pasture cattle to control horn flies (*Haematobia irritans*) and face flies (*Musca autumnalis*). These flies are prevalent under pasture conditions because they require undisturbed cattle manure to develop.

Usually, season-long fly control can be accomplished with a single late-spring insecticide-tag application. This offers significant labor savings when compared to gathering cattle every few weeks for pour-on application or spraying.

Identify problem

The first consideration should be which flies are an economic problem in a particular operation. The economic effects of horn flies have not been clearly established, but it is generally accepted that when the fly count reaches 50-100

flies/animal, performance is affected. Improved weight gains in spring steer calves at weaning and in yearling stocker cattle have been demonstrated when horn flies are controlled.

The economic threshold for stable flies (*Stomoxys calcitrans*) is thought to be three per leg, and for face flies, five per head. The total annual cost to the cattle industry of these flies alone has been estimated at more than \$1 billion.

If the primary goal is to control horn flies, the question of insecticide resistance must be addressed. Horn-fly populations resistant to pyrethroids are now widespread over the United States, but pyrethroids may still be effective in some areas. If pyrethroid tags have failed, an organophosphate tag should be selected.

Changing from one pyrethroid to another probably won't improve control. Continued use of any

pyrethroid tag when resistance exists will select for flies with greater resistance and extend the length of time before pyrethroids can be effectively used again.

If pyrethroid tags are still effective, a rotation of pyrethroids and organophosphates should be used on a year-to-year basis. Rotation should be from class to class of insecticide, not within a class.

Insecticide ear tags can help control face flies and stable flies, but there are other considerations in controlling these pests. These flies do not spend most of their time on the animal, as the horn fly does, which makes control with insecticides applied to the animal more difficult. Additionally, when the stable fly is on the animal, it is most frequently located on the ventral abdomen or legs, which are difficult areas to treat with ear tags.

The issue of pyrethroid resistance in face flies and stable flies is less important than it is in horn flies. When selecting a tag to control these pests, refer to the label of the tag under consideration and to the tag's past history. When listed as an aid to control of these species, additional measures must be employed with ear tags in order to achieve adequate control.

Different strategies

A wide variety of tools — not just insecticide ear tags — should be considered when designing a fly-control program. Cultural control (sanitation and other methods of disrupting fly-development areas), insect predators and oral larvicides can be used to reduce the number of adult flies. Once flies begin to increase in numbers, insecticidal sprays, dusts, pour-ons and ear tags can be employed.

After evaluating the most acceptable methods, at least two

different approaches should be employed during the same season. For example, pour-ons or sprays can be used when adult flies first start to increase in number in the spring. This allows tag placement to be delayed until fly populations are at economically important levels, and it extends the functional period of maximum insecticide activity from the tags.

If tags are used at the start of the season and flies begin to be a problem four to five months later, the tags should be removed and dusts, sprays, pour-ons or forced-use back rubbers should be employed to control fly numbers. In addition to controlling flies for the remainder of the season, this would eliminate the fly population that has been exposed to the ear-tag chemical for the previous period.

