mla
MEAT & LIVESTOCK AUSTRALIA

Recommendations for integrated buffalo fly control

Revised Edition

Why have integrated control of buffalo fly?

The aim of an integrated buffalo fly control program is to enable producers to:

- Reduce buffalo fly numbers to acceptable levels for efficient production
- Ensure the welfare of animals
- Reduce reliance on chemicals for control by using non-chemical alternatives
- Prolong the effective lifespan of chemicals used in fly control
- Minimise chemical residue risks

Key points

The following recommendations should be considered in buffalo fly control programs:

1. Use non-chemical control wherever possible

- Do not treat unless flies are building up to numbers that are likely to cause significant welfare or economic problems.
- Control fly levels by non-chemical means, such as buffalo fly traps and dung beetles.
- Cull cattle that are hypersensitive to buffalo flies with irritation and skin sores even when fly numbers are low.

2. Delay chemical treatment for as long as possible

- Monitor cattle and only treat with chemicals when there are more than 200 flies per beef animal (100 on each side of the animal) or more than 30 per dairy animal.

3. Only use chemicals that are still clearly effective

- Synthetic pyrethroid (SP) chemicals should provide protection for up to 21 days when flies are not resistant.Presence of buffalo flies only a few days after treatment indicates resistance.

4. Integrate fly control into worm and tick control programs

- Macrocyclic lactone (ML) pour-ons control worms, ticks and lice as well as buffalo fly. They are expensive and are best used when it is appropriate to treat for more than one parasite.
- The end of the fly season in autumn and early winter is also an important time to treat for worms and lice. Use of a ML pour-on at this time will control a range of parasites with a single application.
- In North America the use of a ML pour-on at the end of the horn fly season appeared to decrease the level of resistance to other chemical classes in the following fly season.

5. Use self-application methods during the peak fly season

- Ear tags
- Back rubbers, and traps should be operational throughout the whole season when flies are present.

6. Apply treatments at the beginning or end of the fly season if needed

- Sprays or pour-ons can be applied to cattle prior to, or following, the use of ear tag control methods if fly numbers are excessive.

7. Follow manufacturers' instructions

- Mix and apply chemicals according to label instructions to avoid under or overdosing.
- Remove ear tags at the end of their effective lifespan – either 10 or 16 weeks depending on product.

8. Coordinate control programs with neighbours

- If using a SP chemical that has a repellent effect, neighbours need to treat at the same time or the flies will simply fly across the fence.

9. Rotate chemical groups

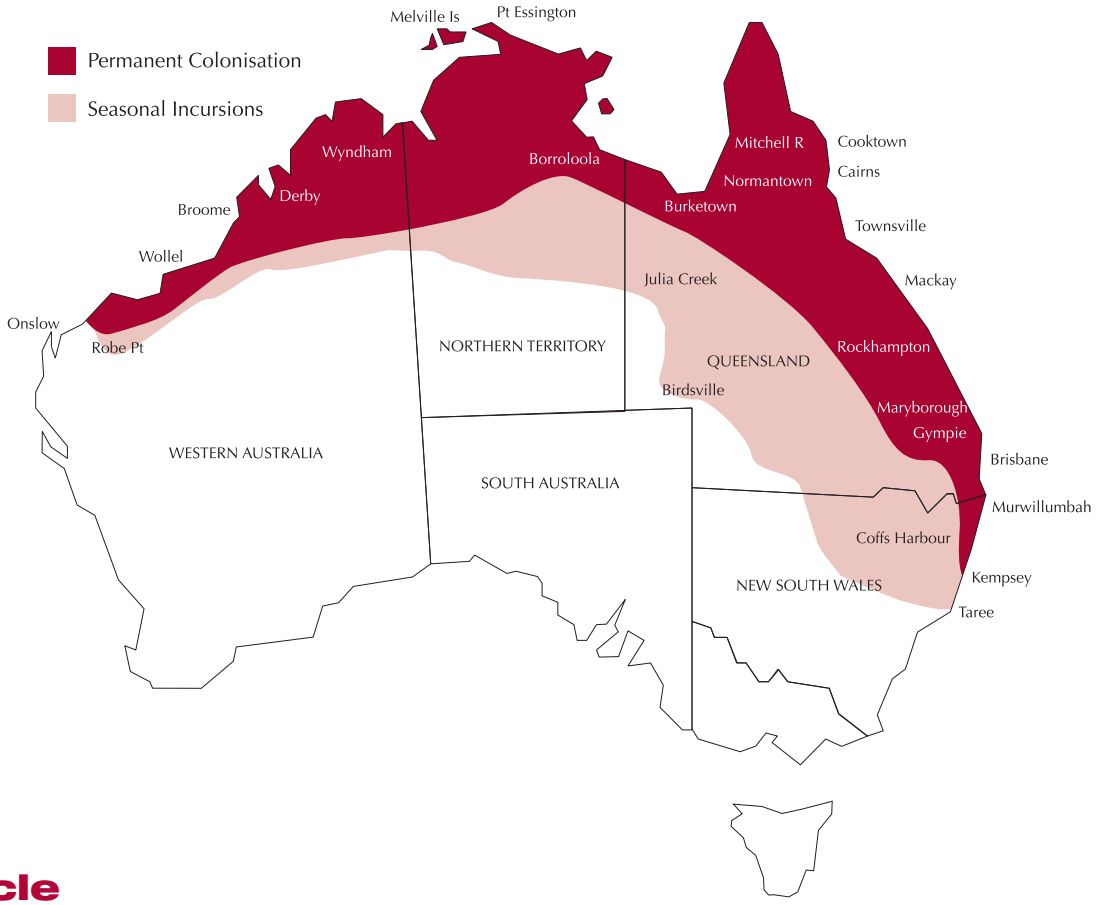
- To prolong the effectiveness of the chemical groups available for fly control do not use the same chemical year in year out.
- Do not use organophosphates (OPs) for more than two seasons in a row.
- Do not use SPs continuously for more than one year.

Distribution

The buffalo fly is a parasite of cattle and buffalo in northern Australia. This small biting fly *(Haematobia irritans exigua)* was accidentally introduced into northern Australia from Asia in the mid-nineteenth century. Since that time they have slowly spread through the Northern Territory, northern Western Australia and Queensland.

By 1977, the buffalo fly had moved down the east coast of Queensland as far as the Brisbane Valley, and in 1978, crossed into north eastern NSW. By autumn 2000, infestations were seen as far south as the Manning Valley on the mid north coast of NSW.

Figure 1: Distribution of buffalo flies in Australia

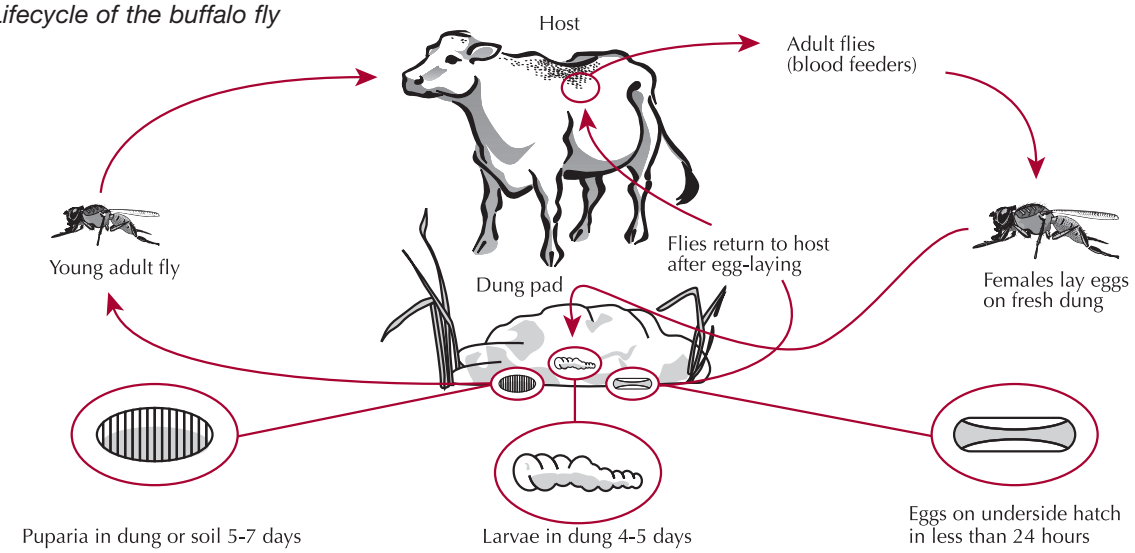


Lifecycle

Adult buffalo flies live for 10–20 days on a cattle host, sucking blood 10 to 40 times per day. Females leave briefly to lay their eggs in fresh cattle dung before returning to a host, as they can only survive for one or two days away from an animal.

Fly eggs hatch in the dung pat within 24 hours. Fly larvae live in the dung pat and develop into young adult flies that emerge nine to 40 days later, depending on temperature. Development is most rapid in hot humid weather. Young flies emerge from the dung pats at night and can fly up to eight kilometres to find a cattle host. The buffalo fly lifecycle, from egg to egg, takes less than 14 days under optimal conditions.

Figure 2: Lifecycle of the buffalo fly



Effect on cattle

Buffalo flies are blood-sucking insects, and heavy infestations cause severe irritation to cattle. The constant irritation of painful fly bites causes distress and disrupts grazing time. Hide damage results from constant rubbing as cattle try to relieve fly irritation.

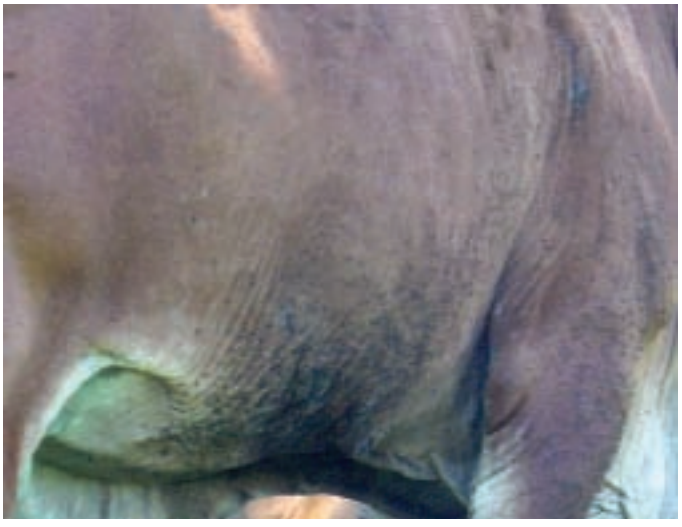
Buffalo flies can also transmit a small parasitic worm, *Stephanofilaria*, which causes sores around the inner corners of the eyes and on the neck, face, shoulders and underline. These sores can vary from small, hairless areas to saucer-sized, raw ulcerated lesions.

Some cattle are 'allergic' to buffalo fly bites and are intensely irritated by only a few flies, leading to excessive rubbing that also results in raw ulcerated lesions. Most cattle tolerate much larger fly numbers. Bulls, older cattle and those in poor condition usually carry the heaviest fly burdens. Dark coated cattle seem to attract more flies than those with lighter coat colour. The prevalence of skin sores is higher in bulls than steers and lowest in cows.

Economic effect

Buffalo flies can cause production losses due to lowered weight gain, lowered milk yield and permanent hide damage. One Queensland study showed that steers protected from buffalo flies had a 14% increase in live weight gain over a 13-month period compared to unprotected steers. Another Australian study investigated weight gain over 21 weeks. Cattle that were protected from buffalo flies gained an additional 33kg compared to unprotected animals. Other studies showed that in some seasons, buffalo flies had no significant effect on weight gain.

In dairy cattle, estimates suggest that a moderate level of buffalo fly infestation can result in losses in milk yield of approximately 0.5 litres/cow/day. The threshold below which no adverse effect is expected is 30 flies per dairy cow. This loss is also important in lactating beef cattle. North American studies into the control of a very similar parasite, the horn fly, have shown significant increases in calf weaning weight and milk production when cows were protected from horn flies. Horn flies also lower sexual libido in bulls resulting in reduced reproductive efficiency.



Buffalo fly costs producers up to $30 per head each year in lost production if cattle are not effectively treated. It is estimated that Australian cattle producers spend at least $4–6 million annually on chemicals to control buffalo fly and this does not include mustering costs. The total animal cost of this pest to the industry was estimated to be $78 million in 2006.

Most cattle in a herd can tolerate a certain level of buffalo fly infestation without significant production losses occurring. The economic threshold, above which treatment is recommended, has been estimated to be 200 flies per beef animal and 30 flies per dairy cow. Treatment is also indicated when cattle show unacceptable fly irritation.

Treatment of beef cattle can be delayed until 200 flies (100 each side) are present

Producer surveys

Buffalo fly was rated as the most important animal health issue affecting beef cattle profitability by 68% of 2,165 cattle producers in a 1990 Queensland survey. A survey of 199 Queensland dairy farmers in 1997 also identified buffalo fly as a major concern, with 55% of farms having a significant fly problem. The main areas of concern in respect to buffalo fly were animal welfare (42%) and lost production (40%). A 1997 Queensland Department of Primary Industry survey reported that 98% of beef herds were affected by buffalo fly and two-thirds of producers used buffalo fly treatments. All dairies in the survey treated their cattle for this pest.

Surveys of over 200 producers in northern coastal NSW in 1992-3 also identified buffalo fly and its control as a significant issue. The major reasons for treating included animal welfare, skin sores and production losses.

These surveys also revealed widespread chemical misuse. Areas of concern included the use of chemicals that were not registered for cattle or for buffalo fly control, incorrect application of registered chemicals and incorrect treatment intervals. Insecticide-impregnated ear tags were often not removed as recommended at the end of their effective lifespan. Chemical misuse can lead to meat or milk residues and hasten the development of fly resistance to insecticides.

Control of buffalo flies

Control of buffalo fly in Australia has relied primarily on chemical insecticides. Historically, spraying, pour-ons and dips were the most popular methods of fly control. In the early 1990s, the first insecticide-impregnated ear tag system was launched onto the Australian market. Ear tags now dominate the buffalo fly control market.

Unfortunately, fly resistance to some insecticides has developed. Chemical use also increases the risk of residues in meat and milk for both the domestic and export markets.

An integrated control program using non-chemical control methods in conjunction with tactical chemical treatments only if required is now recommended.

Do your cattle need treatment?

A low level of buffalo fly infestation is tolerable - you do not have to treat at the first sign of flies. Monitor your cattle and treat only when there are more than 200 flies per beef animal (100 on each side of the animal) and 30 flies per dairy cow, or when more susceptible cattle, such as bulls show *fly worry*.

Non-chemical control options are preferable. This will reduce the cost of chemicals, delay the development of resistance to insecticides and decrease residue risks.

Non-chemical control options

A variety of non-chemical control strategies are available:

1. Buffalo fly traps

Two types of buffalo fly traps are now available:

a) The *buffalo fly tunnel trap* consists of a short darkened tunnel through which cattle pass regularly. Due to changes in the light level on entering the tunnel, flies leave the animals and are subsequently caught in cages attached to the tunnel sides. The trap is simple to build and can reduce fly numbers on cattle by 60–70%.

Traps are ideal for beef cattle properties and dairy farms where access to water or supplements can be controlled. Cattle easily learn to use the tunnel as it has no internal obstructions, especially once they discover the relief of fly control.

Buffalo fly tunnel traps are built from a demountable steel frame with the sides and roof covered with black plywood panels. A window is cut into each side panel and a fly trap cage made from aluminium fly screen over an aluminium frame completely covers each window. Other building materials are currently being evaluated.

The cost of purchasing a tunnel trap varies from $1,000 to $1,500 depending on materials. This can be reduced if built on-farm. Savings in labour and chemical expenses should make the trap economically worthwhile over a five-year lifespan, especially for herds greater than 50 head.

For more information and designs for the buffalo fly tunnel trap go to: http://www.dpi.qld.gov.au/27_12089.htm

b) The *buffalo fly brush trap* consists of a clear plastic tent. Flies are brushed off as the cattle move through the tent and become trapped inside a solar heated dome where they quickly die of dehydration. These traps can remove up to 90% of flies each time cattle pass through. Provided cattle walk through the trap every 1 to 2 days, sufficient fly control is often achieved without the need for insecticides. Brush traps are not commercially available but producers can build their own using published designs. See Sutherst and Tozer (1995). Control of buffalo fly on dairy and beef cattle using traps. *Australian Journal of Agricultural Research* **46**:269-284 and Tozer and Sutherst (1996). Control of horn fly *(Diptera: Muscidae)* in Florida with an Australian trap. *Journal of Economic Entomology* **89**:415-420. The same details can be obtained from the patents 'Improved insect trap' by Sutherst RW and Tozer RS, Australian patents 645304 and 660811 or US patent 5,205,063.

Buffalo fly tunnel trap

2. Culling allergic cattle

A small number of cattle in a herd become intensely irritated by buffalo flies and have severe skin lesions caused by rubbing activity. Treatment of the whole herd is often based on the severe response exhibited by these few cattle. By culling sensitive animals, treatment need not be given until fly numbers build up and the herd as a whole is starting to show *fly worry*.

3. Dung beetles

Buffalo flies breed only in cattle dung, laying eggs in freshly dropped dung pats. Dung beetles break down and bury the dung pats in order to feed their larvae, which live in underground burrows. Buffalo fly larvae cannot survive in buried dung and starve and die if the remaining dung becomes too dry.

Trials in Queensland have suggested that when dung beetle numbers were high their activity lowered buffalo fly emergence almost four-fold compared to that of beetle-free pats. However in dry seasons or cool weather, beetle numbers were reduced and had little impact on buffalo fly numbers. In a study in NSW there did not appear to be effective control, as fly numbers were just as high on farms with dung beetles as those without. Overall it appears that dung beetles may aid in the control of buffalo fly but the level of control varies between and within seasons.

Dung beetles can be harvested from areas where they are well established and released into other areas to increase overall beetle activity. To achieve maximum dung burial from spring to autumn, it is desirable to have four or five different species of dung beetle complimenting each other's activities.

Further information on dung beetles is available in the CSIRO publication *Common Dung Beetles in Pastures of South-eastern Australia* – call 1800 788 000 to order. Live dung beetles can be purchased from John Feehan on 02 6248 0376 or mcnamara@internode.on.net.

Some synthetic pyrethroid insecticides and macrocyclic lactone chemicals can make cattle dung toxic to dung beetles or their larvae. The chemicals can be toxic when formulated as pour-ons or sprays. The use of these chemicals should therefore take into consideration the need to protect dung beetle populations. Dung beetle populations are particularly sensitive to chemical usage in early spring, as beetles emerge from their pupae in spring and considerable beetle activity occurs in the spring after rain. Beetle activity continues at variable rates through to autumn, depending on rainfall. Treatments that affect dung beetles should be avoided during these times. The insecticides in ear tags are unlikely to affect dung beetles, as little chemical is excreted in dung, although no studies have been conducted to confirm this.

Chemical control options

There are three major chemical groups used in buffalo control programs:

- Synthetic pyrethroids (SPs)
- Organophosphates (OPs)
- Macrocyclic lactones (MLs)

To prolong the effectiveness of the chemical groups available for buffalo fly control, do not use a product from the same chemical group year in year out, as this can create resistance in the fly population.

When using chemicals for buffalo fly control:

- only use chemicals that are sill clearly effective

- rotate the chemical groups you use
    - don't use OPs for more than two seasons in a row
    - don't use SPs continually for more than one year

- Always apply chemicals according to the manufacturers' recommendations - underdosing will promote resistance, while overdosing can result in residues.

Combination OP and SP sprays are also available. These chemicals are available in a variety of forms, including insecticide-impregnated ear tags, pour-ons, sprays, dips and back or side rubbers.

Below is a suggested program of treatments and when they should be applied. These should be used in conjunction with non-chemical control options.

Ear tags

Insecticide-impregnated plastic ear tags are the most widely used method of buffalo fly control in Australia. The tags slowly release OP or SP insecticides over a defined period. Cattle grooming and interaction deposits chemical from the tags onto the shoulders, back and flanks of treated animals. All cattle in a mob should be tagged correctly. Tags **must be** removed as recommended by the manufacturer (after 10 or 16 weeks) to avoid flies being exposed to sub-lethal concentrations of the chemical. Ear tag manufacturers often pay a rebate for the return of used tags that have been removed at the correct time after application.

Spring	Summer	Autumn	Winter
Back rubbers or fly traps			
OP spray (if flies are a problem early in the season)	**Ear tags** for 10 or 16 weeks when fly numbers exceed acceptable levels (Use OP tags for two years – then a SP tag for one year)	OP or SP spray* – or ML pour-on# (if flies remain a problem after tag removal) * Use OP spray after SP tags or SP spray after OP tags # Use a ML pour-on to get a combined efficacy against worms	

Sprays

OP and SP chemicals can be applied as backline or full body sprays. The chemicals are relatively cheap, however multiple treatments are required throughout the season. Sprays must be mixed and applied correctly in order to obtain effective chemical levels on the cattle. Failure to apply adequate amounts of insecticide will lead to poor fly control and may hasten the development of resistance to the chemical. Cattle should be treated in a race rather than in a holding yard to ensure each animal gets the correct dosage. A single spray application at yarding (eg weaning) will only have a temporary effect and is unlikely to improve overall fly control. Misting spray over a yard full of cattle is not effective, leading to poor fly control, and possible promotion of resistance.

Pour-ons

Pour-on products containing SP or ML chemicals help to control buffalo fly. ML pour-ons also control worms, ticks and lice. Cattle must be weighed prior to treatment to determine the correct dose, which should be applied through the recommended applicator in a long strip down the middle of the backbone. Application guns should be calibrated and checked prior to and during use to ensure the correct dose volume is being applied. The whole mob should be treated to ensure effective control is achieved.

Plunge dips

The use of plunge dips for fly control is decreasing due to the expense of maintaining dips and producer preference for pour-on products for tick control. Combination OP/SP products are usually used in plunge dips. Dip chemicals must be maintained at an adequate concentration at all times to maintain effectiveness. Amitraz does not provide effective control of buffalo fly.

Back rubbers/side rubbers/rubbing posts

These devices allow self-application of OP chemicals when cattle rub against them as they try to gain relief from fly irritation. They usually consist of absorbent material soaked in a mixture of insecticide and oil fed from a reservoir. The reservoirs should be checked regularly to ensure that the chemical and oil mix does not run out.

The success of rubbers depends on the frequency with which they are used by the animals. They are economical and suitable for sites where cattle congregate such as watering points, cattle camps, cattle pads or supplementary feeding points.

The APVMA recommends a good grade of mineral oil (such as mineral paraffin (BP) and/or mineral oil (USP), or Caltex White Oil Pharma 15) as the most appropriate oil for mixing with registered insecticide products for backrubber use - provided that the backrubber use is indicated on the label of the registered product. Backrubber oils cannot be used with unregistered products or with registered products that do not have a backrubber claim on their label.

The use of sump oil for backrubbers is discouraged as it results in meat residue problems for cattle. Vegetable oils are also not considered suitable, as they are palatable and edible to the cattle. As such, the animals may ingest the chemical, which could potentially cause residue issues. Recycled and unused (new) engine oil is also considered unsuitable for this purpse due to residue and toxicity concerns.

Avoid residues in meat products

Australian beef has a ‘clean’ image worldwide with regard to chemical residues and contaminants. Australia exports 62% of its beef production (2009-10). These beef exports were valued at $4.1 billion in 2009-10. It is vital that residues are not found in exported meat as this could have devastating effects on trade and tarnish the Australian meat industry’s proud record of supplying ‘clean’ food.

Producers who use chemicals in the control of buffalo flies must follow manufacturers’ instructions. There are two sets of requirements for use of buffalo fly control chemicals:

1. A legally set **withholding period (WHP),** which applies to each chemical registered for use in or on livestock in Australia. The WHP between treatment and slaughter safeguards consumers against chemical residues that may affect human health.

2. The **export slaughter interval (ESI)** is the recommended time period between treatment and slaughter to ensure compliance with export standards, as other countries may have a lesser or zero tolerance for chemicals used in Australia.

Producers must by law obey the WHP stated on a product label. ESIs are voluntary guidelines, however it is highly recommended that producers comply with the ESI as their cattle may be processed for the domestic market, the export market or both. Current WHPs and ESIs are available on the APVMAs website at: www.apvma.gov.au/residues/subpage_residues.shtml

Chemical resistance

Parasites including buffalo flies can become resistant to insecticides. If the chemical dose is insufficient to kill all the population, the strong survivors breed and multiply. This leads to a gradual build-up of resistant strains of flies. Chemical resistance is usually seen in the field as a reduced protection period.

SPs were the first class of insecticide to which resistance developed in buffalo flies and resistance is widespread. OP resistance has been reported in some areas of Australia and has emerged in the US in the closely related horn fly. If the resistance pattern in buffalo fly follows that of horn fly, resistance to the OPs will spread widely in Australia. The more frequently a chemical is used, the more quickly resistance will develop to that chemical. The use of sub-lethal levels of chemicals also promotes the development of resistance. This can occur when chemicals are mixed or applied at lower than recommended concentrations or dose rates, or when insecticidal ear tags are not removed at recommended times.

Field surveys of chemical resistance in buffalo flies in NSW and Queensland were carried out in 1994-5, 2000 and 2001. The most recent survey revealed that there is widespread resistance to SPs in NSW and Queensland. Resistance to the OP chemicals, diazinon and chlorfenvinphos, was present at low levels in northern NSW in the 2000 survey. However by 2001 there was no apparent resistance to diazinon in the same area. One explanation was that the diazinon resistant flies might not have survived the harsh climatic conditions experienced in northern NSW in mid to late 2000.

Table 1: Advantages and disadvantages of different application methods

Application method	Advantages	Disadvantages
Ear tags	• Effective for 10 or 16 weeks • Cattle usually only need to be tagged once each season • Nil withholding period (WHP) and export slaughter interval (ESI)	• Labour intensive to apply • Tags must be removed 10 or 16 weeks after insertion • Tags must be removed before slaughter • Failure to remove tags may promote resistance
Sprays	• Relatively cheap	• Multiple treatments required throughout the season • Up to 21-day ESI for some products • Chemicals must be mixed and applied correctly • Many SPs are toxic to dung beetles
Back rubbers	• Low cost • Self treatment	• No control over dose per animal • 10-day ESI • Must use clean oil
Pour-ons	• Easy to apply • Can be used for integrated parasite control, as many pour-ons also treat worms, ticks and lice • Can provide protection up to 2 weeks	• Long ESI for most products • Repeated treatments required • Some products expensive • Some products may be toxic to dung beetles if applied in spring when immature beetles are present • Not all pour-ons are effective - ensure you read the label

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MEAT & LIVESTOCK AUSTRALIA

Level 1, 165 Walker Street
North Sydney NSW 2060
Ph: 02 9463 9333
Fax: 02 9463 9393
www.mla.com.au

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