NSW GOVERNMENT Department of Primary Industries

primefact

Controlling flies on intensive livestock farms

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Nuisance flies can breed prolifically in animal manure, spoiled feed and straw bedding. Depending on the situation several species may be involved. Most are just an annoyance to stock and workers but those that bite can irritate animals such that production may be affected. Primarily however, the presence of large number of flies can irritate farm workers, affect produce, cause neighbours to complain and affect the reputation of the farm, so good farm management must include fly control.

Some level of fly infestation is inevitable when animals are farmed intensively but pest numbers of flies usually indicate a failure is one or several key areas of farm management. Most common deficiencies are:

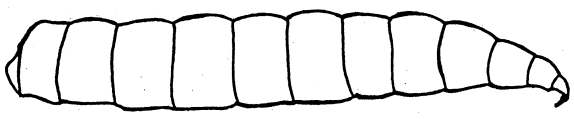
- inadequate manure management
- excessive moisture levels in and around animal sheds
- failure to clean up spilled or spoiled feed or soiled straw bedding
- poor management of compost piles
- ineffective use of insecticides
- lack of understanding of fly breeding habits
- poor maintenance of buildings or services such as watering systems

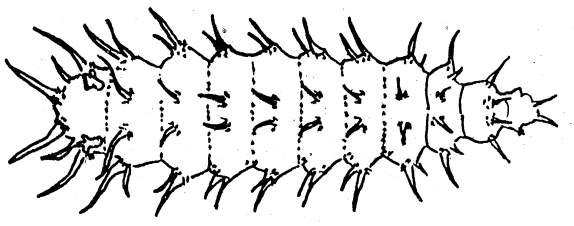
This PrimeFact aims to provide guidance on how to control nuisance flies by briefly outlining:

- the biology of the main pests
- how biological control agents can be protected and encouraged
- how farm management can be modified to reduce fly breeding
- how and when registered insecticides should be used for optimal effect

Many of the examples come from research experience in layer poultry farms but the principles are equally relevant to dairies, horse stables and other animal houses. Several species of pest flies are common across Australia but because each has specific environmental preferences, not all occur at the same time. To tailor an optimal fly control strategy it is essential to know which fly, or flies, are present. This is especially important because house flies have developed resistance to some insecticides whereas other common nuisance flies have not. Failure to select the most effective treatments is likely to lead to poor fly control and wasted money and effort.

'Smooth' *Muscina* and 'hairy' *Fannia* maggots. The actual full-size of *Muscina* is about 12 mm whereas that of *Fannia* is about 9 mm.





Major pests

The false stable fly, *Muscina stabulans*, occurs on poultry farms from late winter until mid-summer. It is most abundant in mid-spring. Females lay eggs into moist manure. Maggots hatch 11-18 hours later, feed on the manure and

then pupate (form a cocoon-like structure from which adult flies emerge) in the drier manure. Adult flies emerge from pupae after another 14 days or so. The presence of this species in winter is indicative of a serious fly problem that is likely to worsen in spring unless a control strategy is put in place immediately.

The lesser house fly, *Fannia canicularis*, is smaller and slimmer than the house fly and rests with its wings overlapping. Unlike the other flies commonly found in animal sheds, *Fannia* spends much of its time in flight. In poultry sheds it commonly circles above the caged birds or in the eggs rooms. Maggots of the lesser house fly have numerous spines along the body giving them a hairy appearance whereas false stable fly and house fly maggots are smooth. Development time from egg to adult is about two weeks during spring/summer when *Fannia* is most prolific. Like *Muscina*, the presence of *Fannia* in winter is indicative of a serious fly problem that requires immediate intervention.

The major pest species, *Musca domestica* (top), *Fannia canicularis* (centre) and *Muscina stabulans* (bottom).

The house fly, *Musca domestica*, may be present throughout the year but is most abundant from mid-summer to early autumn, when *Muscina* and *Fannia* have virtually disappeared. Whereas *Muscina* prefers poultry manure, house flies can also breed successfully in compost, lawn clippings, or any decomposing vegetable matter, as well as in most animal manures. Development from egg to adult fly takes about 10-12 days under optimum conditions.

Minor or occasional pests

Black carrion fly, *Australophyra rostrata*, is a shiny black fly similar in size to the house fly that usually breeds in animal carcasses. It is most abundant in spring/summer and has a development time of about 14 days.

Black carrion fly, *Australophyra rostrata*.

American soldier fly, *Hermetia illuscens*, occasionally becomes very numerous in poultry sheds. Female flies lay eggs in the drier areas of manure and the maggots feed for about two weeks before reaching full size (20mm). Large numbers of soldier fly maggots can cause manure cones to liquefy and collapse. Unlike other species which are a nuisance as adult flies, it is the maggots of the soldier fly that are the destructive pest against which control should be directed. In these situations so called maggot ‘hot spots’ can be directly targeted with topical insecticidal sprays.

There are several common blowfly and flesh fly species that are attracted to intensive livestock

farms by smell. Female flies must have access to protein to mature eggs. All breed in carrion such as dead birds and so long as dead animals are removed regularly are unlikely to be breeding on the farm.

The American Soldier Fly, *Hermetia illucens*.

Hermetia illucens larvae in poultry manure. Large numbers of these maggots can liquefy manure and cause manure cones to collapse.

The drone fly, *Eristalis tenax* resembles the adult honey bee, both in appearance and behaviour. The so-called 'rat-tailed' maggots are found in wet areas such as drains contaminated with manure, or manure pools caused by leaking taps or watering systems. Though rarely in pest numbers the presence of drone flies indicate inadequate site drainage and pooling of wet manure. If these conditions occur in an animal shed it is likely that there are also areas where the major fly pests are also breeding.

The Drone Fly, *Eristalis tenax*.

The 'rat-tailed' maggot of *Eristalis tenax*.

Both sexes of the stable fly, *Stomoxys calcitrans* suck blood from people and from animals. The long, pointed mouthparts of these flies can bite through clothing. The bites are painful and can cause localised skin reactions. Usually, stable flies spend most of the time resting on rails etc. near stock or waiting for animals to pass by. Stable flies will cause extreme irritation to cattle and horses and can affect milk yield in dairy cows. They are most common during summer and autumn. Larvae commonly breed in damp or spoiled feed, damp straw bedding or in manure. Large numbers of stable flies can sometimes develop in poultry manure used as a side-dressing for plants.

The stable fly, *Stomoxys calcitrans*.

The bush fly, *Musca vetustissima* is an outdoors pest that breeds in damp cattle dung but at certain times of the year may be present in large numbers around intensive livestock facilities. Adult bush flies seek moisture from the eyes, nose etc. of people and animals. Several species of dung beetles have been introduced to Australia in an attempt to remove dung from paddocks and so deprive the bush fly of its main breeding material - but they persist. The bush fly resembles the slightly larger house fly but unlike the house fly, does not enter buildings. It may, however, be extremely numerous outside animal enclosures which may be mistakenly blamed for their presence. Bush flies are capable of dispersing hundreds of miles on prevailing winds, when westerlies bring them to coastal areas. In NSW, bush flies are present only in spring and summer.

Principles of fly control

Fly control can only be achieve by an integrated pest management approach. Four basic principles apply:

- It is impossible to eradicate all flies, so control practices are directed at reducing fly populations to tolerable levels.
- There are many beneficial insects and mites that assist in fly control. The control provided by these is called natural, or biological control. Good farm management will preserve these beneficial predators and parasites.
- A good standard of farm management will reduce fly populations and the need to use insecticides. Good management includes general farm hygiene, maintaining healthy animals, trimming grass around sheds, cleaning up spilt feed around storage areas and animal sheds, reducing moisture in and around buildings by controlling water run-off, guttering, drains and maintaining leak-free stock watering systems.
- Despite all management effort, under certain environmental circumstances fly numbers can increase considerably. This occurs most often in spring when false stable flies proliferate but may also occur during warm, wet summers when the excess moisture prevents manure drying and favours rapid fly breeding. At these times insecticides may be needed to reduce the population of flies to tolerable levels.

Biological control

Predatory beetles. Among the most common predators are the beetles *Carcinops pumilio*, *Creophilus erythrocephalus* and *Alphitobius diaperinus*. *Carcinops* adults and larvae are commonly seen in manure searching for fly eggs and larvae. Adult beetles will eat up to 24 fly eggs per day.

Carcinops pumilio (Histeridae).

The Devil's Coach horse, *Creophilus* beetles are very active predators of fly maggots in intensive livestock facilities. They are also very commonly seen feeding on maggots in carrion.

Creophilus erythrocephalus.

Alphitobius diaperinus, also known as lesser mealworm, darkling beetle or simply ‘black beetle’ among poultry producers, can be a pest in some situations. When fully fed, lesser mealworm larvae wander from the manure in search of suitable places in which to pupate. In older sheds they often tunnel into and destroy the solid insulation material in sandwich wall panels. However, the tunnelling behaviour of this beetle in manure helps dry it, thereby reducing its suitability for fly breeding. In ‘high-rise’ poultry facilities this beetle alone can sometime be all that is needed to control nuisance flies.

The lesser mealworm, *Alphitobius diaperinus*.

Predatory mites

These should not be mistaken for poultry red mites or northern fowl mites that are blood-sucking parasites of hens. The poultry red mite feeds on the hens at night and rests in crevices away from the birds at night. The northern fowl mite spends all of its time on the hens, feeding on the skin around the vent area.

The predatory mites are found in the manure and on adult flies. They are not insects but are beneficial organisms closely related to spiders that feed on fly eggs and very young fly maggots. Three families of these mites are represented in poultry sheds: Macrochelidae, Uropodidae and Parasitidae. As manure accumulates, parasitids are the first group to arrive, followed by macrochelids and finally uropodids. The macrochelids are often very abundant in poultry manure. The females are phoretic, that is, they attach to flies for transportation to new areas. Substantial reduction in fly numbers because of macrochelid mite predation has been demonstrated. Whereas the macrochelids are active on the manure surface, uropodid mites feed on larvae deep within accumulated manure.

Predatory macrochelid mites.

Others predators

Spiders and earwigs are often found on poultry farms. Flies form a substantial proportion of their food.

Parasites

These are all tiny wasps belonging to the families Pteromalidae or Chalcididae. Depending on species, female wasps deposit one or many eggs into pupae or full-size fly maggots. By their feeding the wasp larvae that hatch from the eggs destroy the developing fly and emerge from the fly puparia as adult wasps three weeks later. Parasitism rates as high as 40% have been recorded.

Under normal conditions a balance is reached between flies and the predators and parasites that naturally regulate population size such that flies do not reach pest levels. For this reason it is essential that the preservation of beneficial organisms be considered in farm management and especially when using insecticides. Increases in the populations of predators and parasites always lag behind those of the pest and are usually at a slower rate than those of the flies. Complete removal of accumulated manure can also remove many of the predators and parasites. If you remove manure from all rows, leave a pad of manure 2-3 cm thick to help preserve the predatory beetles and mites and the parasitic wasps.

Parasitic pteromalid wasps emerging from house fly puparia.

Use of insecticides

There are a host of insecticidal products registered for use in and around animal sheds to control nuisance flies. These products can be segregated into different insecticide classes depending on the active ingredient they contain. They can also be segregated on the basis of how they are formulated. For example, there are wall sprays, fly baits, a feed additive and topical manure sprays. Each product has particular properties, which means that the effectiveness of each product will differ depending on the species of fly present, shed construction or the timing of the insecticidal application. For example, some fly bait products contain a pheromone that is only attractive to house flies. Smooth, impervious walls such as galvanised iron will retain a surface treatment well whereas insecticide sprays applied to concrete walls are much less effective.

Depending on the product chosen, baits can be scattered on the ground or mixed with water and painted on surfaces, however, it is preferable to sprinkle baits onto damp hessian contained in dedicated bait trays that can be deployed where most effective.

For the current list of registered products go to http://www.infopest.com.au/ or check the Australian Pesticides and Veterinary Medicines Authority website http://www.apvma.gov.au/. Always follow the instructions on the product label including the precautionary advice on the use of personal protective clothing.

Total reliance on insecticides for fly control is unsustainable and has a number of disadvantages. Apart from the financial cost of the products, there are costs in terms of time and labour, occupational health and safety considerations and the capital investment and maintenance costs for spray equipment etc.

There are two major risks associated with excessive or inappropriate use of insecticides:

- Insecticides also kill the beneficial insects and mites, particularly parasitic wasps. This reduces the effect of biological control and can create a persistent fly problem.
- Insecticide resistant flies may eventually build up in the population.

Insecticide resistance

When a new insecticide is first used against an insect pest such as the house fly, the population of the pest in the treated area is drastically reduced if the product has been applied correctly. However, a small proportion of individuals that have a greater ability to withstand the effects of the spray will survive. These insects may survive and breed, resulting in a rapid increase in fly numbers. Under this scenario many producers will apply multiple insecticide treatments. With each treatment, the proportion of survivors will increase until the insect population is largely unaffected by the insecticide.

Research has shown that Australian house fly populations contain flies resistant to several insecticides, whereas false stable flies and lesser house flies are not yet resistant. This means that if the wrong insecticide is used resistant house flies are likely to survive a spray or bait treatment and continue to breed. Differences in susceptibility to the various registered insecticides among the common fly species means that control strategies should take account of the fly species targeted by selecting product(s) that are most likely to have maximal effect. To reduce the risk of resistance

developing it is wise to rotate the use of insecticides to minimise fly exposure to any single insecticide class. This can be achieved by alternating the use of products belonging to unrelated insecticide classes irrespective of whether a wall spray or a fly bait is chosen.

More information

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