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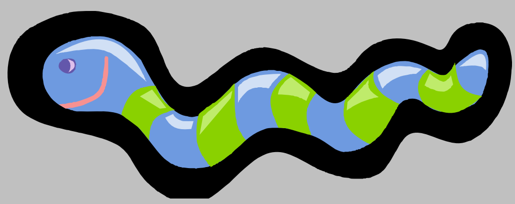

LIVESTOCK (SHEEP)

INTEGRATED PEST PEST MANAGEMENT (IPM)

Monitoring Tools

Victoria
The Place To Be

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LIVESTOCK (SHEEP) INTEGRATED PEST MANAGEMENT (IPM) MONITORING TOOLS

Integrated Pest Management (IPM) is an important aspect of sustainable agriculture. It is based on the planned and strategic use of pest control methods (including chemicals and a range of other methods) – not simply using chemicals as part of a set routine.
Drench resistance is becoming a very serious problem for the sheep industry in Australia. This tool will provide you with background information on livestock IPM, how drench resistance develops and various generic strategies to deal with it. It is recommended, however, that you contact your local livestock expert for management strategies for your area.

The IPM tools outlined below will allow you to manage internal and external livestock pests based on the principles of IPM

TOOL A: Internal parasites in sheep (worms)

TOOL B: External parasites (blowfly in sheep)

What is Integrated Pest Management (IPM)?

During the 1940's and 50's Australian agriculture relied heavily on the use of broad-spectrum pesticides to control pests. However, as reliance on chemicals has grown over the years more and more pests and weeds have developed resistance to herbicides, insecticides and fungicides. Examples include insects in stored grain, blowflies in sheep, ryegrass resistance for most herbicide groups, and internal roundworm parasites in livestock. In other words, a number of chemicals that we have available to us have become less useful.

The era of Integrated Pest Management (IPM) began in the late 1970's and is based on managing pest populations in a way that has the least impact on the ecology of an area. An important principle of IPM is that pesticides should be used only when absolutely necessary to prevent economic loss and these chemicals must be socially acceptable. Using more than one control method is also important. Thus IPM is based on the planned and strategic use of pest control methods, including chemicals, not applying simply because it is part of your usual schedule. Quite often, chemicals are applied when they are not needed or not useful – this is a waste of time and money and puts more pesticides unnecessarily into the environment.

IPM has also been described as a pest population management system, which anticipates and prevents pest from reaching damaging levels. Some of the tools available for use in this system include management techniques like strategic grazing; biological controls, quarantine practices and the strategic use of chemicals.

The strategic use of pesticides in conjunction with other control methods can reduce reliance on chemicals. This means that pests will have less chance of building resistance because they are not consistently exposed to these pesticides.

IPM is a familiar concept in horticulture but is newer for broadacre farming. As growers increase stubble retention and direct drilling there has been more interest in IPM to control the increasing pest issues. For example, slugs are becoming a problem in no-till systems. IPM is also becoming very important in livestock, particularly the need for more strategic use of drenches based on monitoring of worm numbers and grazing management.

Definition of terms

Integrated: Using more than 1 control method or a 'multi-pronged' approach to pest management (Slater 1998).
Pest: Any organism that damages crops or injures or irritates livestock or man (Collins Australian Dictionary 1999).
Management: In most situations pest populations can only be managed, not eradicated (Slater 1998).

What is driving the use of IPM methods?

1. Pesticide resistance
All organisms, including pests, adapt to their environment leading to slow, evolutionary changes to occurring over many generations. When we expose pests to sub-lethal doses of pesticides, this can speed up evolutionary changes. Where heavy use of chemicals occur, this can lead to a higher proportion of individuals to survive who are resistant to that chemical – they then go on to breed a resistant population.

This ever-increasing occurrence of resistance has been a major driver for IPM. By adopting IPM we can use chemicals more strategically and manage the development of resistance. Chemical companies also support the use of IPM because they would like their products to remain useful for longer.

2. The demand for Quality Assured produce re. Chemical residues
International and domestic markets are requiring agricultural produce to be free of chemical residues – or at least have residues well below Maximum Residue Limits (MRL's). Most Quality Assurance schemes have food safety and human health as a minimum requirement. The adoption of IPM ensures that chemicals are used strategically and along with other pest control methods; and that withholding periods are obeyed.

3. Poor prospect of new chemical groups coming onto the market
The prospect of new chemicals being available to help us overcome resistance (in the short term) is low. Pesticides take many years to develop, test and register. This means we need to use the chemicals that we do have more effectively – so that they remain more useful for longer. This has been a strong driver of IPM adoption.

The main elements of IPM

There are 4 main steps in IPM as outlined below and then used to help you to make informed decisions about internal (Tool A) and external (Tool B) parasites in sheep:

☑ *Step 1. Know your enemy*
IPM relies on having a good understanding of the pest you are dealing with. You need to understand their biology and ecology. It is essential to know what causes the pest population to fluctuate at certain times of the year – is it the weather, host plant growth stage, available food source? It is also handy to know how the pest behaves and if the pest has any natural predators.

Part of pest behaviour is understanding the life cycle. Some pests have a short life and produce large quantities of offspring (these are called type 'r' pests). They are opportunistic and can build up a high population very quickly (eg. fruit fly). They are very well adapted to short term cropping systems and can reach damaging levels before a 'bust' in their population. The other type of pest is the 'k' pest. They are more adapted to stable, natural ecosystems and spend most of their time competing for survival. These pests live longer, produce less offspring and have stable populations. Examples include scarab beetles.

☑ *Step 2. Set control thresholds*
Restricting pesticide usage is an important part of IPM. The main way to achieve this is to apply chemicals only when pest numbers reach damaging levels, ie, when faecal egg count numbers reach

a certain level. Over the last few years there has been a number of efforts to define the levels, or control thresholds, for a number of pests. This is also known as ‘economic threshold’ – the point when control measures need to be taken to prevent economic loss.

☑ *Step 3. Monitor the pest population*

Monitoring is very important for successful IPM – you need to accurately assess pest threats, population fluctuations and apply control methods at the right time. As with any on-farm monitoring, it needs to be simple and inexpensive. Taking faecal samples from sheep and having faecal egg counts and drench resistance tests done is vital for informing your livestock IPM program.

☑ *Step 4. Select the appropriate control method*

There are a number of control methods in the IPM toolbox (See Table 1), including the use of pesticides. When selecting control measures it is important to think about long term control, not necessarily ‘quick fixes’.

Table 1: IPM control methods (cropping, pasture and livestock examples)

Chemical	• Eg. Herbicides, insecticides, fungicides, nematicides. • Reliance on chemicals alone leads to resistance, economic loss due to unnecessary use, risk of negative environmental impacts
Mechanical / physical	• The oldest form of pest control • Eg. Cultivation, hand hoeing, improved silo design • Overuse can lead to erosion and soil structure damage and increased costs (fuel, labour)
Cultural	• Eg. Crop rotation, controlling pest-harbouring weeds, seed heat treatment, establishing ‘biodiverse’ headlands to encourage pest predators. • Controlling worm contamination through grazing, cropping and hay conservation practices according to stock susceptibility
Biological / environmental	• The deliberate release of natural predators (requires extensive control, testing and can take many years to develop) • Is also about encouraging natural predators into an area
Quarantine	• Keeping infected materials out of specific areas • Quarantine new sheep purchases until you are sure they are not carrying drench resistant worms

TOOL A) LIVESTOCK IPM – worm control in sheep

Goal: To understand the important components of livestock IPM and the management strategies available.

How do internal parasites become resistant?

Sheep worm resistance to drenches (anthelmintics) has been developing since the 1970’s, when farmers were encouraged to drench every month. The combination of very frequent drenching and under dosing soon led to a resistance problem that didn’t become apparent until the 1980’s. A couple of new generation drench groups have become available over the years, but these too have eventually become less useful. Drench resistance has developed due to a number of other factors including:

- when farmers drench for full worm control it actually leads to rapid resistance (it ‘selects’ for resistant worms to develop)
- not enough rotation between drench groups

- non-strategic use of drenches without monitoring faecal egg counts
- poor grazing practices

Drench resistance is a common problem, occurring on around 90% of farms. NSW Agriculture illustrate the prevalence on drench resistance as:

Table 2: Status of drench resistance (2002)

Drench / drench group	Prevalence of resistance
Benzimidazole (BZ) – the 'white' drenches	Approx 95% of properties
Levamisole (LEV) – the 'clear' drenches	Approx 85% of properties
Combination drenches (BZ + LEV)	Approx 75-80% of properties
Macrocyclic Lactone (ML) drenches (eg. abamectin, ivermection, moxidectin)	Becoming more common. First reports came from WA but is now commonly found in western Vic
Naphthalophos (Rametin®)	One recorded case
Closantel	Common in northern NSW & SE QLD.
Triclabendazole (Fasinex®, Flukare®, Flukex®)	Small number of resistant strains

- Source: Tricia Veale (Para-Site Diagnostic Services)

The main internal parasites affecting livestock

Round Worms (nematodes)

Barber's pole worm (*Haemonchus*)
Small brown stomach worm (*Ostertagia*)
Large mouthed bowel worm (*Chabertia*)
Black scour worm (*Trichostrongylus*)
Thin-necked intestinal worms (*Nematodrius*)
Large bowel worm (*Oesophagostomum*)

Trematodes (Flukes)

Liver fluke (*Fasciola hepatica*)
Stomach fluke (*Paramphistomes*)

Flat worms (Cestodes)

Tapeworms

☑ *Step 1. Know your enemy*

Worms live in the sheep for months and eventually are passed out onto the pasture (see Figure 1). They can survive on the ground for 6 months in wet conditions. The larvae live on the grass until it is eaten. Hot weather can kill the larvae. It is possible to clean up most but not all worms in summer (some larvae survive under dung pats and on dam banks).

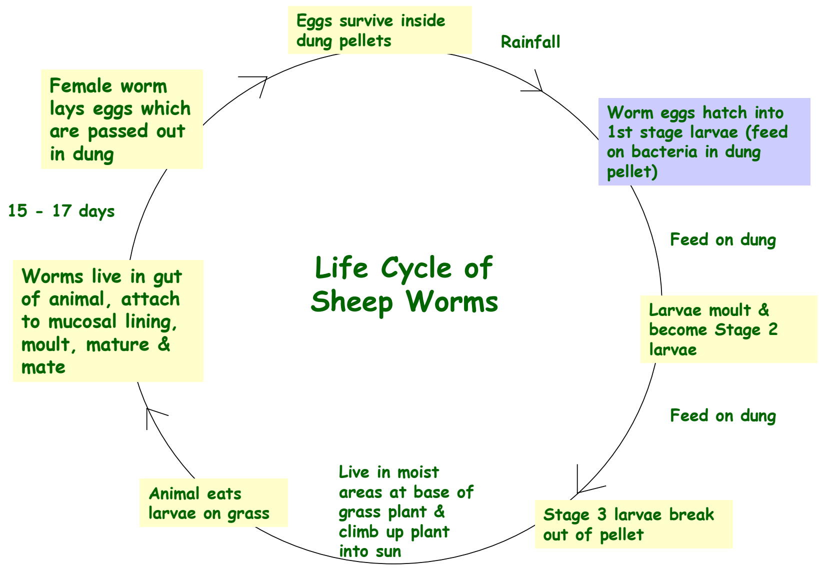


Figure 1. Lifecycle of a sheep worm

☑ ***Step 2. Monitor the pest population***

Monitoring of worm numbers is very important for successful worm control. It ensures that worm control occurs only when it is needed. It is vital to monitor for the need for the 2nd summer drench. It is especially important to monitor susceptible stock such as weaners. Carrying out Faecal Egg Counts is the best way to monitor worm populations in sheep and on the pastures. To collect the samples:

- Put mob in corner, leave 5 minutes.
- Move animals away.
- Collect 10 fresh dung samples. Place no more than 1 teaspoonful of dung in each bag.
- Fill out paperwork supplied with bags.
- Seal all bags and pack carefully.
- Post samples to your local testing service (contact DPI) on same day as collection (not Friday). Collect early in the working week if possible so as not to sit in the mail for prolonged periods.

The results will tell you how serious the worm infection in the mob is and the degree of contamination in the pasture. These results will allow you to make more informed decisions about drenching. The test results are self-explanatory and usually consist of:

- a description of the mob you tested (eg. 3 year old First Cross Ewes)
- date when last drenched and drench used
- the worm egg count per gram of dung (epg)
- an interpretation eg. 'This is a low to moderate egg count. These sheep do not require drenching immediately, but the result does indicate that worm numbers are building up. They are likely to need treatment in 2 weeks time'.

Contact your local DPI office for contact details of your local testing service.

☑ ***Step 3. Know the resistance status of your flock***

The best way to determine if your flock is resistant to worms and which drench groups will be most effective is to carry out a Faecal Egg Count Reduction Trial. Dung samples are collected according to instructions from an animal health adviser, veterinarian or laboratory. Kits are available with specific instructions for sample collection. Contact your local DPI officer for more information concerning local laboratory services. The trial will reveal the percent (%) efficiency for each drench group used on your flock.

The options for managing worms

1. Using anthelmintics (drenches)

There are a number of generic recommendations concerning use of drenches. Contact your local livestock specialist advisor for treatment suitable to your enterprise.

- Weigh individuals before drenching and draft into weight ranges.
- Calibrate the drench gun.
- Do not overdrench.
- Avoid underdosing – always dose for the heavier sheep
- Use the right drench at the right time – only when you need to. **This means monitoring worm egg counts.**
- Drench 3 weeks before sheep are due to be put on stubble (ie. drench B pasture B stubble).

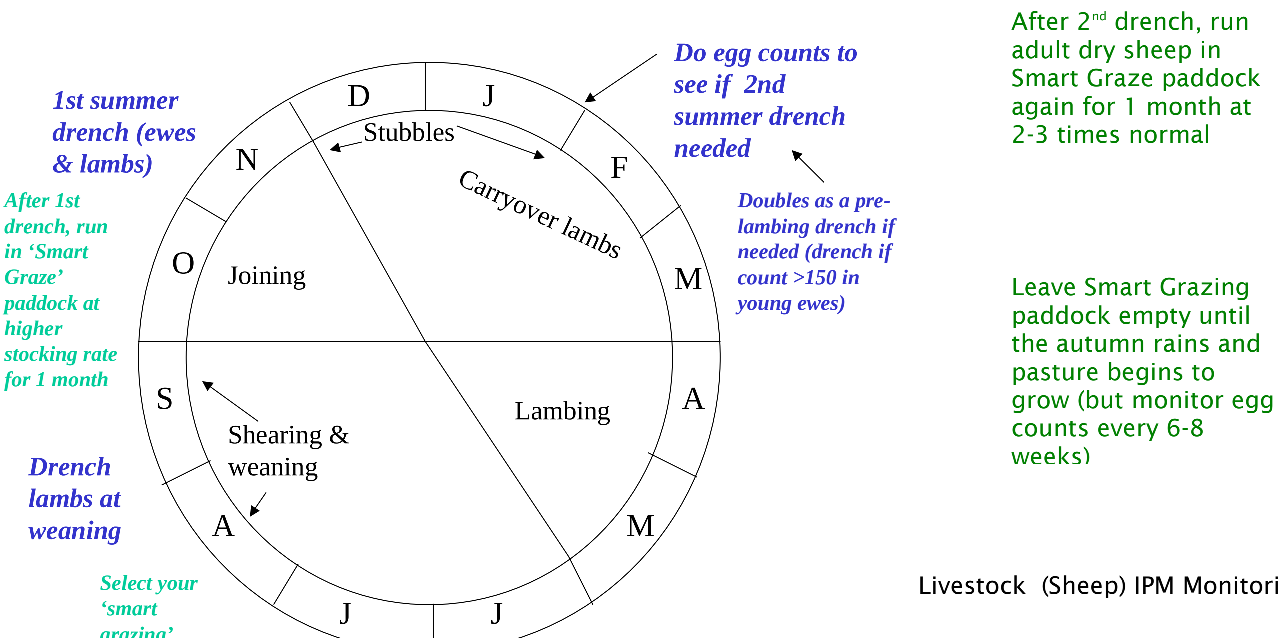
- Continue with the 1st summer drench but choose the right product. The timing of this drench needs to be when worm 'pick-up' is no longer occurring (when daily temperature is regularly over 20 degrees Celsius (8x5 Wool Profit Program, 2003).
- Do a 2nd summer drench only if you need to (based on egg counts) – drench only if egg counts are over 150 epg (8x5 Wool Profit Program 2003).
- Consider a pre-lambing drench but don't do it automatically.
- Ensure good worm control at weaning (10-14 weeks old).
- **Capsules are a last resort – they can lead to serious resistance problems.**
- Give new sheep a 'quarantine' drench (Q drench) – Otherwise known as the 'triple whammy' or 'Q drench' (usually Cydectin plus rametin + BZ or ramazole). Make sure you drench to correct weight – there can be a danger of overdosing.
- After giving them the 'Q' drench, put them into a wormy paddock to pick up the strain of worms on your farm (if you have a few survivors of the Q drench, they are diluted into the system).
- Incorporate other strategies at every opportunity.

2. Grazing management

Understand the susceptibility of your stock and manage grazing accordingly: Certain classes of livestock are more susceptible to worms than others. The least resistant are: weaned lambs, late pregnant and lactating ewes and hoggets. Adult dry sheep more than 2 years old are the most resistant. If pastures are grazed by resistant stock, they will be a lower risk when grazed by susceptible stock. This is an effective way to prepare a paddock for grazing of susceptible stock – it is often referred to as 'smart grazing' the paddock before susceptible mobs go in. Adult cattle can also be used for 'smart grazing'. Pastures grazed by susceptible stock can usually be safely grazed by resistant stock (MLA, 2004). Grazing management should be used in conjunction with a drench program.

Resting paddocks in summer: Where summers are hot and dry for at least 6-8 weeks, resting paddocks is a good option for worm control. However, once the autumn break occurs, worm larvae survive until the next dry season.

Grazing management should be used in conjunction with a drench program. The following diagram illustrates what this might look like. You will need to adapt for your own situation or seek advice on how to go about this.

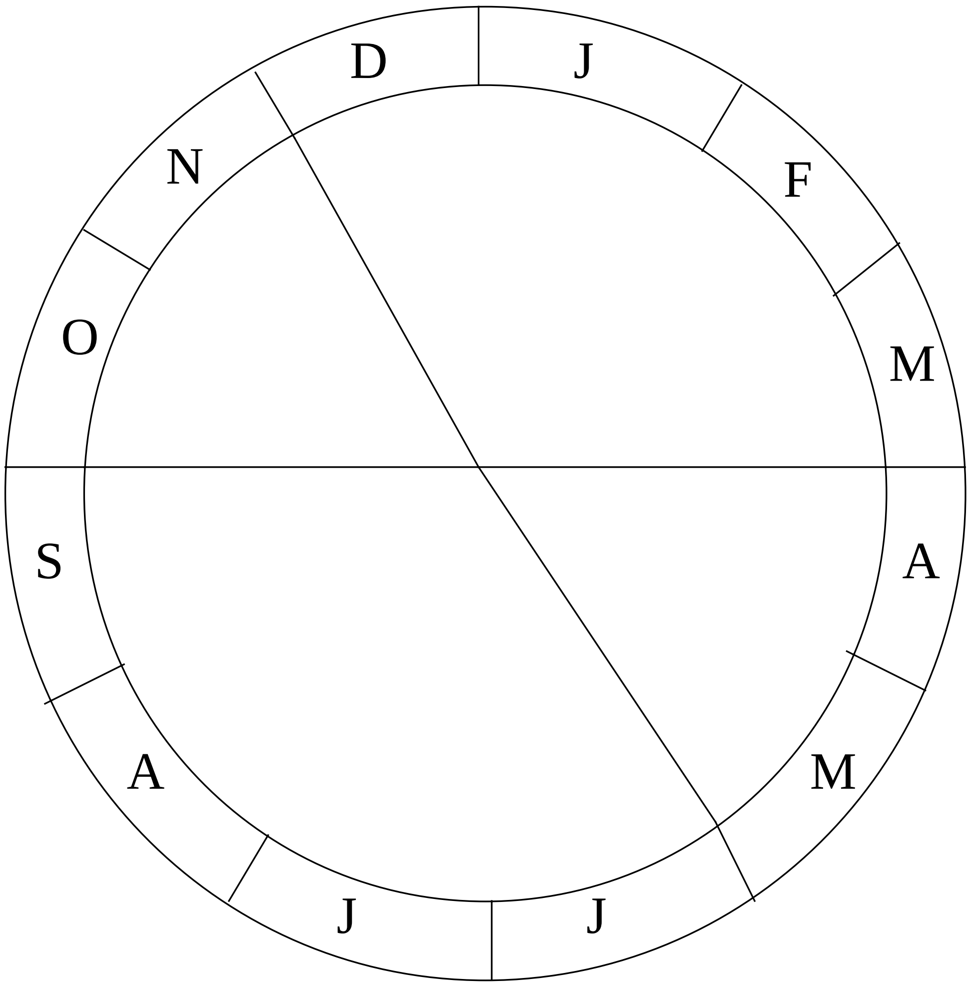


Worm control: Prime lamb enterprise

Figure 2: Worm control program 'wheel' based on a prime lamb enterprise. (Holmes Sackett & Assoc Pty Ltd, 2004 and Mackinnon Project Newsletter, 1999).

✍ **A blank 'wheel' is included for you to map your own enterprise.**

Worm control program wheel
Use the example wheel on the previous page as a guide to come up with your own worm control program to suit your enterprise.



TOOL B: Controlling external parasites in livestock.

Case Study: sheep blowflies

Goal: To understand how IPM applies to control of blowflies in sheep.

IPM can also be applied to the control of blowflies (*Lucilia cuprina*) in sheep. IPM can reduce the incidence of fly strike in sheep, reduce the cost of flystrike treatment and reduce the pesticide residues in the wool clip.

☑ *Step 1. Know your enemy*
It is important to understand some detail about fly biology in order to manage them. Flies live for 2 to 3 weeks. In warm weather, they mature in 17 days. Females hatch from the soil and find a high protein food source such as carcasses or manure – weeping skin is a favourite! The females then mate and produce between 50 to 250 eggs. The eggs hatch in 12 hours and the newly hatched maggots thrive on moist, weeping skin. As they get older they start to attack dry, healthy skin. The maggots spend 3-4 days on the sheep, drop off, burrow into the ground and pupate. In warm weather, the adults emerge 7-9 days later. In cold weather, development is suspended until spring and in southern Australia many pupae die. When conditions become ideal a 'fly wave' can occur. This is usually after 3 breeding cycles and is 6-9 weeks after the first sign of fly activity.

This information tells us that important strategies would include controlling fleece rot (to eliminate an ideal fly environment).

☑ *Step 2. Select the appropriate control method*
There are a number of control methods, including the use of pesticides.

<u>Physical and cultural methods</u> Mulesing, tail docking, worm control, managing skin disease, crutching, time of lambing, managing footrot, pizzle treatment, destroying wool that contains maggots.	<u>Biological / environmental</u> Using fly traps.
<u>Genetic improvement</u> Genetic improvement for reduced fleece rot, dermo, reduced dags and wrinkly skin.	<u>Chemical</u> Preventative jetting and individual treatments as needed.

Sometimes it is necessary to use chemicals to treat individual sheep. To decide which chemical to use, it is important to consider: the length of protection required, the possibility of residues contaminating the wool (check the withholding period) and whether fly resistance has been reported for that chemical. Only treat the most susceptible parts of the body.

Further information

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