



Making More From Sheep

MODULE 11

Healthy and Contented Sheep



A joint initiative of Australian Wool Innovation and Meat & Livestock Australia

Procedures

Page

11.1	Keep your sheep in good condition – know when each class of sheep needs supplementary feeding to achieve production targets.	2
11.2	Plan an integrated health management program – implement preventative sheep health programs.	6
11.3	Adopt on-farm biosecurity measures – apply strategies that keep sheep diseases out.	8
11.4	Manage sporadic outbreaks of diseases – know and recognise what causes common sheep diseases.	10
11.5	Meet animal wellbeing requirements – a range of husbandry factors influence the welfare of sheep.	12

Tools

Page

11.1	Energy and protein requirements of sheep	16
11.2	Condition score targets for all sheep	17
11.3	Template for a management calendar	18
11.4	Calculating the cost of energy and protein of common feeds	19
11.5	Bodyweight targets for weaners and young ewes	19
11.6	Water quality for sheep	20
11.7	Management of trace element deficiencies	20
11.8	Management of worms	22
11.9	Management of drench resistance	24
11.10	Management of liver fluke	25
11.11	Management of flystrike	27
11.12	Prevention of clostridial diseases and cheesy gland	28
11.13	Diagnosis of important diseases	30
11.14	Analysing the risk of potential sources of disease	31
11.15	Quarantine periods for important sheep diseases	32
11.16	Control and eradication of footrot, lice and OJD	33
11.17	Common sheep diseases and their causes	34
11.18	Zoonotic diseases of sheep	35
11.19	Check list of animal welfare compliance	36

11

Healthy and Contented Sheep

What this module does for you?

This module presents an effective approach to managing the health and welfare of your flock by:

- Implementing effective health management programs
- Taking a proactive approach to sheep health and welfare
- Having healthy sheep that are exposed to fewer chemicals

→ Adopting strategies that minimise chemical use and delay development of chemical resistance by sheep parasites.

The module will give you confidence that sheep parasites and diseases can be managed in a cost-effective manner to maximise enterprise profitability.

Procedure 11.1

Keep your sheep in good condition



Background information



Achieving appropriate nutrition throughout the year is the cornerstone of efficient livestock production. Sheep maintained in adequate body condition will achieve production targets. They will also be healthier and have fewer disease problems.

The appropriate body condition of sheep will vary with the type of enterprise, class of sheep and time of year. If sheep fall below critical body condition or graze poor quality and too little pasture, this will result in:

- Poorer reproductive performance of ewes (see procedure 10.1 in *Wean More Lambs*);
- Lower growth rate of lambs and likely failure to meet market specifications
- Increased risk of ill-thrift or death in Merino weaners
- Reduced productivity for all classes of sheep
- Higher risk of disease and health management issues.

Plan to match annual nutritional requirements with feed supply and achieve pasture utilisation without excessive use of supplements. But also know how to formulate cost-effective feeding rations for all seasons.

Key decisions, critical actions and benchmarks

Nutritional requirements

An important management skill is to know when and how much to feed, or when to sell. Be able to recognise when each class of sheep needs supplementary feeding to achieve production targets in a cost-effective way.

Successful management of the feed base will ensure you are able to balance enterprise profitability and pasture utilisation, and that sheep exceed minimum acceptable body condition guidelines (see procedure 8.3 in *Turn Pasture into Product*).

It is important to assess both livestock and pastures when considering nutritional requirements:

Assessing livestock

- Know the feed requirements of different livestock classes (see tool 11.1).
- Be able to condition score (see tool 10.1 in *Wean More Lambs*) and fat score (see tool 3.3 in *Market Focused Lamb and Sheepmeat Production*) all livestock classes and know critical minimum condition scores and fat scores (see tool 11.2) of all sheep. Key times to assess stock include weaning, 2- 3 weeks prior to joining, early-pregnancy, mid-pregnancy, late-pregnancy and lamb marking.
- Draft sheep into priority feeding groups based on condition score when available feed is short or sheep are

AT A GLANCE



- Maintain sheep in appropriate body condition to achieve production targets and minimise health problems
 - Match annual nutritional requirements with available feed supply
 - Develop a farm management calendar to achieve feeding and welfare standards
- approaching critical limits. This may mean allocating priority mobs to the best available pasture or supplementary feeding.
- Make supplementary feeding decisions early and if it is not profitable to feed some sheep consider options to reduce grazing pressure. Note: it takes nearly 4 times as much energy to increase liveweight than to maintain it.
 - Monitor bodyweight of sheep to accurately fine-tune feeding decisions. Weighing is most important when seasonal conditions are unfavourable and supplementary feeding is an option.
 - Consider scanning pregnant ewes – empty, single- and twin-bearing ewes have vastly different feed requirements (see tool 10.7 in *Wean More Lambs*).

→ Be aware of the implications on flock structure and future production of selling different livestock classes.

Assessing pastures

Assess pasture availability and quality and predict sheep performance (see pasture assessment techniques in tool 7.6 in *Grow More Pasture*).

Once livestock and pasture assessments are made, make decisions about feeding management or stock sales. Appropriate levels of supplementary feeding can be provided in a cost-effective way to enable sheep to meet production targets.

Assessing nutritional requirements of livestock (see tool 11.1) is important at all stages of the calendar year. Refer to the example of a farm management calendar (see tool 11.3) designed to map out key management tactics throughout the year.

Feed budgeting

When feed budgeting, understand seasonal growth patterns of pasture. Aim to fit the pasture supply curve with livestock demand. Comprehensive information on feed budgeting is available from a range of sources (see signposts). Within the constraints of pasture growth and animal demand, feed budgeting enables you to better plan feed supply and demand (see procedure 8.3 in *Turn Pasture into Product*).

Feed quality

Knowing the feed quality of a supplement is important for formulating rations, particularly if supplements vary in quality. Consider testing feed quality through laboratory services such as FEEDTEST® (see signposts).

Energy is the essential nutrient requirement for all livestock. Stock can consume higher quantities of feeds that have higher digestibility or metabolisable energy. Purchase feeds based on the cost of energy (cents/MJ). Refer to tool 11.4 or GrazFeed® (see signposts).

Protein is important for lactating ewes and growing young stock. If available pastures are green, protein will usually be adequate; otherwise protein supplements may be required to satisfy the stock requirements. The value of protein can

be calculated based on the cost of protein (cents/unit of protein). Refer to tool 11.4 or GrazFeed®.

Roughage is required in some circumstances. Lactating ewes grazing very short pasture (less than 600 kg DM/ha) will require additional roughage in their ration to ensure lactose production in milk. All sheep in feedlots (whether for production or drought lots) require roughage in their diets.

Supplementary feeding

The basic principles for successful supplementary feeding are:

Introduction of grain

Grains such as wheat, triticale, barley or processed pellets – and, to a lesser degree, oats – that are high in soluble carbohydrates, must be introduced carefully as there is a serious risk of acidosis. Follow the guidelines for supplementary feeding by State Departments of Agriculture/Primary Industries.

Imprint feed lambs

Imprint feeding of lambs with ewes before weaning will reduce the time required to train lambs to eat grain. At least four to six feedings of grain are recommended over a 2–4 week period so that lambs recognise the feeder and remember it.

Frequency of feeding

After the introductory period, ensure supplements are fed two or three times a week. Sheep perform better with less frequent feeding and it is more labour efficient. More frequent feeding is necessary when large volumes of feed are required for late-pregnant or lactating ewes.

Preferentially feed weaners and young ewes

Malnutrition is usually a major factor in deaths of young sheep. Young Merino weaners are the most likely class of stock to require feeding, usually when pasture

feed is dry and quality is poor. Weaning weight is the major determinant of survival over summer and autumn in Mediterranean climates and winter and spring in summer rainfall regions.

The impact of poor growth in their first year will have flow-on effects for the reproductive performance of maiden ewes.

Management strategies to ensure adequate weaner growth include:

- Join ewes for 5 weeks to ensure a compressed lambing, and provide ewes with adequate nutrition (see procedure 10.1 in *Wean More Lambs*)
- Imprint feed lambs at least four times with their mothers before weaning
- Wean lambs at 14 weeks after the start of lambing
- Wean onto high quality pasture, preferably with improved perennial species and about 10cm high
- At weaning draft off the lightest lambs and allocate the best quality pasture
- If lambs are below target weights start supplementary feeding before pasture senesces and quality deteriorates below 65% digestibility
- Ensure worm control is adequate and investigate unexplained deaths
- Keep annual death rates below 5%
- Provide high quality, clean drinking water. Water quality and quantity are important. In hot weather sheep require up to 10% of their body weight in water per day. Tool 11.6 provides guidelines for water quality limits for different sheep classes and tool 5.2 in *Protect Your Farm's Natural Assets* is an AWI information sheet on calculating stock water requirements.

Trace element deficiencies

In some regions, copper, cobalt, selenium and iodine deficiencies cause disease or ill-thrift. These occur seasonally in specific areas. High-intensity production systems can exacerbate deficiencies.

Trace element supplementation is only cost effective when deficiencies are identified.

Determine the risk of deficiency and if it is likely on your property, consult your animal health adviser.

Use diagnostic tests to determine if trace element deficiencies are present.

Determine the likely impact of deficiency and beneficial options for treatment and prevention (see tool 11.7 for management options).

Signposts



Read

Lifetime Wool Regional Guidelines – a series of guidelines and recommendations for managing ewe flocks throughout the year. Visit the Lifetime Wool website: www.lifetimewool.com.au/guidelines.aspx

Managing sheep in droughtlots, A best practice guide.

Managing fodder prices for drought, A guide to help sheep producers.

Which sheep do I keep? A guide to assist producers in droughts. Order your free copies of these three publications from AWI by:

→ Calling: 1800 070 099

→ Downloading from: www.wool.com.au/Publications.htm?Cat=Drought

Trace Elements for Pastures and Animals in Victoria (1986), by Hosking, WJ, Caple IW, Halpin CG, Brown AJ, Paynter DI, Conley DN, North-Coombes PL. Victorian Government Printer, PO Box 203, North Melbourne, 3051.

Soil Analysis: An interpretation Manual (1999). Edited by K.I. Peverill, L.A. Sparrow and D.J. Reuter. Provides details of Australia-wide trace element deficiencies (CSIRO Publishing: Melbourne).

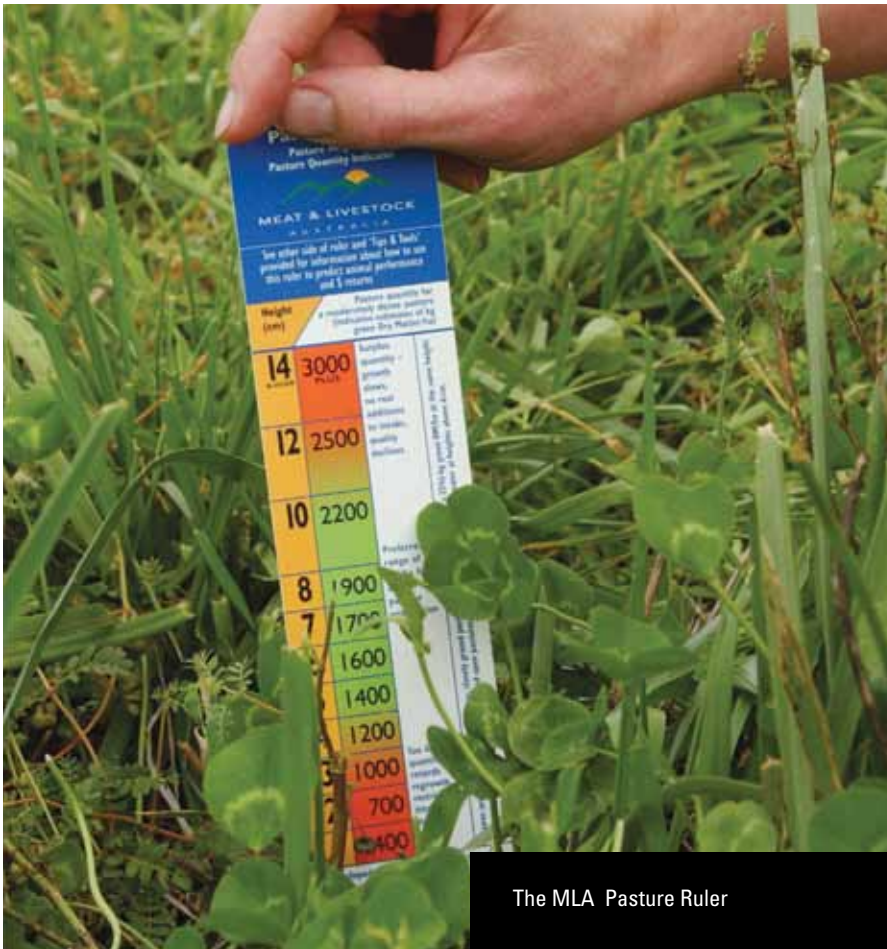
Feeding and Managing Sheep – a 72 page practical guide for farmers finishing lambs, feeding due to drought, designing a feedlot and much more. Purchase a copy from the Roseworthy Information Centre by calling: 1800 356 446

View

NSW Department of Primary Industries Feed Cost Calculator – use this internet tool to calculate the value of feed on an energy and crude protein basis, and to examine the energy, protein and cost of any combination of up to four selected feeds. Visit: www.dpi.nsw.gov.au/agriculture/livestock/nutrition/values/feed-cost-calculator.

Sheep CRC Feedlot Calculator Tool – uses production, economic and feeding scenarios to calculate if feed lotting sheep is profitable. Visit: <http://www.sheepcrc.org.au/industry-tools-and-information/software.php>





The MLA Pasture Ruler

Precision Sheep Management - keep up to date with new technologies for moving from manual, time consuming, imprecise flock management to high tech, fast flowing, accurate individual animal management, visit <http://www.sheepcrc.org.au/industry-tools-and-information/precision-sheep-management/productsandservices.php>

Sheep CRC Lamb Growth Rate Predictor Tool – calculate individual growth rates of lambs and predict finishing times. Visit: <http://www.sheepcrc.org.au> click on the Industry, tools & Information tab, select Precision Sheep Management and check PSM Software.

GrazFeed® – a decision support tool to help graziers improve the profitability of livestock production, through more efficient use of pastures and supplementary feeds. GrazFeed® can be purchased by contacting Horizon Agriculture on www.hzn.com.au/grazfeed.php

GrassGro® – a decision support tool which can help graziers increase profits, minimise risk and test new management methods before committing resources. You can purchase GrassGro® by contacting Horizon Agriculture on www.hzn.com.au/grassgro.php.

Feed testing services analyse the quality of a range of feeds, and are provided by a number of organisations including:

- Agrifood FEEDTEST call 1300 655 474
- NSW DPI Feed Quality Service call 02 6938 1957
- Independent Lab Services (WA) call 08 9242 5876

MLA Tips & Tools: Using the MLA Rainfall to Pasture Growth Outlook Tool – describes how to use the MLA Rainfall to Pasture Growth Outlook Tool, a tool designed to help you understand how your pasture typically grows across the year, and how much this can vary between years. Get your free copy from MLA by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Ordering on-line at: www.mla.com.au/publications

Grazclock – a spreadsheet-based tool that matches animal feed requirements with pasture growth throughout the year. It allows sheep (and cattle) producers to select key management times to correspond with feed demand. Contact NSW DPI via email: Douglas.alcock@dpi.nsw.gov.au

The Lambing Planner (tool 10.2) in *Wean More Lambs*. It provides a systematic basis for planning the management calendar for the breeding flock.

Attend

The MLA *EDGEnetwork®* program is coordinated nationally and has a range of courses for sheep producers. Contact can be made via:

- Phone: 1800 993 343
- Email: edgenetwork@mla.com.au
- Website: www.mla.com.au/edgenetwork

Website link not working?

Go to the Making More From Sheep website:

www.makingmorefromsheep.com.au

and follow the links to updated signposts



Procedure 11.2

Plan an integrated health management program



Background information



Know the important diseases that can occur on your farm, be able to recognise symptoms and adopt preventative strategies rather than relying on treatments to suppress disease. Integrate management and chemical treatments to optimise production; minimise residues; reduce animal health costs; and reduce the development of chemical resistance.

Drench resistance is a major problem in all areas where gastrointestinal parasites occur. Whilst it is the inevitable outcome of using worm drenches, strategies can be adopted to slow the development of resistance.

Management changes may reduce the risk of disease. In such cases, the underlying program may be changed, for example, to reduce frequency or eliminate treatment. Alternatively, changing flock structure may increase the risk of parasitic disease, and so require more intensive monitoring. If you are unsure, consult your veterinary practitioner, sheep health consultant, or State Department of Agriculture/ Primary Industries adviser to determine the likely disease status of your property. Local knowledge from other sheep producers can also help.

Key decisions, critical actions and benchmarks

Important endemic diseases

The major endemic diseases that require preventative programs include:

- Gastrointestinal parasites, including black scour worm (*Trichostrongylus* spp), brown stomach worm (*Teladorsagia circumcincta*) and barber's pole worm, *Haemonchus contortus*, (see tool 11.8 and tool 11.9)
- Liver fluke (see tool 11.10)
- Fly strike (see tool 11.11)
- Clostridial diseases and cheesy gland (see tool 11.12)
- Footrot (see tools 11.13, 11.14, 11.15 and 11.16)
- Lice (see tools 11.13, 11.14, 11.15 and 11.16)
- Ovine Johne's disease (see tools 11.13, 11.14, 11.15 and 11.16).

Implement a preventative health program

Once the risk of disease is identified, adopt cost-effective preventative programs. For worm control important actions include:

- Strategic treatment timed to reduce the number of drenches required to minimise disease impact
- Management systems to minimise the risk of disease in the highest-risk mobs:

AT A GLANCE



- Know and understand the main sheep diseases in your locality
 - Use a preventative health program that integrates chemical control and management to prevent disease
 - Sheep with good nutrition manage worm burdens better
- Grazing management to provide weaner sheep with low-worm-risk paddocks
 - Use 'smart grazing' visit the AWI website www.wool.com and go to Grow, WormBoss, worm management control without drench
 - Rotate sheep and cattle
 - Use intensive grazing management to control barber's pole worm
 - Make sure weaners and lambing ewes achieve condition score targets to minimise disease risk, and supplement if falling below critical limits for both energy and protein
 - Monitor worm egg counts (WEC) as the basis for when to drench
 - Monitor drench resistance on your property to ensure only effective drenches are used (see tool 11.9 for guidelines)

→ Select sheep for increased resistance to worms (low WEC) and lower dagginess, or purchase rams from studs that can demonstrate progress in this trait without compromising wool and meat quality (see procedure 9.2 in *Gain from Genetics*)

→ Use an integrated parasite management approach.

Trigger points for action

Trigger points are particularly relevant when seasonal conditions are ideal for the development of disease or, alternatively, when drought conditions reduce the necessity for normal strategic treatments. Develop a health monitoring plan that includes trigger points for action, such as a reduction in condition score, WEC above drench threshold, obvious signs of ill health or parasite infestation (e.g. rubbing sheep).

Signposts



View

Worm egg count: for better worm control in sheep – CD, available from Department of Agriculture and Food, WA.

WormBoss – a web-based tool to help sheep producers manage worms in sheep. Visit: www.wool.com/Grow_Wormboss.htm

Integrated parasite management – sheep – information on regional programs is available on the AWI website: www.wool.com.au/ click on Grow, Animal Health, Integrated Parasite Management.

FlyBoss a web based resource to help producers reduce and manage flystrike. Visit: www.flyboss.org.au

Assessing the economic cost of endemic disease on the profitability of Australian beef cattle and sheep producers – download this technical report from: www.mla.com.au/final-reports

Internal Parasites in Prime Lambs interactive CD. Order your copy from MLA by:

→ Calling: 1800 675 717

→ Ordering on-line at: www.mla.com.au/publications

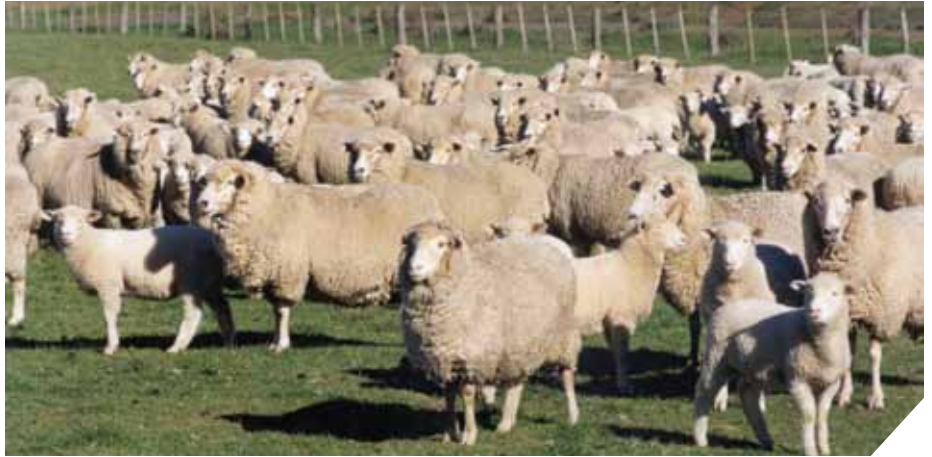
Animal Health - Go to the Department of Primary Industry's website in your state and look under Animal Health. Also go to the MLA website and type "Worm control in southern prime lamb production systems" into the search function to download this fact sheet.



Implement a preventative health program

Procedure 11.3

Adopt on-farm biosecurity measures



Background information



Strict biosecurity measures are required to maintain freedom from economically significant diseases and parasites. Assessing the risk of disease outbreaks and adopting appropriate strategies can reduce the chances of introducing diseases that affect productivity and profit. If a disease is introduced, action must be taken to control or eradicate it.

Key decisions, critical actions and benchmarks

Assess the current disease status of your flock

Some important pests and diseases to be avoided include:

- Footrot
- Lice
- Ovine Johnes Disease (OJD)
- Drench resistance (discussed in procedure 11.2).

Be able to recognise important diseases (see tool 11.13) and avoid their introduction.

Potential sources of disease

Ask for a signed National Sheep Health Statement concerning disease history, to assess the risk of disease when introducing new sheep into a flock. Visit www.farmbiosecurity.com.au/toolkit/declaration-and-statements/ to download a copy of a National Sheep Health Statement template.

Sheep producers should provide a signed National Vendor Declaration (NVD) for all sheep or lambs they offer for sale or slaughter, and insist on a correctly completed copy when buying sheep or lambs. A signed NVD declares that the owner of the sheep has met the basic on-farm food safety requirements of the Livestock Production Assurance (LPA) program (see procedure 3.2 in *Market Focused Lamb and Sheepmeat Production*).

AT A GLANCE



- Avoiding disease introduction is more cost effective than treatment
- Keep footrot, lice and OJD out of your sheep flock
- When disease is detected, take action to minimise its impact

Complete a risk assessment of your boundary fences and policy for new stock introductions, transport and people (see tool 11.14) to identify potential disease risks for your farm.

Quarantine new sheep on arrival

Purchasing stock is a normal part of management on some farms. To minimise the risk of introducing disease, observe quarantine and induction periods during which existing sheep are not exposed to new sheep (see tool 11.15).

Control and eradicate existing diseases

Control and eradicate introduced diseases such as footrot and lice (see tool 11.16).

Signposts



Read

Footrot Control and Eradication, 2nd edition. Edited by John Webb Ware (Mackinnon Project). Call Coopers Animal Health on 1800 226 511.

View

WormBoss – a web-based tool to help sheep producers manage worms in sheep. Visit: www.wool.com/Grow_WormBoss.htm

OJD information is available from Animal Health Australia: www.animalhealthaustralia.com.au

LiceBoss – a support system to help sheep producers decide on the need for a louse treatment, choose the most cost-effective control option and minimise residues. It consists of a number of modules that can be chosen separately to suit the particular situation. Visit: www.liceboss.com.au or www.wool.com.au and

click on 'LiceBoss'.

Alternatives to Diazinon – a fact sheet with information for sheep producers on options for the control of sheep lice: http://www.wool.com.au/Publications/Animal_health_and_welfare/page_2206.aspx

AWI External Parasites web page – learn about new research aimed at minimising chemical residues from the control of external parasites, whilst simultaneously driving lice and blowfly incidences down. Visit: http://www.wool.com.au/Animal_Health/Parasites/External/

Biosecurity Manual - Animal Health Australia. Visit: www.animalhealthaustralia.com.au

animalhealthaustralia.com.au

Livestock Production Assurance Quality Assurance (LPA QA) Manual

– implementing LPA QA will focus attention on the performance and welfare of the animals, ensuring improved productivity, and potentially provide entry to specific markets. Livestock producers can register for LPA QA and:

→ Purchase a hardcopy of the LPA QA manual by phoning the MLA hotline on 1800 675 717

→ Download a free copy of the LPA QA manual at: www.mla.com.au/

The Sheep and Lamb NVD/Waybill.

This is the main document upholding Australia's meat and livestock food safety reputation. The cost of a standard book of 20 LPA NVD/Waybills is \$35.00 and these can be obtained by phoning 1800 683 111



Minimise the risk of introducing new diseases to existing sheep by observing quarantine and induction periods for new sheep

Procedure 11.4

Manage sporadic outbreaks of diseases



Background information



Having a plan to manage sporadic outbreaks of diseases or health problems is critical. Sheep producers should be able to recognise problems early and take corrective action to prevent welfare issues and production losses.

Key decisions, critical actions and benchmarks

Recognise, investigate and take early action on poor sheep health or deaths

Recognise common diseases and know how to treat and manage them. See tool 11.17 for a list of some common sheep diseases. Early recognition is crucial for minimising production and economic losses from sporadic disease problems.

Record disease problems, deaths, and where sheep fail to meet production targets. Records include class of stock, area of farm affected, animal treatments, pasture assessment, stock condition score and grazing management.

Set trigger points for action to avoid delays in investigation and remedial treatment. Take action when:

- The tail in a mob increases
- You observe abnormal behaviour (staggering, standing alone, etc)
- Symptoms of disease (lameness, scouring, coughing, etc) appear
- Feedback from abattoirs indicates a disease problem (liver fluke, CLA-cheesy gland)
- Sheep fail to achieve expected production targets.

As a benchmark, investigate any mobs when there is more than one death or diseased sheep within any 2–3 day period.

AT A GLANCE



- Complete a risk assessment of diseases likely to occur in your locality
- Monitor your flock for disease and health problems
- Act quickly to prevent production losses and welfare problems from sporadic outbreaks of diseases

If an unexplained disease occurs seek professional advice from your local veterinarian or livestock health adviser. If an exotic disease is suspected contact your veterinarian, Department of Agriculture/Primary Industries, or dial the emergency animal disease hotline: 1800 675 888.

Some sheep diseases infect humans

Some common sheep diseases are transmissible to people (zoonoses). These include Q-fever, campylobacteriosis, scabby mouth, yersiniosis, salmonellosis, listeriosis, anthrax and hydatids (via dogs). Conduct a risk assessment for people likely to come in contact with sheep that may have any of these diseases. Tool 11.18 presents the common signs in people.

Toxic plants and noxious weeds

Some plants may be toxic or affect livestock performance. Even desirable pasture species, such as phalaris (phalaris poisoning and staggers), perennial rye grass (perennial rye grass staggers) and annual rye grass (annual rye grass toxicity) can be toxic or have harmful effects.

Be aware of plants that can be toxic to sheep in your area. Consult your veterinarian, agronomist or livestock adviser to help identify dangerous plants and develop a risk management plan in the face of an outbreak.

Signposts



Read

Livestock diseases in Australia (2006). A. Brightling (CSIRO Publishing: Melbourne).

Diseases of Livestock (1990). T.G. Hungerford, ninth edition. (McGraw-Hill).

Poisonous plants of Australia (1981), S.L. Everist – detailed work on native, naturalised and some garden plants known to be capable of poisoning livestock or humans. Targeted to graziers and farmers (www.angusrobertson.com.au).

Poisonous Plants: A Handbook for Farmers and Graziers (1983). E.J. McBarron (Inkata Press).

Medical and Veterinary Aspects of Plant Poisoning in New South Wales (1976). E.J. McBarron (NSW DPI).

MLA Tips & Tools: Perennial Ryegrass Toxicosis – helps you to prepare a management plan to deal with the problem. Get your free copy from MLA by:

→ Calling: 1800 675 717

→ Emailing: publications@mla.com.au

→ Downloading from: www.mla.com.au/

Annual Ryegrass Toxicity: Information on the Control and Management. Visit: <http://www.agric.wa.gov.au/> and search for Annual Ryegrass Toxicity.

Patersons curse (*Echium plantagineum*) may poison sheep, particularly Merinos



Procedure 11.5

Meet all animal welfare requirements



Background information



Animal welfare management is part of total farm management. Start by reviewing all factors that affect sheep wellbeing. Tool 11.19 provides a check list of welfare procedures to assess farm compliance.

Key decisions, critical actions and benchmarks

Meet nutrition targets for all sheep classes as measured by body condition score

Ensure stock maintain recommended condition score targets (see tool 11.2). These guidelines meet production targets.

Freedom from important diseases

Basic animal welfare standards include freedom from disease. All diseases need prompt diagnosis and treatment. As a guide, aim for mortality rates of below 4% for adults and below 5% for lambs (from lamb marking to 1 year old). Major diseases, including footrot, flystrike, gastrointestinal parasites and OJD, can be well controlled with an integrated approach to management.

Follow national/state codes of practice

Currently each state has codes of practice for on-farm husbandry procedures and transport (including curfew times, animals fit for transport, minimising stress, pre-transport preparation, segregation and stocking densities, and loading and truck facilities).

The signposts section lists the codes of practice relevant to sheep enterprises.

AT A GLANCE



- Monitor sheep condition scores to achieve production targets while ensuring physical welfare
- Apply management practices and techniques to prevent diseases
- Use appropriate and efficient stock handling methods and well-designed facilities that exploit natural sheep behaviour
- Audit all factors that could affect sheep welfare

Husbandry procedures

While routine husbandry procedures are conducted on all stock, some important aspects need to be considered:

- Plan husbandry procedures to minimise handling in order to reduce livestock stress. Where possible, combine procedures so sheep are handled less frequently.
- Public scrutiny is focused on invasive husbandry procedures that cause pain and distress to an animal. With regard to mulesing, operators are expected to be trained and registered. Alternative strategies to control flystrike are available (Visit: <http://www.flyboss.org.au>) and the breeding of flystrike resistant sheep should replace the need for mulesing in the longer term.

→ Where an invasive procedure is considered necessary, it should be carried out at the earliest age possible by a competent operator using clean equipment and in a manner that minimises pain. See the signposts section for specific information on these procedures.

→ Skilled handling of stock is very important, either by on-farm labour or accredited contractors (such as members of the Livestock Contractors Association) to provide a level of technical competence to ensure appropriate welfare standards are met.

Manage ewes to improve lamb survival

While some neonatal lamb losses are inevitable, they can be significantly reduced by good management. Considerations include differential nutritional management of single- and twin-bearing ewes (see tool 10.4 in *Wean More Lambs*); planning and preparation of lambing paddocks with a focus on pasture availability; providing shelter; paddock topography; and control of predators during lambing.

Management of sheep after shearing

Shearing is stressful for sheep so effective management is critical. Sheep are most at risk for the first 2 weeks after shearing, but losses can occur for up to 4 weeks in cold, wet and windy weather. Sheep less than 2 years old and those in poor body condition are especially at risk.

Design handling facilities (shearing sheds, yards, laneways and sheep handlers) to minimise the risk of injury to sheep and to take advantage of natural sheep behaviour

Closely observe weather forecasts during and after shearing and muster off-shears sheep into sheltered paddocks in periods of severe weather. Sheds provide the best shelter. Dense bush is next, followed by well designed plantations in sheltered paddocks.

The energy requirements of recently shorn sheep increase by 30–50% for up to 6 weeks after shearing, so provision of adequate feed is critical during this period. As well, sheep that have been heavily grain fed, such as young lambs or pregnant ewes, are at risk of metabolic problems like hypocalcaemia (when the body fails to mobilise enough calcium from the bones to maintain normal blood calcium levels). Vulnerable sheep should not be deprived of feed longer than necessary. Feed good quality hay or a calcium drench to minimise metabolic problems.

Managing sheep in drought

Implement a disaster management plan when sheep come under increased stress from naturally occurring events.

This package does not contain detailed drought feeding information. However, StockPlan® is a suite of computer decision support tools that enables sheep producers to explore options during a drought and to make informative and timely decisions before the onset of a full-blown drought. StockPlan® helps to answer questions such as:

- How much will it cost to feed my stock for a specified time?
- How will my decision affect my flock and financial position this year? And next year?
- Is it better to buy or breed in the recovery phase?

The main aim of these decision tools is to help sheep producers make management decisions that minimise the environmental and financial impacts of drought.

Sheep handling system

Keep sheep handling to the minimum level necessary to avoid unnecessary distress. Design handling facilities (shearing sheds, yards, laneways and sheep handlers) to minimise the risk of injury to sheep and to take advantage of natural sheep behaviour. Some important features include:

- Design yards to ensure a smooth flow of stock, with long, narrow forcing races (1.5 m) so sheep move in one direction
- Bugle-type designs work well as they give sheep the sense of an escape route, operators have access to sheep that baulk and sheep do not see the operator as they enter the draft
- Sheep generally move better on flat ground or on an incline
- Ramps should have a slope of less than 1:3
- Avoid shadows in yards which can cause sheep to baulk
- Front of raceways should be open so sheep do not see a dead end.



- Sheep tend to move better and remain calmer if they see other animals within touching distance
- Use materials that do not make a noise and are designed to avoid potential injury to sheep
- Maintain sheep handling facilities in good working order and complete repairs well before major husbandry practices are carried out
- Provide non-slip flooring.

Stockmanship and education

Stockmanship is a broad term that encompasses the expertise of people involved in handling stock. Sheep handling methods are very important for ease of movement, increasing productivity and reducing OH&S issues.

Understanding sheep behaviour is an important part of good stockmanship and improves a handler’s ability to move stock whilst minimising stress. Key characteristics of sheep behaviour include:

- Sheep are herd animals – they exhibit flocking behaviour and like to follow each other
- A separated sheep will always attempt to return to the mob
- Breeds are different - Merinos prefer to flock as a single group, Southdowns form a few subgroups and Dorset sheep always form subgroups
- In a flock situation there is little dominance but in competitive feeding situations hierarchies occur
- Sheep tend to graze up-wind in warm weather and down-wind in cold weather. This is important to consider when designing shelter belts, and especially for the management of freshly shorn sheep
- Avoid sudden jerking movements and loud noise. Apply optimal pressure rather than excessive pressure to exploit the sheep’s flight zone. If a sheep moves away, the handler has penetrated the flight zone. If the animal is looking at the handler, the handler is outside the flight zone

- Sheep like to see what is pressuring them. When pressured too much they will try to cut back. Attempt to move the lead animals by positioning yourself in the flight zone, rather than forcing from behind
- Use dogs carefully. Muzzle dogs that bite and tie them up when they are not working.

Selection for temperament may improve animal behaviour and stock handling.

Stockmanship is a broad term that encompasses the expertise of people involved in handling stock. Low stress sheep handling methods are very important for ease of movement, increasing productivity and reducing OH&S issues

Signposts



Read

Codes of practice

Model Code of Practice for the Welfare of Animals. The Sheep. CSIRO Publishing. Check the guidelines in this document for a range of husbandry practises including tail docking and castration: www.publish.csiro.au/pid/5389.htm

Model Code of Practice for Welfare of Animals: Animals at Saleyards. Visit: www.publish.csiro.au/nid/22/pid/367.htm

Codes of accepted farming practice for the welfare of sheep, saleyards and transport are available from all State Government offices and Departments of Primary Industries/Agriculture websites.

‘Is it fit to load? A national guide to the selection of animals fit to transport.’ Order from MLA by:

- Calling: 1800 675 717
- Emailing: publications@mla.com.au
- Ordering on-line: www.mla.com.au/ and use the search function

Land Transport Standards and Guidelines - Sheep Best Practice Husbandry Guide visit www.animalwelfarestandards.net.au



Livestock Horizons CSIRO: Livestock Industries Research Magazine – ‘Livestock Welfare’ Volume 2 No 1 February 2006. Download a copy at: <http://www.csiro.au/resources/pfb7.html>

Handling facilities

Sheep Yard and Shearing Shed Design (1994) edited by Fiona Conroy and Peter Hanrahan. Agriculture Victoria.

Electronic versions of the out-of-print books **Yards and Yakka** (sheep yard design) and **Shear Sense** (wool harvesting) are available from the Kondinin Group. Order these publications by:

→ Calling: 1800 677 761

Sheep yard design, NSW DPI. Visit: www.agric.nsw.gov.au/reader/sheep-yards

AWI information on **shearing shed and yard design**. Visit: www.wool.com.au/Harvest.htm

View

AWI is developing **alternatives to conventional mulesing** for the cost effective control of breech blowfly strike. Keep up to date with the latest developments at: www.wool.com.au/Grow-Animal-Health-Flystrike-prevention.htm

Sheep Behaviour and Shed Design

– key behavioural traits useful for managing sheep and maintaining the welfare of sheep during the wool harvesting operation are important considerations. Visit: www.wool.com.au/Harvest_Shearing-Shed-Guidelines.htm

This **animal behaviour** website describes sheep vision and other special senses; social organisation and dominance hierarchies; sexual behaviour; maternal-offspring behaviour; and abnormal behaviour. Visit: www.animalbehaviour.net/JudithKBlackshaw/Chapter3b.htm

Managing sheep in droughtlots, A best practice guide. Order your free copy from AWI by:

→ Calling: 1800 070 099

→ Downloading from: www.wool.com.au/Publications.htm?cat=Drought



Use dogs carefully. Use a muzzle if required

Attend

PROfarm is the training program developed by NSW DPI to meet the needs of farmers, primary industries, agribusiness and the community. NSW DPI PROfarm short courses are available by contacting:

→ 1800 025 520 in northern NSW

→ 1800 628 422 in southern NSW

→ www.profarm.com.au

The PROfarm courses most relevant to this procedure are:

→ **Stock Safe** – improve safe handling skills of stock on farm, reduce the risk of injury to those working with livestock, and raise awareness of animal wellbeing as an issue of public concern.

→ **Stockplan®** – a workshop to help sheep (and cattle) producers explore management options in the preliminary stages and during drought.

Low stress stock handling courses emphasise mutually beneficial outcomes for stock and handlers regardless of yard design. Visit the following websites to find out more:

→ <http://www.lss.net.au/training.htm>

→ <http://www.stressfreestockmanship.com.au/>



Tool 11.1

Energy and protein requirements of sheep

Tables showing Dry Sheep Equivalents (DSE)

Ewes

	Body weights (kg)			
	40	50	60	70
Dry sheep	0.9	1.0	1.2	
Pregnant ewes final month				
Single	1.1	1.3	1.4	
Twins	1.3	1.5	1.6	
Lactating ewes				
Single	2.1	2.5	2.9	
Twins	2.9	3.4	4.1	
Rams			1.5	1.7

The DSE is a value based on the energy requirements of a 2 year old, 50kg Merino wether.
 (Source: PROGRAZE® and Queensland Department of Primary Industries and Fisheries)

Growing Lambs

Growth (g/day)	Body weights (kg)		
	20	30	40
50	0.6	0.9	1.0
100	0.8	1.1	1.3
150	1.0	1.3	1.5



Table showing energy (ME) and protein requirements of sheep

	Dry sheep maintenance requirements			Ewe (mid pregnancy)	Ewe (early lactation)	Weaner		
	40kg	50kg	60kg	50kg	50kg	<20kg	20-25kg	>25kg
MJ ME / hd/day (confinement fed)	6.4	7.0	8.0	10.0	15.0	3 - 4	4 - 5	5 - 6
MJ ME / hd/day (grazing)	7.6	8.5	9.7	11.5	17.0	3.4 - 4.5	4.5 - 5.7	5.7 - 6.8
Protein min %	6 - 8	6 - 8	6 - 8	8 - 10	12 - 14	14 - 16	12 - 14	10 - 12

Source: Ruminant Standards of Australia and GrazFeed®

Note: Ewes carrying twins in late pregnancy and in lactation will have a 15% higher energy requirement than single bearing ewes.

Use these figures when developing feed budgets (see tool 8.4). View tables showing examples to fit the season and pasture type at www.lifetimewool.com.au/toolsmgt.aspx.



Tool 11.2

Condition score targets for all sheep classes

Class of sheep	Minimum condition score	Target condition score
Dry ewe at joining	2.5	3
Pregnancy	2.5	3
Lactation	2	2.5 to 3
End of growing season	3	3.5+
Wethers (minimum feed supply)	2- (winter)	2+
Rams at mating	3	3.5 to 4.0
Weaners (wool)	Better to weigh, but generally >2.5	
Lambs (meat)	Assess growth targets to meet market specifications	

In normal seasons, the target condition score enables sheep to meet production targets. Draft off low condition score sheep and give them good quality feed or a supplement. Minimum condition score targets ensure welfare targets are met and are also the standard in drought conditions.



Tool 11.3

Template for a management calendar

This tool is designed for mapping out your key management events throughout the year, including nutritional management, time of lambing and health treatments. You can add or change timing of events to suit your farm.

The full template can be downloaded from the Making More from Sheep website (www.makingmorefromsheep.com.au) or CD Rom.

An example is provided for south-east Australia.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1 Management calendar													
2 Spring lambing merino flock													
3 SW slopes NSW	January	February	March	April	May	June	July	August	September	October	November	December	
4													
5 Pasture zones													
6 Fodder crops	graze	graze	graze	graze					sow		silage	soil tests	graze
7 River flats							Nitrogen					soil tests	
8 Slopes			fertiliser	fertiliser			spray capeweed					soil tests	
9 Hills							spray patersons curse					soil tests	
10 Pasture renovation						spray/sow	monitor	monitor	monitor		spray top	soil tests	graze heavily
11 Fodder conservation											silage	hay	
12 monitor record	inspect pasture					inspect pasture		inspect pasture				inspect pasture	
13													
14 Nutrition													
15 monitor record CS		+	+	+	+	+	+	+					
16 Lambs												imprint feed wean 12 w/1 moni	
17 weaners	monitor feed	monitor feed	monitor feed	monitor feed	monitor feed	monitor feed							
18 Ewes CS (minimum)			>2.5			3	3			3	2.5		3.5
19 weight target lambs kg										4		22.5	
20 weight target weaners kg					25					30			>38
21													
22													
23 Breeding													
24 Ewes				mate (5 weeks)		Scan >42 days			lambing	lambing			
25 Madens										weigh draft			weigh
26 Lambs									lambing		Mark and mules		
27 rams	feed	feed	CS 4										CS feed lupin
28													
29 Sales													
30 ewes	CFA ewes							empty ewes					
31 maiden ewes	cull maidens												
32 weaners													
33 Wethers								sell?					Sell
34													
35													
36													
37													
38 Purchases											buy rams		
39													
40 Worm control													
41													
42 Strategic drenching													
43 Ewes		WEC						Monitor		WEC			drench
44 wethers		WEC					WEC						drench
45 lambs													weaning drench
46 weaners	WEC	WEC		WEC	WEC	WEC	WEC	WEC	WEC				
47 rams		WEC											drench
48 drench trial													every 2-3 years
49 Grazing management													



Tool 11.4

Calculating the cost of energy and protein for common feeds

The 'Feed cost calculator' is an internet based tool developed by NSW Department of Primary Industries that can be used to compare the value of feeds on an energy and crude protein basis.

- Select a range of common feeds and view estimated values for energy, protein and dry matter
- Change these values if you have obtained your own feed test values
- Enter a price per tonne for up to four different feeds

The program then calculates the value of the feed on an energy and crude protein basis.

The user can also examine the energy, protein and cost results of any combination of up to four selected feeds.

View and use the feedcost calculator at: <http://www.dpi.nsw.gov.au/agricultural/livestock/nutrition/values/feed-cost-calculator>



Tool 11.5

Bodyweight targets for weaners and young ewes

Adult weight (kg)	Birth	Weaning/ pasture dry	Autumn break	Late winter	Mating/ pasture dry
45	4	20	22.5	27	34–36
50	4.5	22.5	25	30	37–40
55	5	25	27	33	41–44
60	5	27	30	36	45–48
70	5.5	31.5	35.5	42	52–56
% of adult	8–9%	45%	50%	60%	75–80%



Tool 11.6

Water quality for sheep

The table listed below outlines important criteria for sheep water quality. Make calculations on the basis that sheep require up to 10% of their body weight in water in hot weather per day. Be aware of the risk of blue green algae in dam water when water levels are low in warm weather.

Refer to tool 5.2 in *Protect Your Farm's Natural Assets* for a system for calculating farm water supply, quality and reliability.

Total salinity (ppm)	Conductivity (µS/cm)	Magnesium (mg/L)	Suitability for use
<5,000	<8500	<400	Suitable for all sheep
5,000–10,000	8,500–16,500	<600	Not suitable for lambs and weaners, caution with lambing ewes
10,000–15,000	16,500–25,000	<600	Only dry mature sheep which have adjusted to water
>15,000	>25,000	>600	Not suitable for sheep

Ensure blue green algae is not present as this can be toxic to sheep.



Tool 11.7

Diagnosis and management of trace element deficiencies

Common trace element deficiencies include copper, selenium and cobalt. The table below summarises the important information for the management and prevention of trace element deficiencies.

Conditions where trace element deficiencies occur

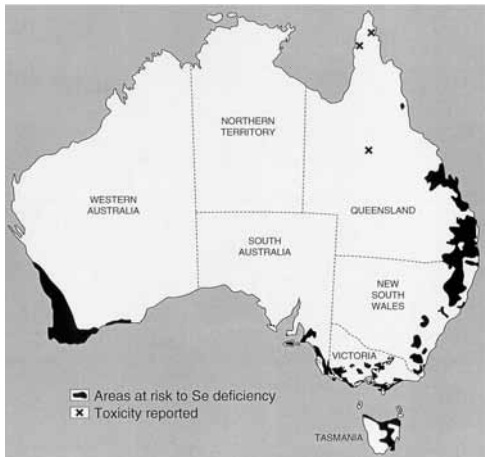
Trace element	Conditions that suit deficiency
Copper	Known deficient regions such as coastal sandy soils, granite soils, peat swamps, exacerbated by excess molybdenum or lime application. Deficiency typically occurs after an extended period of green feed with copper more available in dry feed. Growing and breeding stock most at risk.
Selenium	Known deficient regions, such as coastal sandy soils, acidic soils, sedimentary and granite soils, usually in high rainfall regions exacerbated by high superphosphate application and clover dominance. Typically deficiencies are greatest when feed is lush. Young growing stock most at risk.
Cobalt	Known deficient regions, such as coastal calcareous sands, high rainfall granite soils and krasnozem* soils, exacerbated by liming and high superphosphate application, especially in lush seasons. Young growing stock most at risk.

* Krasnozem: red, deep, well-structured acid soil with a relatively high clay content that gradually increases with depth

Maps of trace element and mineral deficiencies for southern Australia.

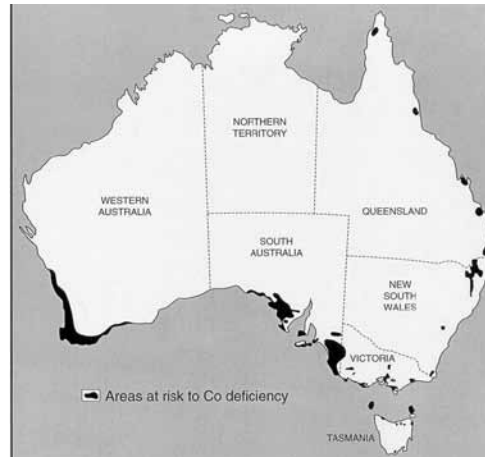
These maps highlight the main regions where trace element deficiencies occur but do not cover all the areas with trace element deficiencies.

Figure 1. Areas where livestock may be at risk of selenium deficiency or toxicity



(Source: G.J. Judson and D.J. Reuter (1999). Soil Analysis: An Interpretation Manual. Edited by K.I. Peverill, L.A. Sparrow and D.J. Reuter. Pp.325–329. (CSIRO Publishing: Melbourne.)

Figure 2. Areas where livestock may be at risk of cobalt deficiency



(Source: K.I. Peverill and G.J. and Judson (1999). Soil Analysis: An Interpretation Manual. Edited by K.I. Peverill, L.A. Sparrow and D.J. Reuter. Pp.325–329. (CSIRO Publishing: Melbourne.)

Management to prevent deficiency

Trace element	Management
Copper	<p>Copper capsules to provide longer-term (12 months) prevention.</p> <p>Top dress pasture periodically (usually 5–7 years) if copper in herbage low – generally most cost-effective.</p> <p>When applying molybdenum to pasture, add copper if copper marginal in herbage. Discuss dosage and options with your veterinarian and agronomist.</p>
Selenium	<p>Oral selenium drench (sodium selenite/sodium selenate) at 0.1 mg Se/kg body weight for immediate treatment of animals, giving 6–8 weeks protection. Many drenches now have selenium added but drenching frequency is a limitation. Will not protect for severe deficiency.</p> <p>Selenium pellets or injection for longer-term protection.</p> <p>Top dress pasture (depends on cost/benefit). Usually too expensive, except in high stocking rate situations.</p> <p>Discuss dosage and options with your veterinarian and agronomist.</p>
Cobalt	<p>Vitamin B12 injection (8–12 weeks prevention) or cobalt pellets for longer-term prevention.</p> <p>Top dress pasture (variable response).</p> <p>Discuss dosage and options with your veterinarian and agronomist.</p>



Tool 11.8

Guidelines for management of worms

Worm control programs are an important part of farm management on most sheep properties. Each state has detailed worm control programs designed to manage worms to minimise production losses and delay drench resistance.

Two broad programs encompass the winter rainfall regions where *Teladorsagia* (brown stomach worm, previously known as *Ostertagia*) and *Trichostrongylus* spp (black scour worm) are the important worm species present; and the summer rainfall regions where *Haemonchus contortus* (barber's pole) is also important. Local variations in climate and management make a significant difference to worm control. Seek advice from a veterinarian or animal health adviser to design a program specific for your property. A good program is flexible enough to accommodate climatic and seasonal fluctuations.

Winter and non-seasonal rainfall regions of southern Australia

Strategic drenching: time drenching to minimise drench frequency

Either one or two summer drenches should be given. These drenches control worms for the rest of the year. The downside of summer drenching is that it contributes to drench resistance. For this reason, give the first drench when pastures dry out, but before late December, regardless of region. In lower rainfall areas, or in dry years, monitor worm egg count (WEC) as drenching may not be required. Always monitor WECs of all mobs to see if a second drench is required in February.

On annual pastures in Western Australia, ewes should NOT be routinely drenched in summer. Do a worm egg count in March/April to determine the need to drench, as egg counts often rise in late summer. Read the WA Department of Agriculture and Food Fact Sheet 11/205: Sheep worms: summer-autumn worm control at www.agric.wa.gov.au (search for "drench") or visit www.wormboss.com.au for specific advice (see also signposts in procedures 11.2 and 11.3).

The other 'must do drench' is the weaning drench for lambs. Drench and wean lambs off Merino ewes at 14 weeks. In some circumstances meat breed lambs benefit from staying on meat breed ewes slightly longer but all lambs benefit from drenching at this time. It is normally not necessary to drench at lamb marking if ewes are lactating well and lambs are weaned at 14 weeks.

Pre-lambing drench for ewes

If ewes are in good condition and grazing recommended pasture, then pre-lambing drenching is usually not necessary, especially with spring lambing flocks. If ewes are less than condition score 2.5 at lambing and grazing short feed on heavily contaminated pasture, pre-lamb drenching on the point of lambing may be justified. WEC monitoring is useful to determine if drenching is necessary. Prime lamb ewes, where lambs remain on ewes for more than 13 weeks, may benefit from pre-lamb drenching, partly to reduce pasture contamination for lambs.

Extra drenching

Additional drenching should only be done on information provided by WEC monitoring. Ideally, adult sheep need only 1–2 drenches per year and weaners, 2–3 drenches per year. Sheep producers exceeding this frequency should seek expert advice.

Worm egg count monitoring

WEC monitoring is done to decide on non strategic drenching and summer drenching. Monitoring is also carried out before and after drenching to check on drench efficacy.



Grazing management

The aim of grazing management is to provide young sheep that are most vulnerable to worms, with the pastures with lowest contamination. Prepare weaning paddocks by grazing with cattle for at least 6 months, or with smart grazing (see WormBoss www.wool.com/Grow_WormBoss.htm). Alternatively, use wethers to prepare weaning areas for at least 6 months before lambs are weaned. Ideally, graze weaners on a second 'safe' paddock the following winter. Intensive grazing rotations will not necessarily reduce contamination with brown stomach worm or black scour worm. Search the MLA website for the fact sheet on Low-worm risk pastures for sheep.

Selecting sheep with low worm egg count (and low dag score)

Research shows that long-term selection for sheep with low WECs (formerly called faecal egg counts) can reduce pasture contamination and, possibly, drench frequency. Integrate with selection for all important wool and meat traits. Selection should also be targeted at reducing dag score as selection just for low WEC will not necessarily reduce dagginess.

Nutritional management

Research shows that sheep with good nutrition manage worm burdens better. Maintain sheep at condition score targets.

Timing of management events and systems

Spring lambing is an important driver of profitability in winter rainfall regions. Generally, late winter–spring lambing flocks have better worm control because ewes have better nutrition during lambing, although weaners have a higher risk in their first winter because they have not been exposed to many worms as a lamb. Wean lambs at 14 weeks for Merinos and slightly later for meat breeds. When considering flock structure, wethers are an important management tool to control worms, especially if no cattle are run on the property.

Summer rainfall regions where barber's pole is the major worm

The program will vary between season, drench resistance status and grazing management. Monitoring WECs is critical to determine when drenching is required. Both barber's pole and scour worms need to be considered.

Control of barber's pole worm

The program required will depend on resistance status. Unfortunately, the key drench closantel is no longer effective on more than 60% of properties so careful selection of drenches is important. The barber's pole season usually starts in October and extends to April on the tablelands. Time the first drench for late October to coincide with new infective larvae becoming available on pasture. Additional drenches may be required in late December and late February, or more often in warm wet seasons.

Closantel used to be the preferred drench but with resistance widespread, alternative drenches must be used to control barber's pole over this time. Other options include combining closantel with a broad-spectrum drench or naphthalophos 3 weeks later, or using moxidectin (if effective) as an alternative to closantel. Another option includes using an effective broad-spectrum drench and/or naphthalophos with a move to clean pasture. Always monitor to see if these drenches are required and consult your veterinary or animal health adviser to fine-tune plans appropriate for your property. Relying solely on long acting products such as capsules or long acting drenches may increase selection for drench resistance.

Additional drenches

Additional drenches that may be required for broad-spectrum control of brown stomach worm and black scour worm include pre-lamb drenching (monitor) of ewes and a weaning drench for lambs at 14 weeks after the start of lambing. Additional drenches for lambs should always be based on worm tests over the following late autumn and winter.

Faecal worm egg counts (WEC)

WEC monitoring is done to decide on non strategic drenching and summer drenching. Monitoring is also carried out pre and post drenching to check on drench efficacy.

Grazing management

The aim of grazing management is to provide young sheep that are most vulnerable to worms with the pastures with lowest contamination. Prepare weaning paddocks with cattle for 3-6 months (depending on time of year) or with smart grazing (See WormBoss at www.wool.com/Grow_WormBoss.htm). Alternatively, use wethers to prepare weaning areas for at least 6 months before lambs are weaned. Ideally, graze weaners on a second 'safe' paddock the following winter. Research indicates that barber's pole can be controlled effectively by rotational grazing where the rotation length extends to at least 50 days. This is useful in summer when barber's pole larvae survive for about 50 days. Search the MLA website for the fact sheet on Low-worm risk pastures for sheep.

Selecting sheep with low worm egg count (WEC)

Research shows that long-term selection for sheep with low worm egg counts can reduce pasture contamination and possibly drench frequency. Integrate selection pressure with selection for all important wool and meat traits. This strategy is most useful for control of barber's pole.

Nutritional management

Sheep with good nutrition manage worm burdens better. Maintain sheep at condition score targets. Research in the New England region indicates that protein supplementation on poor quality pasture can have a significant effect on worm control in lambing ewes.

Timing of management events and systems

As for winter rainfall regions.



Tool 11.9

Detection and management of drench resistance

Drench resistance is widespread in all sheep growing regions of southern Australia. Sheep producers should test the drench resistance status of their sheep every 2-3 years, depending on how many drench groups are effective. Drench resistance is generally said to occur if drenches are less than 95% effective (naphthalophos is one exception). But, in reality, resistance is starting when efficacy falls below 100%.

A simple worm test 10-14 days after drenching will give a rough indication of drench efficacy, especially if the worm count at drenching is known. To properly assess drench resistance status using a worm egg count reduction trial (WECRT), the following guidelines are recommended:

- Select undrenched lambs or weaners (young sheep give the best correlation between worm burden and faecal egg counts) with WEC greater than 250-300 epg.
- The number of groups required depends on how many drenches and combinations are being tested. An additional group that remains undrenched is used as a control group. Sheep are randomly allocated to groups and each group clearly identified with either coloured ear tags or a scourable, coloured spray mark. About 15 sheep should be allocated to each group.

Weigh the lambs and calibrate the dose of drench based on the heaviest in each group. Treat each sheep, except those in the control group, then run the sheep as one mob.



Test the drench resistance status of your sheep every 2-3 years



Collect faecal samples 10–14 days after drenching from 10 lambs per group. Collect faeces directly out of the rectum. Collect about 5 pellets (5 g) from each sheep into a separate container for each sheep. Exclude air from the top of the container. Mark the sample containers clearly. Keep the samples cool and shaded, but do not refrigerate, and send them to the lab as soon as possible (within 24 hours). Avoid sending samples on Thursday or Friday because they may not reach the lab for several days.

Drench efficacy is calculated by comparing the average WEC of each group with the control WEC. Species efficacy can be compared if larval cultures are done on each group.

Discuss results with your veterinarian or livestock adviser.

Important strategies to minimise drench resistance

- Always drench introduced sheep with 3–4 chemically unrelated actives, e.g. a macrocyclic lactone (ML), white benzimidazole and clear levamisole drench combination — check WEC 10 days after arrival to ensure 100% worm kill (see tool 11.15).
- Test drench efficacy and use effective drenches at critical times, such as summer drenching
- Rotate drench groups, including combinations, to avoid reliance on one group
- Minimise drench frequency, especially in adult sheep
- Drench only after monitoring
- Reduce usage of long-acting drenches pre-lambing
- In most regions, preferably use one summer drench
- Reduce exposure of young sheep to heavily contaminated pasture by:
 - 6-monthly swapping sheep and cattle or Smart Grazing (see www.wool.com/Grow_WormBoss.htm) or grazing young sheep on new pastures
 - Rotational grazing (>50 days rest) – appears to be very effective at controlling barber's pole, but is less effective for other worms
- Long-term selection for low WEC will help reduce drench frequency (also consider low dag in winter rainfall regions)
 - Ensure sheep maintain body condition targets and consider protein supplements for pregnant ewes in summer-rainfall regions. Good nutrition appears to improve sheep resilience and immunity to worms.
 - In regions with low worm survival over summer (such as Western Australia), research suggests leaving adult sheep undrenched, provided they are in good condition and appear healthy. This strategy is not recommended for high-rainfall regions where worm larval survival in summer is higher.



Tool 11.10

Guidelines for the management of liver fluke

Liver fluke can cause serious production losses, anaemia, bottle jaw and death. Liver fluke is present in all states but the most at-risk stock are those in south-eastern Australia where there is a suitable habitat for the host snails. This includes the tablelands, coastal margins and irrigation areas of NSW and Victoria.

Lifecycle

Liver fluke have two hosts, firstly a snail (*Lymnaea* species) which is 6 mm long and has a clockwise or right-hand spiral thread (if the snail is laid on the hand with the tip pointing away from the viewer, the opening is on the left). Snails require water to survive, e.g. in marshy or slow running streams. From the snail, young fluke encyst on pasture that is then grazed by sheep. The young fluke burrow through the gut and migrate to the liver, finally settling in the bile ducts where they feed on blood.

Young fluke typically are present on pasture from mid- to late-spring. In severe infestations, sheep can die of acute fluke by mid-December due to massive numbers of young fluke migrating through the liver. More commonly, adult fluke develop by February. Depending on the season and environment, fluke pickup will continue until early winter. In some mild regions fluke will continue to be picked up throughout the year. Fluke snails hibernate in winter when a large proportion of infected snails will die.

Many animals including wildlife, can carry fluke, so it is difficult to eradicate unless stock are excluded from all waterlogged and swampy areas.

Principles of control

Strategic drenching

The frequency of drenching will vary between regions and farms depending on the local lifecycle and climate. Typically, drench with triclabendazole in late summer to mid autumn (April/May) and if necessary in mid winter (August) to eliminate fluke picked up in autumn. In some regions an additional drench may be required in February to stop acute fluke killing sheep. On some properties strategic control is not required but can be based on monitoring. For more information, refer to the NSW DPI Primefact Liver fluke disease in cattle and sheep http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/114691/liver-fluke-disease-in-sheep-and-cattle.pdf

Monitoring

Either test faecal samples to check for fluke eggs or use a blood “liver fluke ELISA” test that can detect infestations as young as 2 weeks. These tests provide the basis for drenching. With sporadic infestations fluke monitoring should take place in late summer/early autumn and mid winter.

Do you know the fluke status of sheep on your property?

If you are uncertain of the fluke status on your property, monitor mobs of sheep grazing waterlogged or swampy paddocks. Alternatively, organise feedback from sheep sold to an abattoir to check for evidence of fluke in livers.

New sheep

If sheep come from a fluke infected area, drench them on arrival with triclabendazole or, if uncertain, do some fluke tests to decide if treatment is necessary.

Control snails

On some farms you can control fluke by fencing off swampy areas. This will stop the lifecycle if all ‘fluke prone’ areas are isolated.

Drench groups

Triclabendazole is the most effective drench that kills all larval stages. Other products do not kill young larval stages but are still effective against adults. There is evidence of resistance to flukicides, so rotation of effective drenches is desirable rather than relying on triclabendazole. Consult your veterinarian for advice on regional control programs.



Tool 11.11

Guidelines for the management of flystrike

Flystrike is the second most costly disease nationally that affects sheep after gastrointestinal parasites. The severity of the problem varies between years, depending on rainfall, but it is a problem in weaners in most years. Flystrike control and prevention are based on integrating management to reduce sheep attractiveness to flies, long-term genetic selection for less wrinkly breeches and less daggy sheep, strategic jetting in the high-risk period and using fly biology to minimise fly numbers.

All aspects of management are important to control flies to reduce production losses whilst maintaining sheep welfare. Strategic management to minimise chemical use is important to reduce the risk of chemical residues as well as reducing the risk of developing resistance.

Reduce the attractiveness of sheep to flies

Correct tail length and mulesing technique

Dock lambs at the third palpable joint of the tail and use the modified mules as indicated in guidelines from the National Mulesing Accreditation Program. All mulesing contractors and sheep producers mulesing their own sheep must undergo training for mulesing. Lambs to be sold for slaughter should not be mulesed but docked with the correct tail length. The use of pain relief is recommended - your veterinarian can prescribe appropriate products. Research shows that Border Leicester x Merino ewes used for lamb production are at much lower risk of flystrike when mulesed. Extensive research by AWI is investigating alternatives to mulesing.

Timing of crutching and shearing

Time of shearing has a major effect on the risk of flystrike. Shearing just before the major fly risk time will reduce the need for jetting to prevent flystrike and supervision for flystrike. In addition, crutching before the major fly risk period will prevent breech strike for a few months, especially if sheep are scouring and have dags. Avoid excessive crutch size as there is no reduction in risk of flystrike compared with moderate crutch size. A large crutch will reduce fleece values by at least 50 cents/head.

Control worms to prevent scouring

Scouring is a major risk factor for flystrike. Effective worm control will reduce the risk of breech strike.

Selecting sheep for reduced susceptibility to body and breech strike

Selecting sheep for low dag score is heritable and, over time, will help reduce scouring. Selecting for low WEC will reduce worm contamination on pasture and in the longer term, help control worms. Select for low breech wrinkle, since this is strongly related to breech strike and if suitable sheep are available, select for low breech cover. Selecting sheep with less fleece rot will also reduce the risk of body strike.



The Australian blowfly
(*Lucilia cuprina*)



A bare breech sheep

Strategic application of chemicals to prevent flystrike

Spray-on applications of chemical (jetting) is an important strategy to prevent body and breech strike during high risk periods. This is especially important when flock supervision is limited. Choice of product needs to be based on length of protection, labour availability, skill level, efficacy, withholding periods for wool and meat and cost. Effective jetting equipment and correct technique are important to ensure that the chemical provides long-term protection.

Other strategies to control flystrike

Strategies to control fly numbers have limited value. Lucitraps® can reduce flystrike by up to 50%. However, this does not necessarily lead to less jetting and needs to be adopted on a regional basis to be of any value. Fly traps can be useful to monitor fly numbers. Some evidence also indicates that the risk of flystrike varies between paddocks, so running high-risk sheep in low-risk paddocks should be of some value. For more information visit www.flyboss.org.au



Tool 11.12

Guidelines for the prevention of clostridial disease and cheesy gland

Use this tool to help identify the pre-disposing conditions for the development of clostridial diseases and cheesy gland. If these conditions exist, adopt management strategies to prevent the diseases. Both clostridial disease and cheesy gland are prevented by vaccination.

Disease	Conditions when likely to occur
Clostridial diseases:	
Tetanus	- penetrating wound including marking wounds
Black leg	- muscle bruising, growing animals
Black disease	- liver fluke infestation
Malignant oedema	- wounds
Pulpy kidney	- lush pasture, heavy grain feeding, change of feed
	With all clostridial disease consider the local risk based on previous local district history and property history
	Intensification is likely to increase risk of clostridial diseases such as blackleg and pulpy kidney
Cheesy gland	Infection commonly through shearing cuts, but can penetrate skin of recently shorn sheep. Dipping sheep is a high-risk strategy. Infection is widespread, does not cause serious production losses on farm but is a major cause of economic loss to the meat industry due to condemnations and carcase trimming

Disease	Clinical signs
Clostridial diseases	<ul style="list-style-type: none"> - tetanus: stiff-legged gait followed by convulsions initially stimulated by sound or touch and gradually progress in severity - black leg: severe lameness, swelling of affected leg, very depressed, fever, skin dry and cracked, often sudden death - black disease: depression and abdominal pain, sudden death - malignant oedema: contaminated wound, often associated with lambing, local swelling, fever, severe toxæmia and death - pulpy kidney: convulsions, sudden death <p>With all clostridial diseases, veterinary assistance will be required to assist in diagnosis with necropsy, bacteriology and histopathology</p>
Cheesy gland	<p>Abscesses develop in lymph nodes around the body</p> <p>Abscesses are obvious in freshly shorn sheep</p> <p>Sometimes sheep will cough if abscesses are present in the lungs</p>
Vaccine	Strategy
Clostridial vaccine	<p>For maximum protection of young lamb: Vaccinate ewe 2–6 weeks before lambing</p> <p>For protection of lambs: Vaccinate at marking and give a booster 4–8 weeks later (weaning)</p> <p>Older stock: Annual booster timed before high-risk period or more frequently in high-risk situation, such as grain feeding in drought or grazing high-quality fodder crops</p> <p>New stock Implement vaccination procedures as for normal stock. If history of vaccination known, implement flock program. If vaccination history not known, give an initial dose, then booster 4–8 weeks later</p> <p>Note that one dose does not provide full protection. In outbreaks of pulpy kidney, removing stock from pasture will often stop deaths</p>
Cheesy gland	<p>Cheesy gland vaccine is incorporated in clostridial vaccine, either as 3-in-1 or 6-in-1. Initially two doses are required to provide protection, and then an annual booster is necessary to maintain it. Sucker lambs do not need vaccinating against cheesy gland as they are sold before abscesses develop. Dipping hygiene is important and sheep should only be dipped if attempting to eradicate lice. Sheep should be carefully shorn to avoid shearing cuts and not dipped until cuts have healed.</p>

Vaccines available

Several companies sell vaccine as either 3-in-1 (pulpy kidney, tetanus, cheesy gland) or 5-in-1 (pulpy kidney, tetanus, black disease, blackleg, malignant oedema) or 6-in-1 (clostridial diseases and cheesy gland). Vaccines are also available in combination with vitamin B12 and trace elements such as selenium but these should only be used when cobalt or selenium are deficient.



Tool 11.13

Diagnosis of important diseases

Avoid introducing diseases like footrot, lice and Ovine Johne's Disease onto your property and seek professional advice on diagnosis and management.

Footrot

Three broad classifications of footrot are benign, intermediate and virulent. Benign strains that cause mild lameness have little economic or welfare significance. By comparison, highly virulent strains can cause serious lameness, welfare and production losses.

Three important factors that can affect the expression of footrot must be considered when determining what strains are present. Environment is very important; wet, warm conditions allow footrot to express. If conditions are dry, or sheep are run on poor quality pastures or rough hilly country, footrot expression may be less than on good pastures. Secondly, recent foot-bathing or footrot vaccination can reduce the expression of virulence and finally, British breed sheep tend to be more resistant to footrot than Merinos.

The following table outlines the key features of footrot.

The table summarises the clinical characteristics of different footrot strains.

Characteristics	Benign	Intermediate	Virulent
Severity of disease	Mild	Moderate	Severe
Ability to heal when dry	High	Moderate	Low
Lesions	Mainly 1–3a	Score 2–4	Score 3–4
% sheep with score 4 lesions (ideal conditions)	<1%	1–3%	>3%
% of lesions > score 3	< 10% score 3		> 20% score 3c/4
Gelatin gel diagnostic test	Mainly -ve	-/+ve	Mainly +ve

Footrot regulations vary between states with regard to diagnosis and management. Generally, intermediate and virulent strains are economically significant and worth eradicating. Always seek expert advice if unsure about the cause of lameness in your sheep or uncertain of the footrot status in sheep you are intending to purchase.

Lice

Lice are diagnosed by visual examination of sheep. Lice are small orange/brown insects, 1-2 mm long that live on the surface of the skin, often in small colonies. To inspect sheep before purchase or shearing, part the fleece in at least 20 places, particularly along the flanks. Target sheep with evidence of rubbing; the more sheep you inspect the more likely you will pick up low level infections. A new laboratory test has been developed that detects the presence of lice by testing wool grease in shearing cutters. In cases where wool rubbing is seen, but no lice can be found, the lice detection test can be used to check whether lice are present. For more information see: <http://www.dpi.nsw.gov.au/aboutus/service/das/veterinary/30-lice-detection-test>.



A sheep louse



Ovine Johne's Disease (OJD)

OJD is a chronic wasting disease of sheep and occurs in all states except Queensland. Affected sheep become emaciated usually over a period of 3 months, often scouring. Once they develop clinical signs, the disease is fatal. It usually affects sheep more than 2 years old. Death rates range from less than 1% to more than 10% in severely affected flocks. Diagnosis can be made by post-mortem examination of affected sheep. Sheep with advanced OJD show characteristic signs of thickened gut wall and swollen lymph nodes. Infection is confirmed by microscopic examination of gut sections that show presence of the OJD bacteria, using special staining techniques.

Faecal culture is the most common flock test to detect the presence of OJD bacteria.

Individual samples can be cultured or faecal samples collected from 50 sheep, combined and cultured over a period of at least 12 weeks to grow the bacteria. Further testing (polymerase chain reaction – PCR) is used to confirm the presence of OJD bacteria and determine if the strain is a sheep or cattle strain. Blood testing can be done, but it has been superseded as a test due to its poor sensitivity and cost.



Tool 11.14

Minimising the risk of potential sources of disease

This tool is designed to examine the risks of introducing important diseases that can have major economic consequences for a sheep enterprise.

General considerations to minimise disease introduction:

- 100% secure boundary fences — most diseases are prevented by secure boundary fences
- Buying sheep — the more mobs of sheep you buy, the greater the risk of disease, so buy as few mobs as possible
- Agistment off farm — always quarantine agisted sheep when they return to the home property as they can be exposed to several potential disease sources (roadways, stray or resident sheep on agistment property, trucks)
- Source of sheep — sheep from properties where regular trading occurs, with poor management or poor fences, are more likely to have disease problems
- Sheep on roadways, in trucks — may be a risk if you are uncertain of stock movements. With neighbours or stray sheep or in trucks, footrot is the major risk
- Contractors — equipment or staff may spread diseases such as lice or footrot, if hygiene procedures are not observed.

Specific disease issues:

Lice

Thoroughly inspect sheep before purchase and assess relative risk based on trading activities and management. Lice can be difficult to find on sheep for several months after an infestation starts and treatment in long wool cannot eradicate lice. The safest option is to maintain all new sheep on the property in quarantine until they have been shorn and treated after shearing. Then maintain quarantine for the required time after treatment, depending on the treatment (some chemicals do not kill all lice immediately). If shearing and treatment is not possible, maintain them in quarantine for 3 months and check closely for signs of rubbing or wool damage. Shearers need to microwave their moccasins before shearing to kill any lice that may have contaminated them from previous sheds. If you have handled lousy sheep, change clothes before handling clean sheep. Boundary fences are a critical barrier to stop the introduction of lice. Many sheep producers with good boundary fences haven't dipped sheep for years and have kept their properties lice free, even when neighbours have lousy sheep.

Footrot

As many sheep as possible should be inspected before purchase, especially lame sheep. Note that previous management, such as foot-bathing and dry seasonal conditions, may mask signs. Purchase sheep with a fully completed National Sheep Health Statement valid / footrot vendor declaration. Seek advice if you are uncertain of footrot symptoms. Place sheep in quarantine on arrival (see tool 11.15). Small numbers of sheep, such as rams, may be inspected several times before introduction to ewes, but always follow quarantine periods with larger mobs. Foot-bathing sheep off trucks is only a superficial disinfectant, and will not clear existing footrot infections. The risk of introducing footrot by contamination on boots is small, but if you or others have recently walked over ground where infected sheep have been, it does no harm to scrub boots with a disinfectant such as Hibitane® or Stericide® between properties.

Ovine Johne's Disease (OJD)

Always buy sheep:

- With fully completed National Sheep Health Statement
- From low risk areas
- With an equivalent or higher assurance based credits (ABC) score.

The more mobs of sheep you buy, the higher the risk of introducing OJD. Current evidence suggests that many flocks are infected with OJD where the owner is unaware of the infection status. The exception is trade lambs, as they are less likely to be shedding bacteria before 12 months of age. Always run older sheep (CFA mob) or cattle on high risk boundaries. Ensure boundary fences are 100% stock proof. Information is available on prevention from your private veterinarian, state government animal health officers, and MLA search the website (www.mla.com.au) for OJD

**Tool 11.15****Quarantine periods and procedures for important sheep diseases**

Quarantine may need to be adopted if sheep are agisted or travel along roads where exposure to other sheep is possible. Quarantine if stray sheep are mixed with your own sheep.

Drench resistance

Drench resistance is widespread. Always drench introduced sheep with 3-4 chemically unrelated actives, e.g. a macrocyclic lactone (ML), white benzimidazole and clear levamisole drench combination. Also consider using naphthatophos or closantel in regions with barber's pole worm. Drench check all new sheep 10 days post drenching to ensure the drench is effective.

Footrot.

The footrot bacterium *Dichelobacter nodosus* survives off sheep for up to 7 days. Keep newly introduced sheep in quarantine and ensure resident sheep do not walk across the same ground for at least 7 days. At least 3 months of lush pasture growth is necessary to allow expression of footrot. Release new sheep from quarantine only after their feet are closely inspected. Seek advice if you have no experience of footrot. Note that in drought conditions, quarantine should extend until the next lush pasture growth period. Some evidence indicates that cattle may act as carriers of footrot for short periods in wet conditions. Quarantine new cattle for at least a few weeks if you are not sure of their previous exposure to sheep.

Ovine Johnes disease (OJD)

Given the very slow nature of OJD development, no quarantine will guarantee freedom. Use other strategies, such as buying low-risk sheep.

**Liver fluke**

Drench all new sheep with triclabendazole on arrival if they come from a liver fluke area, unless you are certain of fluke status. Check fluke egg counts 8 weeks later to ensure the drench is effective as some fluke drench resistance is emerging.

Lice

Over 30% of flocks have lice, so the risk of buying lice with sheep of uncertain origin is high. It may take up to 18 months for low levels of lice to become evident. Contact NSW DPI for details of the new lice detection test (Tool 11.13). In some circumstances, lice can survive off sheep for up to 21 days (normally less), so always put new sheep through handling facilities last, including at shearing.

**Tool 11.16****Principles of control and eradication of footrot, lice and OJD****Footrot****Control**

When conditions are green and pasture is growing, controlling the expression of footrot is the best option. The objective is to limit production losses and reduce the number of sheep with footrot. Control is best achieved with either foot-bathing, vaccination, or a combination of both, depending on labour resources and the severity of the strain of footrot. Control continues while conditions are green. Benign strains may not need control except for occasional foot-bathing in wet years.

Eradication

If virulent footrot is diagnosed on your property, eradication is an important priority. The first objective is to eliminate potential sources of re-infection. It is not worth trying to eradicate benign footrot. Two broad options exist for eradication: total destocking and replacement with footrot-free sheep or inspection and culling of all sheep with abnormal feet when conditions are dry. If high numbers are infected, initial salvage of infected sheep may be warranted. After a few inspections during the non-spread period, mobs should be quarantined and, once all sheep have spent a spring with no evidence of footrot, you can be confident that footrot has been eradicated. Always seek advice on footrot diagnosis and management from an experienced animal health adviser.

Ovine Johne's disease (OJD)**Control**

If OJD has been diagnosed on your property, management options are available to limit the impact of the disease. The main option available is to use Gudair® vaccine to help control the disease in your flock. Initially, if the prevalence of clinical disease is high, identify and remove sheep showing signs of wasting to help reduce death rates. Minimise stress due to worms and poor nutrition. The other important issue is to minimise the risk of spreading OJD to other flocks. Ensuring boundary fences are 100% stockproof is important to limit the spread. In addition, run low-risk sheep in boundary paddocks. Seek advice from your veterinarian or state government veterinarian. Information is also available from AWI: www.wool.com.au, MLA: www.mla.com.au and Animal Health Australia www.animalhealthaustralia.com.au.

Lice

Control

If lice are detected in your sheep during the year, control of fleece damage by jetting may be necessary before shearing. If there is at least six months to go before the next shearing and there are signs of wool damage or lice have been found, then long wool treatment is probably necessary to avoid excessive wool damage. If there is less than 2 months to go before shearing, the long wool treatment will probably not be economic unless wool damage is already severe. Between these times the need for treatment depends on the severity of wool damage (see the LiceBoss long wool tool at www.wool.com/liceboss). Several chemicals are available for lice control. The choice depends on the time before shearing as withholding periods must be observed. Effective control will only be achieved if you follow recommended dose rates and application techniques. Remember that eradication is not possible in sheep with long wool, so long wool treatment is only to control lice and reduce further wool damage until shearing. The most effective control will be achieved by using correct jetting technique. Guidelines for managing sheep lice can be found in the Lice Sense download on the AWI website www.wool.com

Eradication

Eradication of lice will only be achieved if all sheep are treated after shearing at the same time, correct dose rates used, and either a backline or plunge dip correctly applied. If ewes are treated within 8 weeks before lambing using any backline treatment or dipped with an insect growth regulator (IGR) then the lice may not be eradicated before the lambs are born. Lambs may become infested and then reinfest the ewes. Dipping heavily pregnant ewes poses animal welfare risks, so avoid shearing within 8 weeks before lambing if lice treatment may be necessary. Seek advice about application technique and eradication from an experienced veterinarian or animal health officer.

If no lice infested sheep are introduced and boundary fences are 100% stock proof, you will not have to re-treat sheep once lice have been eradicated. This will be a major cost saving, as well as reducing residues in the wool clip.



Tool 11.17

Common sheep diseases and predisposing factors

Many diseases occur on sheep farms. Develop a list of common diseases in your region and be aware of strategies to control the impact if a disease occurs. The table outlines a few common diseases.

Disease	Common signs	Predisposing factors	Management
Perennial rye grass staggers	Staggering, recumbent	Grazing high endophyte rye grass	Remove sheep from toxic pastures and avoid stressful conditions, dilute toxic pasture with supplements, closely supervise cast sheep, replace high-risk pastures with safe pastures
Yersiniosis	Scouring in weaners	Stress in weaners in cold, wet weather	Treat with antibiotic (consult your veterinarian), avoid stressful conditions for weaners



Pink eye	Weeping cloudy eyes	Dust, summer grass seed infested pasture	Treat affected lambs with antibiotics, avoid high-risk grass seed pastures and dusty conditions
Hypocalcaemia in ewes	Ewes cast after handling, often with hind legs behind, respond to calcium injection	Late pregnant, especially older ewes, heavily grain fed	Avoid handling within 4 weeks of lambing, add limestone 1.5% to grain, feed good-quality lucerne hay if handling, treat cast sheep with calcium injection or calcium drench (10+ grams)
Vibrio abortion (Campylobacter)	Late-term abortion storms with up to 30% of ewes aborting, but usually less than this	Occasionally occurs in flocks especially with grain feeding or intensive rotational grazing	Run maiden ewes with older ewes before mating to ensure maiden ewes are exposed before pregnancy or adopt a vaccination program for maiden ewes



Tool 11.18

Zoonotic diseases of sheep

Common diseases that can cause serious health problems in humans (zoonoses)

Disease	How spread	Common signs in people
Q fever	Inhalation of aerosols and dust, handling aborted foetuses or foetal fluids	Headache, chills, fever, muscle pain, malaise, coughing, vomiting. Can be prevented by vaccination in people as long as they have no previous exposure
Campylobacteriosis	Ingestion of contaminated food or water	Severe diarrhoea, pain, fever, headache, nausea
Scabby mouth	Handling infected material from mouths/feet of sheep	Papule that heals spontaneously
Yersiniosis	Faeco-oral route	Acute watery diarrhoea, fever, headache
Salmonella	Faeco-oral route	Acute watery/blood flecked diarrhoea, fever, headache
Listeriosis	Food borne disease, especially chilled foods	Transient mild flu-like to acute meningoencephalitis with case fatality rate of 30%, foetal infection can lead to abortion
Anthrax	Respiratory, ingestion or local through break in skin	Respiratory or gastrointestinal forms have very high mortality rates as does local skin infection if left untreated
Hydatids	Dogs infected with hydatid tapeworms, humans ingest tapeworm eggs from dogs. People cannot get infected from cysts in sheep	May not be obvious for some time but signs in people depend on where cysts occur – can be fatal Prevent by not feeding dogs raw offal and treating dogs every 6 weeks with tapeworm tablets containing praziquantel

Reference: NSW DPI Primefact on zoonoses



Tool 11.19

Check list of on-farm animal welfare compliance

Procedure	Comment	✓ or X
Read and adopt code of practice for welfare of sheep	Have all guidelines been followed for your farm? Copies of all the national welfare codes can be downloaded at www.publish.csiro.au/nid/22/sid/11.htm	
Read and adopt code of practice for transport	Have all guidelines been followed for your farm including not exceeding the time sheep are off water for transport?	
Read and adopt code of practice for animals at saleyards	Have all guidelines been followed for your farm including not exceeding the time sheep are without access to water?	
Read and adopt MLA "Fit to Load" guide	Have all guidelines been followed and do you ensure sheep unsatisfactory for transport are not loaded?	
Do your sheep meet or exceed condition score minimum targets?	Meeting minimum targets is a core requirement for production and welfare of sheep.	
Do you provide adequate quality and quantity of water to your sheep?	Refer to tool 11.6 for water quality for sheep.	
Are sheep free of important diseases (or managed)?	Eradication of virulent footrot and lice, control programs for worms, flies, fluke and OJD.	
Response to health problem	Do you monitor the production of your sheep, including nutrition, deaths and other signs (such as scouring) and have trigger points to investigate disease before they cause significant problems? Mortality rate <4% for adults and <5% for weaners	
Adopt efficient husbandry procedures	Combine management events to minimise handling, follow Codes of Practice. Adopt management systems that prevent impact of diseases.	
Mulesing, tail docking and castration	Follow recommended procedures and ensure mulesing contractor is accredited.	
Management of lambing ewes	Provide adequate nutrition, separate singles and twin lambing ewes, provide good shelter. Invest in long-term plans to improve shelter if exposure is an issue.	
Management of shearing	Have you developed a plan to provide shelter for all sheep off-shears to prevent off-shears losses?	
Management of disasters, fire, flood, drought	Have you developed contingency plans for severe climatic events?	
Management of intensive feeding systems	Do you follow industry guidelines from AWI and MLA websites and Codes of Practice?	
Livestock handling systems	Do your handling systems incorporate features of animal behaviour to minimise stress?	
Stockmanship	Do you and staff continue to develop expertise in animal handling and management?	

For the most up-to-date Making More from Sheep information, including web signposts, products, publications and events, visit www.makingmorefromsheep.com.au

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