Telford
Te Whāre Wanaka Puerua
A Campus of Southern Institute of Technology

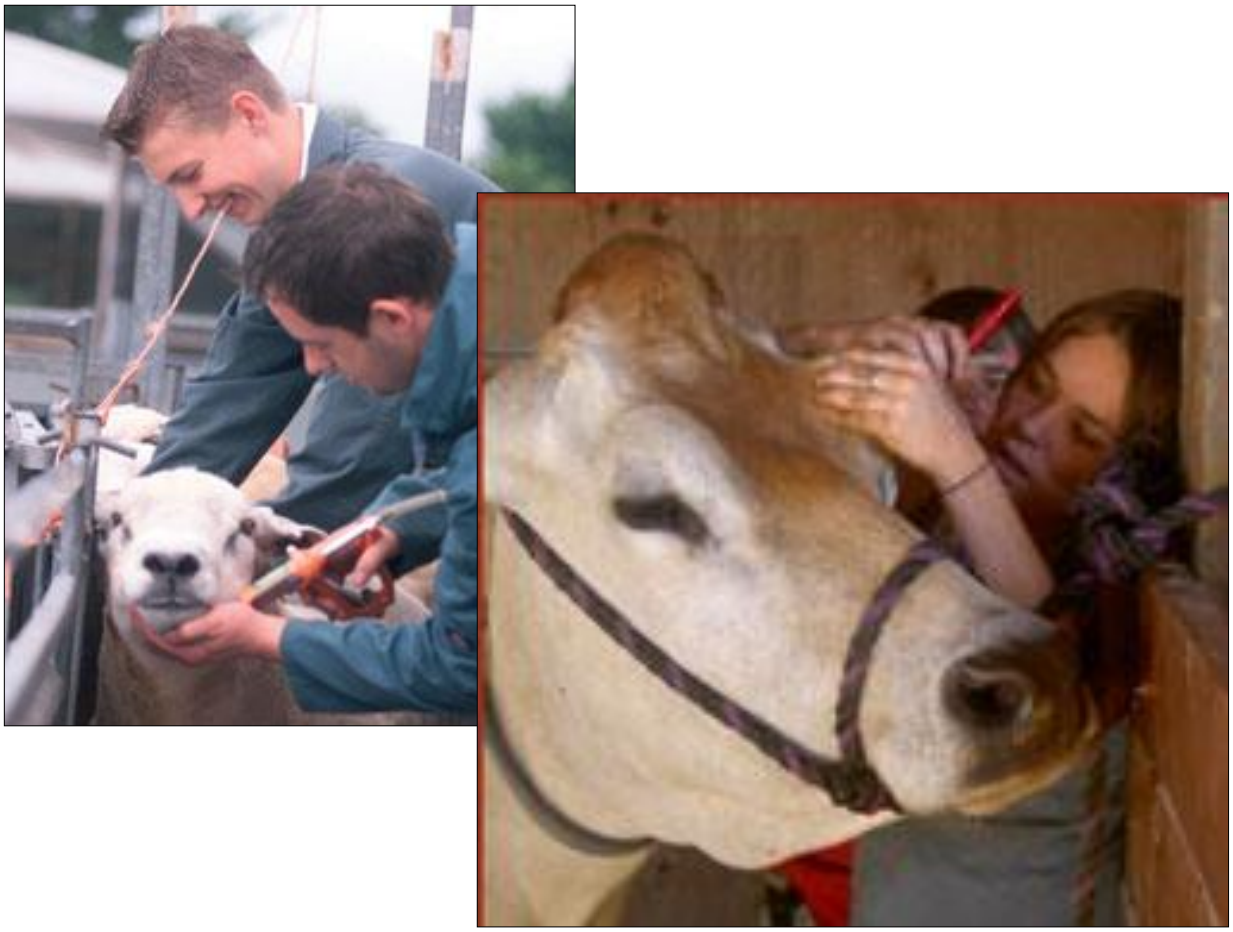
Private Box 6
Balclutha, 9240, New Zealand
Phone 0800 TELFORD
www.telford.ac.nz

Unit Standard 19103

Farming Skills

Demonstrate knowledge of methods for promoting on-farm livestock health and health problems of livestock

Version 2 Level 3 Credit 8



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Learning objectives

This learning module is about health problems of livestock and methods for promoting livestock health.

When you have finished this module you will be able to:

- Describe methods for maintaining livestock health and how they affect livestock health.
- Describe the significance of exotic diseases for livestock health, and control measures which aim to prevent their introduction to New Zealand.
- Describe the economic significance of communicable diseases, and control measures which aim to prevent their spread.
- Describe significant health problems, control measures and their economic significance for the main livestock species farmed in New Zealand.

Introduction

Livestock health, welfare and productivity go hand in hand. Animals that are properly cared for and appropriately fed will be in good body condition, they will be relatively stress-free (i.e. content) and they are likely to be relatively productive. If livestock are not in good condition, the farmer is not the only one to know about it! New Zealand's extensive farming practices are on show to the world, or at least to the neighbours and the tourists who drive by every day. Good stock handing is not just about making money (although that's part of it), it is also about safeguarding New Zealand's reputation as a producer of clean, wholesome animal produce. And it is a way of life as well as a way of making a living – good stockmen (and women) take pride in their livestock.

However, in addition to these moral and economic reasons for promoting good standards of animal health and welfare, farmers have legal obligations to look after their animals and ensure they are healthy and in good condition.

Animal Health and Welfare Legislation

Animal care, health and welfare in New Zealand is governed by law. This legislation sets out the ground rules for the way farmers are expected to manage their animals on a day-to-day basis.

Animal Welfare Act 1999

The main legislation relating to animal health and welfare is the Animal Welfare Act (1999). It sets out the fundamental responsibilities and obligations relating to care of animals and sets out down general standards of conduct towards animals. The Act states that the responsibility of care lies with the owner or person in charge of an animal. They have the responsibility to meet their animals' physical, health and behavioural needs and alleviate pain and/or suffering of animals in accordance with both good practice and current scientific knowledge. They must also ensure that an animal that is ill or injured receives treatment that will alleviate any unnecessary pain or distress or that it is killed humanely.

In other words anyone in charge of animals has a legal responsibility to make sure they are healthy and well looked after, even if they don't own the animals.

The cornerstones of the Animal Welfare Act are what are referred to internationally as the 'five freedoms'. They are in essence the 'rights' of animals in the same way that we recognise 'human rights'. The five freedoms of animal welfare are:

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury or disease
- Freedom to express normal behaviour
- Freedom from fear or distress

The Act itself doesn't lay out specific methods of providing these freedoms for animals because they will vary for different species. Instead it publishes 'Codes of Welfare' for different types of farming enterprises. These codes set out minimum standards and recommendations relating to all aspects of the care of animals. They are developed following an extensive process of public consultation, including industry representatives, and are reviewed every 10 years or sooner if necessary.

Codes of Welfare

There are 4 Codes of Welfare that are most relevant to this module. They are:

- Animal Welfare (Dairy Cattle) Code of Welfare (2010)
- Animal Welfare (Sheep & Beef Cattle) Code of Welfare (2010
- Animal Welfare (Deer) Code of Welfare (2007)
- Animal Welfare (Goats) Code of Welfare (2012)

Other examples of Codes of Welfare are those for pigs, horses, llamas and alpacas, broiler chickens, layer hens, rodeos, circuses, zoos and companion cats. There are also Codes of Welfare for Painful Husbandry practices and for Transport of Animals within New Zealand.

The Animal Welfare Act 1999 and its Codes of Welfare are administered by the Ministry of Primary Industries (MPI) under its Biosecurity section (http://www.biosecurity.govt.nz/regs/animal-welfare/stds/codes).

Codes of Welfare apply to all persons who are responsible for the welfare of animals – that includes both employers and employees. It is important that everyone involved in caring for animals becomes familiar with the relevant codes, because failure to meet a minimum standard for animal welfare could lead to legal action being taken by MPI. Legal action for failing to meet requirements of the Animal Welfare Act or its Codes of Welfare can result in hefty fines, imprisonment or even prohibition from owning or farming animals in the future.

The codes of welfare for dairy cattle, sheep, beef cattle, deer and goats are generally similar but vary in detail according to the special needs of different species (e.g. milking dairy cows, dehorning beef cattle, removing antlers in deer, shearing sheep, etc.). However each sets out the set out minimum standards and recommendations relating to all aspects of the care of animals on farms. These minimum standards must be followed. They are law.

It is strongly recommended that you read the Code of Welfare for the type of livestock you are most likely to be working with. You need not remember everything in the Code of Welfare, but the information will provide a useful background for all that comes later in this module for promoting animal health and welfare. See the activity at the end of this section.

Minimum welfare standards

Though there are slight differences in the detail between the different Codes of Welfare they all specify minimum standards for:

- Stockmanship
- Food and water
- Shelter and facilities

- Husbandry practices
- Health
- Disease
- Inspection and injury control

These are briefly summarised below. For details and the specific minimum standards for each category refer to the Welfare Code Document for the animals you will be working with.

Stockmanship

Owners and persons in charge must ensure that all staff have the relevant knowledge, training or appropriate supervision to ensure that all the health and welfare needs of animals in their care are met.

Food and water

All animals must be fed enough good quality feed every day so that they get sufficient nutrients to meet their requirements to maintain good health and welfare. To make sure they are fed adequately owners need to take into account factors such as: deer age, sex, size, body condition, physiological state, growth rate and the composition of feed. These factors will vary the food and nutrient requirements between individual animals.

Animals must also be offered sufficient drinking water every day to maintain their good health and welfare, although the way in the water is supplied can vary between farms. As with feeding, different stock classes have wide variations for water needs during the year and if they don't get the water they need their health and welfare will suffer.

Shelter

Farmers must provide shelter and shade in adverse weather conditions. The main environmental risks are hypothermia in cold, wet conditions and heat stress in hot, dry conditions. These may be affected by the availability of shade and shelter and also by feed and water availability as well.

Handling facilities

Animal handling facilities must be designed, constructed and maintained to prevent injury to animals during routine husbandry procedures.

Husbandry practices

Husbandry practices must fit the behavioural characteristics and need of animals to prevent injury and stress. This includes things like keeping aggressive animals apart, providing for mating and reproductive behaviours and needs, and being aware of animals' possible fear of handling, etc.

Health and disease

Healthy animals have a good appetite, and are active and aware. To ensure good health and animal welfare, it is necessary for owners, stock handlers and persons in charge to be familiar with animal behaviour and the signs of good health as well as ill health. They also need to be aware of the common animal diseases and the correct ways to treat illness and diseases. Early recognition of ill health will make it easy to tell when expert assistance (e.g. a vet) needs to called in to help.

Inspection and Injury control

The codes of welfare also specify that animals must be regularly inspected to check they are healthy. This is a vital part of ensuring animal health and welfare under all farming systems. This includes inspections of animals for signs of ill-health, disease or injury. It also includes inspection of facilities to ensure that they are safe for deer and deer handling. Some welfare codes require that animals are inspected daily.

Best practice management for welfare

As well as laying out minimum requirements for animal management and welfare, the Codes of Welfare also provide recommendations for best practice to achieve these standards, i.e. the best way to go about meeting these minimum standards.

As you work through the rest of this module on animal health and welfare, you should refer back to the relevant Code of Welfare for background information on minimum standards.

But first you should take the opportunity to read and become familiar with the details of the The Animal Welfare Code of Welfare for the species you are likely to be working with by completing the activity on the next page.

ACTIVITY: The Animal Welfare Act - Codes of Welfare

Copies of the Codes of Welfare for Dairy Cattle, Sheep & Beef Cattle, Deer and Goats are included with the resources for this module. Alternatively you can download them from the MPI website (http://www.biosecurity.govt.nz/regs/animal-welfare/stds/codes).

Choose the Code of welfare most appropriate to your farming operation. It is strongly recommended that you read it from beginning to end and learn about:

- Legal obligations of owners
- Minimum standards for health and welfare
- Best practice recommendations for management to ensure minimum standards are met
- The most important sections are those relating to feeding, health and disease control, though all the other sections are relevant to animal health and welfare too.
- Take note how detailed and specific the standards and recommendations are.
- Remember that these are legal obligations and minimum standards. Failure to meet minimum standards may result in prosecution and is punishable under the Animal Welfare Act (2007)
- As you work through the rest of this module on animal health and welfare, you should refer back to the relevant Code of Welfare for background information on minimum standards.

Healthy animals

By following the requirements of the Animal Welfare Codes a farmer can expect that animals in his or her care will be healthy content and productive. Providing animals with sufficient food and water to meet their requirements and an appropriate environment to ensure they are content and not stressed will go a long way to prevent animal health and welfare problems.

However, things can go wrong and sometimes these can happen without obvious signs. Therefore it is very important that stock handlers have thorough knowledge of possible animal health and welfare problems so they can plan for and take measures to prevent them happening (e.g. vaccination against diseases). Also it is important to monitor animals frequently so that any signs of problems are noticed promptly. Detecting a problem in the early stages means it can often be treated immediately, before it has developed into a bigger problem that is more difficult to deal with. Recognising likely or repeated problems lets the stock manager plan for prevention in future.

Symptoms of ill-health

Symptoms are the warning signs of ill-health and also clues to the type of illness or injury. So what sorts of warning signs can alert you to possible problems?

There are two main ways of identifying potential problems:

- Monitoring animal behaviour
- Physically examining animals

Animal behaviour and attitude

Good stock managers will have knowledge of what is normal animal behaviour in their animals. Any change from normal behaviour can mean that a health problem is brewing. Some possible behavioural indicators of ill-health include:

- Loss of appetite, nor eating or drinking
- An animal that reacts slowly, standing with its head down and taking little interest in what is going on around it
- Animal that stands apart from the rest of the mob
- An animal that is restless or unusually aggressive
- Trembling, teeth grinding and grunting can indicate the animal is in pain, also kicking its belly or looking round at its flank
- Panting or breathing loudly or irregularly
- Excessive salivation or slobbering may indicate fever or poisoning
- Limping and lameness may indicate joint or muscle problems
- Discharge from the eyes, nose, ears, anus, vulva or penis
- Straining to pass urine or faeces
- If it has a brain disease it may move abnormally or circle, possibly holding its head on an angle
- If it is blind it may blunder into obstacles

If it is deaf it may be unresponsive to sound, but herd animals are very good at compensating by using other senses to detect other members of the herd and stick with them, so it takes patient quiet observation to spot some types of abnormality

These are a few of the most obvious behavioural symptoms of ill-health. Usually the more severe the change from normal behaviour the more serious is the problem and the faster the stock manager needs to act.

Most farm animals are herd animals with a strong instinct for self-preservation and if they suspect they are being watched by a potential predator (i.e. a dog, or the stockman) they can mask the signs of weakness and behave almost normally. It is important to observe the mob quietly, preferably at frequent intervals or at the same times each day.

Note: Not all diseases show obvious signs or symptoms in their early stages, even though damage is being done to the animals. Veterinarians refer to this as sub-clinical disease. Clinical disease is where symptoms are obvious (as in the examples listed above). Sub-clinical disease is where symptoms are not obvious. An example of subclinical disease is intestinal parasitism – in the early stages damage is being done to the animals without any obvious outward signs (we will return to this later).

Physical examination

When symptoms of ill health or injury are obvious a physical examination is usually necessary to get to the root of the problem so that you can decide how to treat the animal. Normally a physical examination will be done in holding pens or yards with cattle held firmly in a head bail. Be aware of your own safety when examining animals. Sick animals and those in pain may behave unpredictably and there is a high likelihood that you could be injured. Take all steps to keep yourself safe – secure the animal and wear protective equipment.

For a full physical examination you should:

- Check the mouth, tongue, teeth, eyes, inside the ears, the lymph nodes especially in the throat area, all over the skin, the joints and bones, under the tail, the feet and check for any discharges from the ears, nose, eyes, mouth, anus, penis or vulva.
- Check for symmetry on both sides of the animal, looking out for unusual swellings that could indicate the site of injury or disease.
- Notice any unusual smells, which could for example indicate infections (e.g., of gums or feet).
- Take note of the colour of the mucous membranes inside the mouth, nose and eyelids (for anaemia), capillary refill time and hydration status (see below).
- Take the body temperature, pulse rate and respiration rate. Bear in mind that the stress of handling, pain and physical activity can push pulse rates, respiration rates and body temperatures above normal.

It may not be necessary to do a full examination – you usually know which part of the animal appears to have a problem and that is why you have caught or head-bailed it. However, a full examination might show something that is contributing to the problem or help diagnose a 'mystery' illness. In many cases it is at this stage that a veterinarian becomes involved in diagnosis and treatment.

Abnormal pulse rate, temperature and respiratory rate are often regarded as important signs in clinical disease and are known as the 'cardinal signs of disease'. Although farmers seldom measure these, they are useful indicators for veterinarians.

Body temperature

Rectal temperature can be measured using a mercury-filled thermometer or a digital thermometer.

Have someone hold the animal steady. Shake a mercury-filled thermometer down to below 35°C or set the digital thermometer to measure (according to its instructions). Lubricate the bulb with spittle or Vaseline. Standing to the side, lift the animal's tail and hold it to one side. Gently insert the thermometer bulb into the anus to suit the animal's size (about 2 cm for a small lamb, up to two thirds of thermometer length in large animals) and angle it a little so that it rests on the bowel wall. Hold the thermometer in place for 1-2 minutes, then remove it and read the temperature.

Normal rectal temperature (range):

- Cattle 38.5°C (38-39°C)
- Sheep 39°C (38-40°C)
- Goat 39°C (38-40°C)
- Deer 38-39°C

If the temperature is unexpectedly low, repeat the process for a second reading. Of course, in a hypothermic lamb or calf, you are expecting it to be low.

Temperatures higher than the normal range (hyperthermia) are often an indicator fever caused by infections or toxins and acute inflammation. Note that temperatures may be towards the high end of the normal range in young animals and in animals that have recently been running around.

Temperatures lower than the normal range temperature are evidence of hypothermia which can be caused by a cold environment, especially in small or hungry animals. The temperature also drops below normal in animals that are close to death and in animals with slow metabolism, possibly inactivity of the thyroid gland.

Pulse and Heart Rate

The heart rate is best determined using a stethoscope if you have one. Place the stethoscope on the left side of the chest just behind and above the elbow joint. You may be able to hear the heart of a large

(placid) animal by putting your ear to the chest wall in the same area. If you don't have a stethoscope you can take the animal's pulse. The pulse can be taken by:

- feeling the femoral artery (inside the hind leg about a third of the way towards the back of the leg where the muscles meet the abdominal wall),
- or the carotid artery in the neck on either side of the trachea (windpipe),
- or the facial artery where it runs over the edge of the jaw bone.

Count the number of beats in 15 seconds and multiply by 4 to give the heart rate for one minute. The femoral artery may be the easiest site in sheep and goats, the facial artery in cattle.

It is important to use only a light finger touch and it pays to practice on normal animals to learn the technique. The pulse is not easy to find, especially in an animal that may be suffering from shock.

Noting the nature of the pulse can be helpful. It should be relatively strong and steady. It may be weak and fast in animals suffering from shock and/or serious bleeding, and with some types of heart disease the pulse is jerky and strong.

Normal heart rate (beats per minute):

- Cattle 60-70
- Sheep 70-90
- Goat 70-90
- Deer 50-70

The pulse rate can be raised by fear or pain, exercise, fever, heat and anaemia. For example, it can double in normal deer brought into yards.

It may be lowered by sleep or coma, by anaesthetics and certain poisons, and it is normally at the low end of the normal range in very fit animals.

Respiration (breathing)

When recording respiration rate, the animal must be relaxed and not anxious, sniffing the air or calling out.

Watch the animal's chest and count how many times it rises in 15 seconds, then multiply by 4 to calculate the rate for 1 minute. If it is not easy to see the chest rise and fall, it may help to hold your hand or a tissue in front of the animal's nose to feel or see movement each time it breathes.

Note any abnormal breathing behaviour such as laboured breathing, gasping, abdominal effort, unusual posture or neck position (head extended), grunting, coughing, choking or sneezing. The cause could be an

obstruction, pneumonia, pain, blood or air or pus in the chest cavity outside the lungs. Animals having trouble breathing are usually very anxious and distressed.

An animal with its nose blocked will breathe through its mouth (but note that horses and camelids (e.g., alpacas) have a long soft palate at the back of their mouth and cannot breathe through their mouth).

If the chest wall is hardly moving but the abdomen is, this is 'abdominal breathing' and it occurs with painful chest conditions such as broken ribs or pleurisy (inflammation of the lining of the chest cavity).

An animal with damaged alveoli in the lungs (emphysema) may make a double 'heave' (chest then abdomen) when it exhales.

Normal respiration rate (breaths per minute):

- Cattle 10-30
- Sheep 10-20
- Goat 15-20
- Deer 12-18

The respiration rate can increase because of anxiety, pain, anger, exertion, shock, fever, heat stress, some drugs and poisons, or because of difficulty with breathing (e.g. pneumonia).

A fall in the respiration rate can occur during sleep or because of a head injury or coma, or in some poisonings.

Membranes

The mucous membranes lining the mouth, eyes and nose should be a healthy pale pink colour. Some animals have pigmented membranes in their mouths so look at the lining inside their lower eyelid.

If the membranes are unusually pale the animal may be anaemic; if they are pale blue then the blood is not fully oxygenated so there may be heart or lung problems. If they are dirty dark pink the animal may have toxaemia (toxic substances circulating in its blood). If they are yellowish there may be liver disease (jaundice).

Check the membranes of a normal animal for comparison if you have any doubt about the appearance of the mucous membranes of a sick animal. Get to know what normal looks like.

Capillary refill

The 'capillary refill' time can be a useful indicator of blood pressure. You are assessing the speed with which blood re-enters capillaries in the mucous membranes after being forced out by finger pressure.

Use your thumb or forefinger to press the mucous membrane. A useful site is the gum inside the upper lip. When you release the pressure the gum will be white but the pink colour should return within 2 seconds.

The capillary refill time is longer when blood pressure is low, e.g. after significant blood loss and/or in shock.

Hydration

Check for dehydration. When there has been blood loss, fluid loss or lack of water intake the tissues become dehydrated. Pinch or 'tent' the loose skin on the neck or shoulder between your fingers and thumb. In normal animals the skin returns to normal (flat) almost immediately, in dehydrated animals it may take some seconds to return to normal and the longer the delay the worse the dehydration.

Pain

Pain is hard to define and measure in humans, and not surprisingly it is even more difficult in animals. We should assume that anything that would cause pain in humans will also cause pain in animals. Because there is no other way of communicating with them, we have to rely on their behaviour to tell us where the pain is and how bad it is.

Some indicators are useful (e.g., heart and respiration rates increase with pain) but they also rise with stress and fear, so they are not necessarily good indicators of pain or the degree of pain.

Common behavioural signs of pain in livestock are:

- reluctance to eat or drink
- listlessness and failure to react to things happening around them
- holding head low to the ground
- drooping ears or ears laid back
- agitation and restlessness
- standing apart from its herd mates
- aggression towards stock handlers
- grunting, groaning, calling out or bellowing, especially if the injured part is moved or pressed
- kicking at the affected part or kicking out at the handler
- grinding teeth
- trembling and/or muscle rigidity, or rigid posture
- unusual immobility or reluctance to move
- increased muscle tone (tight feeling, harder) around the affected area
- paying attention to the injured part (licking, rubbing)
- limping, lameness, holding a foot up from the ground
- head pressing (e.g., against a post or building)
- increased heart rate, increased respiration rate
- flaring open tear glands in deer

Keeping Stock Healthy

As well as being a legal responsibility (under the Codes of Welfare) it makes good practical and economic sense to keep stock healthy rather than having to treat problems. Healthy animals are more productive and it is cheaper and easier to maintain good health than fix problems. Many things can be done on the farm to reduce the likelihood of injury and disease, such as:

- feeding to meet the animal's needs (e.g., maintenance, growth, pregnancy and/or lactation)
- keeping animals in suitable body condition
- maintaining a safe environment where animals are less likely to be injured or catch diseases
- vaccinating against expected health problems
- using quarantine to stop parasites or disease from spreading
- practicing good hygiene
- providing adequate shelter for cold and adequate shade for heat

Farmers also use products to manage recurring health problems that are difficult to completely eliminate (e.g., parasites) and help animals recover from injury or disease, such as:

- drenching to reduce internal parasites
- pour-on or dip to control external parasites
- drugs to treat specific conditions – e.g., antibiotics for mastitis or other infections

Management

Together these options can be considered to be the foundations of good animal management. Different options will be more or less important on any particular farm – not all farmers need to practise all of these, although some are universal. Let us look at each one in turn.

Appropriate feeding

Suitable feeding is a legal obligation – it is an offence under the Animal Welfare Act to fail to provide suitable feed and water. However, suitable feeding is also a universal principle for good farm management and high animal performance.

The amount of feed an animal needs varies considerably, as you will learn in the feeding unit standards. Major factors that affect feed requirement include:

- size (usually measured as liveweight) – the bigger the animal, the more feed it needs to maintain itself and run normal body processes
- growth – the faster an animal is growing, the more feed it needs
- fat gain – if an animal is laying down fat it needs more feed than if it was gaining muscle at the same rate
- pregnancy – pregnant animals need more feed, especially when the foetus grows rapidly in late pregnancy

- lactation – animals producing milk need more feed than 'dry' stock, especially around peak lactation; their feed requirement falls as lactation continues and milk production drops

Sometimes several of these things apply at once – e.g., a dairy cow in late lactation is still milking and is pregnant but we might also want her to put on condition (i.e., gain some fat).

For formal feed planning, we can use feed tables to work out how much dry matter (measured in kg of dry matter, kgDM) or energy (measured in megajoules of metabolisable energy, MJME) a particular animal or mob needs. Feed budgeting lets us plan how to supply this and ensure animal needs are met.

Informally, we often judge animal feeding by looking at how low the animals graze or whether they are walking fence lines and bawling. These can give feedback about how well we have allocated feed. Over a bit more time, we can see whether feeding has been correct by monitoring animal performance. For example, suppose we wanted young cattle to grow at 1.5 kg/day. We weighed them and then fed them according to the feed tables. Three weeks later we weighed them again and found they had only gained 1.1 kg/day. This might tell us that we did not actually give them as much as we thought or that the feed quality was not good enough.

As well as offering the right total amount of energy or kgDM per head per day, farmers also need to be sure that the feed is suitable quality. For example, ewes carrying triplets in late pregnancy cannot fit in enough hay or other bulky feed that supplies low energy for every kgDM eaten – they are just too full of lambs and their rumen capacity is reduced. They need feed that supplies more energy from a smaller amount of feed. Poor quality silage might be fine for maintaining steers but is not suitable for milking cows, and so on.

Animal performance (e.g., weight gain or milk output) is the best indicator of how well feeding has met requirements but it is historical – i.e., it tells us how well we fed the animals recently, not how well we are feeding them today. We need to learn from the performance we see and adjust feeding accordingly.

As well as output, animal body condition is another good indicator of feeding.

Suitable body condition

Ideal body condition for an animal also varies depending on what we want it to do. We waste feed if we have animals too fat, and fat can lead to health problems (e.g., calving problems). On the other hand, skinny animals do not produce well and may fail completely (e.g., thin cows that do not cycle and do not get pregnant). Target condition therefore varies depending on the class of animal and the time of year.

Before we set targets, we need to know how to assess condition. In the past, farmers were told to weigh stock for objective information but liveweight has several problems:

animals must have the same amount of gut fill at each weighing – if they are empty today and full when we weigh in a month's time, it could look like they have gained a lot of weight. It does not indicate fat level. Ideal weight for a particular animal depends on its frame size – i.e., weight may not be related to the size of the frame of the animal. For example, a 60 kg ewe could be thin if she is large-framed, or quite fat if she is small-framed or young.

Particularly for breeding females, condition is often more important than actual liveweight for effects on production. It is a balancing act between too fat and too thin. We also want to use feed efficiently. Some examples:

- Body condition at mating is important for beef and dairy cows – thin cows may not cycle so they do not get pregnant, or they are later to begin cycling after calving so they calve late next year (and miss out on AI, for dairy cows)
- Body condition at mating is important for ewes because ewes in good condition release more eggs at ovulation than thin ewes do – they conceive more lambs and have a higher lambing percentage
- Being too fat at lambing, calving or fawning increases the risk of dystocia (difficult birth) – more intervention is required and there may be more deaths of dams and offspring
- Being too thin at lambing, calving or fawning reduces colostrum production and total milk production – the young do not get enough antibodies for good immune protection and there is more risk of starvation/exposure, especially for multiple lambs; calves/lambs/fawns have lower weaning weights than if they were raised by ewes who were fatter at birth

'Body condition scoring' is a way of objectively assessing condition (i.e., fatness) with no special equipment. We may have to handle the animals (e.g., sheep need to be touched, not just looked at) but some species can be assessed in the paddock (e.g., cattle).

Rather than saying "thin", "fat" or "OK", we can assign a score to indicate the animal's condition. When we re-assess again in future, we can calculate the difference and judge our management.

Usually, if the animal could not be thinner (i.e., there is no fat and very little muscle) then the body condition score is 0 or 1. The top end of the scale (often 5 or 10, depending on the scale) is reserved for animals that could not be fatter. Refer to the Readings booklet for detailed information about how to assess body condition score for sheep, cattle and deer.

Water

Farmers must provide sufficient potable water (i.e. fit to drink) for all animals on a daily basis to meet their requirements. The best way is to provide unlimited access (also known as ad. lib.) via an automatic, continuous supply of clean cold water from a reticulated, treated supply to water troughs with a ballcock regulator.

On less intensive or remote farms springs, creeks, farm dams and rivers are common water supplies. Be aware that the quality of water can vary – e.g., creeks can collect a lot of sediment and faeces washed off

the paddocks by heavy rain, possibly making them unsuitable for stock for several days. Cattle are very prone to walk into waterways, especially creeks and dams, and will wallow about in them, depositing faeces and stirring up sediment. This is unhealthy for the stock in that mob, which have to drink the contaminated water, and also reduces water quality downstream. Regional Councils are increasingly enforcing rules that require animals, especially dairy cattle, to be fenced out of waterways, to preserve water quality and prevent pollution downstream.

Factors affecting water quality and acceptability to livestock include:

- Temperature – livestock prefer to drink cool water
- Taste – may be influenced by;
- naturally occurring minerals in water
- faecal and contamination which may also cause disease
- mineral supplements added to water supplies (e,g, zinc or magnesium products (discussed later in the module) which make the water taste strange and stock reluctant to drink it
- carcasses or dead animals in the water supply, which may also lead to disease.

Lack of water can result in dehydration, kidney problems, impaired digestion (rumen microbes need water to digest feed) and even severe rumen impaction (as rumen contents dry out). Ultimately lack of water can result in death.

Water supplies must be checked regularly to make sure water is always available and is of good quality. Lack of a good water supply will reduce animal production and make the animals susceptible to other health problems.

Shelter

Livestock can usually cope fairly well with either rain or wind or cold temperatures.

When two or more of these conditions occur together, livestock can quickly suffer cold stress. If they get so cold that they shiver, their requirement for feed increases hugely, and if they do not get extra feed they soon lose weight.

Cold stress makes livestock more susceptible to disease. For example outbreaks of the scouring disease yersiniosis outbreaks are most common in yearling deer in cold wet weather.

The animals that really need shelter are the old and the young, the newly-shorn and the fine-skinned, those in thin body condition and those that are not well.

Goats are particularly susceptible to cold because they have little fat under the skin and their coat is not waterproof.

Newborn animals are very vulnerable to bad weather. Rain, wind and cold temperatures together make a lethal combination. They are most susceptible to cold stress and hypothermia from birth until they get their first good feed of colostrum, which is a high energy food. Providing pregnant livestock with good shelter around the time of birth is like taking out an insurance policy. With effective shelter, the odds of the newborns surviving are improved. Relatively small newborn animals (e.g. twins, triplets) are especially vulnerable to cold conditions.

In some intensive operations, lamb covers can provide useful protection from wet windy weather. Lamb covers must fit comfortably and they should not flap or rustle to frighten the mother.

Newly-shorn sheep need good feed for at least 6 weeks after shearing, and in bad weather they need shelter. Using a cover or lifter comb, or shearing with blades can help prevent cold stress, because it leaves a short length of wool to provide some insulation.

Do not shear pregnant ewes in winter unless you use a cover comb, have good pasture (up to 50% more than before) and plenty of effective shelter from the time of shearing until after lambing.

What and when to plant for shelter

There are many and varied types of shelter plant from low dense flax to native bush, from conifers like macrocarpa and pine to deciduous poplars and willows. Fast-growing species can often be harvested for firewood. Trees like ash, poplar and tree lucerne can be harvested for stock food.

Dense low shrubs provide long-term shelter at stock level, and taller trees slow the wind further out into the paddock.

Eating fallen branches from macrocarpa trees can cause abortion in cows that browse on the foliage.

Winter is a good time to plant trees and shrubs to provide effective shelter and shade for years to come.

Ineffective shelter belts

Many so-called shelter belts are ‘dysfunctional’. They often have so many gaps at stock level that they are not effective windbreaks. They might be sited on poorly drained ground so that the lee side becomes muddy with use. There may be insufficient shelter for the stock that want to use it so that the sheltered area becomes overused, muddy and a disease risk. Short belts may be ineffective, and shelter may need to be continuous on at least two sides of the paddock. You will need to fence both sides of the trees.

Shade in summer

Another benefit of some types of trees in and around paddocks is that they can offer stock shade from the sun.

Shade can provide welcome relief when it is hot. Shade also helps prevent skin damage when there is a risk of facial eczema, and it can provide relief for sheep and cattle that already have facial eczema.

Wind shelter evergreen belts are best oriented north-south. Deciduous should be east-west for best summer shade.

Temporary shelter

Because an effective shelter belt of trees and shrubs takes years to establish, temporary shelter is useful in paddocks where there are very young animals or newly shorn animals.

Wind netting secured tightly to the fence on the windward side of the paddock can be effective. Big bales of hay or baleage can be lined up on the windward side of the fence. Arranging bales of hay in the paddock in pairs in a V-shape angled into the prevailing wind provides good shelter for lambing.

Minimising stress

Stress can be caused by physical factors (e.g., cold, heat, underfeeding) or can have an emotional basis (e.g., fear, a herd animal being kept alone). You have probably seen animals respond to stress on the farm– think about cows in a cowshed when someone makes a lot of noise or an unfamiliar person comes in; ewes in the paddock often squat for a pee as the farm dog casts out.

The response to stress is a physiological reflex (sometimes called the “fight or flight” response or “stress reflex”) - it happens without the animal having any mental control over it. It is most obvious in response to fear. When an animal is startled or threatened it usually has two options: stop and fight off the threat or run away from the threat.

In both cases the animal’s body quickly goes into readiness for fight or flight:

- Heart rate, blood pressure and breathing rate increase to provide oxygen
- Blood flow to the brain and limb muscles increase to provide oxygen and nutrients for fighting or running
- Blood flow to the guts and other organs decreases as they are not essential for fighting or running non-essential organs decreases to make sure
- Often an animal will urinate or defaecate in fright – lessening the load
- The animals become acutely alert making it lighter and faster when it runs away.

The stress response began as a self-protection mechanism to help the animal escape a predator or deal with other threats. In farming, however, chronic or repeated stress reduces animal performance and can increase the rate of disease. Stress causes hormonal and chemical changes that can predispose to infections. Stressed animals do not graze as much and they have less effective immune systems so they cannot fight off infection or other health issues as readily as unstressed stock can. They can be harder to work with and may be more dangerous (e.g., in a cowshed).

There are many possible sources of stress to animals on the farm. Here are just a few:

- lack of water
- underfeeding
- sudden change of feed, especially to an unfamiliar type
- cold, wet weather
- biting or barking dogs, especially unfamiliar ones
- sudden or loud noise – e.g., people shouting, crashing things together
- unfamiliar or uncommon situations – e.g., travel on a truck, first time into the milking shed, shearing and crutching
- being separated from young – e.g., weaning or accidental separation, dairy cow having calf taken off
- being mixed with unfamiliar stock – e.g., mobbing up two mobs of young bulls
- use of an electric prod

We cannot remove all sources of stress and sometimes we use these things deliberately – e.g., dogs or the electric prod – to get the animals to do what we want them to do. Good management removes unnecessary stress and gives the animals an environment that keeps them calm and comfortable. Some things to watch out for:

- Keep animals with familiar herd mates as much as possible.
- Never put a herd animal on its own for extended periods. They need company and will be stressed if kept alone.
- Weaned animals can be kept in adjacent paddocks (if the fencing is good enough). Cows and calves settle more quickly if they can "chat over the fence" and see each other.
- Good husbandry means providing livestock with an environment in which they experience little stress. This means they should be adequately fed, watered and sheltered, and kept relatively comfortable, and they should have the opportunity to socialise appropriately.
- Watch out for poor hygiene and poor ventilation in rearing pens for calves or lambs. Ventilation especially important because ammonia concentrations rise and dangerous bacteria and viruses can accumulate in the atmosphere unless there is a constant throughput of fresh air (but not enough to cause draughts).
- Providing an appropriate and safe environment is about common sense and respecting the needs of different types of livestock. Livestock requirements are remarkably similar to our own!

Minimising risk factors (i.e. "predisposing causes")

Many things can increase the risk of animals getting injured or sick even though they do not actually cause the problem. These are risk factors or "predisposing causes". These include any factors that make a particular health problem more likely.

For example, think about mastitis in a dairy herd. The healthy udder is exposed to dirt and bacteria in the environment but the teats seal quickly after milking and natural anti-bacterial systems help keep bacteria out. The cow's immune system responds quickly to disease threats and she stays free of mastitis. However,

many things can interfere with these natural health mechanisms. Imagine a cold, wet spring with poor pasture growth. Lots of mud keeps the bacteria count high and teats that are repeatedly wet and dry tend to crack. The cows are underfed because pasture growth is slow. Cold, miserable staff, hurrying to finish and go home, who do not wait for the slow milkers to milk right out. Is it any surprise that more cows get mastitis?

The cold, wet weather increased the risk of mastitis, but bacteria entering through the teat caused it. However, combined predisposing factors pushed the risk higher. Farm staff could not do anything about the weather but some risk factors could be managed. Supplementary feed could make up for the pasture, good milking technique and careful teat spraying (and perhaps cream to treat badly cracked teats) would all help. Some mud might be reduced or avoided, and shelter could be provided. Early detection, treatment and careful hygiene after milking a mastitis cow would also reduce risks.

Hygiene

Hygiene is about limiting animals' exposure to potentially dangerous bacteria, viruses and other pathogens in the farm environment. These occur in the air, soil and water, on pastures, on and inside both farm and wild animals, and also on the farm staff and the farm environment.

Good hygiene will help prevent diseases being picked up and spread between animals. This is achieved by preventing the build-up of pathogens in the environment and cleaning up after handling infected animals. Much of the hygiene on farms is about cleaning up faeces and urine, especially from sick animals, to reduce contamination between animals.

Some hygiene practices are important for keeping ourselves healthy as some diseases can spread from stock to humans.

Some practical examples of good hygiene on the farm:

- cleaning hands and cups after milking a cow with clinical mastitis
- keeping the cowshed and yard clean
- washing hands after handling a scouring lamb or calf, before feeding other animals
- fencing off dirty bare areas in paddocks where ewes are lambing (to reduce exposure of newborn lambs to bacteria) – but this can conflict with providing shelter!
- spraying navels of calves brought in to the rearing shed
- spraying calf sheds with disinfectant
- keeping feeding equipment clean

Vaccination

Vaccination is good insurance against disease. It works by exposing the animal to a low dose of the disease agent (bacteria or virus), causing the animal's immune system to start making antibodies against the

disease without actually catching it properly. Next time the animal encounters this disease; the immune system will recognise it and be ready to produce lots of antibodies to prevent a clinical case of the disease.

Most vaccines contain modified live or killed disease organisms (i.e., harmless forms of the bacteria or virus that causes the disease). It usually takes about 10 days after vaccination before there are enough antibodies in the bloodstream to be protective.

Properly vaccinated animals are fully or partially immune to the disease organisms included in the vaccine. Some vaccines (e.g., clostridial and leptospirosis vaccines) need a regular booster shot to keep immunity high while others (e.g., against toxoplasmosis) give life-long immunity from a single vaccination.

Vaccine is used to protect the vaccinated animal but may also add protection for the animal's offspring. For example, pregnant ewes are commonly vaccinated against clostridial diseases in sheep; vaccination is routine and probably fully justified on most farms. However, it is important not to waste money by unnecessary vaccination. Every farm should have a vaccination policy, and this should be devised in consultation with a veterinarian.

There are commercial colostrum-substitute products available (e.g., Colozen) to give to newborn animals that do not get a good colostrum intake (e.g., quadruplet lambs or motherless animals) to provide the antibodies they need. These can be especially helpful in reducing disease from common farm bacteria.

Products that contain "probiotics" have bacteria to help establish normal bacterial flora in the intestine. Different products are used for animals at different times of life – e.g., for young animals being reared or for adult stock (e.g., if changing feed types).

Typical vaccination programmes for different livestock species are outlined on the next pages.

Sheep

Clostridial vaccines

Clostridial diseases include pulpy kidney (which can cause sudden death, usually in growing lambs), tetanus, malignant oedema, blackleg and black disease, which are almost always fatal. The most common '5-in-1' vaccine addresses the five common clostridial diseases listed above but there are products with more strains (up to ten) for farms with greater clostridial problems.

Vaccines are highly effective and routine vaccination is normal in New Zealand. Pre-lamb ewe vaccination is good insurance against lamb losses, because lambs are passively protected by antibodies in their mother's colostrum for up to three months after birth.

Sheep need a sensitiser and booster, followed by an annual booster, to maintain clostridial immunity. This can be arranged by vaccinating all lambs at about 12 weeks of age (i.e., at weaning) with a booster shot 4 to

6 weeks later. Vaccinated ewe hoggets entering the breeding flock and all older ewes in the flock have a booster dose 2 to 6 weeks before lambing.

Unvaccinated ewes and hoggets entering the flock should be vaccinated twice then have the annual pre-lamb booster vaccination each year. Bought-in breeding ewes or hoggets should have the two dose programme if there is any doubt about their vaccination history.

This ensures all ewes have good levels of antibodies in their colostrum. If their lambs drink enough colostrum in the first 24 hours of life they will be protected against clostridial diseases for up to 3 months. The downside of this is that the antibodies also prevent direct vaccination of the lambs from being effective so lambs from vaccinated ewes should not have further clostridial vaccines until they are at least 10 weeks old.

Lambs born to unvaccinated ewes should be vaccinated as soon as possible – usually at docking and again 4 to 6 weeks later.

Abortion vaccines

Ewes can be protected from some of the infectious causes of sheep abortion, i.e., toxoplasmosis and Campylobacter abortion. The toxoplasmosis vaccine is given once and confers life-long immunity. Campylobacter vaccine involves two shots in the first year, followed by an annual booster. Ewes should be vaccinated before the rams go out for mating.

There are vaccines against salmonellosis caused by various Salmonella bacteria. Salmonella can cause severe diarrhoea, abortion and even ewe death (especially S. brandenburg). The two-injection vaccination course should be given well before the expected risk period and annual boosters are required to maintain immunity.

Other vaccines for sheep

Other vaccines commonly used in sheep in New Zealand:

- scabby mouth virus – given by scraping product into the skin in the inner thigh. Be careful when using this vaccine – it's a live virus that can cause sores in humans.
- footrot – mainly used in fine wool sheep that are prone to footrot problems on farms where it is not practical to footbath them regularly.
- Johne's disease (a chronic, fatal, wasting disease) on farms with a serious problem – this vaccine causes a nasty reaction and abscess at the injection site and in the carcase. Vaccinated stock must have a compulsory ear-mark to identify them for separate slaughtering at the meat works. Some processors will not accept Johne's vaccinated animals, or not during peak kill times. The vet who provides the vaccine can explain the requirements.

Other vaccines available but not widely used:

- arthritis (caused by Eryspelothrix species bacteria) in lambs
- caseous lymphadenitis (CLA or lympho), caused by Corynebacterium pseudotuberculosis (ovis)
- leptospirosis – likely to be used in dairy sheep only
- enzootic pneumonia in lambs caused by Pasteurella species bacteria.

There are also vaccines (e.g., Androvax™ and Ovastim™) that cause more eggs to be released at ovulation to increase lambing percentage by immunising the ewe against some of her own hormones. Response rates vary and these products are not widely used in New Zealand. Some farmers treat ewes that have had singles to increase their rate of multiples. Initially two doses are given before mating, followed by an annual pre-mating booster.

Cattle

Cattle can be vaccinated against common clostridial diseases such as blackleg, black disease, malignant oedema and tetanus. Reared calves from the dairy industry are usually vaccinated as calves but some beef farms vaccinate calves or older animals. As usual, vaccination requires two injections to establish immunity and annual booster shots thereafter.

Dairy cows must be vaccinated against leptospirosis as heifers before they enter the milking herd and have an annual booster thereafter. This is important for human health, as people can easily catch leptospirosis through contact with urine from an infected animal. See the section about zoonotic diseases for more about this. Vaccination also protects the cow against problems such as abortion caused by leptospirosis.

Cattle can also be vaccinated for protection against:

- bovine virus diarrhoea – a major cause of abortion and ill thrift in dairy and beef cattle
- viral pneumonia caused by parainfluenza
- infectious bovine rhinotracheitis (IBR) virus (also protects from infectious pustular vulvovaginitis)
- Salmonella infections – especially in areas that have had outbreaks or if there are cases on nearby farms. S. brandenburg can cause abortion and cow deaths.
- rotavirus – cows are vaccinated to protect the calf. Rotavirus outbreaks in calf sheds can spread quickly, with dramatic scouring and high death rates.

There is a vaccine against Johne's disease (a chronic, fatal, wasting disease) but because vaccination can interfere with tests for tuberculosis special conditions apply. Consequently use of the vaccine requires written approval from a MPI Veterinary Officer. This vaccine commonly causes a nasty reaction and abscess at the injection site and in the carcase. Vaccinated stock must have a compulsory ear-mark to identify them for separate slaughtering at the meat works. Some processors will not accept Johne's vaccinated animals, or not during peak kill times. The vet who provides the vaccine will advise on the requirements.

Deer

Deer should be vaccinated against clostridial diseases, using two shots initially and an annual booster thereafter.

Deer are very susceptible to yersiniosis (especially soon after weaning), so fawns should be given two injections of vaccine at least 10 days apart, at or before weaning, especially on properties that have had problems in the past.

Deer can also be vaccinated against leptospirosis. At present there is no Johne's vaccine available for use in deer.

Drenching

Drenching refers to the dosing of animals with chemicals to help control internal parasites. These parasites include gastrointestinal worms, flukes, ticks, flies and other parasitic species. The different types of parasites and their life cycles are discussed in more detail later in the module.

In summary, most livestock parasites spend most of their life-cycle on pastures as eggs or infective larvae. When eaten by livestock they grow and reproduce in the host animal's guts (and sometimes other tissues) causing illness and reducing animal production. The parasite eggs are shed onto pastures in the animal's faeces from where they can again infect livestock. At any one time, most of the parasite population is actually on the pastures.

The purpose of drenching is to kill and flush out the reproducing parasites from the animal's guts before they can do serious damage to the host. The problem with drenching is that it only kills parasites that are present in the animal. They have no effect on the eggs and larvae on the pastures. So drenching doesn't prevent livestock from getting reinfected. Between drenches the animal continues to pick up new parasite larvae from the pasture and production can be badly affected if there are lots of larvae present on pastures.

Therefore effective control of parasites is a balance between:

- Regular drenching to kill parasites in livestock to prevent illness and production losses
- Grazing management to prevent animals from grazing on pastures with a heavy burden of infective parasite larvae

Another problem with regular drenching is that it can encourage the parasites to become resistance to the chemicals in drenches, much like antibiotic resistance in bacteria.

Internal parasite control is a complex topic – see the section on internal parasites for more detail. In the meantime, be aware that drenching cannot prevent infection with parasites and that effective parasite control includes grazing management and other control measures (like breeding livestock that are resistant to parasitism).

Drugs

"Drugs" are chemicals that produce some sort of response in the animal. For example, they might relieve pain (drugs called "analgesics"), reduce inflammation ("anti-inflammatory" drugs) or kill disease organisms (e.g., "antibiotics"). Sheep, beef and deer farmers in New Zealand give drugs only to animals that have an injury or disease but some countries use antibiotics in animal feed to reduce disease in intensively farmed animals (e.g., United States beef feedlots).

In New Zealand drugs are treatments, not preventive measures. They should be used only when necessary, especially antibiotics. Repeated exposure of the bacteria population to antibiotic can select for those

bacteria that can survive – i.e., resistant bacteria. Over time we can render the antibiotic useless if we create an antibiotic-resistant strain of a problem disease.

Many drugs have a withholding period for milk or meat – i.e., we must wait the specified time before the animal can be milked or slaughtered for human consumption. It is illegal to violate this time! Keep careful records about animals treated so that they are not accidentally introduced to the food chain. Dairy farmers are well aware of the financial cost of sending antibiotic-contaminated milk to the factory and sheep/beef farmers have been prosecuted for sending animals for slaughter inside withholding periods, too.

Quarantine

Quarantine means keeping an animal or mob isolated from contact with other animals. This stops any disease they are carrying from being passed on or, in imported stock, might give time for a disease to show up. It is especially important for exotic diseases that New Zealand wants to keep out – see the section about these for more information. However, on the farm we might also use it if we want to stop a disease from spreading.

- Times when quarantine is useful on the farm:
- when an animal is sick and we do not know why
- when an animal is sick and we fear a contagious disease – e.g., scouring lamb or calf, aborted ewe or cow
- if a neighbour's animals arrive and we do not know what diseases or parasites they could be carrying
- if cattle or deer are dropped off without their animal status declaration (see the section about tuberculosis)!
- if we suspect an exotic disease (in which case the whole farm will be quarantined – see the section about exotic diseases)

Farms that rear lambs or calves should have "sick pens" organised for isolating scouring animals or other sickies. Leaving them in the pen with healthy animals increases the risk of spreading highly contagious diseases, especially when young animals like to suck and chew on everything.

Breeding and selection

Few livestock diseases are actually inherited from a parent but the susceptibility to disease and other animal health problems is more heritable. Sometimes this happens by the animal inheriting a physical feature that makes disease or injury more likely (e.g., saggy udders that are at higher risk of physical damage). Other disease susceptibility is related to the animal's response to a physical challenge – e.g., some sheep are able to hold their production quite well even with a high internal parasite burden while others suffer greatly from the same level of parasites. These features tend to be controlled by many genes interacting, rather than a single gene.

Breeding for better health is usually quite slow. It might seem that we make immediate progress by culling badly affected animals (e.g., dairy cows with repeated mastitis) but their daughters and other related females remain in the herd. Susceptibility to health problems generally has quite low heritability – i.e., it is more influenced by environment than by genetics – and it can also be hard to identify animals with true genetic resistance to the problem. For example, if we just cull the lame cows, we may have many more that would go lame under just a little bit more challenge.

Science has addressed this for some important animal health issues in New Zealand. Here are some animal health issues in which we can make definite genetic progress:

- facial eczema (FE) – we can test rams for their response to a facial eczema challenge and breed from those that show the least effect. This is costly because animals must be dosed with FE and have blood samples tested; susceptible animals may be quite badly affected.
- footrot – DNA-test results for particular 'marker genes' allow breeders and ram buyers to choose rams with strong footrot resistance.
- internal parasites – ram breeders have made good progress in selecting for animals that have low faecal egg outputs under a worm challenge (i.e., they have worm "resistance") or for animals that hold production levels despite internal parasites (referred to as "resilience")
- calving difficulty – bull buyers can choose bulls with low birth weight breeding values and/or bulls whose daughters are less likely to have calving trouble

Definitions

Diseases are sometimes described as "infectious", "contagious" or "communicable". What do these terms mean?

- "Infectious" means caused by or capable of being communicated by microorganisms that can multiply in body tissues.
- "Contagious" means capable of being transmitted from one animal to another.
- A "communicable" disease is one in which the agent responsible can be transmitted directly or indirectly from one animal to another. Transmission may be by direct contact with body discharges, or indirect contact via inanimate objects such as feed troughs, pasture or instruments, or via vectors such as flies.
- A vector is a carrier such as a possum or a fly that can transfer an infective agent from one host to another. For example a possum that is infected with Tb can excrete the Tb bacteria onto pasture which can be eaten by deer or cattle to cause Tb.

Test Yourself #1

1. What are two of the most common early signs of ill-health in livestock?

2. Which is the best way to detect unwell animals:
   a. walk quietly through the mob and watch their reaction, or
   b. stand back and observe the mob without disturbing them?

3. What are the 'cardinal signs'?

4. What, within one degree, is the normal rectal temperature for each of cattle, sheep and deer?

5. List some reasons why body temperature can be elevated in livestock.

6. List some causes of an abnormally low body temperature in livestock.

7. Where would you feel for a pulse in a cattle beast? In a sheep?

8. What are some causes of abdominal breathing?

9. How would you check for dehydration in a cattle beast?

10. Which of the following are signs of pain?
    a) teeth grinding
    b) closed eyes
    c) tongue protruding
    d) dilated pupils
    e) lameness
    f) standing apart from the group

11. Why is body condition scoring often a better way of assessing animal condition than body weight?

12. List four things that can increase stress on farm stock.

13. How does vaccination work?

14. Drenching kills most of the internal parasites on the farm – true or false?

15. When might we use a quarantine on the farm?

Common Diseases in Farm Stock

Diseases tend to present as 'syndromes'. A syndrome is "a combination of clinical signs resulting from a single cause or so commonly occurring together as to constitute a distinct clinical picture". What that really means is "things you commonly see that give you a good idea of the most likely problem!" The lists below indicate some of the most common syndromes that you might see on New Zealand farms in our farmed animals but you might encounter other (rare) conditions. You will find more detail about causes, treatment and prevention of common problems in later chapters.

Cattle

Diarrhoea in calves < 4 weeks old:

Note that scouring in young calves may lead to death, either due to the disease itself or, often, through dehydration. Scouring in young calves is always important – quick action can prevent a major disease outbreak and high death rate. Possible causes:

- Insufficient colostrum
- Poor quality milk, poor quality milk replacer (the younger the calf, the more susceptible it is) or sudden feed changes (e.g., too much, too cold or a change of feed type (such as from whole milk to calf milk replacer))
- Bacterial: colibacillosis (< 4 weeks)
  salmonellosis (very severe diarrhoea)
- Viral: rotavirus (usually < 10 days but can occur later especially in beef calves)
  coronavirus (1 to 4 weeks)
- Parasitic: cryptosporidiosis (> 2 weeks)

Diarrhoea in calves 4 weeks to 9 months old:

- Parasitic: cryptosporidiosis (> 2 weeks)
- Coccidiosis (> 4 weeks)
- Bacterial enteritis, e.g. salmonellosis or yersiniosis
- Internal parasites in stomach/intestine (> 6 wks)

Diarrhoea in cattle >9 months old:

- Bovine viral diarrhoea (BVD; causes mild diarrhoea or severe fatal diarrhoea at yearling stage)
- Bacterial enteritis, e.g. yersiniosis or Johne's disease (usually > 2 years old)
- Internal parasites in stomach/intestine
- Copper deficiency
- Ruminal acidosis (after over-eating food rich in carbohydrate)
- Feed change (e.g., to lush feed after eating high dry matter feed) until the gut adjusts to the new feed type

Failure to grow and/or weight loss in cattle:

- Too little feed or feed of poor quality

- Internal parasites in stomach/intestine
- Problems with the teeth
- Cobalt deficiency
- Selenium deficiency
- Copper deficiency
- Chronic disease (e.g. pneumonia or womb infection)
- Long-standing liver damage (e.g. facial eczema or ragwort poisoning, usually in older stock)

Abortions in cattle:

- Infectious diseases:
  - neosporosis
  - fungal abortion
  - leptospirosis
  - listeriosis
  - BVD (refer to section n infectious diseases below)
- Macrocarpa poisoning
- Fungal toxins on silage/balage
- Nitrate poisoning

Infertility in cows:

- Poor body condition
- Unbalanced diet (high protein, low energy)
- Management problems (e.g., poor feed, poor heat (oestrus) detection for AI, unfit bulls, etc.)
- Low selenium status
- Internal damage due to calving difficulty or retained foetal membranes
- Venereal disease
- Neosporosis
- Leptospirosis (*L. hardjo*)

Circling, wobbling, apparent brain disease:

- Grass staggers (hypomagnesaemia)
- Milk fever (hypocalcaemia)
- Ketosis (acetonaemia)
- Ryegrass staggers
- Listeriosis ('circling disease')
- Organophosphate poisoning
- Injury to head

Sheep

Abortion:

- Bacterial abortion caused by Campylobacter fetus fetus, Salmonella brandenburg, S. typhimurium, Listeria species, and other species
- Toxoplasmosis (may also cause small weak lambs)
- Hairy shaker disease (also stillbirths, small weak lambs and/or hairy fleece)
- Physical injury (e.g., in gateways)

Unthriftiness in lambs (<6 months old):

- Poor quality feed or too little feed
- Internal parasites (worms in the stomach and intestine) (from 4 wks of age)
- Chronic infection (e.g. navel ill, arthritis, pneumonia)
- Cobalt deficiency
- Selenium deficiency

Less common:

- Chronic infection (e.g. liver disease, arthritis)
- Drench gun injury to throat

Unthriftiness in sheep >6 months old:

- Poor quality feed or too little feed
- Internal parasites
- Fungal toxins in pasture
- Selenium deficiency
- Johne's disease (bacterial) (>18 months)
- Chronic disease (e.g. facial eczema liver damage, pneumonia)
- Faulty incisors or cheek teeth

Less common:

- Intestinal tumour
- Drench gun injury to throat area

Diarrhoea and/or dagginess:

- Lambs
- Rotavirus < 7 days
- Cryptosporidiosis (caused by a tiny parasite) <10 days
- Colibacillosis (bacterial) < 4 weeks
- Coccidiosis (caused by a tiny parasite) > 3 weeks

1 to 4 months old

- Internal parasites (very common) or coccidiosis

Over 4 months old

- Internal parasites (very common) or coccidiosis
- Yersiniosis (bacterial enteritis)
- Fungal toxins in pasture
- High pasture potassium

Over 12 months old

- Internal parasites (very common) or coccidiosis
- Bacterial enteritis, e.g. salmonellosis (very severe), yersiniosis, listeriosis
- Fungal toxins in pasture
- High pasture potassium

Over 18 months old

- Internal parasites (very common) or coccidiosis
- Bacterial enteritis, e.g. salmonellosis (very severe), yersiniosis, listeriosis
- Fungal toxins in pasture
- High pasture potassium
- Johne's disease

Circling, wobbling, apparent brain disease:

- Ryegrass staggers
- Metabolic disease (sleepy sickness, grass staggers, milk fever)
- Listeriosis ('circling disease')

Infertility in ewes:

- Low selenium status
- Toxoplasmosis
- Hairy shaker disease
- Pasture oestrogens (e.g., from aphid-damaged lucerne) or toxins (e.g., zearalenone)
- Poor body condition (especially hoggets)

Goats

Goats are generally susceptible to the same diseases as sheep but their degree of susceptibility differs. They are susceptible to gastrointestinal parasitism throughout their lives, unlike sheep which tend to develop resistance as they mature. Goats are less susceptible to the infectious abortion diseases. They are probably more prone to plant poisonings because of their browsing habits.

Deer

Scouring in deer calves <3 weeks old:

- Cryptosporidiosis

- Rotavirus
- E. coli
- Dietary problems

Scouring in deer 3 weeks to 12 months old:

- Yersiniosis (especially after stress like weaning and bad weather)
- Coccidiosis
- Internal parasites
- Mycobacterial infection (Johne's disease) (>8 months)
- Sudden death in deer:
- Malignant catarrhal fever
- Grain overload
- Yersiniosis
- Trauma
- Lungworm infestation
- Copper poisoning
- Water deprivation
- Pneumonic pasteurellosis
- Clostridial infection
- Stress-induced intestine or abomasal (stomach) ulcers

Ill-thrift in adult deer:

- Malnutrition or undernutrition
- Internal parasites
- Selenium deficiency
- Copper deficiency (especially 6 months - 1 year old)
- Johne's disease
- Chronic malignant catarrhal fever (MCF)
- Tuberculosis
- Tooth faults

Multiple sudden deaths in any ruminant species

- Acute bacterial disease (e.g. salmonellosis, clostridial disease, pneumonia)
- Poisoning – e.g. superphosphate (after topdressing), nitrate/nitrate (especially on winter crops), 1080 (after pest control operations), plants like tutu, yew or rhododendron, salt poisoning/water deprivation
- Metabolic disease (milk fever, grass staggers, ketosis)
- Ruminal acidosis (after gorging on carbohydrate-rich food like grain)
- Selenium or copper poisoning (after accidental overdosing with supplements)

If the farm has an outbreak of sudden deaths (more than one animal) then contact a veterinarian. The vet will want to rule out significant diseases that are not expected in this country.

Test Yourself #2

1. What is a "syndrome"?

2. List four possible causes of infectious abortion in cattle.

3. Six out of 20 yearling steers are losing weight in spite of good pasture. Name three possible causes.

4. What are some common causes of scours in calves less than 2 weeks old?

5. On a sunny day in March several adult stags are found dead. Name four possible causes.

6. At scanning in June a high proportion of ewes are found to be not pregnant. What are some possible reasons?

Parasites of livestock

Parasites that infest livestock include internal parasites, such as worms, flukes and protozoa, and external parasites, such as flies, ticks, lice and mites.

Of all the diseases that occur in New Zealand livestock parasitic diseases have the largest impact on animal health and welfare and have the largest financial impact on farm productivity.

Parasites can have a severe negative impact on the health and welfare of animals:

- Some parasites cause blood loss which, if substantial, can lead to anaemia and death.
- Other parasites cause diarrhoea which, if severe, can lead to death.
- Infestation with parasites can reduce the appetite of animals, resulting in weak animals that are more susceptible to other diseases.
- Parasites can also act as vectors, transferring diseases from one animal to another.
- External parasites like flies cause open sores on the skin of livestock.
- Flies can also annoy animals, causing them to reduce grazing behaviour or, in severe fly waves, become very agitated (fly worry).

These harmful effects can have a negative effect on the productivity of livestock by:

- reducing growth rates
- reducing reproductive rates
- reducing milk production
- reducing fleece weight, fibre diameter and staple strength
- damaging hides and fleeces
- causing condemnation of carcase parts or even whole carcases at slaughter.

Parasites of livestock can also be zoonoses, meaning humans can also become infected e.g. hydatid tapeworm found in sheep and dogs.

Internal parasites: worms, flukes and protozoa

There are three main types if internal parasites in livestock:

- Worms (e.g. roundworms and tapeworms)
- Flukes (e.g. liver fluke)
- Protozoa (e.g. coccidiosis and cryptosporidium)

In biology roundworms, tapeworms and flukes are collectively known as helminth parasites. The name is not important for this module other than it gives its name to the family antiparasitic drugs (drenches) which are referred to as anthelminthics (anti-helminth). This is a term commonly used by veterinarians and drench manufacturers.

Most internal parasites cause problems in an animal's stomach and intestines, also known as the gastro-intestinal tract or simply the gut. Therefore these parasites are also referred to as gastro-intestinal parasites though one type lives in the lungs and airways.

Roundworms

Roundworms are probably the most important threat to the health and welfare of grazing animals in New Zealand. Preventing infection and treating 'worms' is an enormous economic burden on farmers in terms of the time an planning involved and the cost of expensive anti parasitic drugs.

In biology roundworms belong to a family of worms called nematodes. Nematodes are very common in soil and most are not parasites.

Most parasitic nematodes are microscopic and you would not be able to see them in the stomach or intestines of a slaughtered animal. However some are big enough to appear like small hairs and one species (the pig roundworm – which can infect humans) can be up to 20cm long and as thick as a knitting needle.

Basic roundworm parasite life cycle

For most roundworm parasites the mature adult worms live, feed and reproduce in the animal's gastro-intestinal tract. They mate and produce eggs which are passed out in the animal's faeces onto the pasture. In the dung pat the eggs develop and larvae hatch out living and feeding on bacteria. As they grow they go through 3 larval stages, moulting (shedding their skins) as they grow. These three larval stages are known to biologists as L1, L2 and L3 larval stages. When L2 turns into L3 it retains the L2 skin (like an overcoat) as a protection against drying out.

At this stage the larvae can infect a grazing animal. This is known as the infective L3 stage. The Infective L3 larvae climb up grass blades in the surface water film on dewy mornings and wait to be eaten by a grazing animal. When eaten the L3 larvae shed their protective skins and moult by twice more (L4 and L5) before becoming breeding adults. The lifecycle is now complete.

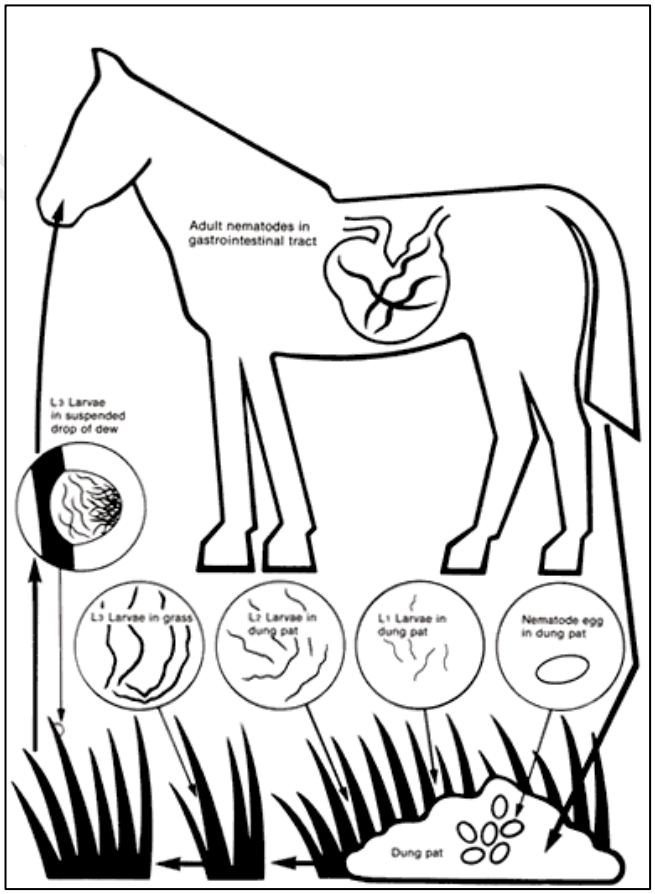

Figure 1 Basic Roundworm parasite life cycle

http://www.merial.co.nz/Horse/diseaseinformation/Pages/en_life.aspx

Some things to note:

- Eggs and immature larvae cannot infect new hosts, only the L3 larvae can do this. If eggs and immature larvae are eaten they will die.
- Drenching only kills adult parasites in the host animal – it does not affect the huge population of worm larvae on the pasture waiting to reinfect the animals.
- The time taken for eggs to hatch and develop into infective larvae varies with temperature and humidity. It is quicker under ideal warm, moist conditions and slower in cold conditions. This is why worms can be a bigger problem in the spring and autumn when it is warm and moist and less in the summer (hot and dry) and winter (cold).
- Eggs and infective larvae can survive on the pasture for many months, sometimes over winter. This means that a pasture can still have dangerous levels of larvae many months after it was last grazed.
- Frost does not usually kill parasite larvae. They can survive frost but just develop more slowly in cold conditions.

Adult worms can produce thousands of eggs in every gram of faeces passed. We can get an indication of the number of adult roundworms in the animal by doing a faecal egg count – i.e., counting the number of eggs found in a sample of faeces. The result is expressed in 'epg', eggs per gram (of faeces).

Hot dry weather tends to kill eggs and larvae while cold temperatures slow larval development. Pasture contamination can drop during cold winters and dry summers. Worm burdens build up to their highest levels in animals in autumn as parasites are 'multiplied up' by young stock through late spring and summer. Most of the parasite larvae are low down on the pasture plants so animals take in more worms when they are forced to graze pasture to low levels. Around 50% of the larvae in a typical pasture are found in the bottom 2 cm of the sward. Animals grazing higher in the pasture generally have low larval intakes.

How nematode parasites cause disease

Typical signs of internal parasites in all farmed animal species can include diarrhoea, anaemia, poor weight gain and loss of condition and reduced appetite. Left untreated animals may die.

After the infective L3 larvae are eaten and they develop into breeding adults, the adult parasites live in the mucus on the surface of the stomach and intestinal lining. Some species even burrow into and live inside the glands of the stomach lining. This causes inflammation, the host animal's reaction to a foreign organism in its system. The severity of inflammation is affected by the numbers of parasite larvae that have infected the host – basically the heavier the infection, the greater the inflammation. One species, the Barber's pole worm (which infects sheep – see below) also actively attacks the lining of the stomach and sucks blood.

Both inflammation and direct damage to the gut lining makes the gut lining 'leaky' so the animal leaks blood and plasma (like a weeping scab) into the intestine. Of course this blood is very valuable and losses must be made up and replaced. So a lot of the host animal's energy and nutrients go into repairing damage and replacing lost blood, leaving less for its own growth, milk production or reproduction. This is why

infected animals lose weight and condition, milk production is reduced, animals can fail to get pregnant or pregnant animals may produce smaller offspring.

It's also why well-fed animals can cope with parasite infection better than those on low feed allowances or on poor feed – they have more nutrients to make up the losses caused by the parasites.

The severity of symptoms and production loss depends on the 'worm burden'. Worm burden is a combination of the number of larvae the animals are eating from the pasture and the number of adult parasites already established in the host. The greater the worm burden the worse the symptoms and the greater the production losses.

It also important to remember that in animals with low worm burdens, this inflammation and production loss may be quite mild, and can occur without any obvious outward symptoms. Nevertheless, the animals will not be growing as fast as they should. This is referred to as subclinical parasitism – i.e. there are no clinical symptoms. The only clue to whether parasites are a problem would be to do a faecal egg count (FEC- see below) and see if the animals are shedding parasite eggs – evidence that they are infected.

Young animals are generally more susceptible to worms than older animals. As they age, most species (except goats and deer) tend to build up a level of natural resistance (so long as they have been exposed to some parasites).

The main roundworm parasites

Cattle

The main types of worm that cause problems in cattle are *Ostertagia ostertagi, Trichostrongylus axei*, and *Cooperia* species. *Ostertagia* inhabits the abomasum (4th stomach) and *Trichostrongylus* and *Cooperia* the intestines.

Ostertagia, also known as the brown stomach worm is widespread in New Zealand and is by far the most important roundworm affecting cattle. It occurs in two forms, Type I and Type II Ostertagiasis. The Type I disease occurs in calves during their first grazing season. Infective larvae eaten on pasture burrow into the glands in the abomasum (the 4th stomach) where they cause inflammation and symptoms as described above. Type II disease occurs calves 9-12 month old when the ingested larvae, instead of developing into adult parasites, go into a kind of hibernation in the stomach glands. During this time the inflammation interferes with acid production and digestion in the stomach and causes blood loss into the stomach.The hibernating larvae mature in the following spring and cause severe illness as they suddenly all mature at once. Affected cattle not only lose weight but often die of overwhelming clinical Ostertagiasis.

Sheep

The main types of worm to cause problems in sheep are *Haemonchus contortus* (barber's pole worm) and *Ostertagia circumcincta* which inhabit the abomasum. Barber's pole worm is particularly damaging in warmer climates in the North Island because it attacks the lining of the stomach and sucks blood, as

described above). *Ostertagia* has symptoms similar to cattle but the parasites do not 'hibernate' as with Type II *Ostertagiasis* in cattle.

In the small intestine species include *Trichostrongylus* species, *Cooperia* species, *Strongyloides papillosus* and *Nematodirus* species. Note that the *Trichostronglyus* and *Cooperia* species are not the same as those in cattle In fact sheep parasites do not usually cross-infect cattle (or vice versa).

Nematodirus is mainly a problem in lambs pre-weaning. The reason for this is that the parasite eggs that are shed onto pasture by ewes accumulate on the pasture. The three larval stages (L1, L2 and L3) all occur inside the eggshell. They remain in the egg until spring when the temperature starts to rise and grass begins to grow, which coincides with lambing. When the temperature is right the eggs all hatch in a short time (synchronised hatching) and the pasture becomes loaded with infective larvae just as the lambs are beginning to wean and eat grass – excellent timing for *Nematodirus* but not so good for the lambs.

Goats may be affected with the same species of parasites as sheep, particularly *Ostertagia* and *Trichostrongylus* (but not Nematodirus)

Deer

In deer, various species are found in the abomasum, including Ostertagia species, while Trichostrongylus and Cooperia species affect the small intestine. Again young deer are especially at risk. The signs are as for cattle.

Lungworm

Adult nematode worms in the airways (the trachea, bronchi and bronchioles) of livestock and immature forms in the lung tissue can cause respiratory disease. There are various types of lungworm – Dictyocaulus species in cattle, deer and sheep, and Muellaris species in sheep.

Lungworms in cattle and sheep do not commonly cause serious respiratory disease. Affected cattle may show a persistent cough but affected sheep often show no signs of infection or a minor cough. However, badly affected farms may even see deaths due to lungworm. Lungworm is diagnosed by checking faecal samples for larvae or examining lungs in a post-mortem.

Deer are relatively susceptible to lungworm and in this species lungworm are more likely than gastrointestinal worms to cause clinical disease, i.e. loss of condition, breathing difficulties and occasionally coughing. Most anthelminthics are effective against lungworm so problems are usually prevented or controlled as part of the farm's normal drenching practice.

Controlling nematode parasites (worms)

As noted earlier effective control of nematodes parasites is a balance between:

- Regular drenching to kill parasites in livestock to prevent illness and production losses

- Management to prevent animals from grazing on pastures with a heavy burden of infective parasite larvae

Drenching

Sheep and cattle of all ages need drenching to control parasites. Each stock class needs to be treated differently as they have different needs.

- Drenching has three main benefits for parasite control:
- It removes adult parasite burdens which cause disease and production loss
- It can kill incoming parasites to prevent infection
- Keeping a low adult parasite population can help to reduce contamination of pastures with parasite eggs.

All three things could be done quite easily if we were able to drench all animals on a regular basis to prevent parasitism ever getting a hold in the animals. Unfortunately this would be prohibitively expensive, extremely time consuming and it causes parasites to become resistant to drenches. This is the same reason that bacteria become resistant to antibiotics when they are overused.

Drench resistance

Drench resistance is a huge and growing problem on livestock farms. 'Resistance' means that some of the worms on the pasture and in the livestock can survive a dose of a particular type of anthelmintic, so drenching with products from that drench family will not kill all of these worms. Worse, the worms that remain in the animal are the resistant ones so we are now breeding more resistant parasites – i.e., the eggs shed onto the pasture come from resistant parasites. The resistant worms gradually become a larger proportion of the worm population and the drench has less and less effect every time it is used.

Many farms have internal parasites that are resistant to one or more drench family. The worst farms have resistance to all three of the older drench families. Once drench resistance is present in the worms on a farm, it is very difficult or impossible to get rid of it. Drench resistance occurs more quickly if we:

- Under-dose – we effectively select for animals that survive a low dose of the product
- Drench very often – each time we drench, we are selecting the resistant worms and killing the rest
- Keep using the same product for years – again, selecting more often for resistance to it
- Buy animals that could bring resistant worms with them and fail to treat them before or on arrival.

The best things we can do to reduce the rate of resistance development are:

- Use only products KNOWN to work on our farm (see the section about testing below).
- Drench ONLY when necessary, not according to the calendar. Plan a programme with the vet; use faecal egg counts (if appropriate) to check the need to drench.
- Use other management techniques to reduce the worm burden, rather than relying on drench (more about this below).

- Leave some animals undrenched (e.g., large or good condition animals) – these animals are clearly not affected badly by parasites and any eggs they put out will not have been selected for resistance.
- Immediately after drenching, the animals should be returned to pasture that has some level of pasture contamination. Vets used to recommend putting animals onto 'clean' pasture (not been grazed by that species for some time, e.g., regrowth after a hay or silage crop) but this ensures that the pasture is then only contaminated by any parasites that have survived the drench. We want to mix any resistant eggs with a 'normal' population on the pasture.
- Avoid buying in animals or 'quarantine drench' all arriving stock with a product that is likely to kill all worms in them (e.g., a double or triple combination product, chosen in consultation with the vet).
- Avoid long-acting products unless there are clear production advantages and use an effective combination drench for the stock that do not have capsules – e.g., if ewes are treated with 'Maximiser' (Ivermectin) capsules then lambs should get a two or three family combination for their oral treatments throughout the summer, not another Ivermectin product.

Testing for drench resistance by checking drench effectiveness

Testing for drench effectiveness involves getting laboratory tests done on faecal (dung) samples collected from ten animals before drenching (to find out what worms are present) and again about 10 days after drenching. The degree of drench resistance is judged according to the proportion of eggs still being put out. Larvae can be cultured to identify the parasite species resistant to the drench. If the drench is fully effective then there should be no worm eggs in the post-drenching samples.

The tests will show how many worm eggs there are per gram of faecal sample (epg). If the drench was effective then there will be no worm eggs present 10 days after drenching. Even if the animals have been taking in larvae, these will not have matured to produce eggs in 10 days.

If drenching was not effective in reducing faecal egg counts to zero then some of the worms are resistant to the drench or (possibly) the drench was not given properly. For example, the drench gun may not have been delivering the correct dose, the dose rate was not enough for the size of the animal, some animals spat out some of the dose or missed treatment altogether.

If there is drench resistance, all future drenches must be from another (effective) drench family or a combination of drench families. Most farmers do not bother to check until they believe a drench has failed – i.e., they have drenched animals (at least once) and do not think their health has improved. It is better to check at the start of the season, to be sure that the drench chosen for the season will be effective.

If capsules are used, check samples from treated animals 60 to 80 days after the capsules were given. Ineffective capsules must not be used as there is a great risk of quickly increasing the population of resistant parasites. All of the eggs put out by the treated animals must be resistant parasites.

Use the correct dose rate

Dose rate must be checked to make sure you do not under-dose animals and encourage drench resistance Some tips for deciding the correct dose rate are:

- Every treated animal needs a full dose for its body weight because under-dosing encourages survival of resistant worms.
- If all the animals in the mob are similar in size, set the drench gun to treat the heaviest of them and treat all animals with this dose. If you are not sure what the animals weigh, weigh some of the biggest.
- If the mob is very mixed in size, draft them into two or three lines and then treat for the heaviest in each line. Cattle can be treated individually over scales.
- Check the dose rate regularly during drenching. Squirt ten doses into a good quality measuring cylinder or jug and work out the dose rate delivered (i.e., divide the total volume by 10). Re-set the gun if necessary.

Do not bring resistant worms onto the farm.

Drench resistant worms can arrive on the farm inside introduced stock (e.g., bought or coming for grazing). Any cattle, sheep, goats or deer arriving should be drenched with a suitable combination drench immediately on arrival. They should be held in a quarantine area for a few days and released onto the farm only after the drench has had time to act. Ideally stock would be treated before leaving the previous property but this is uncommon.

Using anthelmintic products

Most anthelminthics are given by mouth in a liquid 'drench' but there are also long-acting capsules that sit in the rumen, gradually releasing anthelmintic over a period of up to 3 months. There are also injectable anthelminthics and, for cattle and deer, products that are poured onto the skin along the middle of the animal's back ('pour-ons').

All types require care when giving them. Some points to watch:

- Drench guns for oral drenches must always be set for the heaviest animal in the mob and this should be checked by measuring out ten doses as discussed earlier. Watch out for animals that dribble or spit out their dose and re-treat them.
- Long-acting capsules must be given carefully as they can lodge in the throat causing terrible injuries.
- It is also easy to damage the throat or roof of the mouth if you are rough with the applicator. The head should be extended out so that the neck is straight. NEVER force the head back or down towards the chest.
- Animals need to be well held (e.g., in a head bail, crush or packed very tight in a race) for injecting.
- It is easy to get hurt if you do not restrain animals well.
- Pour-on products are designed to be absorbed through the skin – including human skin. These products are toxic – wear long sleeves and gloves when administering these and wash off any spills immediately.

Used according to the manufacturer's instructions, anthelminthics are reliable and effective treatments with no side effects. Used carelessly they can be dangerous to human and animal health or just a costly waste of time.

Strategic drenching

Drenching with anthelmintic (medication to kill internal worms) at strategic times is usually necessary for good stock health, especially in young animals. However, the need to do this varies depending on grazing management, stock species and expected animal performance. There is no 'recipe' for all farms. It is best for the farmer and veterinarian to devise a cost-effective worm control programme to suit the farm.

Typical regimes use some of the following:

- Deer and goats may require drenching at strategic intervals throughout their lives because they do not develop robust immunity to parasites.
- Lambs are typically drenched with oral anthelmintic at 4 to 6-week intervals from weaning until autumn.
- Young cattle may require several drenches during their first summer and autumn.
- Older sheep and older cattle may require strategic drenching depending on performance level and management.

Some anthelminthics continue to work for longer so fewer drenches are needed with a longer interval between drenches. Anthelminthics have withholding periods before milk or meat can be used for human consumption. It is vital to think about this when planning the animal health programme, especially when regular lamb or cattle drafts are being taken.

Drench types

There are many brands of drench available in New Zealand though they fall into 5 'families' based on the anthelmintic chemical they contain:

- Benzimidazoles – BZs or 'white drenches' - Thiobendazole, Oxfendazole, Fenbendazole, Albendazole
- Levamisole – 'clear' drenches
- Macrolytic lactones – Ivermectin family including Moxidectin, Abamectin, Selamectin
- Aminoacetonitrile derivatives – e.g. Monepantel
- Spiroindoles – Derquantel

Each of these chemicals has a different chemical action on parasites so that if a parasite becomes resistant to one, then we hope that another chemical will be effective in killing them. The problems start when parasites become resistant to more than one drench type.

Note that you cannot always identify the drench family by looking at the product. Not all 'white drenches' are white (e.g., some are blue) and plenty of Ivermectin family products look clear. Always read the label.

White drenches (benzimidazoles or 'BZ' products)

These drenches are the oldest types available and are generally the cheapest. They act quickly to kill worms in the animal's stomach and intestine but are very short acting – they kill worms only during the day or two after drenching. Since they have been available for many years drench resistance is common, especially on farms that have run mainly sheep and/or goats with an intensive drenching policy.

Clear drenches (Levamisole)

These drenches also kill worms quickly with no lasting activity. Their effectiveness does not appear to be as great as either the white drenches or third generation drenches, and they are commonly used only at weaning and in early summer. In autumn when the worm burden on pasture tends to be greatest, a white drench or third generation drench should be used as the clear drenches do not kill larvae that have lodged in the stomach wall. Levamisole has returned to popularity for use in cattle specifically to kill Cooperia because many farms have used Ivermectin/Abamectin drenches (which are not very effective against Cooperia) for extended periods which encourages the build-up of populations of Cooperia.

Ivermectin types

These include trademarked names such as Ivermectin, Abamectin, Doramectin, Eprinomectin, and Moxidectin (sometimes called 'third generation' drenches or 'endectocides'). These are more expensive than white or clear drenches but are more persistent and tend to continue killing incoming worm larvae in the animal for about 2 to 3 weeks after drenching. Because of this, the interval between doses may be extended, reducing the effective cost. Some of these products also kill some types of external parasites, e.g. lice (and are called 'endectocides').

Monepantel (sheep only)

In 2010 the first new drench family for more than 25 years, Monepantel, was released. It has a different chemical mode of action and is effective against sheep parasites which have resistance to any of the three 'common' families listed above. Sold under the name 'Zolvix', the product also has a new design of drench gun and comes in 'pouches' that fit into a backpack system. Zolvix is very expensive and is most often used strategically by farmers with drench resistance problems or as a quarantine drench. Drench resistance has already been recorded for this type.

Derquantel (sheep only)

Released in 2011 Derquantel (tradename Startect) is the 'fifth generation' drench family which at the time of writing is registered only for use in sheep. Again, due to cost it is used sparingly in planned drenching programs.

Combination drenches (combining two or more drench families)

To combat drench resistance drench manufacturers have devised a variety of combination drenches which use combinations of the 5 types above. These are more expensive than 'single' drench types but offer greater protection against resistant parasites. Combinations are commonly BZ/levamisole and levamisole/abamectin but some combine all three drench families. Even if parasites on the farm are resistant to one of the products in the combination, they should be killed by the other component. Triple

combinations offer even less statistical chance of resistance, as a parasite would have to be simultaneously resistant to all three families if it was to survive. Combinations are ideal for use as quarantine drenches but we could also drench with two or three single-family products instead.

However, the risk is that by using combination drenches you may encourage resistance to two types at once. It is still important to take precautions to avoid drench resistance by using a planned drenching programme.

Management to reduce worm burdens

While most farms use anthelminthics as their main method of worm control, there are other ways in which farmers can manage animals to reduce the effect of parasitism in animals and also to reduce the chances of animals picking up infective larvae from pastures. While most farms cannot avoid using drenches at some time, organic farms must and do cope without drench products. Animal production is always higher when we reduce worm burdens rather than relying on drenches.

Here are some management strategies that can be used to reduce worm burdens in susceptible classes of stock (e.g., lambs and young cattle) to reduce the need for drenching:

- Feed animals well – good nutrition boosts the immune system and helps stock suppress parasites. thus reducing the effects of disease on the animal and reducing parasite egg output onto pasture
- Good feeding also helps animals cope with the increased nutritional needs caused by inflammation and blood loss into the intestines, as described earlier.
- Lower stocking rates usually lead to lower pasture contamination with eggs and larvae. Under a high stocking rate animals are forced to graze close to faeces and probably also to graze low in the pasture, increasing the risk of taking in larvae.
- Let susceptible stock leave a higher residual after grazing (good for intakes and weight gains, too). Most parasite larvae are low in the pasture so grazing higher minimises the intake of larvae. Use another class of stock to graze lower and 'clean up' if necessary.
- Graze with different species – e.g., swap cattle and sheep grazing on each paddock or run the two species together. Sheep and cattle do not share parasites so the sheep can clean up cattle parasites without harm and vice versa. (Note this will not work with species that are affected by the same parasites – e.g., sheep and goats.)
- Allow suitable intervals between regrazing to let some or most of the worm eggs and larvae die off. This is most effective in very hot weather, which will dry out many of the eggs and larvae. However, it is ineffective if conditions are good for worm survival – the pasture will be ready to graze again long before the parasites die.
- Use long-acting drench products to reduce the overall pasture contamination – e.g., capsules in lambing ewes reduces egg output from ewes when they lose their natural worm immunity around lambing time. This means there are fewer parasites for lambs to pick up which is good for lamb growth and performance.
- Use alternative summer finishing feeds that do not support parasites like pasture does – e.g., chicory, lucerne and brassica crops.

- Use ‘safe’ pastures for susceptible animals (e.g., regrowth after hay or silage) but note the warning about drenching immediately before putting stock on these.

Combined drenching and pasture management

The best worm control programmes incorporate rotational grazing, mixed species grazing and strategic use of reliable anthelminthics. A well-designed programme will definitely pay dividends in terms of improved stock health and welfare, and productivity. It is best planned in discussion with a veterinarian who understands the farm’s management and goals.

Beware of “alternatives” to anthelminthics

It is important to know that alternative remedies like garlic and cider vinegar can sometimes help suppress the egg-laying of worms and may even remove a few worms but they are not effective drenches and cannot be relied on as a means of worm control.

Tapeworms

Tapeworms, have quite a different lifecycle to roundworms although, like roundworms, they are helminths.

Tapeworms (also known as cestodes – pronounces sesstode) need two hosts in their lifecycle. The primary host, in which the adults reproduce, are not livestock but predators – mainly dogs and cats. Livestock are their intermediate hosts.

Adult tapeworms are long flattened worms made up of many segments. They have a tiny head with a crown of hooks with which they attach themselves to the lining of the dog’s or cat’s intestine (like a boat anchor). The body trails in the fluid of the digestive tract and segments containing eggs ‘bud-off’ the tail end. Immature segments are near the head and larger, mature segments are at the end. As the segments mature they break off and are expelled in the predator’s faeces. Each segment can contain may contain many thousands of infective eggs, that can be blown around in the wind, spreading them on pasture way from the faecal deposit.

Sheep (and cattle) eat the eggs from pasture which then develop into larvae in the herbivore’s gut. Then they burrow into the gut wall and into the bloodstream where they get carried around until they get stuck in a narrow capillary blood vessel, often the liver, lungs and brain or even in the muscle tissues. There they form watery cysts. When a predator (e.g. a dog) eats infected meat or offal the cysts hatch and become mature tapeworms in the gut – the lifecycle is complete.

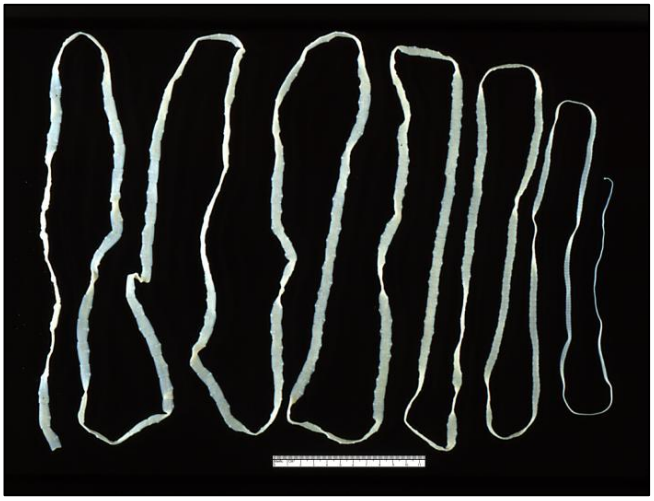

Figure 2 Tapeworm

Image from Patho, 2006. Licensed under CC0 1.0

Various types of tapeworm can cause cysts in livestock and sometimes humans. Their primary hosts (i.e. animals in which the adult form lives) are dogs. Tapeworms include *Taenia ovis* and T. *hydatigena*. In sheep, the intermediate stage of *T. ovis* causes sheep measles (cysticercosis), which can lead to carcase downgrades at the meat works. The pea-sized cysts occur in muscles like the heart, cheek muscles and tongue.

True hydatids, which was for many years a severe human health risk in New Zealand, has been eradicated is caused by *Echinococcus granulosus* see the section on zoonotic diseases).

However livestock can be primary hosts to some tapeworm species, so that the adult tapeworms occur in sheep and cattle. The common sheep tapeworm (*Monezia expansa*) life cycle involves mites, which eat tapeworm eggs and are, in turn, taken in by the sheep when it eats pasture.

Various tapeworms have cattle, sheep, deer and goats as their primary hosts. Adult forms generally live in the small intestine. Despite their relatively large size they do not appear to do much damage. At one time it was thought they predisposed lambs to pulpy kidney disease but this has not been proved.

Tapeworm control

To control tapeworm cysts in livestock arising from dogs the only sure way is to break the parasite life-cycle by never allowing dogs to eat raw sheepmeat or offal. If you are feeding cull sheep to farm dogs (or even pets) then the meat must be either cooked or frozen to kill the infective cysts. Meat must be frozen to below -10°C for at least 7 days to kill cysts. Also make sure that home-kill facilities are dog proof to prevent dogs sneaking in and stealing raw meat. Also dead sheep carcasses must be picked up and disposed of in a dog-proof offal hole to prevent scavenging.

Tapeworms in sheep are diagnosed by faecal examination. Tapeworm segments full of eggs can be readily seen (they look like white melon seeds) in faecal samples and many farmers treat for tapeworm if they see segments. This will not necessarily boost liveweight gains but may reduce dagginess and flystrike risk.

Sheep and cattle can be drenched to remove tapeworm but be aware that not all anthelminthics will kill both roundworms and tapeworms – check the label or consult your veterinarian. .

Liver fluke

Adult liver flukes (*Fasciola hepatica*) are leaf-s haped parasites that live in the bile ducts of the liver in sheep, cattle, goats and occasionally deer. The life cycle of the fluke involves an intermediate host, a type of aquatic snail (*Lymnea* species), so liver fluke is most likely on farms with swampy or damp areas. Liver fluke cannot occur where the snails are unable to live. Eggs passed out by

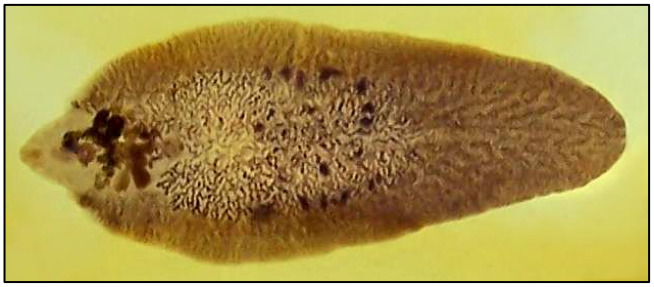

Figure 3 Liver Fluke

Image by Tango22, 2007. Licensed under CC0 1.0

infected stock hatch into free-living larvae which swim until they find a snail host. After infecting the snail they multiply inside the snail until eventually they kill the snail host.

The infective larvae then leave the dying snail and are eaten with pasture. Inside the animal's gut they develop into adult flukes, which invade the bile ducts of the liver and can be found by cutting open the liver and checking the ducts for rolled up flukes. Because liver flukes can seriously damage the liver, badly affected livestock may lose weight, develop jaundice and even die. Farmers in fluke areas should check the liver whenever they kill animals on the farm. Liver fluke can only be treated with specific products for the purpose. Check with your veterinarian.

Coccidiosis and Cryptosporidiosis

Coccidiosis and cryptosporidiosis are the names given to diseases caused by various species of *Coccidia*, and *Cryptosporidium*. Both are microscopic single-celled protozoan parasite. Most species infect the cells lining the small intestine and can affect calves, lambs, kids and fawns.

Coccidiosis and cryptosporidiosis can cause severe diarrhoea in animals up to yearling stage but young animals are most susceptible especially when kept in crowded and stressful conditions. The signs are diarrhoea, possibly containing blood. Coccidiosis is diagnosed checking for coccidial eggs in faecal samples.

Effective drug treatment is available. Meal or pellets fed to young animals intensively reared (e.g., lambs orcalves) should contain a coccidiostat.

External parasites: flies, lice, keds, ticks and mites

External parasites live on the outside of the animal. Most cause itchiness and discomfort but some, such as flystrike, can be fatal. The incidence of external parasites varies around the country – get to know what is most likely where you live. External parasites are easy to get rid of with the correct treatment.

Good general health is also important as well fed, healthy animals are less affected. For specific prevention and treatment, insecticides are commonly applied as powders, pour-on liquids, sprays or saturation products (plunge or shower dipping). Contract dipping is common on sheep farms without dipping facilities.

Remember that insecticides usually have a withholding period before meat or fibre can be harvested, so itis important to read the label instructions carefully.

Flystrike

Flystrike is an infestation of blowfly larvae on the live animal. Adult flies lay eggs on the skin, which hatch into larvae (maggots) that eat into the skin and flesh. Affected sheep suffer irritation, pain, loss of fluids, infections and eventually they die.

Flystrike is a sickening sight, even for the most experienced farmer. It is a cruel disease that costs the sheep industry millions of dollars each year. it is especially important because of its animal welfare effects and the risk of animal deaths, especially in flocks that are not checked frequently at high risk times.

Sheep are most often affected, because dags and wool (especially wet wool) attract blowflies, but other animals can be struck in wounds or heavy dung build-ups (e.g., around the tail of a cattle beast). While most flies strike in dags or dirty areas, the Australian green blowfly will strike clean areas such as the top of the shoulder or poll (top of the head), and it has a longer season than other species. It occurs in almost all areas.

Blowflies favour warm, humid conditions, dirty sheep (dung and urine), wet conditions, wounds (e.g., shearing cuts) and mycotic dermatitis (skin infection). Rams may be struck in head wounds from fighting; rams and wethers can be struck around the pizzle. Flies may also strike in footrot.

Flystrike is often seen as a dark, wet patch on the sheep, which may be biting at the area or rubbing it. It might be seen in the early stages as an animal that is restless, twitching its tail, stamping its feet, humping its back and generally looking annoyed. Affected animals may go off on their own, especially to shade. They stop eating, dehydrate as fluid is lost through the wound, and lose weight very quickly.

Treatment

Remove wool on and around the strike area because the smell will attract further flies. If possible, shear ‘above the skin’ to leave some protection from sunburn. Destroy the material to kill the flies if you can. Treat with an approved insecticide dressing for flystrike, on the wound and in the surrounding wool. In an

emergency, small flystrike wounds can be treated with fly spray but sheep dip products are preferred, especially to prevent further strike.

Organophosphate dips are effective and quick but be aware that they are absorbed through the skin. Treating a large raw area can kill the sheep. Just shearing off the wool and treating the wool around it may work. It is important to treat flystrike as soon as it is seen and animals need to be checked often during the flystrike season. Extensive flystrike is very difficult to treat and euthanasia may be the only humane option.

Prevention

Prevention is vital in areas prone to flystrike (most of New Zealand). Dirty or wet wool and injuries attract blowflies so keep sheep clean to lower the attraction. Good worm control helps reduce dags but there are many other reasons for dags forming. Regular dagging is important and shearing date should be chosen to suit the expected flystrike risk. Sheep should never carry more than a year's growth of wool.

Shearing reduces the risk of body strike for a few weeks so choose a shearing date that helps with flystrike control. Preventive dipping will probably also be important. Various products are available for saturation dipping (e.g., in shower or swim dips), pour-on or spray-on use, giving different protection periods depending on product and application method. Follow the manufacturer's mixing and application instructions, including suitable wool length at treatment, to the letter.

Most dips are best applied a few weeks after shearing so that there is enough wool to hold the chemical. Remember there is a withholding time from treatment to shearing. There are two reasons for this – shearer/woolhandler safety and to reduce chemical levels in the wash water when the wool is scoured.

Blowflies favour sheltered areas during periods of high risk (e.g., humid weather in late summer and autumn) so keeping sheep on breezy, more exposed paddocks can help. Blowflies breed in carcases as well as on live flesh so dispose of all dead animals as quickly as possible. Ideally, this includes wild animal and bird carcases.

Flytraps help reduce fly numbers and are also good for monitoring numbers (e.g., to indicate the need for preventive dipping). You can buy commercial flytraps or make your own. Vets and consultants can advise on how to make effective traps and you will find plans on the internet, too.

Lice

Lice are species-specific – i.e., each farm animal species (cattle, sheep, deer, horses, etc.) has its own type(s) of louse.

Lice spread from animal to animal during close contact (e.g., when yarded or from ewe to lamb). They cause itching and discomfort, and the animal responds by rubbing against solid objects, damaging the skin and hair or fleece. Woolly sheep with strands of wool pulled out might be lousy. Severe lice in cattle may be seen as bare or even raw patches due to rubbing. Animals also tend to be more irritable.

Part the hair or fleece over the itchy areas and look for lice scuttling for cover (to avoid the light) or eggs ('nits') attached to the base of hairs. Infestations tend to start building up in autumn and are highest in winter and into spring, particularly if animals are underfed or have big internal parasite burdens. Seasons vary and lice can catch you out if populations have been low for a few years.

Lice need to be treated with an appropriate insecticide at the right rate. Some cattle anthelminthics kill lice as well as internal parasites but check the label. Shearing removes many lice and exposes the remaining ones to sun and rain. Woolly sheep need dipping with a lice product, chosen to suit the wool length at treatment time. Thorough treatment is essential and all animals of that species on the farm must be treated, to avoid reinfestation. (This includes any of the neighbour's that happen to have come through the fence. Beware of buying in lousy stock or taking lousy grazing animals, too.)

Keds

Sheep keds (Megaphagus ovinus) are much less common. They can cause skin irritation, rubbing and loss of wool but are usually controlled by normal lice control measures.

Mites and mange

Mites are less common external parasites. Some that you might encounter in New Zealand farming include:

- Itch mites – usually in Merino or Merino-cross sheep in the South Island high country, caused by Psorergates ovis. Most sheep lose their sensitivity to the itch mites with time but a few suffer continued misery. Injections of ivermectin or moxidectin at normal internal parasites treatment doses will kill the mites.
- Scrotal mange is sometimes seen on rams. It is caused by microscopic mites (Chorioptes bovis) that live in or on the top layers of skin, causing hair loss, sores and irritation. These mites can infest both sexes of sheep and often cause little problem. Scrotal mange is treated with insecticide (e.g., organphosphate dip).

Ticks

The 'cattle tick' (*Haemaphysalis longicornis*) mainly affects cattle and deer but can also infest sheep. Heavy infestations can cause significant loss of blood, especially in small animals like fawns. Adults are 1.5 to 2 mm diameter and can swell up to 10 mm diameter when engorged with blood. They tend to be most common in the north and east of the North Island but are also found in the South Island. They are controlled with insecticide – talk to the vet about suitable products.

Toxicity

Several diseases of livestock are caused by the toxic effects of things that the animals encounter in their pasture or crop while grazing. Occasionally animals are directly poisoned by plants (e.g., tutu) but toxic fungi or things we add to pasture (e.g., excessive nitrogen fertiliser) are more common.

Facial eczema

Facial eczema (FE) is a serious disease caused by a fungus (*Pithomyces chartarum*) that grows in the dead material at the base of the pasture in warm, moist conditions. The fungal spores produce a toxin (called sporidesmin) that poisons grazing animals when they eat it.

When the spores are eaten by ruminants, the toxin damages the liver. The liver cannot get rid of phylloerythrin, a product of chlorophyll breakdown, so this compound circulates in the blood. Phylloerythrin releases energy when exposed to sunlight, causing skin damage that looks like severe sunburn. FE can affect sheep, cattle, goats and deer, especially fallow deer.

FE is a major health and animal welfare problem in much of the North Island and the warm north and west of the South Island. Outbreaks vary between years depending on seasonal conditions. Spore numbers can rise rapidly in the warm, humid conditions that commonly occur in later summer and autumn, so FE is common in parts of the North Island from January to May.

Clinically affected animals are uncomfortable, may be in pain and look miserable. They will stand with their head down, ears drooping, and prefer to be in shade if possible. If you can see skin damage then liver damage is already severe. Affected animals suffer ill-thrift, reduced fertility, lower milk production and sometimes death. Sub-clinical FE (i.e., without symptoms) depresses production on many farms without the owner or manager being aware of it. Many parts of the North Island have reduced milk output and poorer reproductive rates (in all livestock species) caused by sub-clinical FE.

The first visible signs are often reddening and swelling of skin exposed to the sun, especially around the eyes, ears, lips and nose. White skin is more badly affected than darker pigmented skin. The animals become restless, shaking and rubbing their head and ears, and seek out shade. The skin reddens, swells, weeps, then it sloughs off and the site can become infected. Animals with severe liver damage can appear jaundiced, with a yellowish tinge to the whites of their eyes.

Treatment

It is important to treat or euthanase clinical FE cases because the animals suffer badly. Failure to treat or destroy them is inhumane and could lead to animal welfare charges.

At the first signs, affected stock should be taken off pasture and offered shade. A dose of zinc oxide should be given by mouth (see the vet for mixing instructions and dose rates). Jaundiced stock should be offered a diet of hay and water for a few days before gradually introducing high-quality nutritious feed to help their

liver recover. They will probably need vitamin and mineral supplements as their liver is no longer supplying these nutrients.

Opaque protective cream can be applied to damaged skin to hasten healing and act as sunscreen. Veterinarians may recommend antibiotic injections for severe skin infections and also vitamin B12 injections to boost appetite. Jaundiced stock should not be slaughtered or sent for slaughter for human consumption.

Getting affected animals out of the sun provides relief from the sunburn symptoms and helps prevent further damage. Affected animals often seek the shade of trees or hedges, but this may not be enough.

During high risk periods or when severe signs appear suddenly (e.g., swelling of the head and ears), stock can be kept in darkened, well-ventilated housing during the day to let the worst of the reaction subside. They can be offered hay and water inside and let out at night to graze. Where there is appropriate housing this is a simple, cheap and effective way to help treat FE. This is usually only attempted for very high value animals and most severe FE cases will be euthanased.

Monitoring the risk

Minimising FE is an important part of farm management in areas prone to the disease. Even sub-clinical FE can have a big effect on farm profit so it is worth reducing animals' exposure to FE spores.

Happily, it is easy to monitor spore levels in the pasture. A sample of pasture is washed and the wash water is viewed on a special counting slide under a microscope. Representative district spore counts are published in local and farming newspapers, and some veterinary practices display spore count charts in their reception areas. Farmers can do their own counts to identify the safest pastures on their property or to use as a trigger level to start preventive zinc dosing (discussed below).

Prevention

Spore monitoring indicates the degree of risk. This is much better than waiting for clinical cases to appear. By the time 5% of a herd or flock has obvious skin damage, up to 50% of the group will be liver-damaged and at real risk of developing skin signs too. Production is badly affected before the first signs are seen.

FE prevention may include grazing safe pastures (identified by low spore count), avoiding grazing low into dead material and zinc dosing. Zinc has a protective effect for the liver and is good 'insurance'.

Many farmers drench with zinc oxide in water. Depending on the circumstances, drenches can be given daily (e.g., in the cowshed), several times a week or once a week (more likely for ewes or beef cattle). Check the dose rates and mixing recipe carefully with a vet or farm adviser at the beginning of the season. For dairy cows, zinc oxide can be added to the trough water.

Alternatively, cattle and sheep can be given long-acting boluses (capsules) that gradually dissolve in the rumen. These release zinc slowly, for about 4 weeks in cattle and 6 weeks in sheep. Special care needs to be taken in administering these boluses as they can seriously damage the animal's throat if excessive force is used or the head is forced too far back or tucked in too much towards the chest. Stock should be put onto grass as soon as the bolus has been given, so that they can drink or graze to help the bolus go down.

It is important not to risk zinc overdosing by doubling up on prevention methods. Use only licensed products. There are currently no licensed injectable zinc products on the market.

Farmers in high risk areas get to know their worst paddocks and keep stock off these when spore counts rise. If spore counts are high across the farm, stock can be held off pasture and pad fed (e.g., hay or silage and grain) on bare ground or in yards until spore counts drop. This may be a practical option on small farms and some dairy farms with suitable facilities. However, there are risks in concentrating stock on bare land or short pasture for too long as the combination of high stocking density and stress can increase the risk of disease.

Spores can be killed by spraying pasture with fungicide. This is relatively expensive but may be worthwhile in high-risk areas. Follow the manufacturer's instructions carefully and check the effectiveness of spraying by monitoring spore counts on sprayed pasture.

Long-term solutions

In sheep, FE resistance is strongly inherited, so farmers in high-risk areas can choose to buy FE-resistant rams that have a certificate to prove their status. Some ram breeders have bred for FE resistance for 20 years or more, and now have a very high level of protection built into their flocks. This means their sheep show fewer ill-effects after grazing pastures with high spore counts than do less tolerant sheep.

Resistant animals are identified by dosing with sporidesmin and measuring the level of GGT (an indicator of liver damage) in the blood. FE-susceptible animals may show major clinical symptoms and will not be suitable for sale (severe cases may even have to be destroyed) so it is not done lightly. Testing is usually confined to ram hoggets that may be sold as breeding rams or used within a stud's own breeding programme.

Most newly imported breeds have less resistance to FE than New Zealand breeds. The Finn breed is an exception and is surprisingly FE tolerant.

Ryegrass staggers

Ryegrass staggers affects the brain of sheep, cattle, horses, deer and alpacas. It is caused by a toxin called 'lolitrem B' produced by endophyte fungus growing within perennial ryegrass plants. The highest concentrations of toxin are in the leaf sheath at the base of the pasture and in the seed heads. Lolitrem B affects brain cells that coordinate movement, causing the characteristic 'staggers'. (Be careful not to

confuse ryegrass staggers, due to endophyte, with grass staggers caused by lack of magnesium (Mg) in the blood. Treatment with Mg will have no effect on animals suffering from ryegrass staggers.)

The endophyte is present in the ryegrass seed and grows up within the plant. It grows up through the stem and infects the new seeds when the plant sets seed, passing on to the next generation of ryegrass plants.

It is common throughout both islands of New Zealand. Farmers enthusiastically planted high endophyte ryegrass in the past because the fungus gives protection against Argentine stem weevil (a pasture pest). Ryegrass staggers is most common in late summer and autumn, especially when stock are forced to eat infected seed head and/or leaf sheath.

The signs are most obvious when affected stock are disturbed and forced to move. They become anxious and mild cases may show slight trembling of the head and of the skin of the neck, shoulder and flank.

More severe cases show head nodding and jerky movements, swaying while standing and staggering while moving. In severe cases animals have a stiff-legged gait, short prancing steps and may collapse with rigid spasms that last for up to several minutes.

The disease itself is rarely fatal but production losses can be considerable. As well as the staggers symptoms, endophyte can lead to poor weight gains, heat stress and reduced fertility in ewes (especially because of the timing of the disease). It is also impossible to get a staggery herd in for milking! There is a risk of injury or death as a result of ryegrass staggers because:

- Affected stock lose weight through reduced grazing.
- They may not be able to drink sufficient water.
- They can become caught up in obstacles like electric fences.
- They can fall into holes and ditches, and over bluffs.
- They can drown in creeks, dams, drains and swamps.

Managing ryegrass staggers

There is no cure so it is a matter of reducing exposure to the endophyte and making sure animals come to no harm while the effects wear off. Things to do:

- Remove stock from high endophyte pasture and put them onto low endophyte ryegrass or other safe feed (see prevention discussion below).
- If safe pasture is not available, put the stock into yards and feed them hay or silage and plenty of clean water.
- Affected stock should be handled quietly and only if absolutely necessary. Avoid shifting them if at all possible.
- If animals stagger and collapse while being moved, leave them to recover in their own time.

Prevention

The best long-term solution in areas where the disease is a problem is to replace the affected ryegrass pasture with grasses that do not contain the dangerous endophyte types.

Possibilities include:

- alternative crops for summer/autumn (e.g., lucerne, summer brassicas)
- alternative pasture grasses, such as fescue, cocksfoot or prairie grass
- nil endophyte perennial ryegrass (if pasture pests are not major problems)
- perennial ryegrass with 'safe' or 'animal friendly' endophytes (e.g., AR1) – these still give insect pest protection but have low levels of lolitrem B, so they do not cause staggers or related animal health issues. Seed is more expensive, however, and pastures need careful establishment to avoid infecting the new ryegrass with 'wild type' endophyte.

Nitrate poisoning

Nitrate poisoning occurs when animals eat feeds high in nitrate. Nitrate in feed is normally converted to nitrite in the body, then to ammonia. When the nitrate intake is high, the animal cannot convert the nitrite fast enough. Nitrite levels in the blood increase, reducing the blood's oxygen-carrying capacity and producing the poisoning symptoms. Without oxygen, the animal's organs may fail and it dies.

Often the first sign of nitrate poisoning is death! You might see animals that are weak, down or distressed, with shallow breathing and perhaps trembling. Membranes in the eye and nose may appear brownish. Cows or ewes may abort.

The management history of the feed often highlights the risk of nitrate poisoning. Risk factors include:

- high risk crop – e.g., brassicas, Italian or short rotation ryegrass, cereal greenfeeds
- high rates of nitrogen fertiliser – this is especially common when farmers decide the crop was not good enough so they add some more nitrogen fertiliser to be sure.
- dull weather or frost followed by a dull day – the nitrate level increases over night, as the crop takes up soil nutrients but does not use them. The level usually falls during the day as the crop grows some more and metabolises its nutrients, but this does not happen on a dull day. Moving stock later in the day may be all that is needed.
- hungry stock, which gorge when they get onto the crop (especially first thing in the morning). Beware a breakout of hungry animals in the middle of a frosty night, on a high risk crop!

Occasionally nitrate poisoning happens on pasture that has rapidly grown after drought, on pasture with high clover levels. Nitrogen accumulates in the soil during the drought (because the pasture is not taking it up) and is rapidly taken up when the rains come. The nitrate level will fall again over time as the pasture grows more.

A word about frost: Many farmers mistakenly believe that “it is the frost that does it.” The point above explains why nitrate levels are highest early on a frosty morning. However, it is NOT the frost itself that is dangerous; it is the high level of nitrate. Stock may be moved safely on a frosty morning on a low nitrate crop.

Treatment

If you suspect nitrate poisoning, remove the rest of the mob from the feed immediately and offer safe feed to ‘dilute’ the nitrate levels. Call the vet. Affected animals may respond to treatment with methylene blue but few farmers will have this on hand.

Prevention

Knowing the history of the feed will give you some idea of the likely risk level. Applying lots of nitrogen fertiliser to a high risk feed type, within a month or so of grazing, is asking for trouble. If there is any doubt about the safety of a pasture or crop, it is quite easy to test the feed’s nitrate level on-farm. Talk to the vet about this if you are using a feed crop that could have high nitrate levels.

Other poisons

Accidental poisoning of livestock is not common, but it does happen and could usually be prevented with a little forethought.

There are too many different signs of poisoning to list them all here, but the most common signs include diarrhoea, regurgitation of rumen contents, unusual excitement or dullness, body tremors, pain (e.g., shown as teeth-grinding, reluctance to move, arched back) and convulsions.

If poisoning is suspected, consult a veterinarian immediately.

To minimise the risk of poisoning, garden prunings and grass clippings should not be thrown into the paddock. Even cut grass can cause severe indigestion if stock gorge on it. Many garden plants are poisonous to livestock (see below) and many are tastier when wilted.

Rubbish dumps should be fenced off, and patches of scrub should be checked for tutu and ngaio before stock are allowed access for grazing.

Poisonous garden plants and weeds

Rhododendron	Cestrum
Yew	Oleander
Laburnum	St John’s wort

Oak (acorns)	Tutu
Delphinium	Ngaio
Blue lupin	Foxglove
Iceland poppy	Goat's rue

Ragwort (sheep are more resistant to ragwort poisoning than cattle or horses but their liver can be damaged if they eat enough of it)

Poisons in pasture

Some of the most serious diseases of stock are caused by fungal toxins in pasture (see ryegrass staggers and facial eczema). Some other 'pasture poisons':

- Zearalenone is a toxin produced by a fungus that grows in the base of pasture. It can cause infertility in ewes.
- Some clovers can cause dermatitis.
- Phalaris grasses can cause signs of brain disease (phalaris staggers).

Chemical poisons

Stock can be overdosed with zinc (see facial eczema), copper (especially sheep) or selenium (see mineral deficiencies).

Superphosphate poisoning can occur when animals are put onto top-dressed pasture before the fertiliser has been washed into the soil, especially when pasture is short. Basic slag applied as fertiliser has also caused poisoning when pastures were grazed before it had been washed into the soil.

1080 poisoning has occurred in stock when poisoned bait was accidentally dropped onto their pasture or when they got access to poisoned land. It is also dangerous to farm dogs (e.g., scavenging on poisoned possums).

Overdosing with some anthelmintics or organophosphate insecticide can cause toxicity. Most anthelmintics are safe to several times their normal dose rate but pour-on products may have more risk. Organophosphates are absorbed through the skin so treating a large patch of flystrike may give the sheep a fatal dose of insecticide, too.

Test Yourself #3

1. What is a faecal egg count?

2. What is drench resistance?

3. Ten days after a mob of sheep has been drenched, faecal egg counts from ten of them show results ranging from 0 to 500 eggs per gram. What does this mean and what would you do about it?

4. On a farm with a history of facial eczema problems in dairy cows, describe how you would monitor the risk and prevent the disease.

5. What are the signs of ryegrass staggers, why does it cause production losses and what is the best long term strategy to prevent it?

6. List at least four risk factors that increase the chances of nitrate poisoning on a winter feed.

Metabolic Diseases

In late pregnancy and early lactation, ewes and cows are under great metabolic stress. Their foetuses grow fast in late pregnancy, and after giving birth they have to produce a lot of milk. If their feeding is interrupted, e.g. by bad weather or by yarding, they can easily be tipped into fatal metabolic imbalance.

The three common metabolic diseases are:

- ketosis (technical name “acetonaemia”), also called sleepy sickness, pregnancy toxaemia or twin lamb disease in ewes – caused by lack of energy from feed and the use of body fat to supply energy
- grass staggers (“hypomagnesaemia”) – caused by lack of magnesium in the blood
- milk fever (“hypocalcaemia”) – caused by lack of calcium in the blood

In all these diseases the first signs are usually changes of behaviour. You might see dullness and lack of appetite or interest, progressing to the stage where the animals go down unable to rise, or become agitated, with trembling and nervousness leading to convulsions.

Early treatment is essential for best results. It is important to learn to spot the signs early and to anticipate problems if the farm has a history of metabolic disorders.

Animals with residual liver damage from facial eczema (or ragwort poisoning) can be predisposed to metabolic disease. Other risk factors include poor body condition, a check or sudden change in feed supply, cold, wet windy weather and the stress of yarding or transportation.

To prevent metabolic diseases, farmers should try to keep their feed supply steady or increasing, provide sheltered paddocks in bad weather, minimise the time stock spend in yards and supplement with appropriate minerals depending on their stock type. More about this below.

General treatment recommendations

When you read the symptoms you will see that finding a cow or ewe down often indicates a metabolic problem but it might be hard to tell which one. If in doubt, treat for all three! There are many good products on the market for this, although they are more expensive than plain calcium (Ca) or Mg solutions. It is usually better economics to treat successfully with the dearer product than fail to save an animal if you guess wrong!

Grass staggers (hypomagnesaemia)

Grass staggers is caused by lack of Mg in the blood. It is most likely when animals are lactating heavily on feed that cannot supply their Mg needs but can also occur before lambing or calving. Higher milk output animals have higher Mg needs.

Grass staggers in cows

Grass staggers is relatively common in cows in heavy lactation and on lush pasture (with inadequate energy intake and low magnesium content). Low body condition, changeable bad weather, yarding and transportation all increase the risk. Recent application of potassium in fertiliser can also interfere with magnesium absorption in the animal's digestive system.

Often the first sign is sudden death, usually with ripped up grass where the legs lie. Cows may show signs before death, such as nervousness, unusual aggression (they may even attack!), body tremors, walking with stiff legs, collapse with paddling and the head held back.

Dairy cows may have a mild, chronic form of the condition. The only signs are lowered milk production, weight loss and increased nervousness, which may make the cow seem 'difficult' to milk.

Grass staggers in ewes

Grass staggers is quite rare in sheep – milk fever and ketosis are more common. Grass staggers can cause dramatic signs such as body tremor, walking with stiff legs, collapse with paddling and the head held back. Usually ewes are simply found dead, on their sides with scuff marks in the ground where they have paddled their feet.

If any ewes are found dead or with serious clinical signs, assume the rest of the flock is at risk. The early signs can be subtle, with an increase in nervousness that is easily overlooked or misinterpreted. Get the vet to arrange blood tests to check blood Mg levels urgently.

Treatment

Affected cows or ewes need urgent treatment with subcutaneous injections of Mg solution. Note that Mg acts as a heart stimulant and can be fatal if injected in the vein. Check the instructions for the product your farm uses and take the veterinarian's advice. Following successful treatment, look at ways to supply Mg in future to avoid a recurring problem.

Prevention

Prevention in dairy cows is managed by adding Mg to the water supply or dusting it onto silage or the pasture break ahead. Supplementation should start 3 to 4 weeks before calving and continue until several weeks after calving. Beef cows can get grass staggers, especially dairy-cross cows, and need similar Mg dusting or a long-acting Mg rumen bolus to supply their Mg needs if dusting is not practical. Licks and blocks do not reliably treat the whole herd with enough Mg to prevent problems.

Most grass staggers in sheep occurs after prolonged time off grass (e.g., for pre-lamb shearing or crutching), especially if combined with bad weather. Minimise the time off grass for essential operations in late pregnancy and providing shelter from bad weather. Talk to the vet for recommendations about dusting pasture or hay with magnesium oxide powder or calcined magnesite if the farm has had problems in the

past. Dusted pasture may not be very palatable, and if the powder is applied too liberally the stock may go hungry to avoid it. This can lead to ketosis.

Ketosis (acetonaemia)

Ketosis is fairly common in both sheep and cattle, especially high producing animals. It develops when the animal cannot get enough energy through her diet so she uses her body fat to make up the deficit. Substances called 'ketone bodies' are produced when she breaks down fat and these substances cause ketosis symptoms.

Ketosis in cows

Ketosis is most common in cows in early lactation, when they are producing large amounts of milk. High production cows cannot eat enough to support their output so they use body fat and lose condition from calving to peak lactation. The best cows are most at risk.

The symptoms include dullness, not eating, staggering or aimless wandering, twitching of the face and ears, blindness, going down, coma and death within a few days. Sometimes the only signs are a drop in milk production and weight loss.

Ketones are excreted in the urine and in the breath. Ketones have a characteristic sweet smell (like nail polish remover) which about 50% of people can detect. The blood concentrations of ketones rise before signs develop, so blood tests can be used by your vet to predict problems.

Sleepy sickness, pregnancy toxaemia or twin lamb disease (ketosis) in ewes

Sleepy sickness is the most common metabolic disease in sheep. It is most likely in late pregnancy, especially in ewes that are carrying two or more lambs and/or are very fat. Ewes with multiples have high energy requirements, especially in late pregnancy when the foetuses grow quickly, but have reduced rumen capacity because they are full of lambs. Fat ewes have a higher maintenance requirement and plenty of fat to mobilise! Both are at higher risk if they are on bulky, low energy feed as they simply cannot eat enough in a day to meet their needs and must use fat.

Underfeeding or a sudden check in food intake in the last 6 weeks of pregnancy is most likely to trigger clinical signs. Ketosis can also be brought on an increase in the ewe's maintenance requirement – e.g., with inadequate shelter in bad weather, especially if she also eats less at this time (e.g., on a muddy brassica crop). Anything that reduces her feeding ability (e.g., sore feet or unwillingness to eat supplements such as barley) increases a particular animal's risk of ketosis.

Unlike the other metabolic diseases, the onset of sleepy sickness is usually more gradual. Signs include slowness, lethargy, not eating, staggering or aimless wandering, twitching of the face and ears, blindness, leading to going down, perhaps with the head up as though gazing at the stars. Coma and death can follow in 2 to 7 days.

Treatment

Cows or ewes with ketosis need an immediate energy boost with a sugar solution (glucose or dextrose) or ketosis products such as Ketol. Sugar solutions can be given orally or into the vein (ask the vet to teach you). Oral energy supplements with electrolytes can be helpful if given in the early stages. Animals are also often dehydrated so make sure she has sufficient fluid.

Prevention

The key to prevention is good feed – uninterrupted, good quality and plenty of it! Cows and ewes should have an increasing level of feed leading up to birth. Concentrates such as barley or pellets may be necessary, especially for multiple-bearing ewes in late pregnancy.

Milk fever (hypocalcaemia)

Milk fever is caused by lack of calcium (Ca) in the blood. It is more common in older, high milk output animals, as they have mobilised Ca with each lactation in the past but not replenished their stores.

Milk fever in cows

Milk fever in beef and dairy cows occurs most often in high producing older cows within 48 hours of calving, but it can occur several weeks before or after calving. Ironically predisposing factors include high calcium or phosphorus in the diet in late pregnancy. Supplementing with Mg in the last few weeks of pregnancy often helps prevent milk fever as well as managing the risk of grass staggers.

Affected cows are often found down, characteristically with the head swung round beside the body. Early signs can include reduced appetite (perhaps seeking roughage), lower milk production and reluctance to move. Left untreated, they begin to show ‘drunken’ behaviour, walking in circles aimlessly, with vigorous licking, great anxiety and trembling.

Commonly, dairy cows develop a mild form of the disease in which the only signs are a drop in milk production and infertility problems. This has recently been called “sad cow syndrome”.

Milk fever (or hypocalcaemia) in ewes

In ewes, milk fever tends to occur in older ewes in the weeks around lambing (from 6 weeks before to 8 weeks after lambing). It is often brought on within 24 hours of a sudden stress. This might be yarding, transportation, forced exercise, very bad weather or insufficient feed. Interestingly, a sudden change to better feed (e.g. a move to lush pasture) can sometimes trigger milk fever.

Signs include restlessness, trembling, staggering, depression and going down. Ewes are commonly found down on their chest (rather than on their side) with their hind legs extended out behind them, head down and extended forward. There may be a discharge from the nose, they may become bloated and they may abort dead lambs. Affected ewes may just be found dead.

Treatment

Both cows and ewes need Ca urgently. There are many products available, some of which are suitable for injecting into a vein while others (that include Mg) may have to be given under the skin. Check the product instructions carefully!

Subcutaneous injections are absorbed more quickly if you warm the solution (e.g., inside your shirt) before injecting it and massage the site. Use several sites, rather than giving the whole bag of product in one place.

Response to Ca is usually quick (a matter of minutes), although you may need a second treatment for full recovery. If you get no response at all to your milk fever treatment, try something else – it is probably not a simple milk fever case after all.

Prevention

Normal Mg supplementation goes a long way towards preventing milk fever on many dairy farms. Watch feeding levels and feed changes in late pregnancy and early lactation for all cows and ewes. Animals that have had milk fever in the past are at more risk in future and might justify their own mob for special attention.

Downer cows

When cows with metabolic disease go down, it may be difficult to get them on their feet again – they become 'downer cows'. Usually the initial cause is milk fever but grass staggers and/or ketosis can develop as well, because now the cow is not eating. All three can occur together.

Cows go down for other reasons, too – e.g., damage at calving, such as paralysis due to nerve damage in the pelvis.

When the cow has been down for a while, her body weight crushes her muscles and she may not be able to get back on her feet unaided, especially if she is heavily pregnant or very thin or weak. Get veterinary attention right away.

Hip clamps can be used to lift and support the cow, to allow her to graze and encourage a return to standing. Clamps should be padded and not be left on for more than 5 to 10 minutes at a time. Take care to prevent damage to the hips, skin and pelvis. Slings under the abdomen can be used for longer periods.

The longer the cow is down, the less her chances of getting up again. She must have good food and clean water throughout her recovery.

Abortions and Pregnancy-related Problems

Abortions can occur at any stage of pregnancy, although usually only mid to late-term aborted foetuses are big enough to be noticed.

Causes of abortion in sheep

There are various possible causes and it is not usually possible to make a definite diagnosis just by looking. The most common causes are toxoplasmosis (caused by a tiny parasite), *Campylobacter* infection, *Salmonella Brandenburg* and toxins from things like mouldy silage.

Toxoplasmosis ('toxo') is spread through the faeces of cats, which can excrete the eggs for a short time (usually as kittens or young cats). If ewes that have not encountered toxo before ingest the eggs when they are pregnant, they may abort. Toxo can cause foetal death right up to birth and also causes weak live lambs, but the ewe does not appear sick.

Campylobacter infection generally causes abortion in the last 6 weeks of pregnancy. The ewe usually seems otherwise healthy unless the abortion leads to infection in the uterus.

Some types of *Salmonella* cause abortion in ewes, and affected ewes become very dull and may have severe diarrhoea. They require veterinary treatment. Salmonella Brandenburg has caused major abortion outbreaks and deaths of ewes and cows in the South Island in recent years.

Poor quality silage and balage can contain toxic mould products and/or bacteria (e.g. Listeria species) that can cause diarrhoea and/or abortion in ewes. Aborting ewes will require veterinary treatment.

If abortions start, aborting ewes should be isolated and the rest of the ewes should be spread out (if possible) to reduce the risk of infection spreading, preferably in well-sheltered paddocks. Monitor feeding levels, especially in bad weather.

Collect and bury aborted foetuses and membranes to keep scavengers from spreading infection. Take care while handling this, as some abortion diseases can be caught by humans.

If the aborting ewe is unwell, consult a vet as soon as possible. Most common abortion diseases do not cause the ewe much problem and this may indicate something more serious (e.g., Salmonella Brandenburg).

Prevention of abortion in sheep

There are effective vaccines available against toxoplasmosis, Campylobacter and Salmonella infections in sheep. Vaccination should be carried out well before mating or early in pregnancy, according to the vaccine producer's instructions.

Older cats do not usually pose a risk to sheep, so do not heed old wives' tales about getting rid of farm cats to prevent toxoplasmosis. (Note that neutering the farm cats will prevent the kitten problem!) Ideally the top layer of hay should not be fed to younger, more susceptible pregnant ewes if it comes from barns where there may have been kittens. This hay can be fed to non-pregnant hoggets and can help them develop immunity for future years.

Poor quality balage or silage should not be fed to pregnant ewes because of the risk of listeriosis and mould toxins. Avoid any feed that is visibly mouldy or where you doubt the quality of preservation (e.g., if it was made very dry), even if you cannot see mould.

Causes of abortion in cattle

In cattle, a tiny parasite called Neospora causes neosporosis, and this is one of the most common causes of abortion. It is thought that some dogs have a role in spreading the disease. Salmonella Brandenburg has been reported, especially in dairy herds, and may cause cow deaths as well as abortion.

Mouldy hay and silage are common causes of fungal abortions in cattle. Eating macrocarpa foliage can also trigger abortions.

Prevention of abortion in cattle

Dogs should not be allowed to eat afterbirths (placentae) or aborted calves, and pasture should be kept clear of dog faeces as much as possible.

Poor quality balage or silage should not be fed to pregnant cows because of the risk of listeriosis and mould toxins. Avoid any feed that is visibly mouldy or where you doubt the quality of preservation (e.g., if it was made very dry), even if you cannot see mould.

Cows often like to browse tree foliage if they can and must not be allowed access to macrocarpa when pregnant. A hot wire is enough to keep them back.

'Bearings' in ewes

A 'bearing' occurs when the vagina is pushed inside-out. It appears as a mass of flesh bulging from the vulva. It is also known as a "prolapse".

Bearings usually happen in heavily pregnant ewes but can even occur in dry hoggets. They are thought be related to high pressure in the abdomen but there may also be hormonal and other effects. Despite a lot of study, the causes are not fully understood.

Known risk factors include:

- large litters (e.g., triplets), especially in sheep that have had smaller litters before

- steep hills – heavily pregnant ewes often stand with their heads uphill, increasing pressure at the back
- breed – some breeds are more prone to trouble and some seem relatively immune (e.g., Finn) for the number of lambs they have
- sudden increase in feed – ewes suddenly introduced to a large amount of bulky feed, especially if hungry, may have more bearings

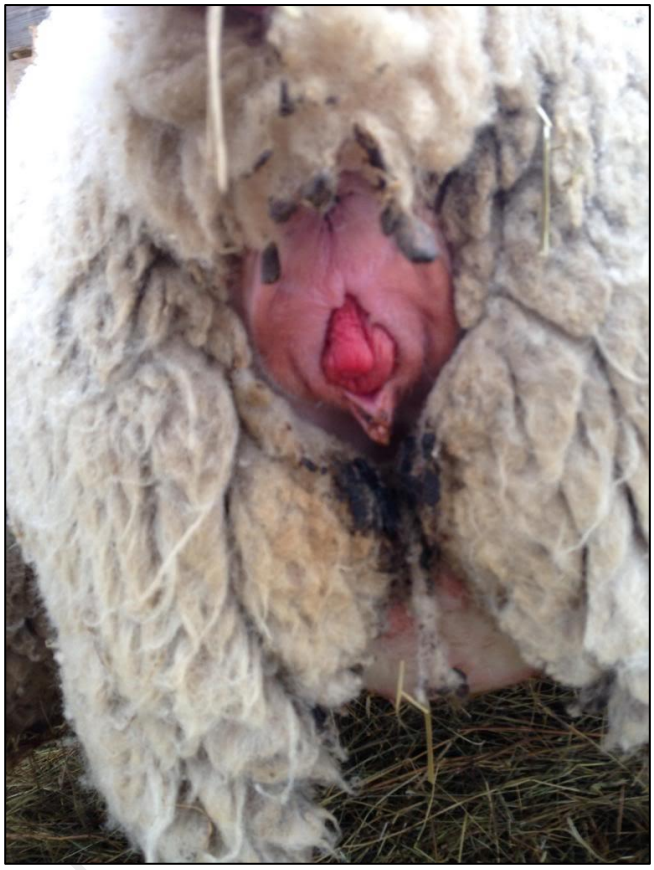

Figure 4 Sheep bearing

Image from: http://www.backyardherds.com/threads/ewe-prolapse-help.28556/. Retrieved 20 September 2015

Despite farmer beliefs, there is no evidence that bearings are caused by ewes being fat. They happen in skinny sheep, fat sheep and those in between. The biggest risk is actually good condition at mating, because these ewes will conceive maximum numbers of lambs and litter size is the biggest risk. If the farm scans a record lambing percentage then a higher than normal rate of bearings is also likely.

The risk of bearings can be reduced by ensuring a steady supply of quality pasture. Recent work in Southland and South Otago suggests some advantages of shifting ewes every four days, rather than daily, in pregnancy. Keeping at-risk ewes off hilly land as lambing approaches, and perhaps encouraging them to take gentle regular daily exercise, may help.

There may be a genetic component to susceptibility to bearings, so it is best to cull ewes that have survived bearings and not to keep their daughters.

It is important to check all ewes in late pregnancy at least once daily for the first sign of bearings. Bearings are easier to treat at an early stage than when the bearing has dried out and become damaged. In advanced cases euthanasia is the most humane option.

It is important to use only humane methods to replace and retain bearings. Talk to a veterinarian about the best methods of retaining bearings.

Treatment involves gently cleaning and replacing the bearing. Hold the prolapse up to allow the bladder to empty before trying to replace it – you will see the mass greatly reduce! Raising the ewe's hindquarters helps make the mass go back in more easily. Lubricant is useful too. Be gentle and expect to spend some

time rather than forcing the vagina back in. Inject antibiotic to prevent infection (which may also cause the ewe to return to straining).

Once the bearing has been replaced, it must somehow be retained or it will prolapse again. Commercial plastic bearing retainers can be inserted into the vagina and tied to the wool to keep them in place but some ewes find the retainer an irritant and may begin straining again. String or wool can be tied across the vulva but seldom achieves enough tension to keep a bearing in.

The quickest and most reliable retention method is stitching. Get the vet to teach you how to do a 'purse string' suture for bearings with a large, curved needle and strong tape. The stitches should be cut when the ewe starts lambing so she needs to be kept where she is easy to observe and catch.

Prolapse in cows

Cows are more prone to prolapse of the uterus. Prolapse can result from dystocia (difficult birth with a lot of straining). Milk fever may be involved in some cases, too. Because of the much larger size of the animal, it is best to call a veterinarian. If the uterus is damaged or very dry then the cow should probably be put down.

Treatment involves removing the placenta (if it is still attached), thorough and gentle cleaning of the surface of the prolapse, and then gently pushing the uterus back in place through the vagina. If the prolapsed uterus has become very swollen and/or dried out, the veterinarian may give the cow an epidural anaesthetic (injection of anaesthetic into the spinal canal) and/or hormone to help the uterus contract. Treatment for hypocalcaemia should be given, and antibiotic by injection.

Birth Problems

All herd animals have a strong instinct to give birth alone in a quiet, safe and sheltered place with no disturbances. It is nature's way of giving the mother and young a good chance to bond, and for giving the youngster time to find its feet and get a good feed of colostrum. It is important not to disturb them unnecessarily. This is especially important for first-time mothers and highly-strung animals – their mothering instincts are more easily overwhelmed by events.

Before birth, pregnant stock should be moved to a clean paddock with plenty of shelter from cold wind and rain. Ewes and cows often seem to choose the most exposed place to give birth but this may be an attempt to get away from the rest of the mob – who happen to be in the best shelter.

The normal birth

Most farm animals give birth naturally with no problems. Once birth begins, keep a watchful eye on events without making the mother aware of your presence. It is important not to interfere unless there is a problem.

The first signs in the mother-to-be are a bulging udder and a swollen vulva. (Note that some first-time mothers show minimal udder development before birth; others have a soft, swollen vulva for many days before birth.) She moves away from the other animals in her group, and womb contractions begin, positioning the youngster for delivery. Fluid and the membrane surrounding the 'baby' appear at the vulva and the membrane 'bag' may bulge or hang from the vagina. Once the bag breaks, she will remain on that spot for birth unless disturbed.

Some people think farm mammals are born in a diving position –front legs extended so their knees are alongside the muzzle – but this is not true. The nose appears over the top of the front feet in a normal delivery, and it is not hard for one or both feet to become stuck (especially if the youngster is relatively large). The mother may lie or stand for a few more pushes, and then the youngster is on the ground, shaking its head.

When things go wrong

The birth can be complicated by the baby animal (neonate) becoming stuck in the birth canal. The chances of the birth process or mothering-up going wrong increase greatly if the mother is disturbed unnecessarily, e.g. by people or other animals.

It becomes important to intervene or to get advice and/or help if the animal has been down straining or if the membranes or part of the youngster have been protruding from the vulva for 10 minutes or more and no progress is being made. You should also act quickly if you can see that something is clearly wrong – e.g., you can see back feet (soles facing up) or a tail.

For more information about assisting with birth and rearing young animals, see the notes for Calving, Calf Rearing, Lambing and similar topics.

Congenital Diseases

Livestock may be born with any one of a wide range of abnormalities that may or may not be fatal. The foetus may die before birth, at or soon after birth, or the defect may not be lethal. The cause may be genetic (e.g. spider lambs in Suffolk sheep) or viral (e.g. hairy shaker disease) or chemical or nutritional deficiency (e.g. selenium deficiency can cause white muscle disease and iodine deficiency can cause swollen thyroids (goitre). The abnormality may be immediately obvious at birth (e.g. an extra limb) or soon obvious (e.g. cleft palate) or it may become obvious at a later stage (e.g. heart abnormality and some sorts of progressive brain abnormalities in sheep).

Gross abnormalities may mean that the dam cannot give birth normally. She may need a caesarean delivery to save her, or the vet may cut up the dead foetus inside and deliver it through the vagina. This is especially likely to be done on a dairy farm or stud farm if a valuable cow has a dead or seriously deformed calf that cannot be delivered normally.

Abnormalities may affect any body system, such as the skin (e.g. absence of hair or abnormal colouration), brain (e.g. hydrocephalus) or bones (arthrogryposis, i.e. twisted limbs).

If abnormalities affect more than one animal it is important to try to find the cause. This means detective work to determine such things as the pedigree of the affected animals, and the diet of the dams throughout their pregnancy.

Diseases of young animals (especially lambs and calves)

Navel infections and joint ill

Navel infection ('navel ill') occurs when bacteria gain entry through the wet navel of newborn animals. Initially this causes inflammation around the navel but infection may travel in the bloodstream, leading to abscesses in the liver and/or it may settle in the joints which swell up with pus ('joint ill'). Early signs include swelling and redness around the navel and perhaps poor appetite. As the disease progresses the lamb or calf may have swollen joints and be lame, or might just be found weak or dead.

Treatment success depends on spotting the disease early. Long acting antibiotic repeated every 48 hours (for 4 to 8 days) may clear a navel infection but established infections (joint ill) are very hard to treat. Daily antibiotic will be needed if the joints are already swollen and it may be kinder to euthanase the animal.

Applying antiseptic (e.g., iodine solution) to the navels of newborn animals is helpful. It should be standard practice on dairy farms when calves are collected, preferably when loading them onto the trailer and again when unloading them at the calf pens. In very dirty conditions, stock should be moved to clean lambing or calving areas.

Watery mouth

Watery mouth is a common infection of lambs caused by the lamb swallowing faecal bacteria (e.g., from dirty wool or teats) before it has had a good feed of colostrum. In the neutral pH of the newborn the bacteria breed quickly. This causes paralysis, swelling and pain of the abomasum and intestine. In response the lamb salivates or drools, showing the characteristic 'watery mouth'. Where watery mouth is a problem it may be necessary to give newborn lambs a prophylactic (preventive) shot of antibiotic immediately after birth.

Good colostrum intake is important for preventing watery mouth. There are commercial colostrum substitutes which can be used if there is any doubt about the lamb's ability to get colostrum from its mother – e.g., to supplement a quadruplet lamb or lambs being artificially reared.

Scours

'Scours' means diarrhoea, i.e. faeces that should be solid but instead are soft, perhaps runny or very watery and even blood-stained. There are many causes of diarrhoea – from irritants in the food to infections. It is always best to assume that it is contagious and isolate the scouring animal, rather than running a risk of scours affecting a whole pen or shed full of lambs or calves.

Scouring is obvious, especially if you see the lamb or calf passing the faeces. You will see soiling below the anus and sheep may become daggy.

You may know the reason – e.g., if you have just changed the feeding regime, changed batch of calf milk replacer or introduced some animals that came from another farm. If many animals are affected then it may pay to call in the vet, especially if you suspect a contagious disease.

Scouring animals lose fluid rapidly and may not get much value from their food. They need electrolyte solution to hydrate them but also need some milk once the worst is over, to enable them to recover. Vets used to recommend electrolyte only, without any milk, until scouring stopped but recommendations have been revised because lambs and calves need protein and fat to grow and repair the gut, even while still scouring.

Untreated scours can be fatal, usually due to dehydration. If the scouring lamb or calf cannot or will not drink, give electrolyte by stomach tube. Suggested treatment regimes:

- mild to moderate scours: milk at morning feed, electrolytes at lunch time, milk at usual afternoon/evening feed time
- moderate to severe scour: Day 1 = electrolyte at morning feed, milk at lunch time, electrolyte at afternoon feed; Day 2 = milk at morning feed, electrolyte at lunch time, milk at afternoon feed; Day 3 same as Day 2 or back to normal milk feeding if recovering.

Remember to keep clean, fresh water available at all times, even if you think the animals do not drink. Once scouring stops, re-introduce the normal milk or milk replacer diet.

Antibiotic treatment may be necessary for infectious scour diseases – talk to the vet. They might also recommend 'probiotics' to re-introduce good bacteria to the digestive system after the antibiotic treatment.

Viruses and cryptosporidiosis

Viruses like rotavirus and a very tiny parasite *Cryptosporidium* can cause diarrhoea in calves, fawns and lambs up to a few weeks old, particularly if they are stressed, housed or hand reared and if they have not had enough colostrum.

Colibacillosis

There are some types of *Escherichia coli* bacterium that are pathogenic (i.e. they cause disease). *E coli* bacteria are called coliforms. Some types cause fatal septicaemia (bacteria circulating and proliferating in the blood-stream) often in newborn animals, and some are toxigenic (enterotoxin is produced by live coliforms and endotoxins are released by dead coliforms) causing diarrhoea and sometimes deaths. The diarrhoea can be pasty or watery, foul smelling and pale. It is especially a problem in young calves up to 4 weeks of age.

Preventing scours

Some lamb and calf rearers have very low rates of scours in their young animals. They achieve this through:

- good colostrum intake by young animals in the first 24 hours, especially in the first 6 hours of life (preferably 600 ml to lambs, 2 litres to calves), or use of a suitable commercial substitute that provides colostrum antibodies
- good hygiene – e.g., clean, well ventilated sheds, well cleaned feeding equipment
- suitable vaccinations for pregnant cows, e.g., against rotavirus

Test Yourself #4

1. What are the three major metabolic diseases and what causes each one?

2. What should you do if you suspect metabolic disease in a cow but cannot decide which one it is?

3. Why should you isolate a ewe that has just aborted and clean up the aborted material?

4. What can you do to help prevent navel infections in dairy calves?

5. How long should you wait after the nose or feet of a lamb or calf appears at the vulva before helping or getting help?

6. How much colostrum should a calf get in the first 6 hours?

7. Why is colostrum so important?

8. What is "watery mouth"?

Infectious Diseases

Some of the most common diseases discussed so far are contagious, Here, in alphabetical order are more significant infectious diseases that you may encounter.

BVD

BVD (Bovine Viral Diarrhoea) is a viral disease that causes big financial losses in beef and dairy herds across New Zealand. A recent estimate for the dairy industry was a loss each year of $37 million. About 90% of farms are thought to have had the virus at some time.

Animals get BVD either directly from another cow or as an unborn calf when the dam gets infected. If cow is infected between 1 and 4 months of pregnancy, the foetus may survive and be born as a persistently infected (PI) animal. PI calves spread the disease. Unfortunately these PI animals can look normal for a while and they can easily go undetected in a herd. Many PI's develop severe diarrhoea and die before they reach 2 years of age but some will persist in the herd as adults causing problems for a long time.

Effects of BVD in adults:

- Poor conception rates
- Embryonic loss
- Increased numbers of long returns
- Increased calving spread
- Abortions
- Stillbirths
- Dummy calves and birth defects
- Temporary infertility in bulls

Effects of BVD in calves:

- Scouring
- Ulcers in mouth
- Weight loss
- Eye and nose discharge
- Immunosuppression (leading to pneumonia, lice, worms and mastitis)

Your vet can arrange blood tests to tell if an animal is PI or if it has been exposed to the virus. Bulk milk samples can also be tested.

Vaccination (Bovilis BVD) can be used as a method of control but it should be used in conjunction with a test and eradication programme for PI animals. The vaccine must be given 4 weeks before cows are served and they need two doses 4 weeks apart, then an annual booster.

Brucellosis

Brucella abortus causes abortion in cows, orchitis (inflammation of the testicles) in bulls and 'undulant fever' in humans. The disease has been eradicated from New Zealand cattle.

Brucella ovis causes inflammation of the epididymis at the head of the testicle and infertility in rams. It can also cause abortion or the birth of weak lambs that may die in early life. In New Zealand it is the subject of a voluntary eradication and accreditation programme. The incidence has declined but outbreaks still occur on some farms.

Clostridial diseases

These include diseases caused by **Clostridium perfringens** type D, *C. chauvoei, C. haemolyticum, C. novyi* type B, *C. septicum* and *C. tetani*. In sheep, the disease caused by *C. perfringens* type D is pulpy kidney (also called enterotoxaemia) and there is also a delayed form of the disease, focal symmetrical malacia (FSE). The organism causes enterotoxaemia in cattle, goats and deer.

Pulpy kidney disease was once common in lambs from 2 to 6 months old, but nowadays thanks to the widespread use of vaccines, it is unusual. It is uncommon in other species. Affected animals are usually found dead and characteristically the carcase decomposes (autolyses) very rapidly after death. FSE is a less acute form of the disease in sheep and it is characterised by brain damage (tremors, staggering, leg paddling, head pressing, coma).

C. chauvoei causes a localised gas gangrene in the muscle masses of sheep, cattle and deer called blackleg. Bruising of the muscle is usually necessary for the infection to establish. Animals are often just found dead and as with all clostridial disease they autolyse rapidly.

C. haemolytica causes bacillary haemoglobinuria, a sporadic rapidly fatal disease of cattle characterised by blood poisoning and haemoglobinuria (redwater). At post-mortem there is a large dead area in the liver where the infection originated.

C. novyi type B causes black disease, a disease of sheep and occasionally other species in which areas of liver damage (for example by liver fluke) become infected leading to hepatitis (liver inflammation) and blood poisoning.

C. septicum can also cause gangrene of muscle in all species, but it occurs more often as a cause of navel infections in lambs. There is a puffy swelling of the affected areas and death is rapid.

C. tetani causes tetanus. Its spores are common in the environment but they only cause disease when they are pushed deep into wounds where they can proliferate in the absence of oxygen. The toxin produced by the bacteria causes muscle rigidity (in advanced cases there is a typical 'saw-horse' position). Early cases can be treated successfully with antibiotic but there is a high mortality rate.

In most cases death occurs very quickly so no premonitory (warning) signs are seen before the animal is found dead.

Fortunately vaccines against the clostridial diseases are very effective, and routine vaccination of stock is the norm on New Zealand farms. For complete protection, stock are given two vaccinations at least 10 days apart and thereafter single booster shots annually. (See 'Vaccination')

Johne's disease

Johne's disease is caused by a tuberculosis-like bacterium (*Mycobacterium paratuberculosis*) that causes progressive weight loss and often diarrhoea, leading to emaciation and death. There is no cure.

The disease affects cattle, sheep and deer and occasionally goats. It occurs throughout the country. In infected herds and flocks, about 25% may be infected but only about 1-2% develop signs of the disease – the rest carry it for life but never show it. Affected cattle typically show diarrhoea and weight loss until death, affected sheep may show only weight loss.

Johne's disease is especially important in deer, which may show one of two syndromes. In adults, sporadic cases occur at about 3 to 4 years of age but usually only a few deer in the herd are affected each year. The signs are weight loss with or without scouring. Johne's outbreaks in young deer (i.e., 8-15 months old) can be major, with affected deer showing rapid weight loss and scouring with green faeces pasted round their tails.

Animals that are well fed and not stressed may carry the disease for life without any signs. However, stresses such as too little feed and/or cold weather, especially in pregnancy, often trigger an outbreak in infected animals in late winter/spring.

The organism is hardy and can survive in the soil for years. There is no effective treatment for the disease and eradication involves a programme of culling affected animals.

Sheep and goats can be vaccinated but this is expensive and has to done before young animals pick up the disease from pasture. Talk to the vet about the possibilities if your farm appears to have a high rate of Johne's disease.

Listeriosis

Disease due to *Listeria monocytogenes* is rare but serious when it happens. Listeria can cause bacterial gastroenteritis and brain infection (sometimes called 'circling disease'). The signs of the gastroenteritis are severe diarrhoea, often with deaths. If the brain is affected, the animal may tilt its head or press the head against a post (or other object), walk around in circles, go into a coma and die. Pregnant ewes often abort.

Listeria bacteria are found in the soil and they thrive in poor quality silage or balage (e.g., poorly preserved, with a high pH). Outbreaks tend to occur in association with feeding poor quality silage, sometimes a few weeks after the feed was given. The bacteria can track to the brain via the nerves from the teeth (they get in through the sockets of erupting teeth) to cause 'circling disease'.

Treatment with antibiotics is worth a try but is seldom successful because animals are usually seen too late and it is difficult to get effective doses of antibiotic to the brain where the infection is seated.

Mastitis

Mastitis is a disease of major importance in the dairy industry but also reduces performance in sheep and beef cattle. It is inflammation of the udder, caused by bacterial infection. It reduces milk output, may damage the udder and can even be fatal. It also costs money in lower production, treatment costs, time taken to treat animals, milk kept out of the vat under antibiotic withholding times and milk downgrades due to high somatic cell counts.

In cows the most important causes are *Streptococcus agalactiae*, Strep. *dysgalactiae, Strep. uberis*, and *Staphylococcus aureus* but there are other bacterial causes (such as *Corynebacterium* species, *Escherichia coli* and *Pseudomonas species*), too.

The udder is usually infected through the teat canal and often there are predisposing factors such as teat or udder injury from milking machines (e.g., excessive vacuum) or very dirty conditions. Mastitis is most common in older animals but it can occur in any lactating animal (including humans). It occurs at any time but is most common soon after calving or in the drying off phase; however, it sometimes develops before calving.

The cow may be off her food, dull, have a raised temperature, dehydrated and unwilling to move. One or more quarters of the udder may be hot, swollen and obviously painful to the touch. Affected quarters may be red or dark ('black mastitis', indicating gangrene). Cows may kick the cups off or be more irritable than usual. Sometimes the animal walks strangely and seems lame as she tries to avoid bumping the udder while walking.

The milk may be 'cheesy', clotty, gritty, watery or bloodstained. The quarter may be reddened and hot, or darkened and cold (gangrenous or dead). In the most severe cases the cow will die. Some badly infected quarters are destroyed by the infection and may slough off over a period of about 6 weeks.

The somatic cell (white blood cell) count (SCC) in bulk milk is tested daily by the dairy company. Individual cows' milk can be tested in the shed, using test kits from the vet and at herd testing. An elevated count usually indicates mastitis (but can also occur if the cow has another infection).

Treatment

Treatment consists of milking out the affected quarter completely and infusing antibiotics through the teat canal. Injected antibiotic may also be used. In some cases the affected quarter (or the cow) may be dried off.

If the quarter is gangrenous then it may be necessary for a veterinarian to surgically drain it or even cut out the dead tissue.

Prevention

Prevention requires good shed hygiene, care after handling an affected cow, and attention to good milking practice. Well maintained plant (especially liners), correct vacuum and perfect milking technique (neither over-milking nor under-milking) are all essential. Corrective management – e.g., stripping a quarter each milking to check carefully for mastitis – should start as soon as the bulk SCC reaches the farm manager's chosen 'trigger level'.

Dry cow therapy ('DCT'; strong antibiotic treatment inside the teat) at drying off can help prevent mastitis but is expensive and not justified for all herds. The vet can advise about the need for DCT in a particular herd.

Teat wounds and sores must be treated effectively and early. It is important to recognise new cases early and separate them for treatment. Repeat mastitis cases and cows with persistently high somatic cell counts should be culled if possible.

Mastitis in ewes and beef cows

Mastitis in sheep tends to occur soon after lambing and after weaning. The most common causes are the Staphylococcus aureus, Streptococcus species, Escherichia coli, Pasteurella haemolytica and Corynebacterium pyogenes. Infection happens through the teat canal and factors that predispose include cold, wet weather at lambing and sometimes scabby mouth affecting the teats. The signs are as for dairy cows.

Mastitis in ewes and beef cows is often first noticed when lambs or calves look poorly fed or a female is seen aggressively keeping her offspring away from the udder. By this time, the udder is probably beyond saving. Gangrenous mastitis may quickly spread up the abdomen and cause death by blood poisoning – it is kinder to destroy the animal before this happens.

If a case is noticed early enough and you have enough time, you can try treatment as for a dairy cow. Milk the affected quarter out and let the animal's own offspring keep feeding from the unaffected part(s). You may save a cow, if not the entire udder, and at least have a calf of suitable weight at weaning.

Pinkeye

Pinkeye (technically infectious keratoconjunctivitis) of sheep, cattle and goats is caused by various bacteria. The surface of one or both eyes looks cloudy, with a watery or gooey discharge. Infection is more likely in dry, dusty conditions and/or when animals are grazing long feed with seed head. All ages of stock can be affected.

There are various treatments available, including powders to dust on the surface of the eye, but most cases heal over time, without treatment. However, in severe cases the surface of the eye may ulcerate, causing permanent damage and blindness, so treatment should be considered for high value stock or pets. Early treatment has the best chance of success without permanent eye damage.

Pizzle rot

Pizzle rot is a disease of male sheep (often wethers but sometimes rams), especially when grazing protein-rich feed. It is caused by the bacterium *Corynebacterium renale,* leading to inflammation of the penis and sheath. Risk factors include:

- breed (Merinos are most susceptible)
- lush, protein-rich pasture, which makes the urine more alkaline (which suits the bacteria)
- poor penis development (more common in wethers).

The signs include sores and/or swelling in the sheath, difficulty in passing urine, pain and a dirty smelly discharge around the end of the penis.

Treatment is more effective in early cases than in chronic cases. It involves taking affected sheep off pasture (offering hay and water only) for 2 to 3 days, possibly giving various urine acidifiers by mouth, applying topical (i.e. on the sores) antibiotic cream and injected antibiotic. Just the change in diet may be sufficient for minor cases.

Pneumonia

In all species, acute pneumonia can cause sudden breathing difficulties and death, sometimes with coughing. In the more chronic forms of pneumonia, especially in hoggets, there may be few obvious signs apart from poorer weight gains and reduced returns from the meat works. Various micro-organisms work together in the lungs to cause pneumonia.

Sudden, severe outbreaks of pneumonia in sheep can follow mustering in dry, dusty yards in hot conditions or shearing, particularly if newly shorn sheep get cold and hungry.

Affected animals can be treated with antibiotics but this is not always successful. Preventive measures include:

- damping down dusty yards

- mustering early in the morning if sheep have to be yarded in summer
- providing good shelter and extra feed after shearing

Clumsy administration of medications like drench or bloat preventive into the lungs instead of down the gullet can cause pneumonia, which is usually fatal.

Salmonellosis

Some *Salmonella* bacteria can cause severe diarrhoea in livestock. Infections tend to occur most often in hand-reared calves, dairy cows and pregnant ewes, especially if they are tightly grazed (e.g., on daily shift or grazing a crop in winter). *Salmonella typhimurium* and *S. brandenburg* are the most common nasties.

Affected sheep are very dull with severe watery and blood-stained diarrhoea. Get the vet involved immediately, because the disease is often fatal and can spread to other types of animal including humans. *S. Brandenburg* often causes abortion and can be fatal to stock.

Scabby mouth

Scabby mouth (also called orf) is a viral disease that causes crusty sores, mainly around the lips of lambs up to six months old. It can also affect goats. Scabs can also form around the muzzle, ears and lower legs, and around the teats of ewes. In most cases the sores heal in a few weeks without treatment. However, it causes problems if the sores are severe enough to stop the lamb from sucking or if it transfers to the ewe's udder. Painful sores on the teats or udder may make the ewe reluctant to let lambs suck and she may develop mastitis.

Thistles and gorse can increase the risk of infection, probably because they cause scratches that then become infected.

There is no treatment, but the sores will heal eventually. Antiseptic creams do not kill the virus but help prevent secondary infections and can aid healing. Lambs can be vaccinated at tailing.

Note that humans can catch the scabby mouth virus, usually from infected lambs or scratching the skin while vaccinating lambs. It commonly causes irritating, itchy, scabby sores on the hands but can transfer from hands to other parts of the body. Beware of secondary infection, which can be fatal if severe.

A closely related virus can cause scabs on the velvet and skin of the head of deer, causing downgrading of the velvet.

Yersiniosis

Yersinia pseudotuberculosis and occasionally *Y. enterocolitica* bacteria cause a disease called yersiniosis, which is most common in sheep, cattle, goats and deer in their first winter. It can be relatively minor, causing only soft faeces for a week or so, but occasionally (especially in deer) it is more severe. In these

cases animals show a watery green (and sometimes bloody) scour and may die unless treated quickly with antibiotics. Stress due to weaning and/or transport seems to increase the risk in deer. They can be vaccinated and this may be a good choice on farms with a history of problems.

‘Notifiable’ diseases

A “notifiable” disease is one for which cases must be reported to the appropriate authorities. While exotic diseases, even if only suspected and not confirmed, must be reported to Ministry for Primary Industries (MPI), there are other diseases that must also be reported to various agencies. For example, incidences of bovine tuberculosis (Tb), in live animals or found in slaughtered carcases, must be followed up and the herd monitored for further Tb infection.

Several zoonoses (diseases that humans can catch from animals) are also notifiable diseases, which must be reported to the public health officer (usually on the staff of the local council). These include campylobacter, cryptosporidiosis, salmonella and toxoplasmosis. The doctor will usually notify the appropriate person when they diagnose the illness and should explain the notification process. You can expect contact from the local health officer for more details about how you caught the disease.

Notification is important in cutting the incidence of these diseases. The health officer will want to trace the source of the disease, perhaps isolate anyone else who may have caught it from you or from the same source, treat a contaminated water supply or close down an unhealthy food supplier.

Test Yourself #5

1. Which age group of deer is most susceptible to yersiniosis: less than 12 months, 2-3 years, old age?

2. What are the signs of yersiniosis?

3. What are the signs of Johne's disease in sheep?

4. At which age are cattle, sheep and deer respectively most susceptible to Johne's disease: less than a year, middle age or old age?

5. What can happen if pinkeye is not treated?

6. What causes mastitis?

7. List at least three predisposing factors that increase the risk of mastitis in dairy cows.

Mineral Deficiencies

Livestock need at least 14 different minerals in their diet in order to maintain good health and production.

Some are required in relatively large amounts because they form a significant part of the composition of the body tissues. For example, bone is made up from mainly calcium (Ca) and phosphorus (P). These types of minerals are known as the major elements.

Others are required in much smaller amounts and they are usually involved in increasing up the rate of the body's chemical reactions (e.g. enzymes). These are known as trace elements.

The essential minerals are:

Major elements	**Trace elements**
Calcium (Ca	**Cobalt (Co)**
Chlorine (Cl)	**Copper (Cu)**
Magnesium (Mg)	Iron (Fe)
Phosphorus (P)	**Iodine (I)**
Potassium (K)	Manganese (Mn)
Sodium (Na)	**Selenium (Se)**
Sulphur (S)	Zinc (Zn)
	Molybdenum (Mo)

The elements in bold type are those which are the most important economically in New Zealand livestock farming.

For more information on the biology of these elements see:

- *Managing mineral deficiencies in grazing livestock (2009*) by ND Grace, S Knowles and AR Sykes. Occasional publication No 15, New Zealand Society of Animal Production.

Livestock usually get all their mineral requirements from pasture. Pasture plants get their minerals from the soil. Therefore mineral deficiencies in livestock are often related to low mineral levels in the soil. For example, many New Zealand soils are deficient in cobalt and selenium. In a few areas, the soils are copper deficient, or high molybdenum and/or sulphur levels interfere with copper absorption.

In other cases the mineral status of the soil (and animals) can be affected by the levels of other minerals in the soil or diet. For example, excessive use of potassium fertilisers can cause magnesium problems in pregnant and lactating ruminants.

The science and management of mineral deficiencies is complex so it is usually best to consult a veterinarian to identify and manage deficiencies. Some properties may have problems with more than one mineral deficiency.

Veterinarians can diagnose deficiencies by arranging blood tests or liver samples (taken from live animals or collected at the meat works). They will interpret the results and tell the farmer if the animals are likely to benefit from mineral supplements and advise on how to provide the appropriate supplements safely and cost-effectively.

Soil mineral tests can also help determine the cause of any deficiency and will help determine what measures can be taken (e.g. fertilizer application) to help correct soil mineral deficiencies.

Magnesium (Mg)

Magnesium deficiency is common in cows in late winter and spring and causes a metabolic disease known as grass staggers (hypomagnesaemia). Refer back to the section on “Metabolic diseases” for information on Mg deficiency, treatment and prevention.

Cobalt (Co)

Cobalt is an important component of vitamin B12 which is involved in energy metabolism in animals. Cobalt deficiency can cause ill-thrift in all ruminants, but particularly in lambs. Affected animals have reduced appetite, poor growth, weight loss, wasting and eventually die. They may show watery discharge from the eyes and scabby ears.

Cobalt deficiency is typical of pastures growing on volcanic soils such as those in the central North Island (Taupo, Rotorua and Bay of Plenty districts).

Clinical Co deficiency is usually treated by injecting vitamin B12. Long-acting vitamin injections, lasting weeks or even months, are available.

Co deficiency can be prevented by applying Co to pastures along with fertilizer. Cobalt can also be presented to livestock in mineralised salt licks. However this is not always reliable as some animals do not like salt licks and will not get enough mineral supplements.

Selenium (Se)

About a third of New Zealand's soils are deficient in selenium. Selenium is used in biochemical reactions that protect cells from damage by peroxide which is released in normal cell metabolism. Selenium deficiency can cause ill-thrift in all species, especially young growing animals.

It can cause specific diseases like white muscle disease in lambs, kids, fawns and calves, at birth or as young animals. It has been associated with infertility in ewes and cows, and reduced milk production and retained afterbirth in cows.

As for Cobalt, Se deficiency can be addressed by top-dressing pastures with Se along with fertilizers.

Selenium can also be included in salt licks and also in 'mineralised drenches'. Long-acting selenium injections are available and there are pour-on products for cattle.

Selenium toxicity

Selenium is required by animals in only small amounts and farmers must take care not to overdose as excess Se can be extremely toxic. Selenium toxicity usually only occurs when animals are getting minerals from several different sources at the same time e.g. fertilized pasture, salt licks and mineralised drenches or pour-ons.

It is very important to involve your veterinarian when treating selenium deficiencies to make sure animals are not accidentally overdosed.

Iodine

Clinical iodine deficiency affects the production of thyroid hormones from the thyroid gland (in the throat), which control metabolism. Clinically deficient animals usually have an enlarged thyroid (i.e., goitre), usually seen in new-born animals. Other signs include poor survival of new-born animals, reduced milk production by cows, reduced wool production by sheep and reduced fertility (ewes and cows). Goats are particularly susceptible to iodine deficiency.

Although serious iodine deficiency is not common, it does occur in some areas. Even where clinical deficiencies are not common, supplementing with iodine may benefit lamb and calf survival.

Iodine deficiency can be induced by feeding brassicas and clovers, which contain chemicals that interfere with thyroid function (goitrogens).

Pregnant cows, does and ewes, and young growing animals, can be drenched with oral potassium iodide solution at intervals. For example, ewes might be treated in mid-pregnancy (around pregnancy scanning time) and shortly before lambing (when 5-in-1 vaccine is given). Long-acting iodine injection products are also available.

Copper (Cu)

Copper is involved in many biochemical functions including those in nerves, blood cells, protein metabolism and hair growth. Copper deficiency causes hind leg weakness, joint (stifle) disease, fragile bones, poor growth rates, infertility, reduced fleece weight, loss of wool and pale, brittle hair. In cattle, Cu deficiency can cause diarrhoea, blood problems after calving, and reduced milk production.

Copper deficiency is more common on peaty soils and leached sandy soils. Livestock species vary in their susceptibility to copper deficiency, with deer and cattle generally more susceptible than sheep or goats. Some breeds of sheep, such as Texel and Finnish Landrace are more susceptible to copper poisoning than other breeds.

Copper availability is affected by dietary molybdenum, sulphur, iron and zinc, and it is often lowest in winter and spring because this is when molybdenum concentrations in pasture tend to be highest. Deficiency may therefore be caused by interference by other minerals rather than lack of copper.

Copper deficiency can be treated with rumen capsules or injections. Copper can also be added to water supplies but care must be taken to avoid toxicity. Beware of adding copper to a water supply serving both cows and sheep, because a beneficial dose for the cattle may be toxic to the sheep.

Copper toxicity

As with selenium, Cu is required by animals in only small amounts. Animals can suffer from copper toxicity if they accidentally get too much copper from multiple sources, e.g. fertilizer, slat-licks and mineralised drenches or other medications. Check with your veterinarians.

Foot Problems

While lameness might not seem much problem in itself, foot problems (especially) cost New Zealand farmers hugely in treatment, lost time (e.g., slow cows coming to the dairy shed) and lost animal production (due to reduced grazing, poorer feed conversion efficiency in unhealthy animals and product that cannot be used due to antibiotic treatment). Lame rams or bulls may lead to poor conception rates, high empty rates and/or long drawn out calving.

Foot rot

In cattle, sheep, goats and deer, foot rot is a painful and debilitating disease that can spread from the skin between the toes into the tissues between the hoof horn and sensitive underlying tissue, then into the joints where it can cause arthritis that is very difficult to treat. It is caused by particular anaerobic bacteria (i.e., bacteria that thrive in the absence of oxygen). These live in the soil and are picked up through minor damage or soft, wet feet. Some animals may carry foot rot with few symptoms, invisibly providing a pool of infection for other animals.

The infection causes pain particularly when it tracks into the horny wall of the toe to separate the horn from the sensitive underlying tissues. The space becomes filled by dirt. The inflammation causes rapid horn growth and the horn often overgrows and becomes distorted.

If a ruminant is lame, the horn has overgrown and separated from the wall of the foot and it smells rotten, it probably has foot rot.

To treat foot rot, the hoof horn should be cut back using clean, sharp clippers (being careful not to draw blood) to expose the bacteria to the oxygen and let the treatment in. Foot bathing with 10% zinc sulphate solution is effective but animals need to stand in the bath (ideally 30 minutes) not just splash through. Formalin solution (4%) is also effective and does not need long standing time but is nasty stuff to deal with and leaves the feet very hard, making future trimming difficult. Formalin-treated stock should stand in the solution for a few minutes, then on concrete for half an hour so that the formalin dries on the feet. Occasionally the vet might advise the use of antibiotics, especially in cattle.

It is wise to cull stock with persistent problems, and pay special attention to the feet of any sires used. Susceptibility to some foot diseases is partly genetic. Some ram breeders use DNA testing for foot rot resistance marker genes so buyers can choose rams with high levels of resistance. This is especially useful for farms with a history of foot rot problems.

There is a foot rot vaccine available for sheep, and a veterinarian will advise on whether it is appropriate to use it.

Foot scald

Foot scald in sheep shows as red, inflamed or blanched, white areas between the claws. It is a bacterial infection common on lush and/or wet pastures and is likely to cause lameness, sometimes so severe that the sheep is reluctant to stand. It can be just as painful as foot rot and can develop very quickly. Scald is common in lambs in a wet spring and can reduce liveweight gains considerably.

Scald often leads to foot rot as the wet skin makes an ideal entry point for foot rot bacteria. It is smart to treat scald as though the animals have the early stages of foot rot, rather than waiting for an outbreak.

A good soak in a 10% zinc sulphate footbath is usually effective. Repeat treatments may be needed if conditions stay damp.

Foot abscesses

Foot abscesses are nasty foot swellings caused by bacterial infection. They contain pus and make affected animals very lame. Strong antibiotic treatment is needed and the damage takes time to heal. It is often wise to cull affected animals, as the problem may recur.

Lameness in dairy cows

Lameness in cows is a significant health and welfare problem on many dairy farms, and causes big production losses. Lameness rates vary greatly between farms, pointing to management factors that help prevent lameness. Dairy farms with low rates of lameness tend to:

- Have good track surfaces, free from stones or other loose material and without pools of mud or
- Have clean, dry yards with no stones on the concrete (where they drive up into the foot if stepped on).
- Let cows walk at their own pace, to and from the shed. Cows will avoid holes or stones if they have time to look and place their feet. Pushed cows, with the heads up or over the back of the cow in front, cannot see or take time to place their feet carefully.
- Treat any lame cows as soon as they are seen.

When conditions underfoot are constantly wet, the horn of the feet becomes soft and this predisposes to bruising. If the cows then walk on uneven surfaces or stones, these cause scratches and bruises. Gravel and dirt can become trapped and infections start. Ideally the track surface should be well-drained on both sides. Compacted base material should be covered with a crowned surface (to shed rain) that stays smooth and relatively dry.

Cows should flow easily in the lane and raceways. Cows turning sharply tend to ‘screw’ their feet on the surface, separating the horn from the sole at the ‘white line’ and letting in infection. Wide, straight races and gateways help to prevent barging or crowding and poor foot placement. The design of yards and sheds should allow easy cow flow and quick efficient milking to minimise the time the cow spends on concrete.

The distance to the shed should be as short as possible, especially in wet weather. Well-drained and firmly compacted resting pads can be used in very wet spells. Corners, especially on concrete, should be gentle.

Lame cows should be treated as soon as possible. Sore feet should be examined carefully to remove trapped stones and overgrown hooves should be trimmed. Lame cows should be kept near the shed for easy access for attention and short walks to milking. If cows are not treated, infections can become chronic and difficult to treat and may spread into the joints.

Good management is very important too. Cows should be moved quietly and slowly so that their heads stay low and they are able to look and position their feet carefully. Rushing causes jarring and injury to the feet. Dogs should not be used if they agitate the cows.

Foot baths or mats containing zinc or copper sulphate or formalin can be used when infections are a problem. Foot baths can be placed in the exit race and used twice daily during problem periods.

Tooth Problems

The most common tooth problems are excessive wear and periodontal (gum) disease.

Excessive tooth wear

With excessive wear, the incisors (front 'biting' teeth) get very short and may be worn down to the gums. Wear increases when soil or sand on pasture gradually files away at the teeth over time (e.g., on soil-contaminated crop) or when grain fed, so it is usually occurs in older stock.

Animals with very worn incisors can do well if they do not have to eat short or stringy pasture. They can be fed long, soft pasture, hay, silage or concentrate feed. However, very worn teeth make effective grazing of short pasture impossible – such animals should be culled before they have bad weight loss.

Periodontal disease

Periodontal disease can cause the incisors to grow long and loose, eventually falling out. Culling is the best option. Occasionally 'gummy' ewes perform well enough if offered long, soft pasture, hay, silage or concentrate feed but few farms can ensure this throughout winter.

Molars (chewing or 'back' teeth)

It is difficult to examine the molars but you might sometimes notice swellings in the jaw or cheek. If the gum and supporting structures around the roots of the 'cheek teeth' (molars and pre-molars) are badly infected, the roots of the teeth and the bone around them become swollen and sore. The animal will be reluctant to chew its cud and it will lose weight. Culling is the only option as there is no cure.

Overshot and undershot jaw

Some animals are born with a lower jaw that is too short – i.e. it meets the top pad well behind the pad's front edge. This is called and 'undershot' jaw or 'parrot mouth'. Sometimes the lower jaw is too long and protrudes – this is an 'overshot' jaw.

In either case, the animal might be able to suckle but it will probably not be able to graze properly. It might grow acceptably to slaughter weight on long pasture. Check breeding stock for these jaw faults, as they can be hereditary.

Test Yourself #6

1. What is the relationship between cobalt and vitamin B12?

2. Name some of the ways in which selenium supplementation can be given to cattle.

3. What are the signs of iodine deficiency?

4. Which species is most susceptible to iodine deficiency?

5. Why are salt blocks or licks not suitable for treating serious mineral deficiencies?

6. List some of the actions that can be taken in dealing with a foot rot problem in a flock of sheep.

7. List some ways to prevent lameness in dairy cows.

Bovine Tuberculosis

Tuberculosis (Tb) is an infectious disease caused by bacteria called *Mycobacterium* species. There are three main types, *M. tuberculosis, M bovis* and *M. avium*. The main hosts for these are humans, cattle and birds respectively. All vertebrates can be affected by Tb but in New Zealand the main concern in farming circles is with *M. bovis* in cattle and deer. Sheep and goats are relatively resistant to Tb. Some wildlife such as possums and ferrets are also susceptible, so these animals can carry the disease, and can spread it onto farmland where it can infect livestock.

The importance of Tb in New Zealand farming

Bovine Tb has considerable economic and political importance. Its presence in livestock can severely damage trade opportunities and restrict exports. It is vitally important to reduce and, ideally, eliminate bovine Tb from our cattle and deer herds.

Tb can be carried and spread by wild animals (especially possums) and this complicates efforts to eliminate it because wild vectors are widespread, difficult and costly to control. However, great progress has been made over the last 10 years, so that Tb is now limited to certain areas and is generally at a low prevalence. However, aerial dropping of 1080 poison for possum control is a hot political topic.

Until 1 July 2013, the Animal Health Board (AHB) was the organisation legally responsible for managing and implementing the National Pest Management Plan (NPMP) for bovine tuberculosis (bovine TB) in New Zealand.

It was restructured to form TBfree New Zealand (www.tbfree.org.nz), which continues to derive its powers from the Biosecurity Act 1993. TBfree New Zealand's mission statement is "To eradicate bovine TB from New Zealand".

The disease

Tb is usually a slowly progressive chronic debilitating disease but it can take a more rapid course. The first lesions are generally small abscesses in the lungs or intestine and in the lymph nodes that drain them, or in the throat. These slowly enlarge and spread. The affected animal eventually loses its appetite and perhaps develops breathing difficulties or a cough, but the main sign is chronic wasting.

Tb spreads from infected animals in saliva. It is easily transmitted between infected livestock by direct contact and from contaminated pasture. Possums dying of Tb will come out during the day, attracting the attention of curious stock (especially cattle). A dying possum's final hiss is enough to introduce Tb to a cattle herd!

Tb testing and movement control for infected herds

Tb is monitored in farmed cattle and deer by testing animals for their reaction. Herds in higher Tb risk area are tested annually while lower risk areas only test every two or three years. Some herds are not tested at all – they are monitored in the routine meat inspection at slaughter.

The test involves an injection of Tb material (which cannot cause the disease), usually beside the tail. Three days later the injection site is checked and the size of lump is noted. A large response means the animal already has Tb antibodies – this animal is labelled a "reactor" and is immediately tagged with a bright orange 'reactor tag'. Usually the animal is slaughtered and the carcase is inspected to confirm the Tb diagnosis. Farmers are paid for the slaughtered animals.

Sometimes animals react because they have been in contact with avian, not bovine, Tb. High value animals may have a further skin test or a blood test to check that they are responding to bovine Tb, rather than being slaughtered immediately.

If the herd has no reactors then it is "Clear" (C) and is given a number to indicate the history of clear tests – e.g., C6 means six clear tests – up to a maximum of C10. Note that this does not always indicate the number of years since Tb was found. For example, farms that trade cattle or deer but have no breeding animals cannot get a Tb status higher than C2. This does not necessarily mean the farm had Tb until 2 years ago; the number cannot be increased because the same animals are not carried over between years.

While Tb is suspected (e.g., due to a reactor or receiving stock from an infected herd), the herd's Tb status is "Suspended". When Tb is confirmed, the farm is identified as "Infected" (I). A newly infected herd is "I1" with further numbers added for every year it remains infected. To become clear again, the herd must have two consecutive clear tests, at least 6 months apart.

The infected herd is placed under movement control and a process of culling affected animals begins with regular strategic re-testing of the herd until the disease has been eradicated. Animals must be tested before leaving the farm and can only go to slaughter except under very strict criteria.

Eartagging regulations

Before 2012, bovine TB was monitored and managed by the AHB through a strict regime of animal identification and movement control. All cattle and deer had to be tagged with AHB approved tags to enable animal movement to be traceable between farms and between farm and slaughter premises.

In 2012 a new compulsory identification scheme came into force. It is called the National identification and tracing scheme (NAIT: www.nait.co.nz).

Amongst other things NAIT aims to contribute to TB monitoring and control by:

- providing fast and accurate tracing of all animals from birth to death or live export

- providing information on the current location and movement history of any animal
- improving biosecurity management

The ability to trace infected animals and properties quickly and accurately should improve New Zealand's ability to control and eventually eradicate TB and also respond and contain the damage from other biosecurity risks such as foot and mouth disease or food safety scares.

The scheme uses two main methods to trace animals:

- radio frequency identification device (RFID) ear tags for animals
- a registry of data (the NAIT database)

Each farmer or person in charge of deer and/or cattle needs to get a NAIT number. This is incorporated into a unique RFID ear tag number for every animal belonging to the farmer. If farmers have separate properties more than twenty kilometres apart (or very large farms where animals may be moved more than 20km within a farm) then more than one NAIT number is required.

The NAIT database stores information about each animal's individual RFID tag number, its location, and the contact details of the person in charge of the animal. From this database, information aims to show the current location and past movements of any individual animal in the scheme.

Cattle were the first livestock species to become part of the scheme in 1 July 2012. Deer were included in the scheme from 1 March 2013. Eventually it is expected that sheep sheep will be included in the scheme at some future date.

Ear tags

NAIT tags use radio frequency identification device (RFID) technology. Each tag has a unique 16-character identification number encoded on the inside of the tag, and can be read by both RFID readers and scanners.

In addition to the RFID number, NAIT tags have information printed on the outside of the tag. This can include a TBfreeNZ/AHB herd number or dairy participant code, the year and animal sequence number.

Farm, meat processor, saleyard and transporter requirements

Farmers need to:

- ensure all deer and cattle are tagged with a NAIT-approved tag
- record all animals onto the NAIT database either themselves (via the Internet) or through a third-party (e.g. a consultant)
- notify NAIT of all farm-to-farm animal movements

Every agent involved in the movement of cattle and deer has to record animal movement whilst in their care:

- Processors are required to record the receipt of all cattle and deer into their processing facilities, and provide the date of slaughter and other details for electronic transfer to the NAIT database.
- Saleyards must record the receipt and dispatch of all cattle and deer and provide the date of transactions and other details (e.g. ownership transfer and individual animal ID) to the NAIT database.
- Transporters, drovers and anyone moving animals are required to record transition points where animals are unloaded for consolidation with other mobs, for new transport arrangements, or when overnighting on a long haul.
- In addition all parties need to comply with existing regulations and schemes (e.g. for bovine TB, and in respect of Animal Status Declaration forms).

Document requirements when moving stock

Animals leaving the farm need to be accompanied by an "Animal Status Declaration" (ASD) form. For Tb purposes, the form details the Tb status of cattle and deer herds, including date of last test for the herd and for the animals being moved (which might be different – e.g., if they were bought in). It is an offence to falsify details about animals and farmers have been prosecuted for lying about the status of animals being moved.

As well as Tb information, the ASD also details any animal health treatments if active withholding periods still apply and the use of things like Johne's vaccine or hormone growth promotants. This information is important for anyone considering buying the animals (e.g., at saleyards) or accepting them onto their farm.

Animals cannot be loaded for transport without a complete ASD and truck drivers are asked not to accept such animals. Likewise, you should not accept any stock (especially cattle or deer) arriving on your farm without a fully completed ASD.

Declared movement control areas (MCA)

Some areas of high Tb risk are declared "movement control areas". Farms in these regions must follow special precautions before moving stock, even though the herds have not tested positive for Tb themselves. Cattle or deer being moved from these farms must have a clear pre-movement Tb test within 60 days of movement (unless going direct to slaughter) and declare the date and result of this test on their ASD.

Wild vector control (noxious animal eradication)

A 'vector' is anything that can carry and spread Tb. While possums (especially) and ferrets are the most common wild animal vectors, Tb is also found in wild pigs and deer. Possums are the main vector risk in many areas. The AHB runs vector control programmes using contractors in high risk areas throughout the country to reduce vector numbers and limit or eliminate the spread of Tb.

Keeping a herd Tb-free

Farmers can reduce the risk of introducing Tb in their herd. Some practical ideas:

- Run a 'closed' or 'self-contained' herd – i.e., do not bring any cattle or deer into the herd from outside the farm. This avoids the risk of unknowingly bringing Tb with purchased stock or grazers. Many herds are closed except when adding stags or bulls for mating. A truly closed breeding herd would have to use AI or breed its own males (but the latter risks inbreeding).
- Buy from low Tb risk farms – e.g., C5 or better, preferably from areas known to have low Tb risks. Avoid buying from low status herds or from within a movement control area.
- Control vectors such as possums and ferrets.

Getting more information

For general information about Tb and the Tb control scheme, cattle farmers should phone 0800 4TB INFO (0800 482 4636), and deer farmers should phone their Tb testing provider. If you have any doubt about the Tb status of animals you have bought or are considering, you can get this information via the 0800 number, too.

Nutritional Diseases

This section includes the effects of too little and too much feed, an imbalanced diet and lack of water, and some specific diseases caused by faulty nutrition, such as bloat and grain overload.

If livestock are not fed enough food or food of suitable quality then they will not grow well or produce milk, wool or other products well. They may lose weight and, in severe cases, can die. There are other causes of ill-thrift and poor body condition, of course, e.g. internal parasites and a wide range of other diseases. However, poor performance due to lack of suitable feed (sometimes referred to as “grass deficiency”) is surprisingly common.

There are various ways of assessing whether growth rates and body weights are on track. Eye appraisal, can be useful (especially for non-woolly animals – e.g., cattle and deer) but more objective measures are important. Objective measures include:

- body condition scoring
- weighing for liveweight – e.g., to compare liveweight with target weights for breed and age
- monitoring liveweight gain – e.g., to see how soon young stock will be finished for slaughter and compare rate of gain with targets.

If nutrition is poor then other aspects of production may suffer – e.g., lower milk output in dairy cows, cows may be slow to return to oestrus after calving, young females (e.g. heifers and hoggets) may be slow to reach puberty, wool weights may be lower than expected, and carcase weights/grades will be poor. All of these are likely to reduce farm profit.

Some common diseases associated with nutrition are discussed elsewhere in this unit – e.g., trace element deficiencies, bone disease (rickets and osteoporosis), metabolic diseases and the main diseases caused by fungal toxins.

Bloat

Bloat can cause problems in spring when grass and clovers are growing rapidly. It usually occurs in cattle but has been known to happen in sheep on feeds such as lucerne. These feeds contain natural foaming agents that generate stable foam in the rumen. Normally rumen fermentation produces gases that are belched up, but the foam is thick (almost like dessert mousse) and it cannot be belched up. The gas accumulates, distending the rumen until the animal is bloated and may die.

You will see the rumen swelling as distension and then a large bulge in the left flank area behind the rib-cage (in front of the hip where there is normally a depression). The animal will stop eating and become restless; it may bellow, repeatedly try to defecate or urinate and regurgitate boluses of herbage. Its breathing will become rapid and more laboured, maybe with the mouth open and tongue protruding, as the rumen puts pressure on the lungs. The beast may groan and grind its teeth because of the pain and discomfort.

If the bloat gets worse the animal will become staggery and the mucous membranes (lining the mouth and nose and eyes) will become blue. Finally it will go down, develop convulsions and die of suffocation and heart failure. It can take as little as 30 minutes from access to rapidly-growing high risk pasture or crop to death.

Early treatment of bloat is usually successful. If treatment is left until the animal is down, the outlook is not good. Take the animals off the feed as soon as you see bloat developing and give an anti-bloat or anti-foaming agent (e.g., bloat oil) by mouth. These products down the foam in the rumen. In an emergency, 100 ml of vegetable oil, or 250 ml cream, or 1 litre of milk may do the trick.

A little gentle exercise may help break down the foam and make the animal start to belch – this is a good sign that pressure is being released.

If bloat is severe and the animal is distressed, call the veterinarian immediately. The vet may need to operate on the rumen to release the pressure caused by the foam. If the cow is very distressed and gasping with head extended and tongue protruding and no vet is available, you may need to do an emergency rumen puncture. This is not for the faint-hearted and is a last resort. Even then, it is best to speak to a veterinarian first to make sure it is the best thing to do. Get someone experienced to show you or explain the procedure to you.

The emergency operation involves plunging a sharp pointed knife into the distended rumen and making a short incision into it. Sometimes the gas will explode outwards so beware of the knife ripping through your hand if this happens. You may need to scoop the foam out by hand. Oils like liquid paraffin or antifoaming agents should be added to the rumen contents, and then the site should be cleansed and sutured like a standard operation site. Get the vet to do this if possible.

Prevention measures

Cows should go into lush clover-dominant pasture or other high risk feeds while still reasonably full, not when they are hungry. Shift them from their last paddock before they are badly hungry or feed hay/silage first. Hungry cattle will gorge, increasing the risk of bloat.

Anti-foaming agents can be sprayed onto risky pasture before it is grazed.

Dairy cows on risky pasture can be drenched once or twice each day at milking time, using with a suitable anti-bloat product.

Some anti-bloat treatments can be given in the drinking water but this may not be enough in wet weather if the cows do not drink as much as usual. Drinking water medication plus once daily drenching may be a practical approach.

Cows can be given long acting (controlled release) anti-bloat capsules, which last for 100 days or more. These ensure that all animals in the herd have continuous bloat prevention and they are ideal for beef cattle on high risk feeds.

Anti-bloat blocks and licks are available but not all animals will take a suitable dose each day. They are not suitable for high risk situations.

Grain overload

Grain overload (also called acidosis) occurs when ruminants overeat low bulk, carbohydrate-rich food such as grain, bread or potatoes (or, sometimes, root crops). These feeds do not require a lot of rumination (cud chewing) because they have little fibre, so the animal does not swallow lots of saliva as it normally would when ruminating. Without the saliva to buffer the acid in the rumen, the rumen pH drops dramatically with excess lactic acid production by the rumen micro-organisms. The result is acidosis and dehydration that can be fatal.

Grain overload usually happens when hungry animals suddenly get access to a high risk feed. The signs are loss of appetite, swelling of the rumen (seen as abdominal swelling), dullness, diarrhoea, dehydration, staggering, going down and death within a few days. Sometimes affected animals seem to recover then go down a few weeks later with fungal infections in the rumen.

Animals that recover from mild grain overload may die a year later when a scab caused by the initial problem releases from the rumen and gets into the bloodstream. The animal is depressed, off its feed and might bleed from the nose if the problem affects the lungs. This is sometimes seen in dairy cows that scoffed grain in the shed last year! These animals are hard to save but antibiotics are worth trying.

Treatment

In mild cases, it may be enough to take the animals off or away from the high risk feed immediately and give a bulky, low carbohydrate feed (e.g., straw or hay) to increase chewing and saliva. Animals with more severe acidosis need an oral dose of something to raise the rumen ph – e.g., sodium bicarbonate ('baking soda'). Call the vet urgently if the animal is distressed.

Prevention

The key to preventing grain overload is to recognise high risk feeds and take care when introducing them to the diet. Some practical tips:

- Introduce carbohydrate-rich, low fibre feeds very gradually over at least a week or two. It takes time for the digestive system of grass-eating animals to adapt to significant amounts of any new food, and this is particularly true if the food is high in carbohydrates. When getting livestock accustomed to grain or concentrate feed, it should be offered at the rate of about 50 gm per head daily for each of the first 10 days. The amount offered can be increased gradually over 1 to 3 weeks until all animals are eating their full ration.

- Choose supplements carefully. Oats are probably less likely to cause problems than wheat or barley, which require a longer conditioning period.
- Stock should not be hungry before any new feed is offered, so they are less likely to gorge. Feeding hay or silage first may help prevent this.
- Do not let greedy milking cows eat grain from the empty bail next door or get a second ration when going round a second time in a rotary shed.
- Concentrate feed can be sprinkled on hay or silage, or spread out in long lines on the ground, allowing ample room for all animals to feed and get used to the new feed. Shy animals need plenty of space to eat.
- Watch to make sure that all animals eat at the same rate. Adjust the total amount fed if some animals do not eat. For example, if you are aiming to feed 200g of barley per ewe per day to a mob of 500 ewes, then you would feed a total of 100kg per day. However, if you can count 60 ewes standing off and not eating, you are really feeding 100kg to 440 ewes – that is nearly 230 g/day/head.
- Grain should always be fed with roughage such as pasture, stubble, hay or straw, and not as the sole diet. The vet can advise you about maximum amounts of grain to feed – e.g., if pasture is short in a drought but you want to flush ewes with grain.

Nutritional problems on brassica crops

Brassica crops can cause several possible health problems depending on the crop, its management, the crop's maturity at grazing and the way animals are introduced to the crop. Some of the most common problems are:

- Poor initial performance on the brassica – many farmers are surprised that lambs or other young stock put into high feed value crops gain little weight in the first few weeks. It takes at least two weeks for the rumen micro-organism balance to change so that animals make the best use of the feed. Introduce animals to the crop slowly (making up the balance of the diet with pasture or other good feed) and allow at least two weeks to adapt to eating the bulk of the diet as crop. Adding fibre (e.g., with pasture around the edge of the crop, hay or silage) can help. Straw is commonly used as fibre for dairy cows on winter crop but lambs are not likely to eat it when grazing a summer crop!
- Redwater (nutritional haemoglobinuria), caused by the SMCO (an amino acid that can cause anaemia on livestock) in crops like kale and rape. High levels of the toxin break down red blood cells, causing characteristic red urine. This is followed by worsening anaemia with loss of appetite and weakness. Deaths are possible. Stock should be removed from the crop at the first sign of redwater.
- 'Rape scald' is common in lambs grazing some brassica types (e.g., rape) when the plants are immature. Affected lambs have fluid collecting around the ears and neck, and the skin eventually goes scabby and sloughs off. They may also show redwater. Remove the mob from the crop and offer shade – recovery should be rapid. Crops that need to ripen must not be grazed until the leaves take on a blue tinge and slow introduction of animals to the crop is important. The seed supplier can usually advise about whether the planned crop needs to ripen – choose an alternative crop if necessary.
- Nitrate poisoning is common where nitrate levels in the plant are high (e.g., if excessive amounts of nitrogen fertiliser have been applied, perhaps because crop growth was poorer than expected).

Brassica crops are particularly prone to high nitrate levels. See the separate section about nitrate poisoning.

Test Yourself #7

1. How does bovine tuberculosis usually spread?

2. What must adult deer or cattle have before they can be transported to another farm 200km away?

3. Why is pest animal control an important part of the strategy to control tuberculosis?

4. On what type of pasture are cattle most at risk of bloat?

5. How can bloat be prevented?

6. What happens to ruminants if they over eat high carbohydrate food such as grain?

7. If you plan to feed grain to a mob, what steps should you take to prevent grain overload?

Exotic Diseases

"Exotic" diseases are diseases that are not present in New Zealand but could arrive from overseas. When we talk about exotic diseases, we are usually referring to some specific diseases that would greatly disrupt agriculture as we know it, largely because of their effects on trade.

Exotic diseases that you are most likely to hear talk about include:

- foot and mouth disease
- bovine spongiform encephalopathy (BSE or 'mad cow disease')
- scrapie (the important sheep form of encephalopathy)
- chronic wasting disease of deer (the deer form of encephalopathy)
- bird flu
- anthrax

Other exotic diseases that we definitely do not want include other vesicular stomatitis, vesicular exanthema, rabies, bluetongue, contagious bovine pleuro-pneumonia and rinderpest.

New Zealand's geographical isolation, short colonised history, temperate climate and absence of significant insect vectors of disease all combine to give it a low disease profile. We are lucky not to have many diseases that can cause major economic losses for farmers and upset trading opportunities overseas. It is important to keep it that way. Importation of any of these diseases would have a disastrous effect on the economy, not just for farmers but for the whole country.

An outbreak of any exotic disease would see particular export products immediately banned from many key markets with no exports possible until New Zealand proved itself disease free again – months or possibly years later. Affected stock would be compulsorily slaughtered and animal movement would be strictly controlled, with compensation to farmers unlikely to match true productive value. Jobs would be lost on farms, at processing works and in businesses supported by the farming economy.

Keeping exotic disease out

MPI Biosecurity is responsible for monitoring New Zealand's animal disease status and keeping it secure, including preventing the introduction of disease at our borders, i.e. at ports and airports, where live animals and animal products could introduce disease, as could passengers if they carry infected animal products or any infected material from animals. That is why it is so important to comply with the requirements of 'border control'.

The number of passengers arriving from overseas is increasing by the day and, with them, the risk of importing exotic diseases. A big effort is made at airports and ports to alert incoming passengers to the dangers and prevent them from bringing in animal products that could spread disease, but the risk if always there. Even fines do not stop some people from trying to bring in banned products.

Everyone entering and within New Zealand has legal responsibilities to comply with biosecurity and other disease-related laws. For example, farmers must report suspected exotic disease and follow the instructions of MPI and other officers directing the control of any outbreak. Failure to do so can lead to prosecution and heavy penalties!

New Zealand also has laws against practices that increase the risk of exotic disease spread. For example, it is illegal to feed protein from ruminant animals back to ruminants. This practice was the source of infection of cattle with BSE in Europe. Beware of the risk of this happening accidentally. For example, a farmer can make feed containing ruminant protein to feed to pigs or poultry, but if cattle or other ruminants get access to it then the farmer is breaching the law.

Reporting suspect exotic disease

Farmers and people working on farms have a legal obligation to report any suspected exotic disease symptoms and can be prosecuted if they do not do so. Early reporting is essential to contain an outbreak if it turns out to be real.

Some exotic diseases are very infectious and because New Zealand's livestock have not been exposed to them they would spread very rapidly. The result would be a catastrophe for the whole country because of the effects on trade.

The signs of exotic disease are many and varied and they can be very subtle! The first sign could be sudden death in a number of animals or it could be blisters in the mouth and between the toes (foot and mouth disease). Any sign of brain disease (e.g., head pressing, circling, drooling without symptoms of other common diseases) should be reported to a vet.

The best rule of thumb is that if any of your livestock develop unusual lesions, strange symptoms unlike anything ever seen on the farm before or any disease that seems to be spreading rapidly through the mob, contact your vet for advice. If you suspect exotic disease and/or cannot reach the vet, phone the MPI hotline on 0800 80 99 66. In the meantime, do not allow any people or stock to leave the farm, for fear of spreading disease. MPI or the vet will tell you when normal movement can resume.

Foot and mouth disease and the other blistering diseases are very infectious. In cattle, foot and mouth disease causes blisters on the tongue, lips, between the claws, on the udder and teats, lameness, smacking of the lips, drooling foamy saliva and rapid spread through the herd. In sheep and goats, there are similar signs but usually milder. In pigs the disease mainly affects the feet, more rarely the mouth and snout, and typically there is widespread lameness in the herd due to lesions in the cleft of the foot and front part of the sole. It is vitally important to contact your veterinarian or MPI if any farm animal shows any of these signs.

The transmissible spongiform encephalopathies (TSE – e.g., mad cow disease, scrapie) usually cause signs of brain disease that get steadily worse but in deer TSE may cause chronic weight loss or acute pneumonia. It

is important to notify your veterinarian or MPI if any cattle beast, sheep or deer over 2 years old shows signs of brain disease that get steadily worse, or if any deer over 2 years old shows steady weight loss for no obvious reason or develops sudden pneumonia and there is no obvious cause.

Livestock in New Zealand are not infected with the TSE agents (the cause of mad cow disease, scrapie and chronic wasting disease of deer) but New Zealand's MPI has to prove this so that New Zealand can trade as TSE-free. Being TSE-free brings huge trading advantages.

In order to demonstrate that New Zealand is TSE free, we have an internationally-acceptable on-going TSE surveillance and monitoring programme. This programme involves laboratory examination of a stipulated number of brains from ruminants that show signs of brain disease. To encourage farmers to report possible cases to their veterinarian, there are incentive payments for the brains of any animals that show appropriate signs. Talk to the vet if you have a cattle beast, sheep, goat or deer that appears to show signs of brain disease that get steadily worse. The vet will euthanase the animal and remove the brain for further analysis.

Legislation

Border control is regulated by the Biosecurity Act 1993 (and associated regulations relating to importation of animals, embryos, semen; and regulations relating to identification of animals; and regulations banning the feeding of ruminant protein to ruminants). Other relevant legislation includes the Animal Welfare Act 1999 and the Animal Products Act 1999.

These laws impose strict controls on the importation of live animals and animal products (including semen and embryos). Importation of live animals requires the permission of MPI and compliance with all MPI requirements, which may include quarantine.

Animal products are subject to rigorous screening, too. For example, there are strict border controls on the foodstuffs that passengers can bring into the country. These are important because food products such as processed meat could contain foot and mouth disease virus; if fed to pigs or ruminants these could be responsible for a disastrous foot and mouth disease epidemic. Semen and embryos can also potentially carry disease.

Transmissible spongiform encephalopathies

From the MPI Biosecruity website: www.biosecurity.govt.nz/pests/

Transmissible spongiform encephalopathies (TSEs) are invariably fatal diseases characterised by lengthy incubation and neurological signs. They are caused by infectious agents of uncertain nature known as prions. The animal diseases in this group are

- scrapie
- bovine spongiform encephalopathy (BSE)

- transmissible mink encephalopathy (TME)
- and chronic wasting disease of deer (CWD)

Scrapie is a fatal brain disease of sheep and goats. It has been recognised in Europe since the mid-18th century and occurs worldwide. Only a few sheep producing countries (Australia and New Zealand among them) are recognised to be free from the disease. The disease has spread by international movement of breeding sheep from infected countries. It was introduced by that means (sheep from the UK) to New Zealand and Australia in 1952. The disease was eliminated by depopulation of infected and in-contact flocks and four year quarantine of the affected properties.

In recent years a condition known as 'atypical' scrapie or 'Nor 98' has been described. Although having some similarities to scrapie, this condition is clinically, pathologically, biochemically and epidemiologically unrelated to 'classical' scrapie. Atypical scrapie/Nor 98 is probably not contagious and may, in fact, be a spontaneous degenerative condition of older sheep.

BSE is mainly a disease of British cattle, although cases have been reported in all but one of the countries of the European Union (Sweden) as well as several other countries in which the disease has been associated with importations of European cattle or meat and bone meal. The epidemic of BSE in the UK has been waning since 1993 and since 2002 in the rest of Europe.

Feline spongiform encephalopathy (FSE) in domestic cats and zoo cats and TSE of antelopes in zoos have been reported in animals of European origin. These TSEs are caused by infection with the BSE agent.

CWD was first observed in the 1960s but until 1997 appeared to be restricted to a rather limited area in the western United States. However, it has subsequently been found in free-ranging and/or farmed cervids in Nebraska, Wisconsin, Montana, South Dakota, Oklahoma, Kansas, New Mexico and the Canadian provinces of Saskatchewan and Alberta. CWD has also been detected in South Korea in an elk imported from Canada.

Cause

TSEs of animals are caused by infectious agents of uncertain nature called prions. Infected neurones contain an accumulation of an abnormally folded form of a normally coded protein known as PrP, which is infectious and is partially resistant to protease.

No DNA has been demonstrated though, in many respects, such as strain variation and mutation, prions behave as if a genome were present. The agents causing TSEs are unusually resistant to most forms of disinfection but are not indestructible.

Host species

Sheep and goats are naturally susceptible to scrapie. The definitive host for the BSE agent is cattle, but it has also been demonstrated to be the cause of feline spongiform encephalopathy (FSE) in domestic cats and zoo cats and TSE in antelopes in zoos. Sheep and goats have been experimentally infected with BSE,

producing a disease indistinguishable from scrapie but very extensive surveillance has allayed earlier fears that BSE could be present in European sheep and goat flocks. CWD affects several species of deer and elk. TME occurs only in mink.

Transmission

Scrapie is contagious. Lateral transmission occurs naturally, possibly by consumption of or exposure to, infected placentas. Infection may also be transmitted to lambs in the milk of infected ewes.

The origin of BSE is not known. Some experts speculate that it may have resulted from the scrapie agent crossing the species barrier into cattle through the practice of feeding meat and bone meal containing tissue from infected sheep. Subsequent to infection establishing in cattle, it was recycled by bovine material included in meat meal. This might also have had the effect of passaging the agent in cattle and favouring the selection of a cattle adapted strain. Though infectious, BSE is not contagious. No lateral spread or maternal transmission has been detected by a number of studies.

FSE in domestic cats caused by BSE agent is presumed to have resulted by ingestion of food containing infected cattle offal or meat and bone meal. Similarly TSE in some captive antelopes was probably caused by feeding of meat and bone meal. In the case of disease in felidae in zoos, direct feeding of uncooked cattle carcasses containing central nervous system tissue is implicated. FSE is not contagious.

The origin of TME is not known but it may have originated from feeding scrapie infected carcases to farmed mink. TME is not contagious.

CWD is contagious but the means of transmission is not known.

Clinical signs

Scrapie is insidious in its onset. Exercise tolerance is reduced and the gait unsteady. Affected animals drink small quantities of water frequently and urinate abnormally, passing small quantities of urine. Pruritus (itchiness) is common (though not present in all cases) and animals rub or nibble themselves in an attempt to relieve the irritation, causing loss of wool. Rubbing the back commonly stimulates a nibble reflex. Animals may be nervous or aggressive and may separate from the flock. Hypersensitivity to sound or movement may be seen. Muscular twitches or tremor may occur. Ataxia of the hind limbs is a major feature. Sometimes animals will hop or trot. Some animals, however, are found dead without apparently having shown any of those signs. (This was the case with the animals that died of scrapie during quarantine of sheep imported into New Zealand from the UK in 1972.)

BSE has a peak incidence in cattle 4 to 5 years old. Affected animals may exhibit hypersensitivity to touch or sound, excessive nose licking and teeth grinding, apprehension and frenzy, and abnormalities of posture and gait including low head carriage, arched back, abducted, stiff, straight and straddled hind limbs, hind limb ataxia, swaying, trotting, hypermetria and falling. There is loss of condition and milk yield. The clinical

course of the disease usually lasts a few months, but can be as short as 2 weeks or as long as a year or more.

In captive antelopes, SE has a short clinical course. The signs are neurological and mimic those of scrapie and BSE in cattle.

In domestic cats, SE results in ataxia and abnormal behaviour. Altered grooming habits and hyperaesthemia are common. Abnormal head posture, tremors and salivation occur in some cases. There is difficulty in positioning for defaecation or urination. Animals walk with a crouching gait. Unusual aggression or timidity may be exhibited. In captive wild felidae ataxia is a consistent feature.

CWD is characterised by a loss of body condition and changes in behaviour in affected deer or elk. Animals may become anti-social and difficult to handle. They may show repetitive behaviours such as pacing, sleepiness or depression, or may carry their head and ears lowered. In later stages many animals drink and urinate excessively, lose their coordination, drool and slobber profusely and have difficulty swallowing. Death is inevitable.

However, sometimes signs are not so obvious and it is not uncommon to see cases of older animals in excellent condition losing weight quite suddenly, not responding to treatment, and dying from pneumonia caused by inhaling food or cud.

Most cases of CWD are in animals three to seven years old, although the disease has been seen in animals as young as 17 months and as old as 15 years. The length of time the animals are sick may vary from a few days to a year, with most surviving for only a few months. Occasionally sudden death may occur.

In mink affected with TME, hyperaesthesia, hyperexcitability and increased aggression are common signs. Ataxia develops, a creeping gait is adopted, circling and body tremors occur and blindness is common. The course of clinical disease is a few weeks.

Diagnosis

The presenting clinical signs usually suggest the possibility of a TSE. Confirmation can be made by microscopic examination of brain tissue for neuronal vacuolation and other pathological changes. MPI's National Centre for Disease Investigation acquired the new "Prionics" western blot test for TSEs in 2000. This test has the advantage that it can be applied to brain samples which are not fresh enough for microscopic examination.

Risk of introduction

Scrapie would only be introduced by the importation of live sheep from countries where the disease occurs. New Zealand policies permit the importation of sheep embryos and semen, as accumulated scientific research has shown that these commodities are unlikely to transmit scrapie. Nevertheless, importation is via a rigorous quarantine process.

BSE could be only introduced by imported live cattle or meat and bone meal. New Zealand import policies prohibit importation of live cattle and meat and bone meal from countries where BSE occurs.

CWD could be introduced through importation of deer and elk, or their semen and embryos, and for this reason importation of these from North America have been suspended.

Effects of introduction

Introduction of scrapie could have adverse effects on the export of live breeding sheep and embryos. Meat exports would probably not be affected, but the developing biopharmaceutical industries could be severely affected. The cost of any control programme would be considerable.

Introduction of BSE would have a much greater impact. It would require the exclusion of a range of tissues (so-called Specified Risk Materials) from all animal and human food chains, possible exclusion of cattle over 30 months of age from food chains, and possible testing of cattle at slaughter. Exports of meat, biopharmaceuticals and livestock would all be adversely affected.

Control

Any diagnosis of scrapie would almost certainly result in quarantine of the entire sheep or goat flock in which affected animals were found. Further action would depend on the results of epidemiological investigation to determine the extent of the problem and consultation with the sheep industries over their willingness to embark upon a control programme. Destruction of affected flocks and in-contact flocks was the policy followed in the early 1950s when the disease was introduced by sheep imported from UK. Though expensive, it was effective.

BSE would be dealt with by destruction of individual affected animals, and incineration of their carcases. Offspring of clinically infected animals would be traced and probably destroyed.

Foot and mouth disease

Foot and Mouth Disease can affect all cloven-hooved animals such as cattle, sheep, pigs, goats, llamas and deer.

The virus is naturally transmitted by direct contact with animals and animal products. The virus can also survive outside a host for a limited time and can be spread through human and mechanical activity as well as being airborne. Infected animals can spread the virus simply by breathing, and the virus is also present in their nasal discharge, saliva, blood and fluid from burst blisters.

Animals can be contagious for up to four days before they show any signs of the disease. They can also act as carriers without showing any signs of Foot and Mouth.

Foot and Mouth rarely kills adult animals, but because recovery is often prolonged and infected animals spread the disease rapidly, quarantine combined with the slaughter of affected animals is often the only viable method of control.

Protecting your farm

The New Zealand Government is committed to taking every possible step to prevent Foot and Mouth entering New Zealand but farmers must be prepared and able to move swiftly in the event of an outbreak.

All New Zealanders need to take the threat of Foot and Mouth very seriously, and farmers are very important in ensuring New Zealand is kept free from Foot and Mouth. Farmers and rural residents can help prevent an incursion of Foot and Mouth.

What to do

1. Keep a close watch for signs of Foot and Mouth:

   Cattle

   Slobbering and smacking the lips; shivering tender feet with sores and blisters; raised temperature; reduced milk yield and sore teats.

   Deer

   Symptoms are generally mild; raised temperature; lameness and depression; blisters in and around mouth and hooves; off feed.

   Sheep and Goats

   Sudden and severe lameness; with a tendency to lie down; raised temperature; blisters on the hoof and mouth; generally off colour.

   Pigs

   Sudden lameness, with a tendency to lie down; raised temperature; squealing when attempting to walk; blisters on the upper edge of the hoof (where skin and horn meet); blisters on the snout or tongue; off feed.

2. Report any signs immediately to MPI by calling the emergency hotline on 0800 809 966.

3. Update and keep detailed records of stock movement on and off the property (starting now).

4. Be sure to adhere to standard biosecurity measures such as disinfection of farm equipment.

Dealing with overseas visitors

If your visitor has been in a foot and mouth infected region and is returning to a farm in New Zealand, then as an added precaution do not allow them to go near livestock on the farm for seven days from the time of last contact with animals or infected places in a foot and mouth region overseas.

This is the length of time the foot and mouth virus could possibly survive outside of a host. MPI recommends that people who have been in heavily contaminated environments (on infected farms) not contact animals in New Zealand for at least seven days since contact with the heavily contaminated environments. FMD transfer by humans occurs by two possible means: on clothing and footwear, and in nasal passages. Risks associated with clothes and footwear are managed by ensuring cleanliness and disinfection (which is managed by MPI at the New Zealand border). Risks associated with carriage in the nasal passages are managed by the seven day stand-down recommendation. This is an extremely conservative measure: the data indicate virus carriage in nasal passages of humans only occurs for up to 28 hours.

The length of time the FMD virus survives outside a host varies greatly, depending on the medium, temperature, and pH. This has been well-studied, and there is a great deal of data on survival in different products. In some circumstances, survival may be for a number of months.

Zoonoses

Diseases that people can catch from animals are called zoonoses (singular = a zoonosis; also called 'zoonotic diseases'). There are about 30 zoonoses in New Zealand. The following are the most common zoonoses associated with the handling of farm animals.

Zoonoses are typically most dangerous to the very young, the old and anyone with a poor immune system. It is important to understand the risks, for yourself and (especially) children on the farm.

Campylobacter

Campylobacter can cause scours in lambs or calves and abortion in ewes. It affects humans with vomiting and diarrhoea, usually caught through infected water supply, from food or contact with infected lambs or calves. Illness can be nasty with dehydration. Campylobacter is a notifiable disease and the local health officer will want to trace the source of infection to reduce the risk of spread to more people.

Cryptosporidiosis

Cryptosporidium parvum is a protozoan parasite commonly found in the intestines of a wide range of animals, and adults can be symptomless carriers. It usually causes disease only in calves, young deer, lambs and goats up to 3 weeks of age. Cryptosporidiosis in animals can cause profuse diarrhoea that is very difficult to treat and is often fatal.

Humans are most commonly infected through contaminated water or food, but can also develop cryptosporidiosis through poor hygiene after handling infected animals. Most affected people suffer watery diarrhoea for a few days but severe disease can require hospital treatment.

Hydatids

Hydatids is a tapeworm disease that can be fatal to humans. It has been eradicated in New Zealand but still occurs in some other countries. Hydatids tapeworm eggs from dog faeces are picked up by grazing sheep and develop into cysts in the sheep's abdomen. People most commonly catch hydatids from dog faeces (e.g., in the children's sandpit!) and suffer similar cysts, affecting the stomach or other organs (including the brain).

New Zealand eliminated hydatids through control programmes including compulsory 6 weekly dosing of dogs. Sheep carcasses are still inspected for cysts at meat works. (Farmers should still dose dogs against tapeworms to control sheep measles.)

Leptospirosis

In the past, leptospirosis was one of the most common zoonoses in New Zealand, with a peak of over 400 cases reported annually in the 1970s. In recent years the vaccination of cattle and pigs has reduced the incidence in humans to less than 200 a year.

'Lepto' is caused by Leptospira species bacteria, carried by cattle, pigs, sheep, possums, rats, mice and hedgehogs. Transmission to humans is usually by contact with infected urine (e.g., when a stressed animal urinates during handling) or water contaminated with urine. Infection is thought to be by direct entry of bacteria through skin cuts or through the eyes, especially from urine splashes in the face.

Dairy farm workers were most at risk until vaccination became widespread. Dairy farms routinely vaccinate heifers entering the herd (with an annual booster thereafter) because of the Occupational Safety and Health (OSH) implications if staff catch an easily prevented disease at work. These days meat workers face more risk than dairy farm staff, due to exposure to infected kidneys or urine. Few farm workers are aware that sheep can carry lepto – assume you are at risk whenever you contact animal urine.

Orf (Scabby mouth)

Scabby mouth is a disease of sheep (and occasionally goats). The virus may persist in the environment for many months after the lesions are gone. Human infections are usually caught from infected lambs (e.g., through scratches or abrasions on the hand) or accidental self-vaccination with the live scabby mouth vaccine. Pelts or wool can also convey infection.

Signs usually start as a single sore on a finger, hand, wrist or forearm. A red spot develops over a few days into a large painless blister. This crusts over and forms an ulcer, which usually heals in 4-6 weeks. Sheep farmers and meat workers are most at risk. Although orf is not a major risk, secondary infection through the orf lesion can cause septicaemia – seek medical attention if you have an orf lesion and then see red spots along your arm or have swollen glands (e.g., under the arm or armpit).

Ringworm

Ringworm is caused by Microsporum and Trichophyton fungi and is seen as raised, red, itchy patches on the skin (often hands, arms or face). Most zoonotic ringworm infections in humans are caused by M. canis and occur in children who have handled infected cats. However, every year some farm staff (or their children) catch T. verrucosum from infected calves. Ringworm can be treated with fungicide cream.

Salmonellosis

This is caused by a various strains of Salmonella carried by animals, especially cattle, sheep, pigs and birds. The bacteria live in the intestinal tract of infected animals and may cause diarrhoea, abortion and death, but are often spread by carrier animals that show no signs of disease.

Infected humans may develop diarrhoea, dysentery and septicaemia (blood poisoning), which can be fatal. Infection is most likely through food contamination or poor hygiene measures after handling infected animals. S. brandenburg has recently spread to many sheep farms (and some dairy farms) in the South Island and is a major cause of sheep abortions. Farm workers should be particularly careful when handling aborted foetuses and other material from ewes suspected of being infected. There have been a number of human infections (including vets!) with this organism, resulting in severe diarrhoea and dysentery.

Tetanus

Tetanus is not a true zoonosis (i.e., you do not catch it from an infected animal) but Clostridium tetani, is common in the soil, especially around yards and other high stock intensity areas. C. tetani gets in through a wound (especially a puncture-type wound), then multiplies and produces toxin. The toxin travels up the peripheral nerve fibres to the spinal cord and brain. Often the first symptoms of tetanus are spasms of the eye muscles and jaw (lock-jaw). Without treatment, the mortality rate in humans is about 50%. If you suspect tetanus or have been in contact with tetanus-affected animals, see the doctor.

Toxoplasmosis

In adult humans, toxoplasmosis is usually mild and passes quickly but occasionally causes a nasty flu-like disease with painful joints, lethargy and headaches that can continue for weeks. However, if caught by a pregnant woman, toxo can pass to the baby in her uterus, causing serious and abortion.

Humans usually acquire the infection by inadvertently ingesting (eating) Toxoplasma oocysts from cat faeces (hence the reason why pregnant women should avoid contact with cats and particularly kittens) or in poorly cooked meat. Many New Zealand children catch toxo as children (e.g., from cat faeces in the sandpit), which causes mild illness as a child but leaves them immune as adults.

There is a risk of infection in humans managing sheep flocks that are having toxoplasmosis abortions and pregnant women should avoid aborting sheep or any aborted material. Everyone handling aborting sheep should be scrupulously hygienic, and avoid putting soiled hands near their mouth.

Tuberculosis

Tuberculosis in humans is usually caused by Mycobacterium tuberculosis but in a small number of cases (the zoonoses) it is due to M. bovis – i.e., bovine Tb. Possums, ferrets, cattle, deer and feral pigs are the major reservoirs of M. bovis infection. Diseased animals can have tuberculosis lesions in the lungs and lymph nodes of the throat, chest, abdominal cavity and carcase. Tuberculosis caught from animals is most likely to be contracted by drinking unpasteurised milk from an infected cow, handling infected animals or working in confined areas with them and breathing in contaminated dust or droplets breathed out by the animals.

Prevention

Good general hygiene protects against most zoonoses. Sensible steps for farm workers and others who handle animals (e.g., veterinarians, laboratory technicians and scientists) include:

- Always wash your hands and arms thoroughly before eating, smoking, touching your face or blowing your nose – no matter what work you have been doing. It is simply good hygiene.
- Assume that your hands, wrists and forearms are contaminated after handling any animals, animal discharges or excreta, raw meat, pelts or fleeces. Thoroughly wash your hands and arms (and remove contaminated clothing) before putting your hands near your face, handling food, smoking (especially “roll your owns”) or drinking. Beware of risks if you chew your nails, blow your nose or rub your eyes, nose or mouth.
- Wear protective clothing, especially gloves, particle masks, aprons or disposable suits and gumboots, wherever you are likely to be exposed to infected animals, discharges or excreta from suspected infected stock.
- If you have cuts or abrasions on your hands or arms, cover them with dressings, gloves or protective clothing or avoid handling any animals or animal products.
- Avoid splashes of urine, faeces or saliva to eyes, nose and mouth. If necessary wear goggles, face shields or full-face masks and breathing equipment (for high risk handling).
- Dairy cattle are routinely vaccinated against leptospirosis for the protection of the farm staff. Other cattle, pigs and deer can also be vaccinated against leptospirosis. Deer can be vaccinated against yersiniosis to reduce levels of infection in the herd.
- People working with animals or in a rural environment should be vaccinated against tetanus and boosted every 5 years.

If you suspect a zoonosis

If you are feeling unwell and suspect that you may have contracted a zoonosis, take it very seriously. See your doctor immediately and give him or her a detailed, accurate history of your animal contact or exposure to potential infections. Do not be embarrassed about catching a disease from an animal – you will not be the first (or last) person to do this.

Test Yourself #8

1. Name three exotic diseases.

2. How does New Zealand keep exotic diseases out of the country?

3. What must you do if you suspect an exotic disease on the farm?

4. Name four diseases that people can catch from farm animals.

5. Why is leptospirosis not much of a risk on modern dairy farms?

6. What are the symptoms of toxoplasmosis in people?

7. What should you do if you suspect you have caught a zoonosis?

Diseases of Goats

Although goats generally face similar health problems to sheep, there are some differences. The major one is their susceptibility to internal parasites. Throughout their lives, goats are very susceptible to worms in their stomach and intestines and they do not develop immunity as mature sheep do. Heavy worm burdens cause ill-thrift, weight loss, diarrhoea, even anaemia and deaths. Anthelmintics can get rid of worms carried by the stock but do not reduce the incoming infestation from the pasture.

It is essential to give the correct type of anthelmintic (known to be effective on the farm), to give the correct dose and to drench at appropriate intervals. Giving too little drench is ineffective and will rapidly increase drench resistance in the worm population. Giving too much drench is costly and can cause poisoning, especially if selenium has been added to the drench.

Pasture management

Good pasture management can reduce the larval challenge to the goats, reducing the need to drench, improving animal performance and slowing the development of drench resistance. Sheep share the same internal parasites but grazing goats with cattle or horses (which have other parasite species) can help prevent the build up of harmful worm larvae on pasture. Grazing longer pasture also helps, as the majority of larvae are found at the base of the sward. Feeding browse (i.e., taller shrubs and trees) is good, because these plants are generally free of internal parasites larvae. Cutting grass and carrying it to goats from safe pastures or feeding supplements might be costly and a lot of effort but helps keep worm burdens down.

Efficient drenching

Efficient drenching involves giving an effective anthelmintic at strategic intervals to keep worm burdens in goats down to a level at which they are doing no significant harm. Read the instructions on the drench container and give each goat the correct dose for its weight. It is very important not to under-dose (this favours drench resistance) or over-dose (there may be a risk of toxicity). If commercial animal scales are not available, then use bathroom scales. Weigh yourself, then pick up the goat and weigh yourself and the goat – the difference is the goat's weight. Do this with the largest animals in the mob to make sure you set the dose rate high enough.

To reduce the risk of drench resistance, the less drenching that can be done to control the worm burden the better. Other management techniques (e.g., grazing management) are important for this. Minimal drenching at strategic times with an effective drench is best. Talk to the vet about a suitable drenching programme and other strategies for worm management depending on the farm and other animal species.

Not all drenches are licensed or particularly effective for use in goats. For example, levamisole ('clear') drenches are not particularly effective in goats, they are not licensed for use in goats and are NOT recommended. Most goat farmers tend to rely on the ivermectin, abamectin, doramecton, moxidectin types but heavy use of these may mean that the worm population becomes resistant. These drenches are NOT suitable for use as a quarantine drench when new goats arrive on the farm.

All anthelmintics have a withholding time after administration before milk from treated animals can be used. These times are clearly shown on the label and are legally binding. Note that the withholding time for a drench used in pregnant animals may run into their lactation.

Faecal egg counts

If a drench has been effective, there should be no parasite eggs in faecal samples taken 7 to 10 days later. Your vet can arrange post-drenching faecal egg counts to check drench effectiveness. If egg counts are not zero then the dose rate may have been wrong, the drenching technique (e.g. the drench gun) may have been faulty or the worms may be resistant to the drench used. Talk to the vet about interpreting the results and a new drenching strategy for the future.

Drench resistance

Drench resistance means that some or all of the worms in the goats are not being removed by the drench used. Once you have drench resistant worms in pasture and in livestock on your farm, it is very difficult or impossible to get rid of them, and you must change to effective drenches and test for drench effectiveness to maintain good worm control. Note that drench action is usually greatly reduced in goats because their livers break down the active ingredients very quickly. This means the level of active ingredient falls quickly to below-effective rates, increasing the risk of drench resistance (particularly if the initial dose was low for the size of the animal).

Withholding times in dairy goats

Withholding times for meat and milk must be observed. This means that after the drench has been given, milk or meat from the goat should not be used for human consumption until the withholding period has lapsed. Breaching the withholding period is likely to result in product being rejected by the processor and/or legal action (including heavy fines). Remember to observe the withholding period for meat or milk for your own consumption, too.

For some of the long acting third generation drenches this is a remarkably long time, so think about this when planning the drenching programme. This type of complication makes it important to get advice from a veterinarian when there is any doubt about choosing a drench which is both suitable for dairy goats (especially) and effective in controlling worm burdens.

Trace element deficiencies

Goats need more iodine and selenium than sheep. Iodine deficiencies cause goitre in newborn and young kids, ill thrift and possibly myxoedema (thickening of the skin and underlying tissue) in growing kids. Selenium deficiencies lead to white muscle disease in newborn and growing kids and maybe ill thrift, too.

Iodised salt licks may be sufficient to lift iodine levels if the soil is only mildly deficient in iodine. Oral dosing with the potassium iodine once or twice a year is a better way of ensuring that all animals get a suitable dose. Iodine is especially important on deficient farms for does before mating and in mid pregnancy.

Selenium in the worm drench is not enough to treat true selenium deficiency but can lead to toxicity if you are using other selenium products (e.g., prills in the fertiliser or injected selenium products) as well. Talk to the vet about effective and safe selenium supplementation for the farm's situation.

Foot problems

Goats are generally prone to more foot problems than sheep. Foot scald is common in mild, wet weather, making the skin between the claws sore and white or red. Foot rot can lead to pockets of infection underrunning the horn and distorting the hooves. Keep the feet neatly trimmed and use regular footbaths in 10% zinc sulphate to prevent foot problems and may help treat early cases. Antibiotic injections may be necessary for longer standing and more serious infections – talk to the vet about this.

Clostridial diseases

Pulpy kidney disease, tetanus and black leg are less common in goats than sheep but still occur from time to time and are usually fatal. Prevention is by vaccination using the same products as for sheep. Kids can be vaccinated with 5-in-1 clostridial vaccine at 10 to 12 weeks of age, and boosted at 4 months of age. Annual boosters should be given to does before kidding.

Kids up to 3 months old are usually protected from clostridial diseases by antibodies absorbed from their mother's first milk (colostrum) if she has been vaccinated. Kids need at least 150 ml of colostrum in the first 24 hours of life to give them this protection.

The economic impact of animal diseases

Most diseases cause ill-health that leads to loss of productivity (reduced meat, milk or wool production) and sometimes deaths, and this of course eats into profits.

In controlling and preventing diseases, there are animal remedies to be purchased, veterinary bills to be paid and management practices to be implemented. This all adds to the financial cost to the farmer.

The economic impact of any particular disease varies hugely depending on the severity of the disease, its political importance, how infectious it is and how common it is.

For example diseases like tuberculosis may be present on one farm but not on another, and there is a compulsory Tb control programme that involves testing, slaughter of reactors and restrictions on stock movements. The costs of complying and the effects of restrictions on moving livestock from the farm.

The costs of vary widely from one part of the country to another. In the North Island, there are expenses associated with control and treatment of diseases like facial eczema and ryegrass staggers, whereas in the south there are fewer significant diseases to threaten stock. Throughout the country, all livestock farmers must take steps to control worms and in many areas trace element supplementation is necessary. On dairy farms mastitis and bloat control may be important.

In general the costs of establishing a good animal health programme are more than offset by the resultant improved productivity and profitability of the herd or flock.

Test Yourself #9

1. Goats have a higher requirement than sheep for which two minerals: cobalt, selenium, copper, iodine?

2. Why do goats tend to have more problems with internal parasites than sheep?

3. Goats do not get foot rot – true or false?

4. How can clostridial diseases in goats be prevented?

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“Standard Procedures for Veterinary Nursing and Animal Care”, second edition. NZVA, 2001.

Useful websites

- Beef+Lamb New Zealand — www.beeflambnz.com
- Biosecurity NZ — www.biosecurity.org.nz
- DairyNZ — www.dairynz.co.nz
- Deer Industry New Zealand — www.deernz.org.nz
- Lifestyleblock Magazine — www.lifestyleblock.co.nz
- Ministry for Primary Industries — www.mpi.govt.nz
- National animal identification and tracing (NAIT) — www.nait.co.nz
- Parasite drenches - Merial New Zealand — www.merial.co.nz
- TBfree New Zealand — www.tbfree.org.nz

Test Yourself Answers

Test Yourself #1

1. *Isolation (moving away from the flock or herd), dull, not eating*
2. *(2)*
3. *The most important clinical signs – pulse rate, body temperature and respiration rate*
4. *Cattle 38-39 degrees C, sheep 38-40 degrees C, deer 38-39 degrees C*
5. *Fever, hot environment, exercise*
6. *Cold environment, near death, hypothermia, slow metabolism (due to low thyroid activity)*
7. *Facial artery in cattle, femoral artery in sheep*
8. *Painful chest conditions such as broken ribs or pleurisy*
9. *Pinch or 'tent' the skin with your fingers and watch how quickly the fold disappears*
10. *a, e, f*
11. *Because it is independent of body frame size – i.e., at a given weight a big animal might be thin while a smaller-framed animal is fat. Also, animal performance is often more related to condition than actual weight (e.g., lambing performance, milk production)*
12. *Lack of water, underfeeding, sudden change of feed, cold wet weather, biting or barking dogs, sudden or loud noise, unfamiliar or uncommon situations – e.g., travel on a truck, first time into the milking shed, shearing and crutching, being separated from young – e.g., weaning or accidental separation, being mixed with unfamiliar stock – e.g., mobbing up two mobs of young bulls, use of an electric prod*
13. *The animal is given a low dose of the disease-causing organism (possibly inactivated). This causes the immune system to start producing antibodies to the disease and enables the animal to respond quickly to this disease agent in future. May need two initial doses, perhaps an annual booster thereafter.*
14. *False – most of the parasites are in the pasture, not in the animals*
15. *When an animal is sick and we do not know why, when an animal is sick and we fear a contagious disease, if a neighbour's animals arrive and we do not know what diseases or parasites they could be carrying, if cattle or deer are dropped off without their animal status declaration (see the section about tuberculosis), if we suspect an exotic disease*

Test Yourself #2

1. *"A combination of clinical signs resulting from a single cause or so commonly occurring together as to constitute a distinct clinical picture". What that really means is "things you commonly see that give you a good idea of the most likely problem!"*
2. *Neosporosis, fungal abortion, leptospirosis, listeriosis or BVD*
3. *Internal parasites,,cobalt deficiency, selenium deficiency, copper deficiency or chronic disease such as pneumonia*
4. *Cryptosporidiosis, rotavirus, E coli (colibacillosis), coronavirus, salmonellosis, poor quality milk replacer or a sudden change in feeding, lack of colostrum*
5. *Malignant catarrhal fever, grain overload, yersiniosis, trauma, clostridial disease, lungworm infection, copper poisoning, water deprivation, acute pneumonia, or abomasal ulcers*
6. *Low selenium status, toxoplasmosis, hairy shaker disease, pasture oestrogen (e.g., from aphid-damaged lucerne), zearalenone (fungal toxin in pasture), poor body condition at mating*

Test Yourself #3

1. *The number of nemotode eggs per gram of faeces.*
2. *Drench resistance means that some of the internal parasites (on the pasture and in the livestock) can survive exposure to a particular type of anthelmintic. Drenching with anthelmintics in that drench family will not kill 100% of the worms in the animals.*
3. *It usually means that either the drench technique was faulty or that some of the internal parasites are resistant to the active ingredient in the drench used. Drench technique should be checked and the drench gun's delivery of the stated dose should have been checked before (and during) drenching. The vet will advise you on interpreting the drench check results and help plan the future drenching and internal parasites programmes.*
4. *Initial risk can be assessed by monitoring weather conditions. At high risk times (e.g., warm, humid weather), the risk can be measured using spore counts. Spore counts on the farm are better than 'local' figures from newspapers or the vet. Prevention measures include weekly or daily zinc oxide (drenched or in drinking water) or long-acting zinc bolus in the rumen. Stock should be kept off high-risk paddocks (identified by spore count). Pasture can be sprayed with fungicide. Using facial eczema resistant rams will improve sheep performance on high-risk farms but this is a long term strategy.*
5. *Anxiety, trembling, head nodding, jerky movements, swaying while standing, staggering when moving, stiff-legged gait, short prancing steps, collapse. Production losses stem from inability to graze or drink water, misadventure. Short term management = take stock off the high risk pasture (if possible) or offer supplements to reduce endophyte intake. In the long-term, high endophyte problem pastures should be replaced with alternative pasture species or perennial ryegrasses with 'animal safe' endophyte strains.*
6. *High risk crop type (e.g., Italian/short rotation ryegrass, brassica, cereal greenfeed), high rates of nitrogen fertiliser, feeding before nitrate levels get a chance to fall during the day, hungry stock gorging on the high nitrate feed, re-growth after drought.*

Test Yourself #4

1. *Ketosis (also called sleepy sickness, pregnancy toxaemia and twin lamb disease in sheep) = lack of energy and mobilising body fat; milk fever (hypocalcaemia) = lack of calcium in the blood; grass staggers (hypomagnesaemia) = lack of magnesium in the blood.*
2. *Treat for all three (especially if the animal has been down for some time).*
3. *Abortion can be caused by contagious disease – isolation and hygiene help reduce the risk of disease spreading to other ewes.*
4. *Spray navels with iodine (ideally when picking up the calves in the paddock and again when dropping them off at the shed).*
5. *The calf or lamb should be born within about 10 minutes once nose and feet appear.*
6. *At least 1 litre in the first 6 hours and 4 litres (or about 10% of body weight) in the first 24 hours. Ideally colostrum is fed for the first four days.*
7. *The newborn animal has no natural immunity; colostrum provides antibodies that help protect it from infections. It is also a good energy source.*
8. *Watery mouth is an infection of young lambs in which their abdomen swells and they show excess salivation. They are likely to die unless antibiotic treatment is given very early in the infection.*

Test Yourself #5

1. *Less than 12 months;*
2. *Could be minor scouring or, in more severe cases, watery green (and sometimes bloody) scour and death if untreated.*
3. *Weight loss that cannot be stopped by normal means (i.e., obviously not due to underfeeding, internal parasites or other common causes), progressing to emaciation and death; occasionally scouring but not always.*
4. *Middle or older age, especially if stressed (e.g., underfed in winter while pregnant).*
5. *Most cases recover on their own but sometimes the eye can be ulcerated and blinded.*
6. *Bacteria entering the udder through the teat.*
7. *Perished or damaged liners, excessive vacuum, under-milking or over-milking, poor hygiene after handling a cow with mastitis, teat damage (e.g., due to cracks or stepping on the teat).*

Test Yourself #6

1. *Ruminants use cobalt to manufacture vitamin B12.*
2. *Direct short or long acting injection, pour-on product, adding selenium prills to fertiliser (top-dressing).*
3. *Reduced survival of newborn animals, goitre (enlarged thyroid in throat), sometimes reduced fertility in female.*
4. *Goats are most susceptible (followed by sheep)*
5. *Salt blocks usually have too little mineral to treat serious deficiency; some animals will take no salt while others take too much (i.e., doses are uncontrolled).*
6. *Foot trimming, foot rot spray, foot baths containing zinc sulphate 10% or formalin, culling chronic cases, breeding for resistance, and foot rot vaccination.*
7. *Keep track and yard surfaces free from stones, in good condition and generally dry; let cows move quietly and place their feet to avoid hazards; avoid sharp corners (especially on concrete).*

Test Yourself #7

1. *By infected farm animals (e.g., cattle or deer), less commonly from possums to farm stock. It is spread by contact with saliva or breath droplets from the infected animal (e.g., from pasture or when a dying possum spits).*
2. *Two ear tags for each animal ('primary' and 'secondary' tags, with bar code and individual animal identification) and a correctly completed animal status declaration form.*
3. *Wild animals such as possums and ferrets can spread Tb in the wild animal population and introduce it to farmed cattle or deer. Controlling the wild animals reduces the risks to farm stock.*
4. *High protein lush pasture (e.g., pasture with lots of clover);*
5. *Prevent with bloat products such as bloat oil added to the water supply or long acting bolus given to each animal.*
6. *The grain does not require lots of rumination so less saliva is swallowed. The starchy grain digests easily, reducing the pH in the rumen (i.e., making it more acid). This leads to 'acidosis' and grain overload symptoms.*

7. *Start feeding the grain gradually, increasing the grain feeding rate per animal slowly over at least two weeks and adjusting to allow for any animals that are not taking their ration; not allowing any cow to help herself to two portions if grain is fed in the cowshed.*

Test Yourself #8

1. *Main ones are foot and mouth disease, bovine spongiform encephalopathy (BSE or 'mad cow disease'), scrapie, chronic wasting disease in deer, anthrax, bird flu.*
2. *Border control, inspection of some imported goods, bans on particular items or goods from particular countries, disinfection of incoming items (e.g., boots, shearing hand pieces).*
3. *Contact your local veterinarian or phone the MPI hotline 0800 80 99 66; isolate the farm and do not let people or animals leave until MPI officers have approved this.*
4. *Campylobacter, cryptosporidiosis, leptospirosis, orf, ringworm, salmonella, toxoplasmosis (among others!)*
5. *Modern dairy herds are vaccinated against leptospirosis; farm owners and managers realise that there will be serious consequences for NOT protecting workers from an easily prevented disease.*
6. *There may be no obvious symptoms or a mild flu-like disease; some cases are more severe with painful joints, headaches and lethargy for several weeks. Pregnant women may be very ill and may abort their baby.*
7. *See a doctor immediately and give full details of contact with infected animals.*

Test Yourself #9

1. *Iodine, selenium.*
2. *Goats do not develop immunity to internal parasites as they mature, which sheep do. This means they remain susceptible to internal parasites for life and tend to increase the worm burden in the pasture as adult goats continue to put out worm eggs.*
3. *False – they get foot rot just the same as sheep. Treat the same as you would for sheep.*
4. *Using the same vaccines as used for sheep.*