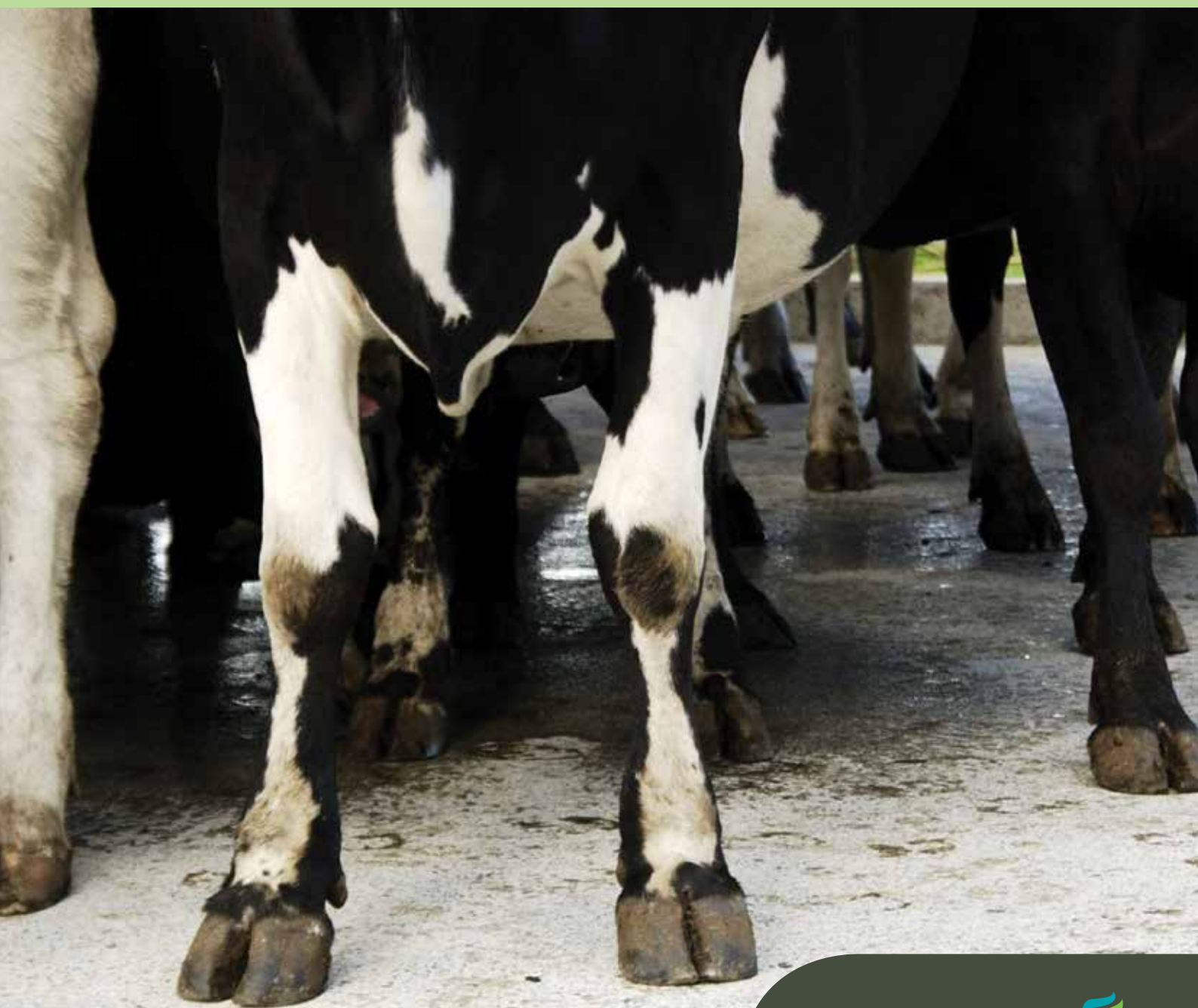


Preventing and managing lameness

A farmer's guide to lameness on New Zealand dairy farms





Ministry for Primary Industries
Manatū Ahu Matua



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About this booklet

This guide is designed for all New Zealand dairy farmers who want to manage and reduce lameness on their farm.

It explains:

- why cows get lame
- the main types of lameness in New Zealand
- how to treat lame cows
- why keeping records can help
- how good stockmanship improves cow flow and reduces lameness
- how to improve tracks and yards.

What impact does lameness have on farm?

Lameness is a major issue for New Zealand dairy farmers. It affects cow welfare, takes time, energy and skill to treat and has a significant financial cost as lame cows produce less milk, lose weight, and take longer to get back in calf.

Prevention of lameness is critical in improving farm profitability and cow welfare. The financial impact of lameness is estimated at \$250 per lameness case. For an average dairy farm this equates to almost \$15,000 per year (average herd size 419 cows, average incidence 14%).

Animal welfare and health is at the heart of any good farming business. Reducing lameness will increase job satisfaction and staff retention. Lameness is very visible and is a public perception risk to all farmers.

How is your farm performing?

The first step in understanding your lameness situation is to keep records of lame cows and benchmark yourself.

Incidence

Definition = number of cows treated by trained staff over one season (usually June - May)

Average = 14%

Top farmers achieve = 8% or less

Seek help if above = 20% for the season or 5% in one month

Prevalence

Definition = number of cows scoring 2 or 3 on lameness score measure at a single scoring event

Average = 8%

Top farmers achieve = 4% or less

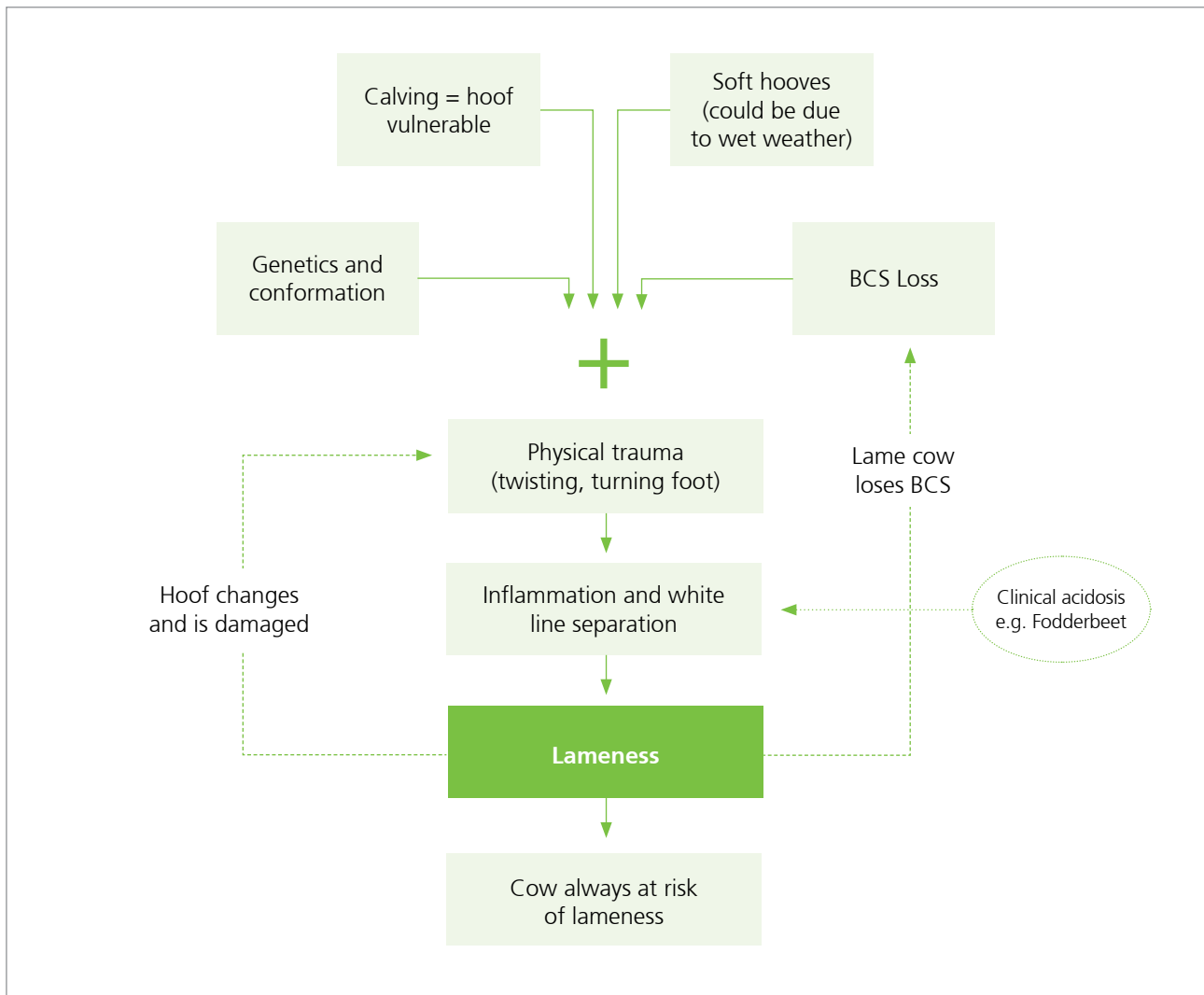
Seek help if above = 10%

All lame cows (score 2 or 3) should be examined and treated within 24 hours as stated in the Dairy Cattle Code of Welfare.

If you reach any of the 'seek help' triggers or are concerned how your farm is performing, seek professional advice on reducing and preventing lameness. There is a network of Healthy Hoof providers throughout the country dairynz.co.nz/healthyhoof

Section 1: Lameness risk factors

Figure 1. Lameness risk factors



Calving

Calving can trigger lameness. During calving the cow's ligaments relax to aid calving, however this relaxation occurs across the whole body including the hoof. This means the bones in the foot are not held in place as tightly and can move around. This movement puts pressure on the live tissue ('corium') and makes the hoof very vulnerable to hoof diseases, such as white line disease and sole injury. This risk period lasts for around 8 weeks post calving and heifers are especially affected.

Body condition

A cushion of fat in the hoof helps with shock absorption. If the amount of fat is decreased, then the cow will be at increased risk of lameness. This can occur:

- at and after calving when cows naturally lose body condition
- when a cow becomes sick (including being lame)
- in heifers as they naturally have much less fat in their digital cushion than older cows.

Breeding/genetics

LIC data clearly shows that, under New Zealand conditions, Jersey and cross-bred cows have a significantly lower risk of lameness than Friesian cattle. The underlying reason for this difference is unclear.

Within any herd, there is significant variation between cows. This means that selecting for traits that protect against lameness, such as good locomotion and conformation, will likely reduce lameness risk over time. Lameness itself has low heritability so it is more useful to select for protective traits, which have higher heritability.

Environment

Experience shows us more lameness occurs in wet seasons and that a high incidence of lameness often occurs after periods of heavy rain.

A short term and long term effect occurs during wet weather:

Short term: Lameness can increase within 1-3 weeks of severe wet weather. There are two reasons for this. The first is that wet conditions are ideal for the development of foot rot (infection of the skin between the claws). The second is that in cows with hoof damage, but which are not yet lame, the wet conditions can soften and weaken the horn making lameness more obvious. Poor track conditions, also caused by wet weather, means stones are more likely to get into the already damaged white line.

Long term: A hoof that is exposed to wet conditions is softer, especially the sole and white line. This increases the chance of hoof damage which can lead to increased lameness six to eight weeks later.

If cattle are exposed to wet conditions over long periods, the constant softening of the hoof can lead to excess wear and thinning of the sole. The combination of wet abrasive concrete and soft easily worn hooves can result in significant numbers of animals becoming lame.

Nutrition

The relationship between nutrition and lameness is complex; many links have been suggested but the evidence of their importance, particularly under NZ conditions, is limited.

One key theory linking nutrition to lameness is the link between an unbalanced diet (specifically low fibre, high soluble carbohydrate diets), acidosis and laminitis.

Laminitis is a complex process where reduced blood supply or inflammation of the hoof interferes with the necessary supply of nutrients to grow healthy horn tissue. Research in pasture-based systems shows that neither clinical, nor sub-acute, rumen acidosis occurs in cows grazing diets comprising predominantly high quality pasture. The pH in the rumen of grazing cows fluctuates throughout the day, but the low pH phases are driven by rapid production of volatile fatty acids that are quickly absorbed from the rumen and therefore have no detrimental effect. This differs from cows offered total mixed rations, or diets containing high levels of non-structural carbohydrates (e.g. grain, barley), where lactic acid is produced during carbohydrate digestion. Adding a fibre source, such as hay or straw, to cows primarily grazing pasture will not alter rumen pH nor impact on laminitis or lameness.

If feeding a diet containing 40% or more of a high starch or sugar supplement (e.g. grain, fodderbeet) there is a risk of rumen acidosis and laminitis. Cows need to be transitioned onto these feeds slowly, and final intakes regulated to prevent rumen acidosis. Visit dairynz.co.nz, or consult a nutritionist or your veterinarian to discuss appropriate strategies.

Evidence supporting the use of dietary supplements such as biotin and zinc is inconclusive. Improvements in hoof health only impacts newly formed hoof tissue, therefore it takes several months to see any possible benefits. Supplementation also needs to be continuous (including over winter) and will only produce a response if correcting a deficiency.

Physical trauma

Lameness occurs when the hoof is damaged. Damage can occur when:

- The hoof is twisted and turned, for instance on the yard, which causes inflammation. Repeated twisting and turning results in weakness and the white line separating, allowing stones and dirt in, causing white line disease.
- A cow has a very thin sole and stands on a sharp object damaging the corium. This only occurs in about 1% of lameness cases.

Physical trauma usually only causes lameness after the hoof has been damaged by other risk factors (refer to diagram 4). Good stockmanship is key.

Previous lameness and inflammation

Damage and inflammation in the hoof leads to changes in the bone (coffin bone). This change is similar to arthritis. The degree of this change is linked to the lameness history of the cow. The changed bone puts inappropriate forces within the hoof, which in turn can lead to further lameness. This may explain why older cows are more prone to lameness.

Research has shown reducing inflammation (through the use of anti-inflammatory drugs) improves treatment response.

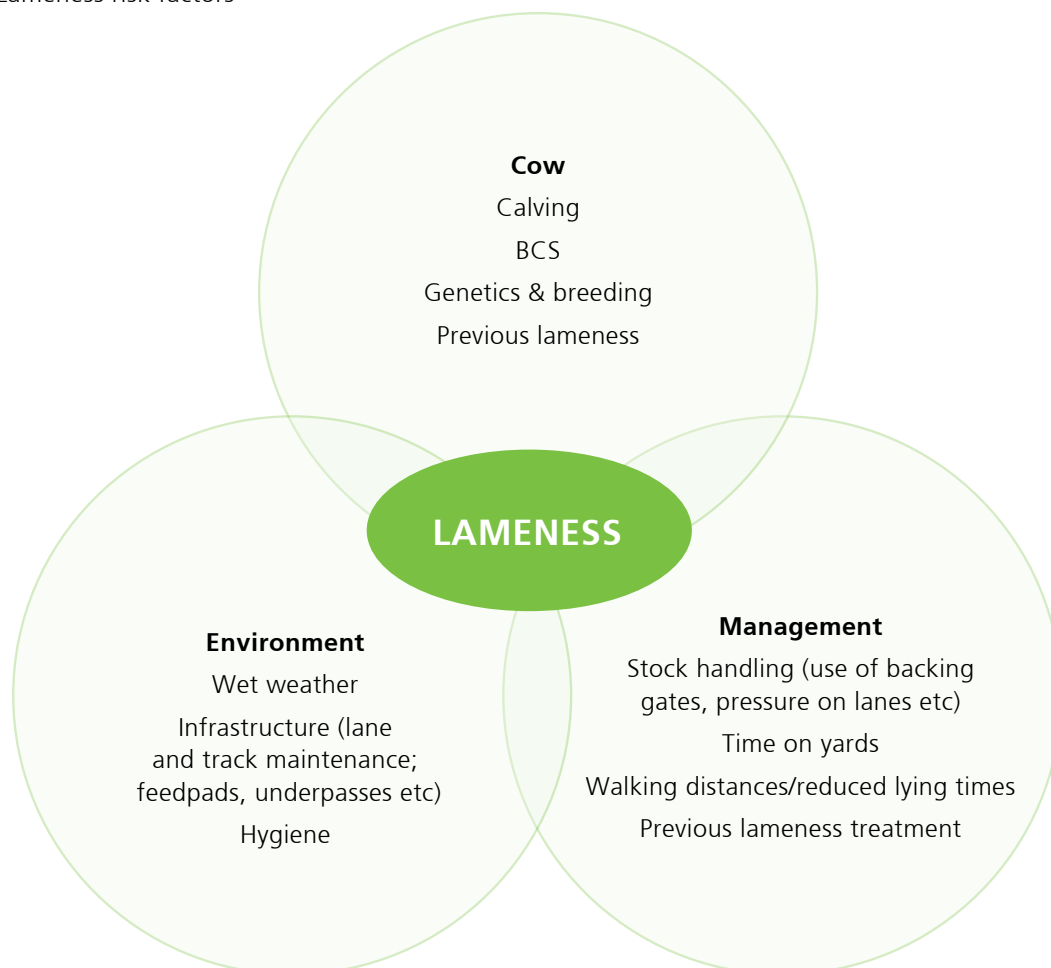
Biosecurity

Digital Dermatitis (DD) is the most important infectious cause of lameness in dairy cattle worldwide. It is now affecting New Zealand dairy herds. Research indicates that long periods standing in wet, dirty conditions increases the risk of DD. The biggest risk of introducing DD on to your farm is from buying or bringing in infected cattle. Other risk factors including cows standing in slurry and the use of off-paddock facilities – especially freestall barns. For more information, visit dairynz.co.nz/biosecurity.

Multiple risk factors may contribute to lameness

Cows become lame when a combination of risk factors occur. It is the interaction of the cow, her environment and management that leads lameness on farm.

Figure 2. Lameness risk factors



Section 2: Seasonal overview of lameness

Good stockmanship, prompt treatment and maintenance of infrastructure should be a year-round focus. There are times in the season when aspects of lameness management are particularly important.

Figure 3. Lameness in a seasonal spring calving herd

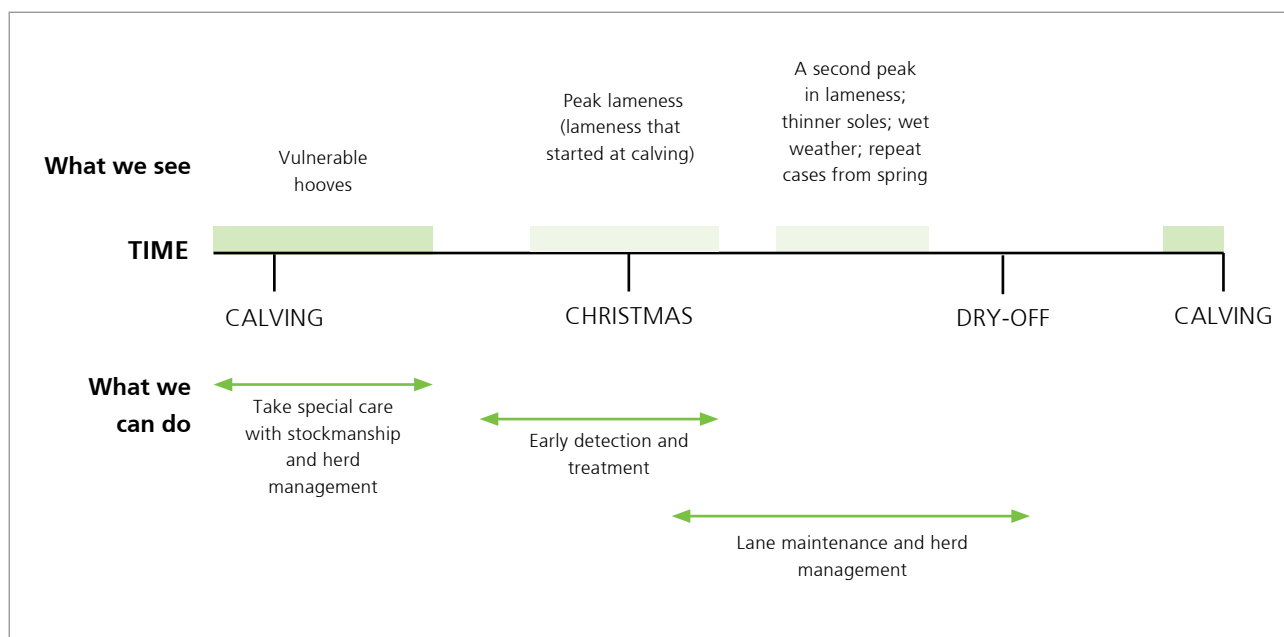


Figure 3 shows us that all cows have the potential to become lame. Herd management should be aimed at reducing:

- long periods of time on concrete
- walking long distances
- underfeeding
- pushing cows on races or in the yards
- poorly maintained races and yards
- poor quality facilities.

Take extra care of heifers. Damage done in the first lactation can lead to life-long lameness problems.

Section 3: Lameness identification and treatment

3.1 What is normal?

Structure and function of the hoof

The first step of lameness identification is understanding what a normal healthy hoof looks like.

Figure 4. Parts of the hoof

CORIUM (LIVE TISSUE)

- Equivalent to the “quick” of our fingernails.
- Support tissue for the foot.
- Contains nerves and blood vessels for the hoof and coffin bone.
- A source of essential nutrients for the hoof structure.

CORONARY BAND

- Pale hairless band at junction of the hoof and the skin.

COFFIN BONE AND JOINT

- Main bone in the hoof.
- It is held in place by ligaments.
- Joint can become infected or injured.

WALL

- The wall grows from the coronary band.
- Very hard.
- Grows at approximately 5 mm per month, so takes several months from growing to being in contact with the ground.

LIGAMENTS

- Run down to the hoof and hold the bones in place.
- Allow the cow to move her foot.

WHITE LINE

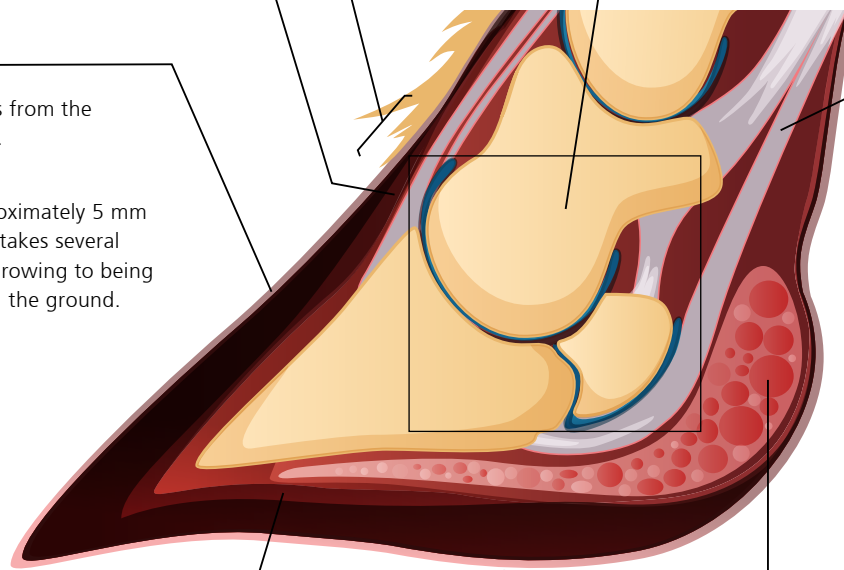
- A junction where the wall and sole meet.
- As it is a junction it is a weak point and is softer than the wall and sole.

SOLE

- The sole grows downwards from the corium.
- Sole horn is softer than the wall horn.

DIGITAL CUSHION

- Contains fat and tough elastic tissue.
- Acts to dissipate the force on the hoof from the weight of the cow as she walks.



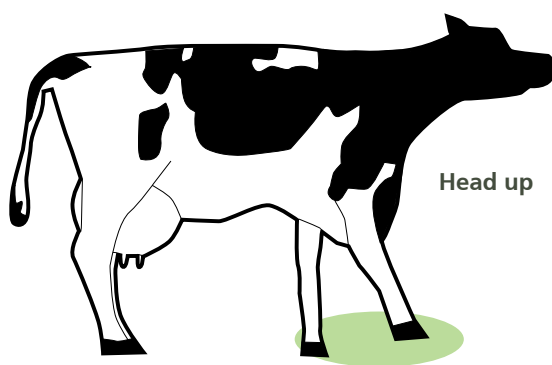
3.2 How to identify a lame cow

The DairyNZ Healthy Hoof lameness scoring system rates cows and gives recommended actions to take. Lameness scoring can be used at a herd level to monitor lameness throughout the year. Carry out lameness scoring on flat, even surfaces when cows are walking at their own pace.

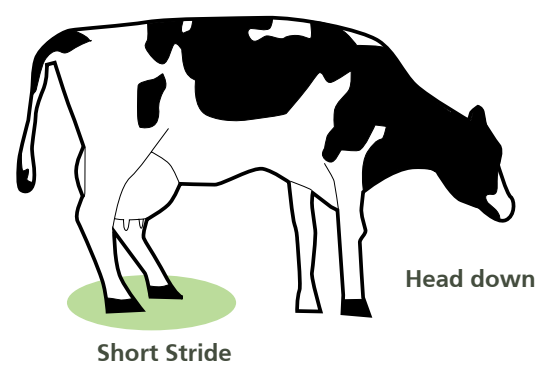
As a prey species cows hide pain, so early signs of lameness are subtle. Early identification and treatment is key to rapid recovery, and minimising the effect of welfare and productivity. Having everyone on farm trained in lameness identification improves early detection.

TIP

Get a trained professional to lameness score your herd and interpret the findings.



If her front foot is lame she will raise her head as the foot is placed on the ground.








If her back foot is lame she will lower her head when the foot is placed on the ground. She will also have a shorter stride for a lame back leg.






Note: the cow might be lame in more than one foot – this can make lameness more difficult to spot. If in doubt, draft her out and examine.






View the lameness scoring video at dairynz.co.nz/lameness-scoring.








DairyNZ lameness scoring

Score	Walking speed	Stride	Weight bearing	Backline	Head
0 Walks evenly	Confident. Similar walking speed to a person. Maintains position in the herd.	Long, even and regular. Rear foot placement matches front foot placement.	Evenly placed and weight bearing when standing and walking.	Straight (level) at all times.	Held in line or slightly below the backline and steady when walking.
No action required					
No action required – this cow is normal.					

Score	Walking speed	Stride	Weight bearing	Backline	Head
1 Walks unevenly	Not normally affected, should easily maintain position in the herd.	May have uneven stride and/or rhythm. Rear foot placement may miss front foot placement.	May stand or walk unevenly but difficult to identify which leg/s are affected.	Straight when standing, may be mildly arched when walking.	May have slight bob and or may be held lower than normal.
Minor action required					
Record and keep an eye on her – some cows normally walk unevenly.					

Score	Walking speed	Stride	Weight bearing	Backline	Head
2 Lame	May be slower than normal; may stop, especially when turning a corner.	Shortened strides rear foot placement falls short of front foot placement.	Uneven – lame leg can be identified.	Often arched when standing and walking.	Bobs up and down when walking.
Action required					
This cow is lame and needs to be reported, drafted and examined within 48hours					

Score	Walking speed	Stride	Weight bearing	Backline	Head
3 Very lame	Very slow, stops often and will lie down in paddock. Cannot keep up with the healthy herd.	Shortened and very uneven. Non lame leg will swing through quickly.	Lame leg easy to identify - 'limping'; may barely stand on lame leg/s.	Arched when standing and walking.	Large head movements up and down when walking.
Urgent action required					
This cow is very lame and needs urgent attention. Draft and examine as soon as possible.					

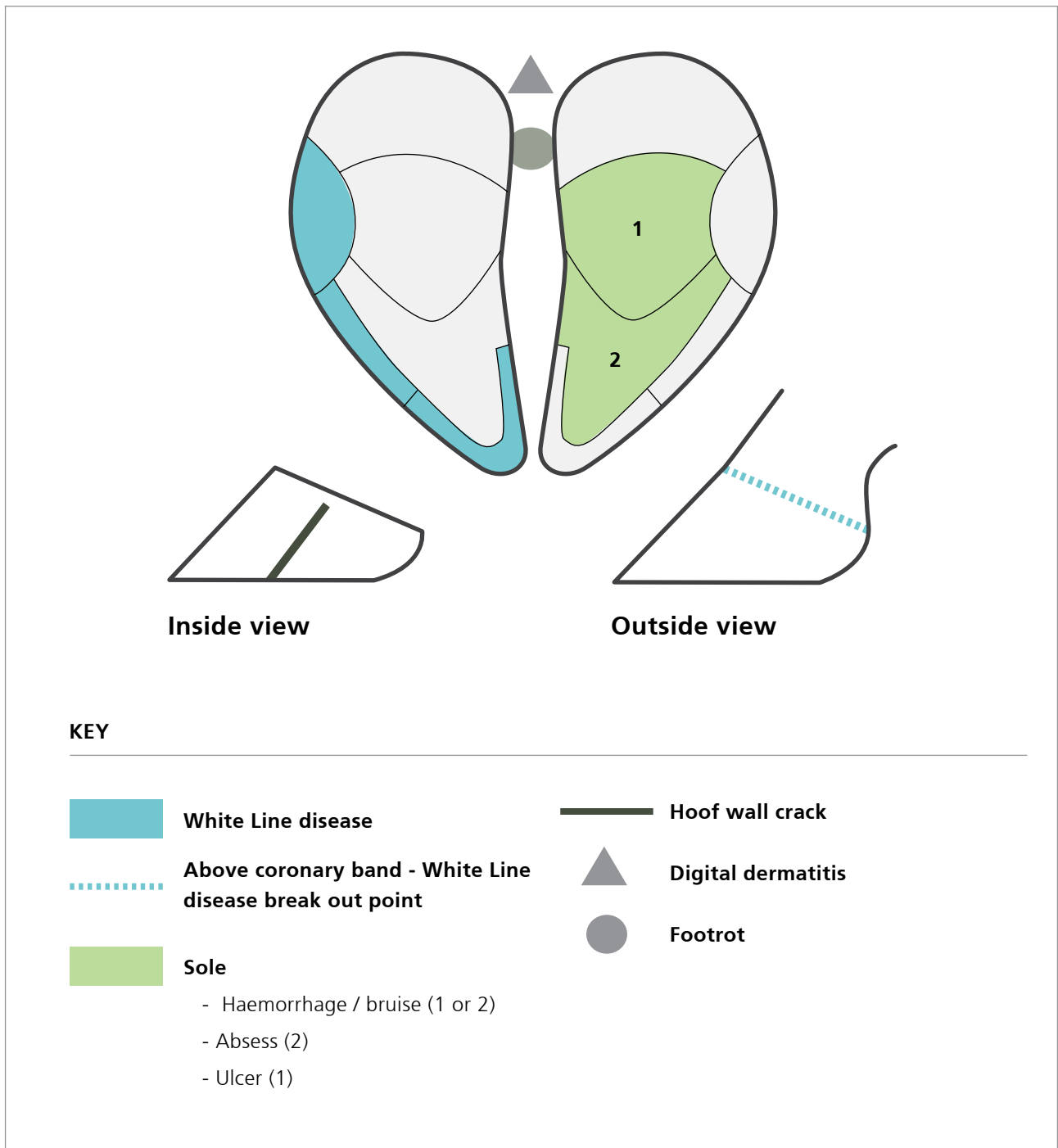
3.3 Main types of lameness

The main types of lameness in New Zealand are:

White line disease, sole, hoof wall crack, footrot and digital dermatitis.

Some lameness is above the claw or the type is unclear/unknown.

Figure 5. Claw zones



White line disease

What does it look like?

- Wall is split away from the sole and may be filled with sand and gravel.
- Break out or abscess at the coronary band or at the back of the heel.
- When the outside wall is trimmed, a dark line can be found running vertically up the hoof from the sole to the coronary band or heel.

Which foot?

Mostly seen in:

- back foot outer claw in mixed aged cows
- front foot inner claw in heifers.



How does it happen?

- The white line is a weak point in the hoof which is easily injured.
- At calving or other periods of stress, the white line becomes more susceptible.
- Twisting and turning of feet on tracks and yards causes the white line to separate.
- Stones are forced upward into the white line which results in further separation of the wall from the hoof.
- If this continues, stone and bacteria will reach the sensitive tissues of the hoof causing pain and infection.



Sole bruising (or haemorrhage)

What does it look like?

- reddish/dark brown areas on the sole
- patches can be localised or they can cover large portions of the sole
- often the cow is lame in more than one foot and they are stiff when getting up and walking.

Which foot?

- can be found in all feet, both inner and outer claw
- common in heifers in their first few months of lactation.



How does it happen?

- from changes in the hoof at calving
- from very thin soles.



Sole abscess

What does it look like?

- have a dark hole or crack in the sole
- may lead to a pocket of pus.

Which foot?

- are common in toes of heifers
- are common in inner claw of rear feet in cows.



How does it happen?

- not completely understood
- from the changes in the hoof at calving.

Sole ulcer

What does it look like?

- has a reddish/dark brown area that is often soft
- underrun horn
- can be very painful

Which foot?

- are usually found on outside claw of rear feet.



How does it happen?

- can be from long periods of standing on concrete e.g. feed pads
- sometimes from severe white line disease where the claw becomes misshaped.

Hoof wall crack

What does it look like?

- A vertical crack found usually on the inner wall of the claw.

Which foot?

- Cracks appear in both front and back feet on any claw.



How does it happen?

- Damage to the soft tissue between the claws that then grows down as a crack. Risk factors are the same as for foot rot.
- Poor conformation of feet e.g. corkscrew.

Foot rot

What does it look like?

- Skin between claws is broken.
- Swelling and heat below the dew claws.
- It often smells.

Which foot?

- Foot rot can be found in any of the feet.



How does it happen?

- Usually the skin between the claws is broken by a stone, especially under moist hoof conditions.
- Bacteria then invade the soft tissue causing an infection.
- The onset of foot rot is rapid and will continue for at least a week or until complications set in.
- It is a very painful condition.



Digital dermatitis

What does it look like?

- Red or grey lesion on skin above hoof – usually between heel bulbs.
- The red surface of the ulcer is sensitive to water pressure or touch.
- Can progress and have a wart like appearance.
- The infection may get deeper into the hoof, causing erosion and underrunning of the heel horn.

Which foot?

- Usually the back feet (80%).



How does it happen?

- Digital dermatitis is contagious, so it can be spread from cow to cow.
- Various bacteria are able to break the skin, usually at the back of the foot and an infection sets in.



Note: internationally farmers commonly refer to digital dermatitis as 'hairy wart' or 'strawberry disease'.

3.4 Treating lame cows

Ensure you have adequate facilities and use the correct techniques for handling cows.

Treatment facilities

Good facilities improve lame cow management by reducing stress for you and the cow, keeping the farm team safe and are more likely to be used to provide prompt and correct treatment.

Good facilities have:

- good lighting
- secure, safe method of restraining cow
- running water
- safe work area for people
- non-slip surface.

TIP

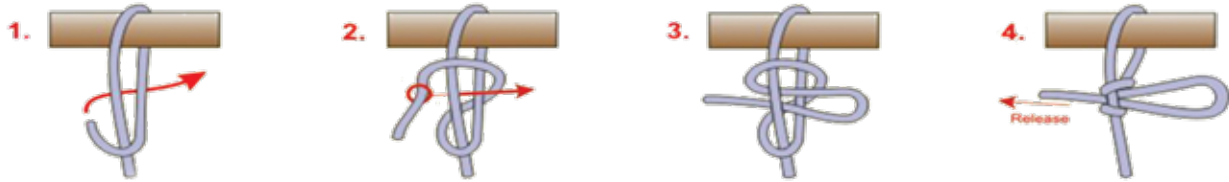
Getting help when treating lame cows makes the task less stressful and safer for you and the cow.



Once you have identified the lame foot/feet by walking the cow around the yard, follow the restraining technique appropriate for your type of facility.

Tying up a leg

Using a quick release knot, secure the leg to the rail.



Ensure the leg is positioned within the natural range of motion for the cow to avoid discomfort. If raising the cows tail to reduce the risk of being kicked, ensure the tail is not twisted.

If you do not have a crush available you can use the herringbone or rotary dairy shed, but this is less safe for you and the cow.

Remember: a cow may be lame in more than one foot; you may need to check multiple feet.

Be aware!

When using head crush, react immediately if a cow goes down on her knees as it puts pressure on her airway. Cows often don't let you know they are suffocating.

Good practice is to put a strap under the cows chest just behind the front legs to prevent the cow kneeling.

3.5 Tools for treating lameness

A fully equipped and well maintained tool kit saves time and frustration when treating lame animals.

Tool kit contents

Keep tools together in a kit that is easy to move around. Regularly check and replace the contents. The following tools are used in the treatment of lame cows.



Hoof knives

- One right sided
- One left sided

Narrow blades with single edge knives are the best as they allow good access between claws in comparison to wide blades or doubled sided knives.



Hoof knife pouch

It is important to protect your knives and keep them sharp. Use an old rubber inflation or piece of alkathene as a pouch to store your knives when not in use.



Hoof test pliers

These are used to identify the correct claw and locate the injured area.



Hoof trimmers

Single or double action trimmers.



Leg rope or strap

3m of large diameter (at least 3cm wide) soft rope or webbing. This prevents injury from rope burn on the cows leg.



Back bar or rope

This is to go behind the cow when treating in a herring bone shed or where the crush doesn't have one. Use 4m long rope or a pipe bar.

Hoof blocks or slips

Blocks or slips for either left or right claws.



Antiseptic Spray

e.g. Iodine or gentian violet.



Sharpening stone

Used for knife sharpening.



Diamond hoof knife sharpener

Used for sharpening inside the curved part of the hoof knife.



Fine round chainsaw file

1/8th or 4mm or less. Use only to shape inside edge in preparation for sharpening with diamond sharpener.



Glove or wrist protector

For the hand holding the foot.

Antibiotics

Generally only needed to treat foot rot. Consult your veterinarian for the best option for your farm.



Methylated spirits

To sanitise surfaces.



Optional: hoof grinder

With appropriate training, some farmers find the use of a hoof grinder useful. Caution must be taken to not remove healthy sole.

Recording booklet or device

To record all lame cows and treatment.

Sharpening hoof knives

Blunt knives are dangerous and frustrating; having a sharp knife makes the job easier. New knives will need sharpening and sometimes reshaping.

Always sharpen the inside edge of the knife!

Step 1



A new knife should be sharpened before use and all knives should be reshaped at least annually. Use a rough stone file or angle grinder with a 1mm steel cutting disk. File blade to change the inside angle to approximately 20°. The knife edge should be gradually tapered.

Too steep



Correct angle



Use a "diamond" file to touch up the sharpened edge again. Ensure a consistent angle.



Protect the blade while not in use inside an old milking inflation or piece of alkathene.



Touch the blade up regularly with a 1/8 chainsaw file and a "diamond" file.

Your local vet, farm merchant or hoof trimmer will be able to help you source good hoof care tools.

TIP

When sharpening a knife, have it securely held to ensure a consistent and sharp edge. Take appropriate safety precautions and wear safety glasses at all times.

3.6 Lesion identification

To ensure correct treatment and prevention, identify the type of lameness the cow has by examining the foot.

Clean Clean the foot with running water.

Between Check between the claws for any trapped stones, breaks in the skin, swelling or heat.

Squeeze Carefully test the claws with a hoof tester. It will save you time if you know which claw is painful. A positive response will be muscle twitching higher up the leg. Not necessarily the cow trying to pull her leg away.

Scrape Clean the sole with a scraper and check for any holes or cracks.

Search Only if you find nothing in the foot do you start looking further up the leg for other possible causes.

Call your vet or hoof trimmer if you are unsure about a lesion or the lameness does not improve after treatment.



3.7 Treatment

Correct treatment by someone that has been trained by an experienced instructor will mean a faster recovery. Contact your local Healthy Hoof provider, vet or hoof trimmer to enrol in a treatment course. Many farmers will use a hoof trimmer or veterinarian to treat lame cows – this is a great idea if you struggle to find time to treat cows or have cases you are unsure of how to treat.

All lame cows should be kept on pasture, have short walking distances, and be provided good quality feed and easy access to water. Many farmers utilise once-a-day milking for lame cows and depending on the time of the season may dry lame cows off.

Treatment principles:

1. Return hooves to the ideal shape so that they are balanced, more able to support the cow's weight and less likely to be affected by future problems.
2. Reduce pressure on a lesion by removing the horn around the lesion. This reduces pinching and aggravation of the lesion by the hard horn. It also allows dirt and slurry to drain from around the lesion which decreases the chance of an abscess forming
3. Removing damaged horn to promote the growth of healthy new horn.
4. Transfer the weight to the other healthy claw by either paring down the sole of the affected claw and/or putting a block/slip on the healthy claw. This transferred weight helps cows to walk with less pain and aids healing.
5. Avoid bleeding.
6. Manage pain during treatment and recovery. Talk to your vet about options.

If after treatment a cow does not heal or improve within one week, contact your veterinarian.

In addition to the treatment principles above, there are guidelines for specific conditions in the 'Healthy Hoof Lameness Field Guide'. Order a copy online at dairynz.co.nz/lameness.

3.8 Recording and re-checking lame cows

Clearly marking and separating lame cows is good practice. This allows everyone on farm to monitor the cow and reduces risk around antibiotic withholding periods. Accurate records help to detect cows that continue to get lame.

At a farm level, recording means you can look at types of lameness and seasonal pattern. This is helpful when you or your advisor are figuring out what the risk factors are on your farm. Good records also allows you to evaluate and monitor your progress in managing and minimising lameness.

Mark

Record

Separate

Treat

Mark:

Identify lame cows with spray paint or other method.

Record:

Use a book, digital device or the DairyNZ App to record each case of lameness. Record all lame cows, even if they did not receive an antibiotic treatment.

Separate:

Lame cows should be kept on pasture and not made to walk far.

If it is not possible to treat lame cows every day, ensure each lame cow is removed from the main herd to a treatment mob the day she is first noticed to minimise further damage. Ensure her foot is checked and treated as soon as practically possible.

Treat:

Deal with lame cows quickly and seek advice if needed

Ensure at least one person on the farm is trained and proficient at treating lame cows.

Lame cows should be checked daily. If lameness worsens or does not improve within seven days, the foot should be lifted and examined. It may be necessary to seek veterinarian help.

Actions:

- Provide training for the farm team on observing cow behaviour and identifying lame cows.
- Identify, draft and treat all lame cows as early as possible.
- Record all lame cows.
- Upskill at least one person on farm to treat lame cows.
- Know your limits – seek advice from a lameness professional.

Section 4: Lameness prevention

4.1 Stockmanship

Research has shown the number of lame cows on a dairy farm is closely related to the knowledge, training and awareness of the people who work with the cows.

Good stockmanship has many benefits on farm including reduced accidents, easier working conditions, saving time in routine tasks, improved milk yield and happier farm teams as well as better welfare for the cows and reduced lameness.

Poor cow flow is not usually a problem with the cows, but a problem with the environment. If cows are consistently slow on tracks and races investigate the cause, and correct it.

Following the suggestions in this section will help to:

- Increase work efficiency and reduce stress on people and cows.
- Reduce lameness and injuries.

TIP

Patience is vital while working with and moving cows.



4.1.1 Bringing cows to the dairy

Allow cows to walk at their own pace along tracks and through gateways. Cows walk at about 3km per hour, this is slower than the average walking speed of people. Tip: Timed gate latches (e.g. Batt-latch) allow cows to start making their way to the dairy, providing efficiencies for the farm team.



This herdsman is putting too much pressure on the cows as shown by raised heads. The cows can no longer watch where they place their feet, or avoid more dominant cows.

Movement in groups is best - cows will follow their herd mates.

If the herd stops, don't put pressure on the rear cows. They won't move if the dominant cows in front of them have stopped. Move to the front of the herd and encourage the front cows to continue moving.

A cow's hearing is very sensitive. Avoid using noisy vehicles such as a tractor to move the herd. Talk in low tones to encourage the mob to move forward, try not to whistle. Avoid using dogs unless they are particularly quiet. If you are using a dog leave it tied up away from the dairy yard.

Talk to cows to keep them moving, but don't frighten them. Use positive interactions such as a stroke, rub, or gentle contact.

On larger farms that run two herds, consider separating heifers from older cows to reduce bullying.



Cows walking with their heads down so they can see where to put their feet.

4.1.2 Moving cows on the yard and in the dairy

Cows are creatures of habit and they respond better if they have a routine.

The most common stockmanship issue seen is incorrect use of the backing or top gates. Another habit observed is milkers leaving the pit or cups on position and entering the yard – this often has the opposite effect than desired. For other aspects of good cow flow visit dairynz.co.nz.

Backing gates are used to take up empty space in the yard – not to push cows.

Top gates or chains are used to encourage or 'sweep forward' a small proportion of cows at the front of the yard.

Using the backing gate or top gate

- Ensure the farm team use the same routine and system when using the top or backing gate.
- It is good to have a buzzer, water or noise associated with movement of the backing gate to provide warning to the cows.
- Electrified gates are not necessary as cows are very sensitive and fearful of electricity, which can result in poor cow flow and slower milking times.
- The control panel or switches for the gates need to be positioned so milkers do not disrupt the cows walking in to the dairy.
- A mirror to see how tightly cows are packed in is useful.
- The first gate movement should be after 15 minutes = about two rows or rounds. Cows need this amount of time to re-form their milking order on arriving to the yard.
- Each gate movement (for both backing and top gates) should only last 3-5 seconds. Tip: get your electrician to install a timer on the forward switch or button.
- Ensure the backing gate does not cause injury to cows legs.



This backing gate is being used correctly to take up space. Cows are still able to rearrange their order and their heads remain down.

Measure the speed your gate moves forward

Often they are too fast which puts too much pressure on cows. Mark a spot 2m in front of the gate, set it moving forward and time how long it takes – halve this figure and compare to the guidelines below.

Round yard

Forward speed of backing or top gate = less than 1 metre every 5 seconds (which is 12m per minute).

Rectangular yard

Forward speed of backing or top gate = less than ½ metre every 5 seconds (which is 6m).

4.1.3 Managing bulls in the herd

Bulls face additional lameness risks from riding cows and fighting with other bulls, and they aren't used to walking long distances on tracks. When bulls come in to the shed with the cows they can cause problems on the tracks and in the yard by disrupting cow flow, causing a health and safety risk and make milking time longer.

Minimise disruption by training bulls to remain in the paddock or move to the next paddock when the herd walks to the dairy for milking. It often takes a few attempts to train them.

If you find it too difficult to train the bulls, or if they need to go through the shed to get to the next paddock, it may be necessary for bulls to walk in with the cows. Ensure bulls are cut out at the shed and allow them to walk to their next paddock, don't leave them in the yard with the cows.

Lame bulls are generally more dangerous to treat than cows so call a vet to treat bulls.

4.1.4. Good stockmanship on your farm

Good dairy stockmanship not only decreases lameness, it helps ensure a safe and efficient work environment for the whole team.

Farm teams play a major role in the prevention and management of lame cows. So how do you get the whole farm team on board?

- Visit the DairyNZ website for excellent resources on training staff including useful templates **dairynz.co.nz/people**.
- Use 'skills checklist' templates from the DairyNZ website to identify training requirements.
- Involve the team in setting the standard on farm. People will have greater ownership of farm policies and procedures if they have had input.
- Get an outsider to help – a great place to start is with a trained Healthy Hoof provider.

For more information on stockmanship and milking efficiency visit:

- **dairynz.co.nz/milking**
- **dairynz.co.nz/animal**

4.2 The dairy shed and yards

Creating a good environment in the dairy is key to an efficient milking and reducing lameness.

To help with a good dairy and yard set up:

- the yard entrance should be at least as wide as the track leading to it
- avoid sharp turns in to the yard
- keep concrete surfaces clear of stones, in good repair and make sure they are non-abrasive but not slippery
- eliminate factors that make cows reluctant to enter the yard and dairy e.g. poor lighting, slippery surfaces, electricity, rails the wrong height, pipework that injures cows and negative human actions such as shouting and yelling
- ensure the yard is the right size for the herd, this is at least 1.3m²/cow for jersey cows and 1.5m²/cow for friesians.



Sharp turns slow down cowflow



Textured concrete, more traction without slipping



Good amount of space in the yard. Notice all heads are down.



Yard too small for number of cows. Notice some heads are up.

For more information visit dairynz.co.nz/milking for detailed information and guides on assessing your milking efficiency, your yard, herringbone or rotary shed.

4.3 Farm tracks/raceways

4.3.1 Efficient tracks

Well designed, constructed and maintained tracks will reduce lameness and save you time and money.

Race width

Tracks need to be wide enough for the herd to move without being pressured. Cows with enough space are less likely to push or be pushed. The width of the track is determined by the number of cows you have – or expect to have in future.

As short as possible

Make sure cows don't have to walk too far. Research shows that cows that walk longer distances is a risk factor for lameness. If you do have long distances, avoid having two long walks in one day. Once-a-day or 16 hourly milking is also used by some farmers to reduce walking.

Distraction-free

Ensure there are no distractions or restrictions as these will lead to cows stopping to take a look, potentially slowing traffic. Cows are also more likely to defaecate when they stop and this degrades the track surface.

Track width guidelines

Herd size (cows)	Race width (m)
<120	5.0
120 - 150	5.5
250 - 350	6.0
350 - 450	6.5
>450	Varies with the split of the herd



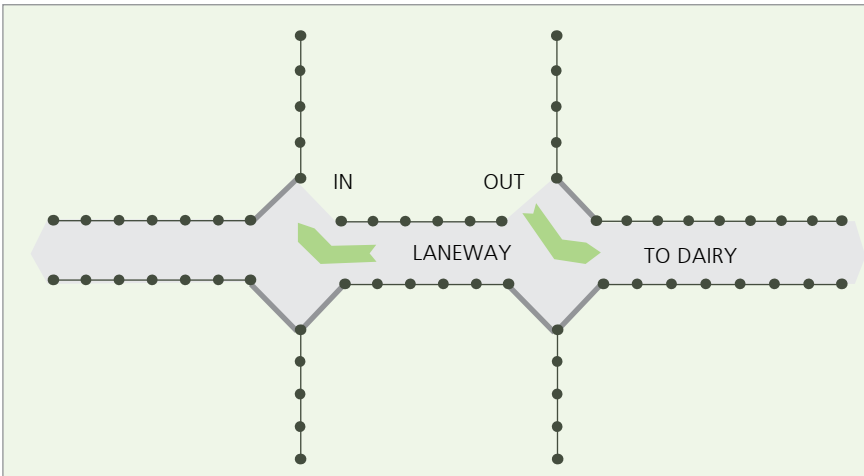
This track has no restriction which will ensure efficient cow flow to and from the shed.

Well fenced

Make sure the track is well fenced from the drains. Good fencing can prevent the edges of the track getting damaged, it keeps cows out of drains and minimises contamination of waterways.

Has good paddock access

Access in and out of paddocks shouldn't be narrower than the track or there will be bottlenecks. Angled or offset gates improve cow flow, reduce track wear and tear and are easier to get machinery through.



Ensure effective gateway drainage to prevent mud as this is one risk area for footrot. Divert water away from gateways and tracks; consider a culvert to carry water underneath.

Keep surfaces in a good state

Fill and compact potholes as they occur. Grade track surfaces on a regular basis. Note: track scrapings contain effluent – make sure you are compliant with council when dumping track surface material.

Ensure effective drainage

Camber on tracks only needs to be 3-5%, and no more than 8%. This is sufficient to move water off the track but will not result in water scouring the track and will be comfortable for cows to walk on.

Clean drains to make tracks last longer. Ensure any side drains are open when it rains and deal with small blockages as they occur.

If grass and manure has built up on track edges and you wish to leave it to help support the track structure, cut lateral drains to allow water to flow away.

Prune or remove trees near high use tracks – they block sun and wind and keep tracks from drying out and roots destroy the track structure.

If you have a track next to a waterway, ensure it slopes away from the water towards a paddock or sediment trap.



The camber on this track is too steep.

4.3.2 Track building

Having a broad understanding of the principles, process and issues that can arise when building a track should help when working with contractors.

It is recommended you use a professional road/track construction contractor when laying down tracks, especially when building new tracks. The shape and drainage of these tracks are extremely important considerations that will have an impact on the amount of future lameness and repairs and maintenance that are required.

The basic race construction principles are:

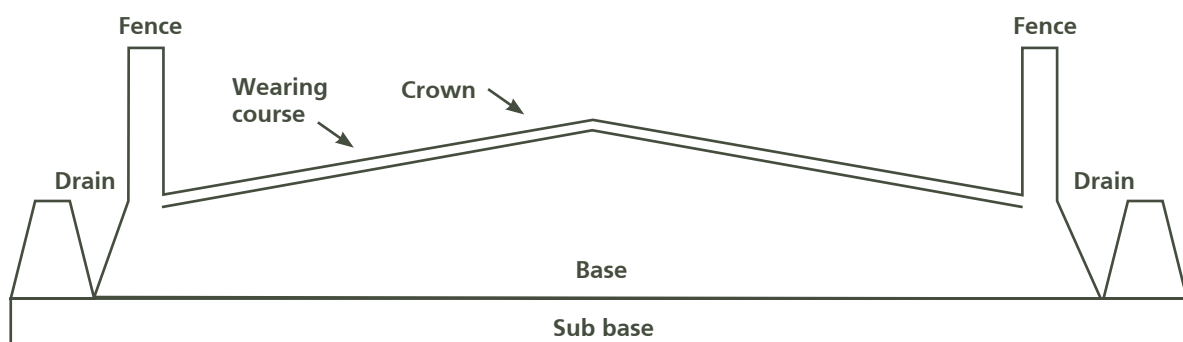
1. Remove all grass and topsoil.
2. Construct a sound base with strong foundation material.
3. Provide adequate compaction.
4. Provide a suitable walking surface.
5. Crown the race (3-5%).
6. Construct an efficient drainage system.
7. Fence cows out of the drain but ensure access for cleaning.
8. Include a maintenance programme in the budget.

A good track is constructed in layers. A foundation, or base layer, is formed with a surface, or wearing layer, placed on top.

The base layer provides the structural support for the surface layer – if it is weak the surface layer may break up and collapse. If water can penetrate into the base layer it may lose its strength resulting in potholes.

The surface layer has two functions: to provide a comfortable surface for cows to walk on and to shed water to protect the structural integrity of the track.

Each layer should be thoroughly mechanically compacted using vibrating rollers. Loose, open layers have much less strength than well-consolidated ones. Cow traffic does not provide an adequate substitute for mechanical compaction.



Track surfacing and formation. Ensure the camber is between 3-8%, and that the paddock side is fenced off if there are drains beside the track

Foundation (base) layer

Topsoil and grass are not suitable for use in the base layer and should be removed before beginning construction. The base should be made up of layers, each up to 150mm deep. After each 150mm layer is laid, it should be firmly compacted before the next is added.

Consider the following when selecting materials

- Moist sub-surface soil is a suitable material.
- Material dug out to make effluent ponds or the material removed from the table drains may be used, provided it is not topsoil.
- Use gravels, pit metal, or rotten rock.
- Soft clay is unsuitable for use in foundations unless stabilised with other materials.
- Hydrated lime, evenly spread and uniformly incorporated to a depth of 125mm, will allow soft clays to become stable once compacted.
- Cement can be used as a stabiliser in base layers – the usual recommendation is 1-4% of the total.
- If the material available does not create a satisfactory foundation, it is possible to use a 'geotextile' (an industrial fabric used in earthworks) to cover the shaped based layer, before adding the surface layer. Geotextiles allow water to pass through but they hold soil and rock in place and will prevent the surface layer from being pushed into the foundation layer, particularly by heavy traffic.

Surface layer

The creation of a satisfactory track surface requires compaction into a hard, smooth, wear resistant layer, with a minimum of particles that can cut or bruise feet.

- It should be 100–150mm thick.
- The surface layer is usually made from a mixture of fine materials – often sand, pumice, limestone, sandstone, small stones and clay.

Consider the following when choosing materials

- Crushed limestone (5-6mm) – check local lime for suitability. It is generally spread as a 50-100mm layer and needs firm compaction.
- Sand alone does not make an ideal surface – it is abrasive on cows' feet and washes away too readily.
- Well rounded gravel, less than 25mm in diameter, is preferable to large stones. Large stones can be kicked aside, leaving the surface susceptible to water penetration and damage.
- Fine particles of clay will fill the gaps between larger particles, binding it together. It also gives the surface a long wearing and smooth finish. Incorporating 0.3-1 percent cement into the clay capping mixture can help stabilise the surface and prolong its life.



Bad surface layer



Good surface layer

Examples of New Zealand track materials

Examples of track materials	Material properties
Rotten rock or volcanic rock	<ul style="list-style-type: none">• Volcanic rock with a clay component that binds well to form a solid compacted surface.• Excellent track maintenance is required when using this material to ensure there are no sharp stones at the surface.• An experienced contractor should be used to lay and maintain this surface.
Limestone	<ul style="list-style-type: none">• Several screened options are available (40mm, 0-80mm and 80mm), but will vary according to region.• The higher the calcium carbonate content the better the lime is as a track surface.• Water does not need to be added when laying if the lime has a naturally high moisture level.• An experienced contractor should be used to lay and maintain this surface.• As with all track surfaces, a limed track requires good maintenance.
Crusher dust	<ul style="list-style-type: none">• This material should not be applied to tracks less than 100m from the dairy because small stone chips get transported onto the hard concrete of the yards and cause bruising and sole penetrations.• It should be only added as a fine layer on top of other base material.• Crusher dust should not be applied thickly as it will impede track drainage.

To check if a material is appropriate for a top surface, a small sample rock should shatter under the heel of your gumboot when ground against a concrete surface. Trial small loads of proposed materials to see what will work.

Concrete tracks can be useful in areas of high rainfall as they provide a clean track and reduce mud on udders. However they do require management at the boundary between the concrete and paddocks. A section of lime fines at the intersection can help stones fall off before they get on to the concrete.

A track on a steep slope can mean water runs down the lane before running off the side – resulting in long water scours in the surface layer. Ideally, design tracks to minimise slope, even if it adds distance it will be worthwhile as maintenance issues will be reduced.

Tips for investing in tracks

- Prioritise tracks that get the most use, and particularly those close to the dairy shed.
- Investigate what materials are available locally.
- Look at neighbours' races and also ask your contractor for examples of their work.
- Ensure you are meeting good management environmental practices.

4.4 Track and yard intersection

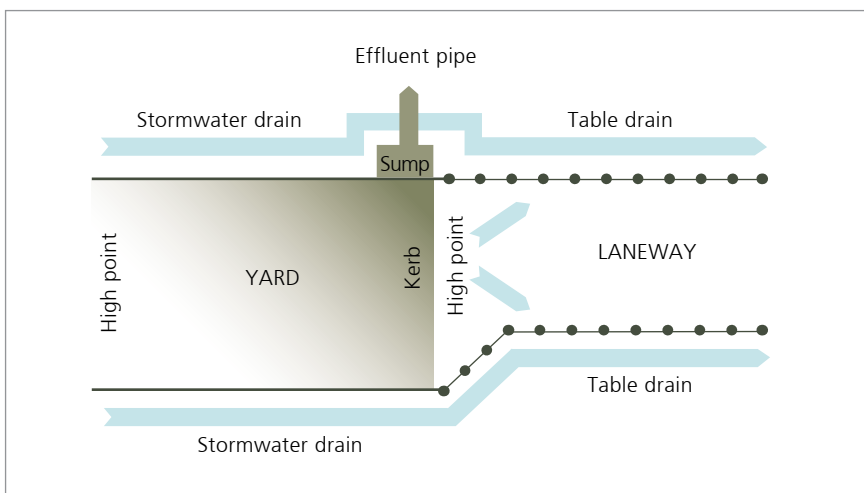
The surface of the yard is different to the track and it can be a common problem area for cow flow and therefore lameness. The intersection needs to be well designed and maintained.

Surface:

Placing lime fines on the first 40m helps to keep the track intersection area dry. The lime fines need to be about 100mm thick.

Drainage:

The intersection becomes very muddy and degraded without good drainage. Making the intersection a high point is the easiest way to drain this area. A 50-75mm square nib also keeps the track dry. Ensure the track is well compacted hard against the nib wall at the intersection to stop large hollows forming. Consider placing the nib wall one cow stride in from the concrete edge (approximately 500mm).



Track intersection showing drainage.

Lead-in area:

The yard entrance should be the full width of the track. The closest 10-20m before the yard entry experiences high stock pressure. Wooden railings provide a robust fence that cows are comfortable brushing up against.



Wooden railings leading to the yard entry provide a strong visual barrier and are comfortable for cows to brush up against.

4.5 Bridges

Bridges should be the same width as the track leading up to them.

Use nib walls where the track intersects the concrete to reduce transfer of small stones onto the concrete.



A well planned bridge will not slow cow flow - use lead in solid railing and avoid any narrowing.

4.6 Underpass

It is important to meet both district and regional council rules and requirements in the design, installation and management of underpasses.

The choice of site is key to efficient use, minimal maintenance and preventing effluent pollution. They should be well away from high water tables and on high ground if possible.

Avoid creating cow flow issues by ensuring the underpass is the adequate width, water is kept out, the floor is flat and even, it is as light as possible, there are no sharp turns and the gradient is not more than 10%.



Underpass design is site specific and requires the skills of an engineer/surveyor to ensure it is well done.

For information on farm infrastructure visit dairynz.co.nz/farm/off-paddock-facilities

Resources include:

- Farmfacts
 - Feed pads design and construction
 - Underpasses
- Dairy cow housing

dairynz.co.nz