Animal & Grassland Research and Innovation Centre

Moorepark

Moorepark Dairy Levy Research Update

Reducing lameness in Irish dairy herds

A guide for farmers

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Reducing lameness in Irish dairy herds –

A guide for farmers

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What is lameness and why is it important?

Lameness is a painful disease that impacts a cow's ability to move normally and is a major problem within the dairy sector worldwide. A recent Teagasc study showed that at any given time, one in ten Irish dairy cows is lame. The worst performing 20% of dairy farms in the study had a lameness prevalence of 15–32% percent. This demonstrates that lameness is a significant problem on many dairy farms in Ireland.

Lameness in dairy cows is important for a number of reasons.

1. It is one of the most costly diseases in dairy herds, with an estimated financial loss of approximately €300 per case (Ryan and O'Grady, 2004). These financial losses arise from decreased milk production (estimated loss €100), reduced fertility (€50), cost of treatment (€50), and increased culling (€100).

2. Lameness is a painful disease and a significant welfare problem for dairy cows. It affects a cow's ability to move normally and changes her behaviour. Animal welfare is an issue of growing concern for consumers of dairy products and society in general. Improving dairy cow welfare by reducing lameness is critical to retain societal support for dairy farming.

3. A high prevalence of lameness in a dairy herd can be very frustrating and have a very negative effect on morale among those looking after the cows.

4. Lameness impacts sustainability. It results in increased greenhouse gas emissions, due to the culling of cows at a younger age. Shorter productive lifespans means that more cows are required to produce

the same volume of milk. With the environmental implications of dairy farming increasingly coming under the spotlight, it is critical that every step is taken to reduce the carbon footprint of dairy production.

5. Lameness increases antibiotic use on dairy farms. Even though most cases of lameness do not require antibiotic treatment, many farmers use antibiotics when treating lame cows. There is an urgent need to reduce antibiotic use in food producing animals because of the growing problem of antimicrobial resistance. Reducing lameness will help to do this.

If you have a lameness problem on your farm, it might sometimes feel like there is very little you can do to improve the situation. The good news is that **by adopting certain simple measures, you can reduce the prevalence and severity of lameness on your farm.**

Why reduce lameness?

Reducing lameness in your dairy herd will:

1. Reduce financial losses
2. Improve dairy cow welfare and the sustainability of dairy farming
3. Improve morale among stock people
4. Reduce premature culling of young dairy cows due to lameness, and achieve longer production lives of dairy cows
5. Reduce the quantity of antimicrobials used in the treatment of lame cows

What is the anatomy of the normal hoof?

It is important to know the anatomy of the hoof, in order to understand how lameness develops and how to prevent it.

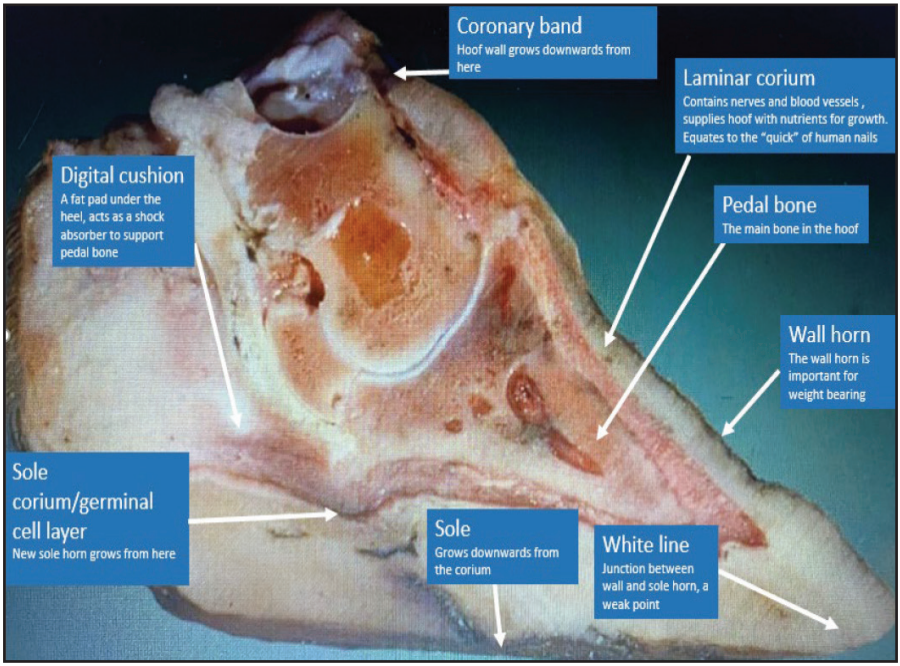


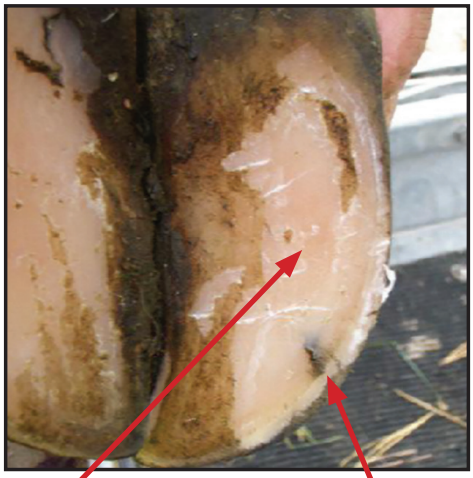
Figure 1. Anatomy of the hoof

What are the most common conditions causing lameness on Irish dairy farms?

More than 80% of the conditions that cause lameness occur in the foot of the cow. The majority of these foot conditions (80% +) occur in the hind foot. Lameness is primarily caused by infectious and non-infectious hoof lesions. The main causes of lameness in Irish dairy grazing herds are non-infectious: white line disease and sole haemorrhages.

White line disease

The white line is a **cemented junction** on the sole of the foot where the horn of the sole is joined to the horn of the wall. As a cemented junction it is the **weakest part of the sole** and the part of the sole that is most vulnerable to being breached by grit or stones. White line disease is characterised by separation of the wall of the hoof from the sole along the white line. It is caused by physical trauma that bruises the horn. It is also caused by shearing forces acting on the white line (such as twisting and turning on a hard surface) and loose stones or grit penetrating the white line. Infection can enter at a point of damage on the white line, causing an abscess. It is predisposed to by factors leading to poor horn quality, including environmental (wet, muddy conditions) and nutritional (poor diet quality) factors. The outer claw of the hind limb is the claw most commonly affected.



Treatment of white line disease involves:

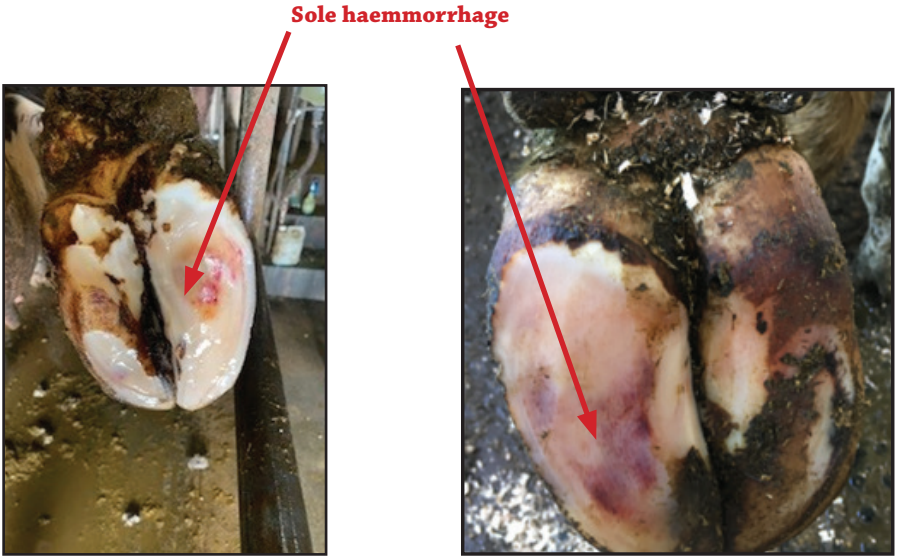
1. Foot trimming, followed by careful examination to identify the lesion. The Dutch 5-step method of trimming (https://ahdb.org.uk/knowledge-library/trimming-cows-feet-the-five-step-dutch-method) is recommended. Do not trim yourself unless you have had training in this method.
2. Removal of the horn wall to create a drainage hole for the pus.
3. Placement of a block on the opposite claw to take the pressure off the affected claw
4. Application of antibacterial treatments on any exposed corium, and administration of non-steroidal anti-inflammatories (such as Ketoprofen).

Very few cases require antibiotics unless the infection has tracked very deeply. Veterinary advice should be sought in all such cases.

Sole bruising/haemorrhages

Sole haemorrhages occur when there is trauma and damage to the germinal layer of cells ("the quick") that are responsible for producing sole horn, resulting in haemorrhage and bruising.
The factors that contribute to this include:

1. Calving: the connective tissue attachments that hold the pedal bone within the hoof capsule become weak and loose at the time of calving, allowing the pedal bone to sink and put pressure on the germinal cell layer between the pedal bone and the sole horn.
2. Excessive body condition loss: this results in a thinner digital cushion (the fat pad towards the heel of the hoof which acts a shock absorber.
3. Shallow foot angle and claw overgrowth.
4. Standing on concrete.



Treatment of sole bruising/haemorrhages involves:

Treatment involves applying a block to the unaffected claw (if only one claw affected), resting the cow and keeping her on a soft surface until she has recovered. She will also benefit from an anti-inflammatory drug. Do not remove excessive horn as the soles are often already thin.

Sole ulcers

A sole ulcer is essentially a much more severe case of a sole haemorrhage. It occurs when the quick is so severely damaged that some cells can no longer produce any sole horn at all. A complete hole in the sole horn results, which allows the sensitive corium to protrude. Sole ulcers are extremely painful. The same conditions that lead to sole haemorrhages also lead to sole ulcers. This is a condition that often affects both hind feet.

Treatment of sole ulcers:

Treatment of sole ulcers usually requires the involvement of a professional hoof trimmer or a vet. If the ulcer is severe, the cow may require local anaesthetic. Treatment involves:

1. Trimming to remove underrun horn and relieve the pressure on the lesion.
2. Application of a block/shoe to the sound claw.
3. Administration of an anti-inflammatory. Sometimes an infection may also be present; in this case antibiotics are also required.

Digital dermatitis (Mortellaro's disease)

Digital dermatitis (also known as Mortellaro's disease) is an infectious disease that affects the skin close to the hoof. It is more prevalent in housed cows, but can also occur when cows are at grass. It is caused mainly by the spirochaete bacteria of *Treponema* species. It is often introduced into the herd via buying-in of infected animals. Unhygienic conditions in indoor housing are a major risk factor for digital dermatitis, as the bacteria that cause it can easily

spread in slurry. Poor digital dermatitis control will exacerbate other conditions, result in slower resolution of lesions, a greater incidence of non-healing lesions, and many more cows that "get lame and stay lame".

Digital dermatitis lesions

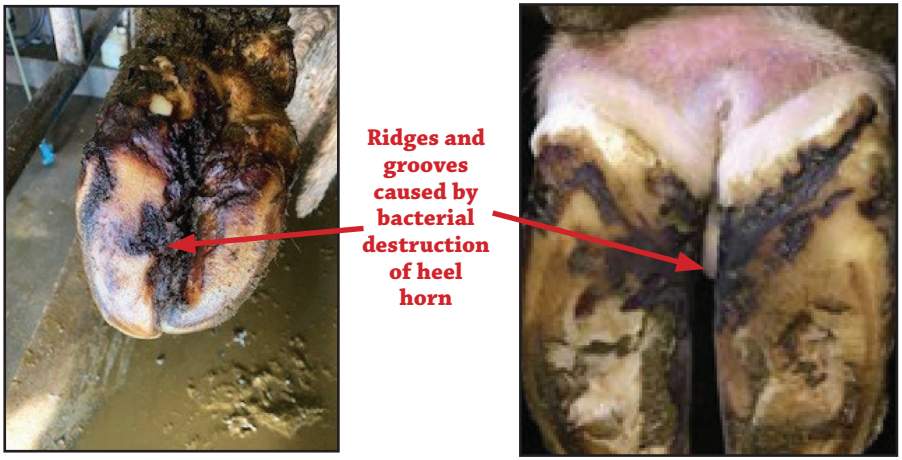
Treatment of digital dermatitis involves:

1. Trimming using the Dutch 5-step method to rule out other claw lesions, and to remove excess horn in order to enhance treatment penetration.
2. Cleaning and drying.
3. Application of a licenced antibacterial product. Treatment should be repeated daily for at least 3 days or until lesion is gone.
4. Put in place a regular footbathing programme to control the spread of disease within the herd.

Heel horn erosion (Slurry heel)

Heel horn erosion is another infectious disease, common in winter milk herds. The surface of the heel is damaged by bacteria (*Dichelobacter nodosus*) which lives in slurry. Destruction of the horn

of the heel results in ridges, layers and deep black grooves. Lameness may not be apparent until the condition becomes severe. Like digital dermatitis, it occurs when indoor conditions are unhygienic, as it too can spread in slurry. Standing in wet conditions softens the horn, predisposing to this disease. The v-shaped cracks visible in the heel often lead to sole bruising and consequently sole ulcers.



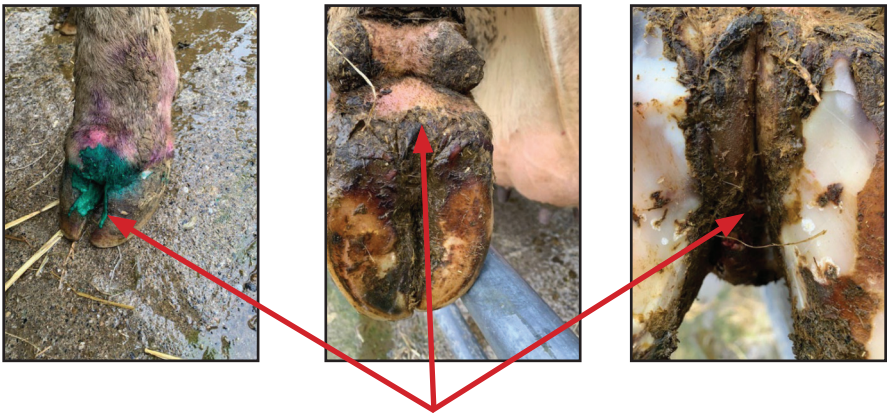
Treatment of heel horn erosion (Slurry heel):

1. Treatment involves paring away excess horn so both heels are the same height.
2. Attention to hygiene and reduction of slurry are essential.
3. It is also important to footbath with an appropriate solution.

Interdigital necrobacillosis (Foul in the foot)

Foul in the foot is an infection between the digits, causing severe pain, swelling and lameness. It is caused by bacteria (*Fusobacterium necrophorum*) normally present in the environment that enter

through damaged skin. Any environment which damages or softens the skin of the foot will predispose to this condition.



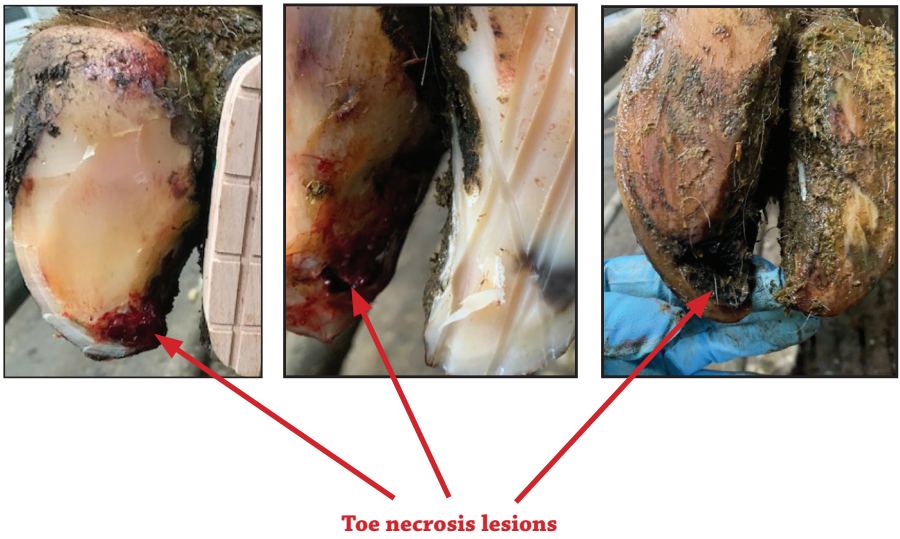
Swelling caused by infection with *Fusobacterium necrophorum*

Treatment of interdigital necrobacillosis (Foul in the foot):

Treatment involves antibiotics (it is one of the few lameness-causing conditions that does require antibiotics). Ask your vet for advice. Early detection and treatment is extremely important when treating foul in the foot. Repeated injections may be required. Anti-inflammatory injections will greatly reduce pain and return the cow to normal production more quickly.

Toe necrosis

Toe necrosis occurs when a bacterial infection enters the foot and causes the tissue to rot away. Toe necrosis generally involves the front of the pedal bone, and is a very painful condition. It is characterized by the animal walking on her heel and has a distinctive unpleasant smell.



Toe necrosis lesions

It is now known that the bacteria that cause digital dermatitis are often involved. **Toe necrosis is more common on farms where digital dermatitis is not well controlled.** Digital dermatitis that occurs at the front of the foot on the coronary band may progress under the hoof wall and can be the route of infection to the pedal bone.

Treatment of toe necrosis:

Treatment involves the removal of the dorsal wall and all the necrotic tissue. This procedure requires a vet or a vet working with a professional hoof trimmer. When the coronary band is found to be the initial route of infection, the wall of the hoof must be removed right to the top.

Footbathing can work well as a preventive measure, as controlling digital dermatitis is critically important to prevent toe necrosis

General points about treatment that apply to all cases of lameness:

- **Early and effective treatment is key to recovery**
- **Correct treatment by a trained person ensures a faster recovery. If you have not received training in the correct treatment for lameness, contact your vet or hoof trimmer for advice.**
- **All lame cows should be kept on a soft surface, walking distances should be minimised and anti-inflammatory pain relief should be given.**
- **Antibiotics should only be used after receiving veterinary advice where a diagnosis has been made.**
- **Once-a-day milking may be appropriate, or if late in the season, cows may be dried off.**
- **Management of all of the risk factors discussed later in this leaflet will assist recovery of lame cows (i.e. improving the environmental conditions, cow flow etc.)**

Lameness prevention:

What are the risk factors for lameness?

Many risk factors can increase the chance of a cow becoming lame. These include factors related to the environment, management, nutrition and the cow herself.

Environmental

Roadways

Poor quality roadways and gateways are a major risk factor for lameness. Uneven surfaces and stones can cause mechanical trauma to the hoof, and muddy, wet surfaces can cause softening of the claw horn and skin. **In grazing herds, the quality of the roadways is the single most important factor that farmers need to get right.**

Poor hygiene

Poor hygiene and standing in slurry can cause softening of the claw horn and skin. Infectious causes of lameness such as digital dermatitis will spread easily in unhygienic conditions and can grow more easily in soft, damaged horn and skin.

Inadequate cubicles and bedding

If cows do not have a comfortable place to lie, they will spend more time standing. This increases the stress on hooves, predisposing to lameness. Longer lying times promote the growth and development of strong, durable hooves.

Inadequate feed space

If cows do not have adequate space at the feed face, they will push and crowd each other, leading to stress and damage to hooves. This type of competition leads to hoof trauma, haemorrhage and white line disease.

Inadequate space in the collecting yard/Incorrect use of backing gate

Inadequate space in the collecting yard, and incorrect use of the backing gate (i.e. using the gate to "push" cows in to the parlour) can lead to cows slipping and falling, which can cause trauma to the hoof. Cows have a walking order and milking order, and these are not always the same. It is important that collecting yards have enough space so that late arriving cows that want to get milked quickly can move up. Cows need space to move.

Slats in roadways

Slats built into roadways leads to uneven weight distribution on the claws, which increases the risk of white line disease.

Inadequate turning distance

If cows do not have enough space to make a turn (for example, when leaving the milking parlour), this increases the shearing forces on the hoof which can increase the risk of white line disease.

Management (potential risks from poor management)

Poor handling of cows

Automatic Gate Opener

Cows do not like to be rushed. If cows are allowed to walk at their own pace, they will look closely at the path in front of them and avoid any stones in their way. Rushing cows does not allow them to do this, increasing the likelihood that they will step on the stones and suffer trauma to the hoof. A "Batt-latch" is an automatic gate opener that removes the need for the farmer to open the gate and walk behind the cows, and so allows them to walk to the parlour in their own time. Most of the cows will leave the paddock voluntarily and the farmer may only have to round up a small proportion of the herd that lag behind.

Ensuring good "cow flow" is key to reducing lameness in your herd. See https://www.lamecow.co.nz/index.html for further information on how to ensure good cow flow in your herd.

No routine mobility scoring/claw inspection

Routine mobility scoring (monthly at least) allows for identification of cows at the early stages of lameness. If lame cows are not picked up until the lameness is advanced, they are far less likely to recover fully. Studies show that the best lameness cure rates are achieved by early and effective treatment. **Early and effective treatment will reduce milk production losses, result in fewer cases requiring repeat treatments, and reduce the number of cows culled for lameness.**

No footbathing programme

A footbathing programme reduces the spread of infection. Herds that are not footbathed have an increased risk of infectious lameness. **If digital dermatitis is present it is essential that regular footbathing be carried out all year round; at least once a week when cows are at grass, and with greater frequency when housed.** Seek advice on the footbathing programme appropriate to your herd from your vet – every situation is different, and what works for one herd may not work for yours.

Biosecurity

Buying in animals carries a risk of introducing digital dermatitis into your herd. If digital dermatitis is present in the milking herd, keep replacement heifers and all other stock away from cow yards and cow housing, to eliminate the risk of transfer into stock other than the milking herd.

Nutritional

Low body condition score (BCS)

A low BCS is a risk for lameness. A cow has a fat pad in the heel of her hoof, which has cushioning and shock absorption properties. In cows that are excessively thin, this digital fat pad is much smaller, and therefore cannot provide the same level of protection.

Rapid introduction of concentrates

If concentrates are introduced to the diet too quickly, rumen acidosis may result. This has been linked to laminitis, an inflammatory condition of the hoof.

Cow

Early lactation

The cow is most vulnerable to becoming lame in the period around calving and early lactation. Hormonal changes that occur to prepare her body for calving also weaken the support ligaments in the hoof, with the result that the pedal bone becomes much more unstable, and the hoof much more susceptible to damage.

Previous lameness

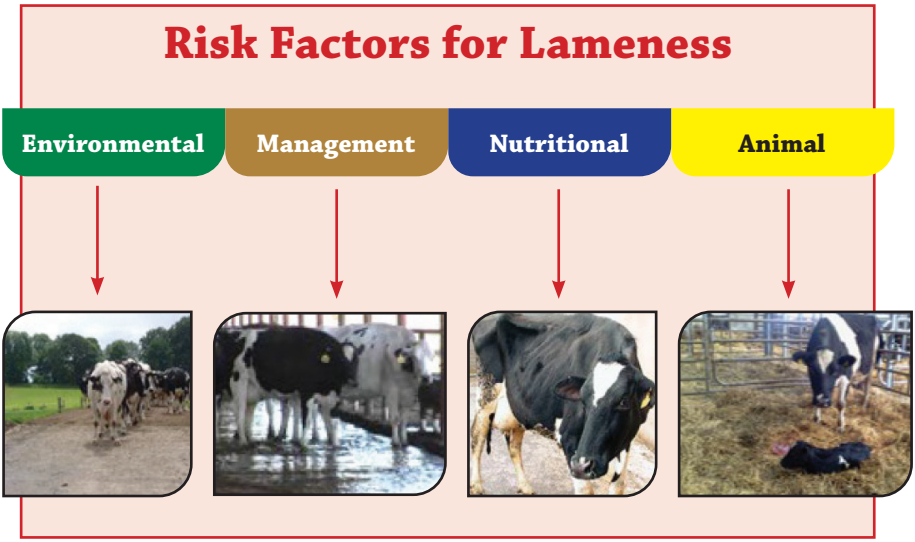
If a cow becomes lame once, it is much more likely that she will become lame again, compared to a cow that has never been lame. This is because when a cow becomes lame, certain changes occur in the anatomy of the hoof that means the hoof is weaker and more susceptible to damage. A previous lameness episode is one of the most important risk factors for lameness.

Age

Older cows are at greater her risk of becoming lame. This is because of bony changes that occur within the hoof over time, and because an older cow is more likely to have had an episode of lameness previously.

Genetics

A cow that has a positive lameness predicted transmitting ability (PTA) has a high genetic susceptibility to lameness, and is more likely to become lame than a cow that has a negative PTA for lameness.

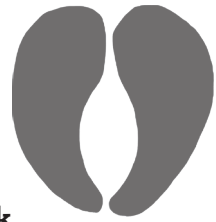


How do I reduce lameness in my herd?

Cows that become lame once are much more likely to become lame in the future. **Preventing lameness in the first instance** is the most important means by which lameness in a herd may be reduced. Management of all the risk factors just outlined is critical to prevent lameness.

Lameness prevention involves:

1. Preventing hoof damage through management of cows and environment (11 actions)
2. Instituting an effective hoof care programme (6 actions) to:
   - Promote healthy hoof growth
   - Identify and treat lame cows EARLY



1) Preventing hoof damage

Through management of environment

1. As a first step, carry out a **lameness risk assessment** on your farm: take a strategic look at your farm infrastructure to identify areas for improvement (see Table 1). Get advice regarding your farm infrastructure from your Teagasc advisor, vet and hoof trimmer. For more information see https://www.teagasc.ie/publications/2017/dairy-farm-infrastructure-handbook.php

2. Ensure your animals have **sufficient space** in collecting yards (1.5 m^2/cow), on roadways and in housing. Allow a minimum of 0.6 m feed barrier space per cow (7 cows per 15 ft span).

3. Improve the **quality of surfaces** on roadways and yards, especially turns and sharp bends. Concrete should not be slippery and should be free of rough ridges and stones.

4. Give cows a **clean, dry environment** for walking, both indoor and outdoor. Run scrapers as often as it is practical when cows are indoors.

5. **Reduce standing times** for animals by having an adequate number of correctly-sized, comfortable cubicles (1.1 cubicles per cow), and by minimizing time spent standing in collecting yards. Lying on bare concrete can injure the limbs. Mattresses or mats should be used to keep cows comfortable and injury-free and to promote lying.

6. Identity and rectify problems with **cow flow** (i.e. sharp turns, slippery concrete, overcrowding, narrow passages etc.). Rubber matting can be used in areas where slippery concrete is present to provide grip.

Through management of cows

7. **Stress-free handling** is extremely important. Reduce pressures during movement and allow animals to move at their own pace (no sticks, shouting, quads or dogs). Use backing gates to move animals gently, do not push them.

8. **Introduce first calving heifers to the herd** well before calving. This will reduce fighting with dominant cows and reduce stress on heifer hooves.

9. **Mind the cow after calving.** Keep calved cows close to the parlour for as long as possible (minimum of 48 hours) to allow the pedal bone to settle post-calving. It is best for all cows to walk short distances if possible, but after calving this is particularly important.

10. Ensure cows are in **appropriate body condition**. It is especially important to minimise body condition loss in the six weeks after calving.

11. Choose bulls with a **lower genetic susceptibility** (i.e. negative PTA) for lameness.

2) Hoof care programme

This should be created in conjunction with your vet, advisor and hoof trimmer. It will outline the plan for monitoring and treating lameness in your herd. Key components are:

1. **Mobility score regularly** to identify lame cows that require treatment/trimming early.
2. **Treat lame cows early**. Early treatment is key to recovery. Discuss with your hoof trimmer the feasibility of a standing arrangement where the hoof trimmer visits regularly (e.g. once every two weeks in larger herds). This will allow for early identification and treatment of lame cows before lameness becomes severe and chronic. Depending on your experience and level of skill, you may be able to treat mild cases of lameness yourself by trimming the hoof. Hoof trimming should always be carried out by an appropriately trained person. Severely lame cows should always be seen by a vet and hoof trimmer. Providing pain relief to lame cows will reduce their pain and improve their recovery rate, and should be considered in the treatment of all lame cows. Ask your vet for advice on this.
3. **Record** cases of lameness in your herd. If you do not know what the level of lameness is, you will not be able to monitor improvements. Record the cause of each lameness case (e.g. Mortellaro, white line disease).Your hoof-trimmer and vet can help you with this.
4. If digital dermatitis is present on your farm, adopt a regular, consistent, year-round **footbathing programme**. The frequency of footbathing required will depend on the level of infection challenge and on whether the cows are grazing or housed. Discuss with your vet and hoof trimmer.
5. Carry out **routine hoof-trimming** (or hoof examination – it is possible some cows will not need to be trimmed). At a minimum, this should be carried out once a year. Drying off is a good time to do this.

6. **Gradual introduction of concentrates** is very important (2 kg first day and increase @0.75 kg/day).

What is mobility scoring, and why/how should I do it?

Mobility Scoring is a simple system of assessing and grading a cow's mobility. Cows are observed walking and given a score based on their mobility and the presence or absence of lameness.

Mobility Scoring is used as an aid to identify cows in the herd that would benefit from having their feet lifted, examined and treated. It is particularly helpful in identifying mildly lame cows and in creating a list of cows for early treatment by hoof trimmer or vet.

Mobility Scoring can also be used as a measure of the prevalence and the severity of the lameness in a herd. This is useful in assessing the scale of the lameness challenge in a herd and as a means of measuring progress over time.

Mobility Scoring is best carried out by recording the cows freeze brand numbers as they stand in the milking parlour and then observing them as they exit. Observe cows walking on a hard, flat, even surface as they exit the parlour, at a point 10-20 metres from the parlour exit. Watch each cow individually, allowing them to make between 6 and 10 uninterrupted strides.

The Agriculture and Horticulture Development Board in the UK (https://ahdb.org.uk/) uses a four-point scale to mobility score cows.

Score 0: Good mobility

Cow walks with even weight bearing and rhythm, has a flat back and long fluid strides. No action needed.

Good Mobility

Score 1: Imperfect mobility

Steps uneven or strides are shortened, but the affected limb is not immediately identifiable. The cow may have a slight head bob. Action: further observation, could benefit from routine hoof trimming.

Imperfect Mobility

Score 2: Impaired mobility

Uneven weight bearing, limb immediately identifiable, short strides, arched back. The cow's head bobs up and down when walking. Action: lift foot as soon as possible to establish the cause of lameness before treatment.

Impaired Mobility

Score 3: Severely impaired mobility

Cow cannot keep up with the healthy herd, may be limping, and her back is arched when standing and walking. Action: this cow is very lame and needs urgent attention from a vet or hoof trimmer, and pain-relief. She should not be made walk far and should be kept on a soft surface.

Severly Impaired Mobility

Key point:

Mobility scoring should be carried out regularly to identify lame cows in your herd

What should I know about footbathing?

Foot bathing regularly and often is an essential element in the control of digital dermatitis.

To foot bath effectively, it is essential that cow flow through the bath is smooth. Ideally, the foot bath should be permanently positioned at, or near the milking parlour exit. Easy access to water facilitates rapid filling of the bath.

Foot bath options include precast concrete, building a site-specific concrete bath, or a stainless steel foot bath that will fill, empty, rinse and refill itself automatically.

Important points:

1. Ensure the footbath is wide enough. A footbath should be a minimum of 700 – 850 mm wide. This will allow cows to pass one at a time with good cow flow. A footbath of 3m x 850 mm works very well for herds of up to 250 cows.
   - A footbath 1.5 m wide and above will allow two cows to pass through simultaneously, and an advantage of a wide design is better cow flow. Herds larger than 250 cows should have a footbath width of at least 2m.
2. Footbath should not have any steps up or down (bottom of footbath level with walking passage)
   - Length: 2.5 m – 3 m
   - Solution depth should be 100-125 mm
   - Volume: 1 litre/cow passage

3. To be effective, the reagents that you use in the footbath must be used at the correct concentrations. To get the concentration right, you need to know the volume of the footbath. Multiplying the length by the width by the depth of solution, measured in metres, will give the volume in cubic metres. Dividing cubic metres by 1000 will be the volume in litres.

Figure 2. Precast concrete footbath measuring 850 mm x 3 m. This size footbath works well for herds of up to 250 cows.

4. Change solution often enough. A good rule of thumb is to allow one cow passage per litre of solution before changing. For example, a 200 litre footbath needs solution changed after 200 cow passages. An automatic footbath may be a suitable option for larger herds or herds where labour is an issue. These can be set to empty and refill after the number of cow passages you choose.

5. Copper sulphate and formalin are commonly used and effective. Antibiotics are not licensed for use in footbaths. Antibiotic use in footbaths contributes to the growing problem of antimicrobial resistance, with risks of potential residues in milk or meat, environmental contamination and ineffective treatment of underlying disease.
6. Consult your Teagasc advisor, vet or hoof trimmer to get tailored advice about the best type of footbath for your farm.

Key point:

Footbathing regularly and often is essential to control digital dermatitis

What should I know about hoof-trimming?

Hoof trimming can be performed for two reasons:

1. To prevent lameness. In this case, trimming is carried out as a routine procedure, a number of times a year. Routine hoof trimming is an important part of maintaining healthy hoof shape and growth, which makes the hoof more resistant to injury. It is a good idea to get your entire herd routinely inspected (and trimmed if needed) by a professional hoof trimmer at least once a year. Before drying off is a good time to do this.
2. To treat lameness. Often, treatment of a lame cow will involve some trimming of underrun horn, and corrective trimming to restore the hoof to a proper weight bearing shape.

Hoof trimming should always be carried out by an appropriately trained person. Hoof-trimming can do a lot of damage if it is done incorrectly, and often make lameness worse.

If you want to be able to trim your lame cows yourself, you can do a hoof trimming course. The Irish Cattle Foot Trimmers Association organise courses for professional hoof trimmers. To find out more, visit www.icfta.ie. Greenway Agritraining solutions run regular hoof trimming courses for farmers. For further information contact **ndunphy@agritraining.ie.**

Key point:

Hoof trimming is carried out to treat lame cows but also to prevent lameness

Take home messages

- To reduce lameness in your herd, **prevention** of lameness in the first instance is critical. To do this, it is vital to focus on managing the risk factors for lameness.
- While considerable effort is required to make these changes, **significant reductions in lameness prevalence and severity are possible** on the majority of Irish dairy farms.
- Farmers, hoof trimmers and vets all have a role to play in reducing lameness. It is important that everyone works together as a team, adopting a **cow-centric approach**.

Table 1: Risk factors for lameness and prevention strategies

Category	Risk Factor	Effect	Prevention
Environmental	Poor roadways, gateways and areas surrounding water troughs	Mechanical trauma to hoof and softening etc. (if wet and muddy)	• Adequate size, surface, cross falls, maintenance etc. • Minimise stones
	Poor hygiene and standing in slurry	Softening of the claw horn/skin → bacterial growth	• Passageways need to be clean & dry (adequate space and efficient slurry collection. Run scrapers as often as possible)
	Lack of/or inadequate bedding, poorly designed or inadequate number of cubicles	Physical discomfort while lying, increased standing time & resulting stress on limbs, hooves	• Adequate cow: cubicle ratio (1:1.1 ideally), and cubicle size with comfortable bedding
	Inadequate feed space	Stress and hoof damage caused by crowding and queuing	• Allow minimum of 0.6 m per cow (7 cows per 15 ft span)
	Inadequate space in the collecting yard, incorrect use of backing gate	Slipping/falling → trauma to hoof	• Provide adequate space (1.5 to 1.8m2/ cow) • Do not use backing gate to 'push' cows into parlour
	Inclusion of concrete slats in initial part of roadways to/from collecting yard	Uneven weight distribution on claws → White line disease	• Install rubber matting over slats
	Inadequate turning distance at parlour exit	Shearing forces on hoof can lead to white line disease	• Ensure plenty of turning space at exit • Installation of rubber mats at sharp bends/ parlour exit
Management	Poor handling of cows when herding	Cows rushed → trauma to hoof	• Allow cows to walk at their own pace • Do not use a dog or quad • Allow cows exit parlour and leave for paddock as soon as finished milking • Consider use of batt latch

Category	Risk Factor	Effect	Prevention
Management *(contd.)*	No routine locomotion scoring/claw inspection	Lameness not detected early enough → poorer recovery rates	• Locomotion score at least monthly to identify cows in need of claw trimming/ treatment* • Organise standing arrangement for hoof trimmer to come in every week or two (may be more suitable for large herds)
	No footbathing programme	Facilitates spread of infection	• Footbath weekly at pasture, more frequently when housed • Essential to footbath when Mortellaro present, seek vet/ hoof trimmer advice
	Poor herd biosecurity	Facilitates spread of infection	• Operate closed herd if possible • Ensure young stock kept away from milking cows if Mortellaro present, to prevent the spread from cows to other livestock
Nutritional	Low body condition score	Fat pad in hoof reduced → lack of cushioning and support	• Regular monitoring of BCS with appropriate intervention (especially in first six-weeks post-calving) • Avoid sudden introduction of concentrates (2 kg first day and increase @ 0.75 kg/day)
Animal	Early lactation	Physiological changes weaken support in hoof	• Allow cows to recover post-calving (avoid long walks, provide soft surface etc.)

Category	Risk Factor	Effect	Prevention
Animal *(contd.)*	Previous lameness episode	Weakens hooves → higher recurrence	• Prevention is best (especially for heifers) • Institute a regular checking system for cows with a history of lameness
	High genetic susceptibility (i.e. a positive lameness predicted transmitting ability [PTA])	Higher susceptibility to lameness	• Choose bulls with a negative PTA for lameness (i.e. lower genetic susceptibility)
	Age	Changes in hoof anatomy and more likely to have had previous lameness episode	• Prevent first time lameness • Ensure early detection and treatment

*** Treatment should be carried out in consultation with the herd vet and hoof trimmer. Hoof trimming improves hoof shape and horn quality, but should always be carried out by an appropriately trained person**

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