FACTSHEET

A

Identifying, treating, and preventing footrot.

- bacterial disease spread cow to cow
- infection usually introduced via damaged skin between the claws
- causes a swelling in the area above the hooves
- responds to antibiotics if treated early

Footrot is one of the most common causes of lameness in dairy cattle. It is an infection of the foot caused by bacteria which usually live in the soil. The bacteria enter the tissue of the foot through abrasions, cuts or wounds in the skin.

The disease is often seen in high rainfall regions, or in areas that are continually damp or wet, for example calving pads or feedlots. Moisture softens skin which is then prone to injury, and infection follows. Moisture and warmth also favour the survival of the bacteria in the soil.

The gap or cleft between the two claws is the usual place for infection to start. The cleft is narrow and tight, so stones, sticks and other objects lodge easily, eventually causing a break in the skin, and an entry point for infection.

Once footrot bacteria have penetrated the skin and invaded the foot, they multiply and produce toxins or poisons which damage the area under the broken skin. The signs of inflammation – pain, lameness, redness, swelling and heat are the result.

The appearance of footrot

- Lameness is usually sudden and severe. The cow may even develop a slight temperature, and a drop in milk production. Bulls with footrot can suffer lowered fertility.

- The area just above the hoof (the coronet) swells. The two claws spread apart. The skin becomes warm, tight and reddened. There's often a split in the skin at the top of the cleft. This split can be at the front, the rear, or all the way along the cleft. The skin edges along the split are swollen. Within the split there is usually dead tissue and very foul-smelling pus.

- Footrot can occur without this split in the skin, and then the only signs of disease you see are lameness, severe swelling, redness and heat.

- Severe infections of footrot can extend beyond the cleft and invade the joints of the foot, or run up the outside of the tendons to infect the upper leg. Then the swelling is massive and disabling. In these cases, the disease has the potential to cause loss of the leg, and so, loss of the animal.

How footrot spreads

- When infected material leaks out from the foot of an animal with footrot and mixes with the soil, it introduces millions of bacteria into the dirt and ground surfaces of your farm, ready to infect other animals. In other words, the infection spreads from cow to cow via the soil.

Treating footrot

- Prompt treatment is essential. Infections become severe if left untreated.

- Although it may be unpleasant to do so, it is necessary to explore the split between the claws with your finger to check for buried stones, sticks or other foreign objects. A yellow core of dead tissue is sometimes easy to remove.

- Once the cleft has been cleaned and checked, it can be sprayed with a disinfectant.

- Intramuscular antibiotics such as penicillin, tetracyclines, or sulpha drugs are usually an effective treatment. A three day course is recommended so that all traces of bacteria are killed while the split heals. Make sure milk and meat withhold times are observed.

Prevention of footrot

- Reduce stones in the environment with appropriate track maintenance. Unstable areas should be repaired.

- Reduce moisture in the environment. Drain muddy areas. Maintain tracks, areas around drinking troughs, gateways and drains. Make sure calving pads have a proper drainage system when installed.

- Rapid treatment and isolation of infected animals limits the spread of bacteria around a farm. Often a prolonged dry period is needed to reduce the numbers of bacteria within the soil.

- Footbaths with chemicals such as copper sulphate or formaldehyde are supposed to harden hooves, and kill bacteria on the skin surface in the cleft of normal animals.

  However the chemicals within footbaths are easily contaminated and diluted with mud and manure. In addition, if hooves are already muddy, the chemicals may not penetrate to the hoof and skin between the cleft. Also, as cows walk out into wet areas, the chemicals can be quickly washed off the foot. So the use of footbaths is debatable.

  The chemicals are dangerous to you and the environment, so seek professional advice before their use.

See Factsheet M for further information about the use of footbaths.

FACTSHEET

B

Identifying, treating, and preventing bruised soles.

- caused by excess pressure on uneven ground, especially on stones.
- many factors increase the risk
- causes pain within the claw and lameness
- responds to rest

Inside the hard, outer layer of hoof wall and sole, a cow has a sensitive layer of tissue rich in blood vessels and nerves. This layer is almost identical to the quick of our own fingernails and toenails. Just as you can get a “black” fingernail or toenail when you hit or squeeze it, cows can bruise their hooves.

If a cow stands on a stone, its sole bends upwards, over the stone. The sensitive layer is severely squeezed between the sole and the pedal bone within the foot pressing downwards, with the weight of the cow above it. (The sensitive layer is caught between a rock and a hard place!)

The resulting damage caused bleeding within the claw, and subsequently pressure, pain and lameness.

The appearance of bruised soles

- To identify bruising, the surface of the sole has to be very well cleaned with a knife, rasp or sanding disc.

- Pink, red or dark red flecks appear in the surface of the sole. This flecking is stale blood growing through the hoof from the damaged sensitive layer. It is similar to the appearance of your finger- or toenails when they turn “black” from damage.

The multiple causes of bruised soles

A number of factors contribute to an increased risk of bruising.

- If many stones are present on the track or in the yard, there is an increased risk of bruising. Damage is more likely if the stones are free on the surface rather than buried, if they are sharp rather than rounded, and if the surface beneath them is concrete or very hard ground.

  If a track “breaks up”, and stones from the track base are brought to the surface, clearly there is an increased risk of bruised soles.

- If the hoof is soft due to very moist or wet conditions, it distorts more easily over a stone and offers less protection to the sensitive layer, and therefore is more prone to bruising.

- If the sole is thin due to excessive wear, it will offer less protection to the damage caused by stones. Excess wear can be caused by abrasive sand carried into the yard, from newly poured concrete, from excessive turning of cows in the yard when on heat, when heifers are bullied by older and more dominant cows, or when the farm operator tries to hurry cows into the milking shed.

- Driving or pushing cows along a track or into an already crowded yard can result in a cow lifting her head and placing her feet in an unplanned manner. She is then more likely to step on a stone and cause bruising.

- Poor hoof shape or conformation can cause excess hoof under the sole. Then the normal pressure of walking may be sufficient to cause bruising and lameness.

Multiple causes of bruising can be present at the one time. For example, winter is a common time for excessive moisture, and for tracks to break up, which in turn may result in a herd being driven. Thin soles may be simultaneously present in young animals.

Treating bruised soles

- Draft cows with bruised soles into a paddock close to the shed at milking time. Bruising will repair with time, but rest is important. Walking long distances can lead to additional bruising. Make sure cows don’t have to walk far for food or milking.

- Particularly severe bruises may need some form of relief from the pressure of body weight and walking. A glue-on plastic shoe can be fitted (if bruising is largely confined to one claw) or a shoof applied (if severe bruising is present in both claws).

- If the sole is excessively thickened, it will require corrective trimming.

Prevention of bruising

- Reduce stones in the environment with appropriate track maintenance. Unstable areas should be repaired. Properly constructed and maintained tracks can reduce the incidence of bruised soles.

- Reduce moisture in the environment. Drain muddy areas. Maintain tracks, areas around troughs, gateways and drains. Make sure calving pads have a proper drainage system when installed.

- Avoid conditions which cause excessive wear of soles, such as the presence of abrasive sand in the yard.

- Use good stockmanship when getting the cows in for milking, or moving them.

- Keep hooves in good shape with corrective trimming if necessary. However, trimming may reduce sole thickness, and is best avoided when animals have to walk long distances to pasture. Sufficient sole thickness must be left to allow for reasonable protection. Hooves can be trimmed at drying off when cows have a rest from walking long distances.

FACTSHEET

C

Identifying, treating, and preventing white line disease.

- the white line is the fibrous join between the wall and the sole
- it is a point of weakness
- in white line disease, the fibrous junction disintegrates and is penetrated by debris
- the resulting cracks can extend into the claw to cause an abscess

What is the white line? The hoof of the cow is divided into two main areas – the wall (which is the visible outer part of the claw), and the sole (which is the undersurface of the claw). The cow actually bears most of her weight on the wall. The fibrous join between the wall and the sole is called the white line.

If you clean the undersurface of the hoof, and then smooth it with a knife, rasp or sanding disc, you can see the join, and it is indeed a *white* line.

The join is weaker than either the wall or sole, and this results in the white line being a focal area for development of lameness.

If the quality of the keratin is poor or soft following laminitis, or if the hoof wall is stressed by cows carelessly placing their feet or twisting excessively, or if feet are poorly shaped, small cracks can occur in the white line.

The cracks cause lameness when they extend deeply into the hoof and reach the sensitive area of the foot. There the cracks allow bacteria into a site rich in blood vessels, but poorly drained. A hoof abscess develops in the confined area of the claw, and pain and lameness result. The abscess results in a cavity within the hoof, “an underrun sole” (see p XX), or an underrun wall, which may discharge at the coronary band.

The appearance of white line disease

- To identify white line disease, the surface of the sole has to be very well cleaned with a knife, rasp or sanding disc.

- Small cracks usually occur along the white line, towards the heel, but may be anywhere between the heel and the point of the toe. They first appear as diagonal black lines crossing the white line. Then they can pack with dirt and gravel, and slowly enlarge until the wall and the sole begin to separate.

The causes of white line disease

A number of factors contribute to an increased risk of white line disease.

- Driving or pushing cows along a track or into an already crowded yard can result in a cow lifting her head and placing her feet in an unplanned manner. She is then more likely to step on stones or uneven ground and stress the white line. Other stresses on the white line can result from excessive turning of cows in the yard when on heat, or when new additions to the herd or heifers are bullied by dominant or older cows.

- If a track “breaks up”, and sand or gravel is carried onto the yard, the white line can pack with the sand or gravel, increasing the risk of abscesses developing.

- The sharp edges of concrete on poorly maintained yards can stress the white line.

- If the hoof is soft due to very moist or wet conditions, the white line offers less resistance, and cracks develop more easily.

- If the sole is thin due to excessive wear, the white line will be thinner, and less able to resist stress.

- Poor hoof shape or conformation can cause packing of gravel under the sole, and eventual penetration and separation of the white line.

- Poor hoof material quality caused by subclinical laminitis can make the white line weaker, and therefore, more prone to cracking. In addition, chronic laminitis causes the normal shape of the hoof to distort, making it more prone to white line disease.

Treating white line disease

- Pare out the fine cracks between the wall and the sole with a hoof knife or sanding disc attached to an angle grinder. Pare the wall away in a shallow “V” so sand or gravel does not pack into the pared area.

- The cracks can extend into the sensitive area of the hoof, and cause an abscess. If this is the case, pus will escape onto the pared area (see treatment of underrun soles, p XX).

- Where white line disease has resulted in an abscess draining to the coronary band, it is necessary to remove part of the wall of the hoof over the defect.

- If the paring results in removal of a significant portion of the wall and sole, apply a cowslip to the unaffected claw to relieve pain and prevent further white line disease.

Prevention of white line disease

- Use good stockmanship when getting the cows in for milking, or moving them. Pushing stock stresses the white line.
- Maintain tracks to reduce sand and gravel in the environment. Unstable areas should be repaired.
- Maintain the concrete in the shed, yard, and concreted areas of tracks.
- Reduce moisture in the environment. Maintain drains to reduce muddy areas.
- Avoid conditions which cause excessive wear of soles, such as the presence of abrasive sand in the yard.
- Keep hooves in good shape with corrective trimming if necessary.
- If feeding concentrates, avoid subclinical laminitis and maintain high quality hoof material with well-balanced rations.

FACTSHEET

D

Identifying, treating, and preventing underrun soles.

- a cavity between the sole and the deeper, sensitive layer
- source of severe pain and lameness, even during healing
- drain promptly
- protect the new sole horn while healing

Any crack or puncture in cows' hooves can penetrate to the sensitive area. Dirt and gravel carry bacteria into the sensitive hoof-growth area. There the bacteria multiply and produce toxins or poisons. White cells move into the area from blood vessels to defend the foot against infection.

Damaged or dead white cells killed by bacteria release chemicals that produce the signs of inflammation - pain and lameness, redness, swelling and heat. This causes significant problems for the cow.

Firstly, because the infection is within the hoof, often the redness and swelling is not easy to observe. The signs of disease are hidden. In addition, unless the foot is lifted and cleaned, the crack or puncture and resulting infection remains undetected and the cow's pain continues unrelieved.

Secondly, infection eventually leads to a fluid of dead bacteria and white cells – pus. Because the hoof provides a hard exterior "case", the fluid can't escape. It builds up and causes pressure. This results in intense pain, and severe lameness results.

Finally, because the pus cannot escape, it builds up until it separates the sole from the sensitive area, forming a cavity. The cavity enlarges until usually, the pus bursts out - often at the heel - where the hoof joins the skin. The process of cavity formation causes a portion or the entire sole to lift from the deeper layer - a disease called *underrun sole*. The process results in severe foot damage.

If the infection does burst out at the heel, the cavity at the heel is free to pack with dirt and gravel between the sole and the sensitive layer, and cause more pain.

Alternatively, the infection may not burst out at the heel, and (like footrot), may penetrate deeper areas of the foot, infecting tendons and joints. Loss of the claw and in severe cases, loss of the cow may result.

White line disease is a common cause of penetrations that cause underrun soles. Hooves with thin soles that are the result of hoof wear are more susceptible to injury and penetration. Large pieces of gravel or the sharp edges of stones can puncture the sole, and introduce bacteria. Gravel can slowly pack into uneven or damaged areas of sole or wall, and can be forced through to the sensitive hoof-growth area. Nails and other objects can perforate the hoof and cause an underrun sole.

While many cases of underrun soles are caused by cracks in the white line towards the heel area, the point of the toe is also prone to developing fine cracks that lead to very painful “point of toe” abscesses.

Very small defects in the sole of the hoof may be sufficient to allow bacteria into the underlying soft tissue, resulting in infection and pus building up within the hoof.

The appearance of underrun soles

- Often lameness is the only outward sign of underrun soles. The resulting lameness may be very severe, with cattle showing a characteristic “sliding” lameness.

- The bulb of the heel on the side of the affected claw can swell and redden in response to the infection. Occasionally the infection can extend to deeper areas of the foot, and even into joints or tendon sheaths. Then the pain, swelling and redness are very severe.

- If the pus under pressure escapes to the outside, the exit area can be seen as a gap between the hoof and the skin. Often the gap appears at the heel where the hoof thins. On other occasions the pus can exit between the claws or on the coronet towards the heel.

- Hoof testers can be used to help determine which claw is affected, and the area of greatest pain. This is the area which requires very careful examination.

- If the foot is correctly cleaned and examined, with careful examination the crack or puncture responsible can be found on the white line or sole. If followed into the hoof as far as the sensitive area, pus will eventually escape or the cavity will be sighted. Drainage can be established by widening the hole.

The causes of underrun soles

Because white line disease and excessive hoof wear are major causes of underrun soles, the factors that cause white line disease and excessive hoof wear are also responsible for causing underrun soles.

- Driving or pushing cows along a track or into an already crowded yard, excessive turning of cows in the yard when on heat, or when new additions to the herd or heifers are bullied by dominant or older cows all cause white line disease and resultant underrun soles.

- If a track "breaks up", and sand or gravel is carried onto the yard, the white line can pack with the sand or gravel, increasing the risk of underrun soles.

- In addition, when a track breaks up, stones are brought to the surface and can penetrate the sole, especially if the track under them is hard, or they are carried onto the hard surface of concrete in a yard.

- The sharp edges of concrete on poorly maintained yards can stress the white line or cause the sole to be cut or punctured.
- If the hoof is soft due to very moist or wet conditions, the white line offers less resistance stresses, and cracks develop more easily. In addition, the sole is softer too, offering less resistance to penetration by sharp stones.

- If the sole is thin due to excessive wear, the white line and the sole will be thinner, and less able to resist penetration.

- Poor hoof shape or conformation can cause white line disease, and subsequently underrun soles.

- Poor hoof material quality caused by laminitis, and abnormal hoof shape caused by chronic laminitis can lead to white line disease, and the development of underrun soles.

Treating underrun soles

- Prompt treatment is essential to prevent the underrun area getting larger, or infection entering deeper areas of the foot.

- Pare out fine cracks between the wall and the sole with a hoof knife or sanding disc attached to an angle grinder. Pare the wall away in a shallow "V" so sand or gravel does not pack into the pared area.

- The cracks that cause an underrun sole can be so fine that they are difficult or impossible to see. Look closely at the hoof to discover them, or apply pressure with hoof testers to squeeze moisture out of fine cracks to aid detection.

- If drainage is established very early in the course of the infection, pus may not be present, or the quantity may be very small. If this is the case, the hole made by exploration may be sufficient allow drainage and prevent a cavity forming, and an underrun sole developing.

- Once pus is found, or cavity sighted, make the drainage hole made larger to allow pus to drain freely. Care is required. Do not cut the sensitive layer of the hoof, and start bleeding.

- Carefully cut away all underrun areas of hoof with a hoof knife or hoof cutters if you are sufficiently experienced. Where possible, leave sound sole and wall for the cow to walk on. On occasions, the whole sole is underrun, and should be removed. Again, do not cut the sensitive layer of the hoof, and start bleeding. Failure to remove the entire underrun area risks further packing with sand and gravel, and continuation of the condition. Delayed or poor treatment of underrun soles can result in a second layer of infection under the initial underrun area, a condition called "double underrun sole."

- If you lack the experience to do this, call your veterinarian so that the condition can be treated professionally.

- Because the sensitive sole is no longer protected by hoof material, protect it to prevent pain, and allow the cow to graze, eat supplements if offered, and express normal behaviour such as bulling. Apply a cowslip to the other claw (see page XX), or apply a shoof to the foot if both claws are affected (see page XX). It may be necessary to dress the affected claw with a temporary bandage to prevent further damage or pain from stones or uneven concrete (see page XX).

- Because it takes time for a new sole to grow and replace the underrun area, lameness can persist for some weeks after drainage. Appropriate protection (above) minimises lameness and its side-effects during the long healing phase.

Prevention of underrun soles

- Use good stockmanship when getting the cows in for milking, or moving them. Pushing stock stresses the white line.

- Maintain tracks to reduce sand, gravel and stones in the environment. Unstable areas should be repaired.

- Remove stones from the surface of the track and yards.

- Maintain the concrete in the shed, yard, and concreted areas of tracks. Repair broken edges.

- Reduce moisture in the environment. Maintain drains to reduce muddy areas.

- Avoid conditions that cause excessive wear of soles, such as the presence of abrasive sand in the yard.

- Keep hooves in good shape with corrective trimming if necessary.

- If feeding concentrates, avoid laminitis and maintain high quality hoof material with well-balanced rations.

FACTSHEET

E

Identifying, treating, and preventing laminitis.

- inflammation of the corium
- 3 phases – subclinical, acute and chronic.
- causes a reduction in the quantity and quality of hoof material.
- aspects of nutrition, exercise, trauma and concussion are important causes
- laminitis is an important cause of other foot diseases

Laminitis is inflammation of the corium - the soft tissue between the hoof walls/sole on the outside of claw, and the pedal bone within the claw. This area is rich in fine blood vessels and nerves, and is responsible for normal growth of the walls and sole. Severe inflammation results in a reduction in the quantity and quality of keratin or hoof material produced.

There are three phases of laminitis – subclinical, acute (and subacute), and chronic. Each phase has a typical appearance and is an important cause of lameness.

The typical signs of inflammation – redness, swelling, heat, pain, and loss of function (lameness) - are present during a case of acute laminitis.

In pasture fed, concentrate supplemented dairy cattle, subclinical laminitis occurs much more commonly than acute laminitis.

Because laminitis interferes with the production of healthy hoof wall and sole, it is an important cause of other hoof diseases and the lameness that they cause, for example, white line disease, sole abscess, sole ulcer and claw deformities.

The appearance of laminitis

- The signs of acute and subacute (less severe) laminitis appear quickly. Cases show the typical signs of inflammation. The coronary band becomes reddened and warm. Increased blood flow may be detected by the findings of increased pulse and engorgement of the veins of the hindlimb. Although the tight skin around the coronet and the relatively inflexible walls of the hoof do not permit a great amount of swelling, it is present (even if only on a microscopic scale). Acute and subacute forms of laminitis are not common in cattle, and are often seen following accidental engorgement of large quantities of grain.

The pain causes cows to change the way they stand. Laminitis often causes lameness affecting more than one limb at a time. Often the hindlegs are positioned forward under the animal ("camped forward"). A cross-legged stance may develop.

- In chronic laminitis, the claw changes shape. It becomes longer, and the front wall of the hoof is concave when viewed from the side. The sole becomes flatter and wider. The wall develops horizontal ridges or ripples due to partial interruptions in its production. The claw is more prone to develop sole bruises, white line disease, sole abscesses, sole ulcer and claw deformities such as slipper foot. Lameness is often due to these secondary diseases.

- Subclinical laminitis produces no immediate signs, but is recognised by the changes in the hooves which occurs several months after episodes of subclinical laminitis. The changes are recognised as deterioration in hoof horn quality and haemorrhages in the sole of the hoof. It is often necessary for the surface of the sole to be lightly sanded or scraped for the changes to be readily observed.

  The white line develops a yellow colour and has small red dots of haemorrhage along it. The sole also becomes yellowish and develops flecks of haemorrhage within it. The hoof material appears "waxy" and is softer. In cows affected by laminitis, other foot diseases are found more commonly - white line disease, sole abscess, sole ulcer and claw deformities.

- When a whole herd is affected, many cows can become reluctant to walk. A herd that normally travels willingly to and from the milking shed to pasture may slow down and become extremely difficult to move in the normal fashion.

The causes of laminitis

- The sudden introduction or unbalanced feeding of high levels of rapidly fermentable carbohydrates such as grain may cause laminitis. Such feeding practices increase volatile fatty acids production by bacteria in the rumen, and pH falls. The acidity kills beneficial bacteria and other microorganisms, and they are replaced by bacteria that produce further acids – especially lactic acid. Rumen pH falls to critically low levels. This condition is called acidosis.

  When this occurs, the rumen wall absorbs the acids together with poisonous chemicals released by dead bacteria and an additional chemical called histamine. They enter the cow's bloodstream and are carried around the body to the feet. There they change blood flow in the blood vessels that supply the corium, the area responsible for hoof growth. This causes inflammation, poor quality hoof production, the signs of laminitis, and lameness.

  In severe cases of excess acid production in the rumen, the rumen wall can develop infected ulcers, and bacteria can be carried from the ulcers to the liver where liver abscesses develop. An elevated body temperature, depression and weight loss may follow. Abscesses on the liver may be fatal.

  The presence of rumen acidosis can be checked by using a pH metre to measure the acidity of rumen fluid. This should be performed 2 to 5 hours after the feeding of concentrates, or 5 to 8 hours after the feeding of a Total Mixed Ration.

- Diets low in fibre, especially when fibre length is short and relatively ineffective, can increase the risk of acidosis. Low fibre diets reduce cud chewing, in turn decreasing

saliva production. Saliva is high in bicarbonate that acts to buffer acid production in the rumen. When saliva production is decreased, the capacity to neutralise the excess acids produced in acidosis is reduced.

- It is also thought that excess protein and a relatively low percentage of fibre in rapidly growing, high-quality pasture may cause laminitis.

- Poisons or toxins produced in other diseases such as metritis or mastitis can also cause laminitis.

- Exercise is required for normal hoof health, and a reduction in exercise, especially when associated with unbalanced feeding of high levels of grain, and especially around calving time may increase the risk of laminitis.

- Trauma to soles due to excessive walking or turning, or walking on uneven or stony tracks may cause laminitis or make the diseases that develop secondary to laminitis worse.

- There is a higher risk of laminitis around calving and when other diseases such as acetonaemia, fat cow syndrome and displacement of the abomasum (or fourth stomach) occur.

Opinions regarding the significance of the various causes of laminitis are divided.

Treating laminitis

- If you suspect acute laminitis, call your veterinarian to assist with diagnosis. When acute laminitis occurs, every attempt should be made to identify the cause(s). Pay particular attention to the diet of the cow or herd. It may be advisable to call a veterinarian, nutritionist or consultant to ensure the correct balance of components. More than one factor may be involved.

- Lameness caused by subclinical laminitis may not occur until weeks or months after the episode(s) of laminitis. Treat the secondary diseases caused by subclinical laminitis - such as sole bruises, white line disease, sole abscesses, and sole ulcer - promptly and effectively. (See Factsheets for treatment of these separate conditions.) The possible causes of this subclinical laminitis should be investigated.

- The lengthening of the claw, and broadening and flattening of the sole caused by chronic laminitis leads to claw deformities such as “slipper foot”. Deformities should be corrected with hoof trimming to restore or improve foot shape. This requires experience. Call a veterinarian for professional assistance if necessary.

Prevention of laminitis

In Australia, how cows are fed varies widely from State to State, and even between farms in the same district. Pasture remains the predominant source of nutrition, but its quality and quantity can vary widely over the period of a year. Excess quantities of pasture grown in the spring are conserved as silage or hay and fed back as fodder to the cows at a later date.

In addition to pasture and fodders, many farmers now use a variety of grains or pellets as a concentrated form of energy to fill in feed gaps when pasture is

insufficient. In addition, if the buying price of supplements is favourable, grains or pellets are used to augment pasture, and better utilise the production potential of cows.

Crops are grown and fed to cows directly, or preserved as silage or hay, and fed subsequently. Byproducts and wastes from the human food industry are also utilised to feed dairy cows, especially when farms are close to food industry centres.

Australian dairy farms vary from being predominantly pasture-based to feedlots. Considering this variety in management, it is difficult to prescribe hard and fast rules to suit every farm.

The following points are guidelines for pasture-based systems.

- The feeding of high levels of grain is a potentially dangerous exercise that can risk the health and life of cows. If not experienced in doing so, seek the expert advice of a dairy veterinarian, consultant or nutritionist.

- Make all feed changes slowly! In particular, animals should be introduced slowly to concentrates, and the level of concentrate feeding should be increased gradually – by around 1 kg every second day. As a rule of thumb, change no more than 10% of the diet in a four day period.

- If cows are to be fed concentrates immediately after calving, provide a concentrate ration 2 weeks before calving, with cows receiving concentrate up to 0.5 to 0.75% of bodyweight, or 2.5 to 3.7 kgs per cow per day. This will condition the rumen to receiving concentrate, and provide a necessary energy source if poorer quality hay is the predominant part of the diet. To avoid milk fever, do not feed sodium bicarbonate or legume-based fodders in the late dry period.

- If more than 3 kg of concentrate per cow per day is to be fed, consider using additives such as buffers (for example, limestone or sodium bicarbonate at a rate of one and a half percent of the concentrate ration) and alkalysing agents such as magnesium oxide to the concentrate portion of the ration. (There is not strong evidence that sodium bicarbonate is effective in cows on pasture.)

  Consider using Virginiamycin[1], an additive registered for the control of acidosis in the diet. There may be some benefit from the use of sodium monensin in controlling acidosis, although there is no product claim for this effect.

- At times of lush pasture growth (when the carbohydrate and crude protein content of the pasture is likely to be very high,) it may be necessary to supplement cattle with fibre. This can be supplied by having cereal hay available for the grazing animals.

- Make sure that crushing of grain is not excessive. Grains such as wheat, barley and triticale should be fractured into 2-5 pieces or be rolled. Corn can be broken into 5-7 pieces or be rolled. Production of fine powdered grain increases the risk of acidosis.

- Check feeders during milking to make sure that feed is not building up in them, and that cows are eating consistently.

[1] ®Eskalin.

The following points are guidelines for producers feeding very high levels of concentrates, and those working in near feedlot situations. (Producers should consult their advisor or nutritionist to help formulate a ration that will minimise the risk of rumen acidosis and laminitis.)

- Make sure the minimum fibre and fodder needs are met. The first and most important calculation of the carbohydrate component of the diet is the NDF (Neutral Detergent Fibre) from fodder. Know the NDF levels of fodders used.

  For high producing cows, formulate rations to contain at least 23% NDF from fodder. The minimum quantity of fodder as a percentage of dry matter intake should be calculated on hay crop fodder-based rations.

  $$\text{Min. fodder DMI\%} = \frac{23 \times 100}{\text{Fodder NDF}}$$

  This results in a minimum percentage of fodder in the ration dry matter ranging from 65% with low fibre (35% NDF) fodders to 40% with high fibre (55% NDF) fodders. Therefore the minimum quantity of fodder alters according to the percentage of NDF in the fodder, and should be no less than 40 to 45%.

  The total ration NDF should be 27 to 34%.

- Do not exceed 36 to 38% Non Structural Carbohydrate (NSC) in the ration, depending on the grain source.

- If silage is chopped, 25% of the particles on a weight basis should be more than 5 cm long. If silage is chopped too finely, consider feeding 2.5 to 4.5 kg of long or coarsely chopped hay per cow daily.

- Supplement with dietary buffers early in lactation. The recommended feeding rate of sodium bicarbonate is 0.75 to 1% of the total ration dry matter. Sodium bicarbonate is effective for maize silage based diets in providing some control of acidosis.

- Closely monitor changes in fodder moisture content and adjust rations accordingly.

- Do not feed more than 4 kgs of concentrate at one time.

- Ideally, if concentrates and fodders are fed separately, feed concentrates at least three to four times daily.

- Ideally, gradually increase concentrate intake during the first 6 weeks of lactation.

- Consider using Virginiamycin[2], an additive registered for the control of acidosis in the diet. There may be some benefit from the use of sodium monensin in controlling acidosis, although there is no product claim for this effect.

[2] ®Eskalin.

FACTSHEET

G

Identifying and treating axial wall cracks

- a diligent search and an expert eye may be required to find axial wall cracks
- treatment difficult
- recovery slow
- retreatment occasionally necessary

Occasionally a crack develops on the inner hoof wall, running from the coronet to the sole. Because the crack is between the two claws, it is not obvious to an inexperienced operator, and can be difficult to treat because it is not very accessible. (The technical name for the inner hoof wall is the “axial wall”, and hence the name “axial wall crack” when a crack appears in this area.

The crack packs with dirt, and when it extends to the sensitive area of the hoof, it causes pain and lameness, and infection can follow.

In some districts, axial wall cracks are a common cause of lameness.

The appearance of an axial wall crack.

- To identify an axial wall crack, the space between the two claws has to be thoroughly cleaned with water and a brush. Large chunks of mud may need to be picked away with a hoof knife first.

- Axial cracks run from the skin/hoof junction at the coronet to the axial groove on the sole, between the two claws, usually closer to the toe than the heel.

Treating axial wall cracks

- Treatment of axial wall cracks is difficult, and requires an experienced operator and sometimes, special equipment. If you are not experienced in the treatment of this disease, call your veterinarian.

- Pare out the axial crack with the curled end of a sharp hoof knife, or with a barrel-shaped bit attached to a Dremel drill. It may be a painful condition, and therefore treatment can be uncomfortable for the animal. If so, call a veterinarian who may decide to use a local anaesthetic.

It is very important not to expose too much of the underlying soft tissue when paring out sand cracks. If a large area of soft tissue is exposed, there is a risk of “proud flesh” or granulation tissue growing at the site, and this growth is difficult to control.

- Proud flesh can protrude through the crack either before treatment or develop after treatment. This is a painful condition for the cow as the proud flesh can be squeezed by the hoof walls either side of the crack. The proud flesh should be removed by a veterinarian.

- Occasionally the hoof wall next to the coronet can be underrun with infection, and if this is the case, remove the underrun hoof. If footrot is present as a secondary problem, treat it with antibiotics. Withhold milk and meat as per label instructions.

- Axial wall cracks may take some time to heal, and more than one treatment is sometimes necessary.

- Excessive pain and lameness can occur. Apply a glue-on plastic shoe to the other claw if this is the case.

FACTSHEET

H Identifying interdigital fibroma

- benign cancer
- often infected with footrot bacteria
- surgical removal

Interdigital fibromas are benign cancers that grow between the claws of cattle, and are important as they cause lameness. Because they can cause a break in the skin, they can act as a site of entry for the footrot bacteria, and be a cause of footrot.

The appearance of interdigital fibromas

- Interdigital fibromas are easily found and identified during a thorough examination of a lame foot. They appear as a fleshy growth hanging down from the skin between the claws of the foot. Occasionally they can be seen between the claws from the front of a cow or bull when standing.

- If infected with the footrot bacteria, the rest of the foot looks like a normal case of footrot. Occasionally an interdigital fibroma can bleed or be flystruck.

Treating interdigital fibromas

- If you identify interdigital fibroma, call your veterinarian and have the fibroma removed surgically under local anaesthetic. Your veterinarian may apply local treatments and dress the foot.

- Intramuscular antibiotics such as penicillin, terramycin, or sulpha drugs may be given as a follow-up treatment. Make sure milk and meat withhold times are observed.

- Surgical removal is usually a very effective cure.

FACTSHEET

Identifying, treating,and preventing hairy heelwarts (digital dermatitis).

- An infectious bacterial disease
- Major cause of lameness in USA, but occurs infrequently in Australia
- Hairy wart-like or ulcer-like sores located on the bulb of the heel
- Responds rapidly to antibiotics applied to the diseased skin

Hairy heelwart or digital dermatitis is a painful, contagious disease causing wart-like areas on the back of the hind feet, on the bulb of the heel or near the interdigital cleft. It was first reported in 1974, and has since been observed in most countries where large numbers of dairy cattle are maintained in drylots.

During the 1990s, hairy heelwart spread throughout dairies in the USA, where it is now a major infectious cause of lameness. Presumably due to dryer conditions and different production systems, hairy heelwart only occurs rarely in Australia. A particularly wet, muddy winter may result in more cases amongst heifers or cows in their second calving.

Hairy heelwarts are caused by bacteria and therefore respond to antibiotic treatment, however the type of bacteria which causes the disease remains unknown. Many types of bacteria have been found in the infected areas. Spirochaetes (cork-screw shaped bacteria) are the most common type.

The appearance of hairy heelwart

- Hairy heelwarts are found after thorough washing of the lame foot. The hind feet are most commonly affected. They may occur on more than one foot including the front feet. The affected area is located on the bulb of the heel at the margin between the hoof and skin (the coronary band). Occasionally it extends into the interdigital cleft or involves the dew claws.

- The infected areas are circular to oval, 2-6 cm in diameter, and surrounded by grey, thickened skin bearing long, erect hairs. They are very painful to touch and prone to bleeding, but there is no swelling or inflammation of the foot.

- Early (ulcerative) sores are moist and red with the appearance of a cut strawberry. As the disease progresses, the sores become grey to whitish yellow, and produce excess tissue with a characteristic wart-like appearance, and long, hair-like projections. The infection is usually chronic, and takes several weeks to heal.

- Cows with hairy heelwart show varying degrees of lameness from none to placing weight on the toes or reluctance to bear weight altogether.

Treating hairy heelwart

- Because hairy heelwart is rarely diagnosed in Australia, it is suggested that you should contact your veterinarian to discuss a suspected case before treatment is undertaken.

- Applying antibiotics to the surface of the infected areas is the most effective form of treatment for hairy heelwart. Intramuscular injections of antibiotics do not result in an effective cure, and are unnecessary.

- Oxytetracycline as a spray applied daily to infected areas at milking, or in soaked gauze applied as a footwrap is most effective.

- Surgical removal can be performed in conjunction with a footwrap for wart-like areas in the interdigital cleft that do not respond to sprays.

Prevention of hairy heelwart

- Reduce moisture in the environment. Drain muddy areas. Maintain tracks, areas around drinking troughs, gateways and drains. Make sure calving pads have a proper drainage system when installed.

- Risk factors that contribute to the occurrence of hairy heelwart in the USA include the use of drylots, the introduction of replacement heifers, failure to quarantine and inspect new stock, the use of hoof trimmers, failure to clean hoof trimming equipment, and grooved concrete flooring.

FACTSHEET

J Conditions of the upper leg.

- hip dislocation
- hip arthritis
- rupture of the cruciate ligaments

Although more than 90% of cases of lameness are due to conditions of the foot, disorders do occur in the upper leg, and are often severe and disabling.

Dislocated hip

- The hip joint is a “ball and socket” joint; the pelvis forming a socket, which cups the ball-shaped head of the thighbone or femur. A ligament from the ball to the socket, and the muscles surrounding the joint, usually prevent dislocation.

- Trauma may cause the ligament to tear, and the ball to dislocate from the socket. Examples of such trauma include service injuries, bulling injuries, slipping in a yard, and struggling to rise if affected by milk fever or calving paralysis.

- Most animals are unable to stand following dislocation of the hip. Some animals may be able to stand, and are usually unable to bear weight on the affected leg, with the leg is rotated so that both the stifle and foot are turned outward.

- Dislocated hips may be relocated successfully in about 50-60% of cases, if treatment is provided within about twelve hours of the injury occurring. The affected animal is usually heavily sedated or anaesthetised, and the leg placed under traction in an attempt to relocate the ball in the socket.

- If the animal is not treated promptly (within twelve hours), the socket can fill with blood and this can prevent successful relocation.

- If hip dislocation is suspected, call your veterinary surgeon to confirm the diagnosis and attempt relocation if the animal’s value warrants treatment. The cost of the treatment should be weighed against the likelihood of success. Treatment is more likely to be successful if the animal is young, standing, and if the injury occurred within 12 hours of treatment.

- Occasionally, both hip joints can be dislocated. In these cases, the animal is unable to rise.

Hip arthritis.

- Cattle may develop hip arthritis due to prior injury to the hip joint, inherited disorders of the hip, or as part of the aging process.
- Lameness is usually mild at first, and slowly gets worse with time.
- Thigh and hip muscles waste, and the hip joint may appear prominent. Occasionally the grating sensation of bone against bone can be heard or felt as the leg is moved.
- The outlook for cases of hip arthritis is very poor as they usually deteriorate with time, and fail to respond to treatment.

Rupture of the cruciate ligament.

- The cruciate ligaments are located in the stifle joint, and run from the thighbone or femur to the shinbone or tibia. Their function is to prevent the thighbone and shin bone from moving forward and backward against one another excessively.
- The ligaments can be ruptured due to twisting of the leg during bulling or service, or to some other accident.
- The lameness which results from a ruptured cruciate ligament is usually sudden in onset. If the animal is closely observed, the leg can click or make a “clunking” sound when it bears weight.
- If you suspect an animal has ruptured its cruciate ligaments, call your veterinary surgeon to confirm the diagnosis. The veterinarian may be able to detect an increase in fluid in the joint, and this sign assists in confirming the diagnosis.
- The outlook for cases of rupture of the cruciate ligaments is poor as they usually develop stifle arthritis, deteriorate with time, and fail to respond to treatment. In less acute cases, the affected animal can be kept in an area where her movement is minimised, and some may recover sufficiently to be culled.

FACTSHEET

K

Lameness in bulls.

- most commonly caused by excess hoof wear when the bulls are allowed to enter the milking yard
- can cause severe lameness and inability to serve
- prevented by keeping bulls out of the milking yard

While bulls are subject to many of the same conditions that cause lameness in cows, a common cause of lameness in bulls is excess hoof wear which occurs when the bulls are run with the herd.

In most cases, the lameness is a result of bulls being allowed to enter the milking yard. The bulls chase cows, commonly twisting and turning on the concrete surface. The result is excessive hoof wear, particularly in the hind feet. The soles of the feet become very thin, readily subject to bruising and injury, often resulting in lameness, and in severe cases, inability to serve.

Hoof wear may lead to small cracks developing in the toe of the hoof, allowing infection to enter, causing abscesses and underrun soles.

The signs of excess hoof wear

- Bulls suffering from excess hoof wear may appear "tender-footed", particularly on hard surfaces. They may show signs of pain when they stand a stone.

- In cases that develop toe abscesses, the lameness becomes severe, and the bull will become reluctant to serve.

- In some cases, when both hind feet are affected, bulls walk with a shuffling movement, and it is difficult to tell which foot is lame.

- Severe lameness can result in reduced fertility. Even severe cases of footrot, if left untreated, may lead to a reduction in semen quality.

Examination of lame bulls

- It may be more difficult to restrain a bull than a cow, and it may be more difficult to lift up the bull's feet for examination. Occasionally it is necessary for a veterinarian to sedate or anaesthetise a bull so that a full examination and thorough treatment can be carried out.

- If the soles can be examined, they will be worn flat, and the bull may show signs of pain when a hoof tester is used.

- Where the toe abscesses have developed, pain on pressure may be severe.

Treatment

- In early cases showing signs of hoof wear, removing the bull from the herd, and resting him for a few weeks will usually result in improvement.

- In a more severe case, when a toe abscesses is present, it is necessary to open the abscess to allow drainage.

- A glue-on plastic shoe may help healing in these animals.

Prevention

- Make sure that bulls never enter the milking yard with the cows. They can readily be trained to stay out of the yard, even when they are running with the herd.

- In some larger herds, a strategy that has worked is to have one group of bulls that are run with the cows during the day. When the cows are removed for the evening milking, these bulls are left behind, and another group of bulls await the cows when they enter the night paddock. These bulls in turn are left behind when the cows are removed from the paddock for the morning milking. The day bulls are moved into the next paddock where the cows will be sent for the day.

FACTSHEET

L Correct abnormal hoof shape by trimming

The need to trim the feet of cattle at pasture is probably less than the need for foot trimming when cattle are kept in stalls or barns for long periods of the year. In general, the process of walking to and from the milking shed causes wear of the hoof, in most cases eliminating the need for foot trimming. However, some cattle at pasture do develop overgrown claws and trimming may be required.

The aim of trimming is to cut and pare the claws in order to make them function as well as possible. The aim is to return claws to their normal shape and proportions.

Claws that require trimming may include claws that are overgrown or claws that have become misshapen. The process of trimming may involve "shortening" and "levelling" the claws.

Trimming comprises several procedures:

- shorten excessively long walls to achieve a better weight distribution between two adjacent claws,
- remove excessive sole hoof material so that the wall (where it contacts the ground) and the heel of both claws bear most of the weight,
- remove loose horn to avoid pressure,
- prevent penetration of dirt,
- and when associated with abscesses and underrun soles, release discharge and remove underrun areas.

Hoof trimming

The first part of the examination of the foot should involve a careful examination of the claws while the leg is still standing on the ground. The length of the claw, and shape of the claw, should be examined and assessed.

The leg with the hoof to be trimmed is lifted and the foot properly restrained (see Guideline 5 on page XX).

Once the foot has been lifted, the two claws should be assessed for size and symmetry. The length of the claw is an important starting point. If it is of normal length, it should not be shortened.

The length of the claw

The outer claw is more likely to have abnormal shape and length. The inner claw usually retains its normal shape, but may be too long. Often the inner claw can be used as a guide for the correct shape and length of the outer claw.

The height of the claw

The difference in height between the outer and inner claws can be noted.

After judging length and height, trimming follows a fixed pattern:

For the hind claws

Any excessive length of the wall and toe of the inner claw can be removed with hoof cutters. The hoof knife is then used to pare the bearing surface of the hoof - it should be trimmed so that the sole is flat.

The outer claw can then be cut back to the same length as the inner claw and then pared back to the same height as the inner claw.

The sole of each toe is pared so that it is slightly concave and most of the weight will be born on the outside wall of the hoof.

An angle grinder can be used to remove the “dished” appearance of slipper feet seen in chronic laminitis, and smooth any rough areas of the outer wall or heel.

The soles of the feet should not be trimmed back too severely - an excessively thin sole may become bruised, and is more readily penetrated by a foreign object.

At the time of hoof trimming, any abnormalities such as white line disease or sole ulcers should be thoroughly investigated.

For the front claws

Regular trimming of front claws is not usually necessary. If front claws to have to be trimmed, the same rules apply as to the hind claws:

- Restore a normal length.
- Trim to equal height

The soles of front feet are normally rather flat hence the slope (concavity) of the sole should be prepared in moderation.

While every effort should be made to restore both claws to the correct length and height, it is important that the hoof trimming not be too aggressive. If underlying soft tissue is exposed, or if the sole of the hoof is pared so that it is excessively thin, an animal that was not lame before trimming may become severely lame after trimming!

In addition, the shape of the underlying soft tissue may be deformed, so that it is not possible to completely return the hoof to its normal shape. In such cases, regular hoof trimming may be required to keep hoof shape as close to normal as possible.

FACTSHEET

M

Notes on construction of a farm track.

- If constructing a track, plan first!
- Make sure track width is adequate
- Remove grass and topsoil
- Construct drains
- Construct, crown and compact a sound base
- Build a suitable walking surface
- Prevent excess wetness at the yard/track junction
- Maintain tracks
- Track faults increase the risk of lameness!

Cows can walk considerable distances to be milked, and the importance of the farm track as a factor influencing the risk of lameness is well known. Poor quality walking surfaces, restrictions to ideal cow flow, excessive wetness in the environment, and impatient human actions that cause adverse changes to cow walking behaviour are all factors that relate back to the farm track!

In addition, well designed farm tracks can minimise contamination of cows' udders with dirt and mud, reducing the need to wash udders at milking time, and having a beneficial effect on the level of mastitis in the herd.

Farm tracks should be built using sound construction principles. Construction should also allow for planned expansion in herd number. Once built, tracks should be maintained as required. Failure to adhere to sound construction principles leads to excessive maintenance, and failure to maintain increases the risk of lameness and its consequent losses and costs. (See "What does lameness cost a dairy farmer?" on page XX.)

Cow numbers will, in part, determine the type and extent of the work needed to build sound farm tracks. The bigger the herd, the greater the amount of work required to construct successful tracks. The farm's management practices will also influence construction. For tracks used rotationally as opposed to daily, a lower construction standard may suffice. Tracks used rotationally appear to recover and reconsolidate, especially after bad weather. There is no relief for farm tracks which are used twice daily.

Applying these principles practically on the farm, and obtaining suitable construction materials locally, and at an acceptable price, can present difficulties.

Planning

- When renovating or building new laneways, it is important to assess their location as part of a whole farm plan. It may be advisable for dairy farmers to talk to agricultural consultants or local advisory officers, and incorporate laneway requirements when planning paddock layout.

- Allow for existing and planned expansion of herd number when considering track width (see page XX).

- Follow sound construction principles. Consider the types of base and surface materials, what is available locally, and the relative costs of materials. Seek local advice from neighbours and contractors regarding materials and construction.

  Most dairy farmers are constrained by the material that is available locally, and have to identify how best to use the material to give the most effective results. To achieve this, the basic construction principles outlined below should be followed, and local knowledge utilised.

- When designing the track, it is important to avoid right angle bends. Sharp bends slow the pace of cows considerably. Use curves to change laneway direction.

- Also consider other uses the laneway may have.

Track width

- There is little information available on track widths. From research work funded by the Massey University Agricultural Research Foundation, the following guidelines have been established (table below):

Herd size	Track width
<120 cows	5 metres
120-250 cows	5.5 metres
250-350 cows	6.0 metres
350-450 cows	6.5 metres
>450 cows	as required

- If in doubt, farmers may find it worthwhile talking to neighbours, and observing their herds moving under similar conditions.

- Patchett (1994) suggested that the width of the track is dependent on the farmer's individual needs, and the size of the herd. He suggested one metre in width for every twenty cows up to a maximum of eight metres is suitable.

Remove grass and topsoil

- Organic material such as grass and manure should be removed first.

Drainage:

Effective drainage is an essential component of good track design and maintenance. The importance of correct drainage must not be underestimated!

- Drains are required along either side of the track to prevent water seeping into the base from the surrounding ground. It is not sufficient to dig the drains, then let them fill with water. They must be correctly graded, and the water must have somewhere to flow to, if the drains are to function correctly.

- In some cases, material from the side drain construction can be used to build the track base above ground level.

- The drains should be fenced off from the track so that cattle cannot walk in them, and cause damage. Electric fence wire on outriggers from the paddock electric fence will leave access for a tractor blade during surface maintenance.

- Culverts will be required where there are paddock entrances across side drains or where water needs to be drained under the laneway. Smaller diameter culverts are often a false economy, 300 mm diameter culverts are suggested for most situations.

- Wherever possible, the water table should be kept at least 600 mm below the track surface. The higher the track above the water table, the better.

Construct, crown and compact a sound base

If the foundation is not adequate, laneways will break down and need to be rebuilt. The base should support the wearing course or walking surface without moving, wetting or breaking up. This can be achieved by using a suitable base course material, and if necessary, stabilising and strengthening the existing material and/or placing down a filter fabric as outlined below.

- Adequate compaction of the track base is very importance. Options include the use of a power grader with an experienced driver, a tractor with a mounted blade, a pneumatic tyred roller, or a loaded vehicle with high pressure tyres. In many cases a vibrating roller will produce the best results. The base should be built up in layers not exceeding 150 mm in depth, and each layer should be thoroughly compacted.

- The top of the track base should lie above the water table, and be free from pugging. In many cases, additional material may need to be bought in to make sure that the track base is sufficiently high to allow good drainage.

- If the quality of the foundation material is not acceptable, it will be necessary to bring in suitable material such as pit or river run gravels to form a base. These need to be compacted firmly into place.

  Soft clay must not be used to form the base of the track. It will not compact to a stable nature. Clay surfaces can be stabilised by mixing hydrated lime to a depth of 125 mm. Cement can also be used for stabilisation - application rates of 1 to 4 % are usually recommended. Other forms of stabilisation include enzymes (Paczyme) and ionic soil stabilisers (eg Terra Firma).

- Problems with boggy sections or wet areas around gateways can be overcome by using a plastic fabric laid on the base material. This fabric allows the downward movement of water, but retains the gravel particles on top, keeping them where they need to be. The fabric must be laid above the water table.

- Tracks are "crowned" to help shed water and maintain a relatively smooth wearing surface. The slope across the track should be sufficient to shed water and be comfortable for the cows. A slope of about 10 percent should achieve this. In some situations the base can slope to one side to suit the lie of the land.

Construct, crown and compact a walking surface

- The surface (or the wearing course) serves two functions:

1. It provides a suitable surface for the cows to walk on. The materials used should be able to compact into a hard, smooth, wear-resistant top that water will run off, not seep through. The material should consist of well-rounded granular particles which will not cause hoof damage. It should not have sharp stones which can cut the hooves, and should be free of loose stones which can cause bruising.
2. It must prevent seepage of water through into the base.

- To achieve these two functions, the surface must be bound together in some way by using:

1. top course gravels,
2. stabilisation,
3. green lime,
4. rotten rock,
5. or river sand or silt.

- If top course is used, it should consist of well rounded gravels less than 25 mm in diameter, and have a 15-30% clay content. A minimum depth of 50 mm of surfacing material should be used, with 100 mm being more suitable. It should be crowned and extremely well compacted. The success or failure of this type surfacing is dependent on the compaction.

  One suggestion is that the ideal surface material is a mixture of gravel, sand and clay, approximately 100 to 150 mm in thickness. The finer particles will fill the pores between the larger particles, binding the material and forming a hard wearing and relatively smooth surface. Large stones should be avoided as these get kicked out of the track and leave a site susceptible to water and damage.

- Green (agricultural) lime is another alternative as a surfacing material. Care must be taken to check that local lime is suitable for this use. Some green limes cannot be compacted into a tight wear- and weather-resistant surface. If suitable, a layer of lime 50-100 mm thick is spread and mixed in with the top 25-50 mm of base. It needs to be crowned and compacted firmly into place.

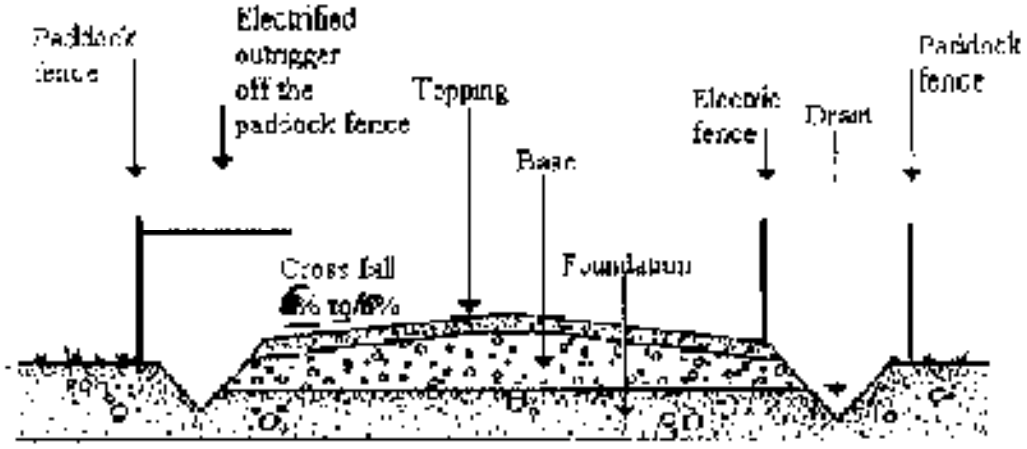
- Sand should never be used on its own as a surface material because it is very abrasive. It is carried from the track into the concrete yards. There it quickly wears down cow’s hooves as they walk or mill around on the concrete.

- It is essential that the materials are adequately compacted. The use of a vibrating roller during the course of track construction can greatly assist in making sure that both the bearing surface and foundations are well compacted. Cows cannot be used to do this!

- The slope (camber) across the track should be sufficient to shed water and be comfortable for the cows. A slope of about 1 in 10 should achieve this.

- Often, many farmers do not have many choices with respect to the type of materials they can use in construction of farm tracks due to cost constraints. However, this limitation can be overcome provided proper attention is paid to construction, particularly with respect to adequate compaction and drainage.

A diagram of construction of a farm track



The yard/track junction

- The junction of the concrete yard and the farm track has the potential to cause problems because:

1. Wash-water or rainwater from the concrete yard runs onto the track causing a wet area where the track surface may break down.
2. Cows often manure on the track before walking into the yard, particularly if there is a problem in the yard or shed.
3. Cows may carry sand, gravel and small stones from the track onto the concrete surface of the yard. These may damage the feet of cows in the yard.

- It is important to prevent water from running off the concrete yard onto farm laneways. To avoid this problem, slope the concrete down from the junction, or form a curbing on the edge of the concrete to control drainage.

- Cows should be encouraged to move away from the shed after milking. Otherwise, accumulated manure will form a barrier to drainage along the edge of the laneway near the shed, ultimately causing breakdown of the laneway.

- Similarly, laneways close to the shed should not be used as a holding facility if the cowshed yards are not large enough to hold the required number of cows.

Management of farm tracks

- Holding stock on tracks: If tracks are used to hold stock during wet weather, or hold stock until all the cows have been milked (so that the entire herd can be placed in the new break of grass at the same time), the track can deteriorate quickly. This can result in the breakdown oì¥Á Y ¿ ô>

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FACT SHEET

Notes on construction
of a farm track.

If constructing a track, plan first!
Make sure track width is adequate
Remove grass and topsoil

Construct drains

- compact a sound base
  Build a suitable walking surface
  Prevent excess wetness at the yard/track junction
  Maintain tracks
  Track faults increase the risk of lameness!

Cows can walk considerable distances to be milked, and the importance of the farm track as a

- ow, excessive wetness in the environment, and impatient human actions that cause adverse changes to cow walking behaviour are all factors that relate back to the farm track!

In addition, well designed farm tracks can minimise contamination of cows’ udders with dirt

- and having a beneficial effect on the level of mastitis in the herd.

  Farm tracks should be built using sound construction principles given sufficient consideration. If drains are not fenced off, cattle walk in them, and spread track material and manure into the drain – destroying their ability to remove water effectively. If drains are fenced off, grass and manure can build up along the edge of the track, preventing drainage off the track. The net result is that the track remains wet for longer than necessary, the walking surface becomes damaged, the course track base material is exposed, and foot damage can result.

- Avoidable wetting of the farm track: Leaking troughs, irrigation delvers and irrigation run-off can subject the track to unnecessary and excessive moisture and wetness. Trees and hedges near the track prevent sunlight and wind from drying shaded areas. Track damage can result.

- Track width: Many farm tracks are too narrow, resulting in poor cow flow. This may not cause a lameness problem if the herdsperson bringing the herd to the shed is patient. However in many cases, slower cow movement results in the herdsperson attempting to hurry the rear cows. Adverse changes to cow walking behaviour occur, and the risk of lameness increases. On a wide section of track, a herd will flow at up to 4.5 km/hour, but often as slow as 1.5 km per hour on a narrow track.

FACTSHEET

N

The correct use of footbaths.

- Effective for prevention of bacterial infections that cause lameness such as footrot and hairy heelwarts
- Have a limited ability to harden the hoof horn
- Largely ineffective in preventing lameness caused by poor quality walking surfaces
- Must be used regularly to be effective

Regular footbathing using formalin or copper sulfate has been widely recommended to control and prevent lameness in dairy herds. Although footbathing has been found to be effective in treating and preventing lameness caused by bacterial infections such as footrot, there is little evidence that it is effective in preventing lameness caused by injury to the hooves, resulting in conditions such as bruised soles or puncture of the sole.

The use of footbaths for prevention of bacterial causes of lameness

- In outbreaks of lameness caused by bacterial infection of the skin between the claws or above the hooves, such as footrot , the regular use of footbaths can provide effective treatment and prevention. The objective is to remove erosive materials from the foot and to disinfect the skin above the hooves. Solutions of 5% formalin or 5% copper sulfate are usually used. In some instances, for the treatment of hairy heelwart, antibiotic solutions are recommended. Formalin is irritant and a dangerous chemical to use. Repeated applications can cause skin burns to the legs and udders. Seek veterinary advice as to the best chemical to use.

Footbathing for prevention of traumatic hoof injury

- Footbathing with formalin or copper sulfate has the effect of drawing moisture from the hoof and hardening it. The intention of this treatment is to make the hoof more resistant to injury from stones and rough walking surfaces. However research trials have not demonstrated any reduction in lameness caused by conditions such as white line disease or sole bruising.

- Some reasons why footbaths are not effective are:

a) Formalin and copper sulfate penetrate the hoof poorly, so only harden the surface layers of hoof. Dairy cows walking on gravel roads and concrete yards quickly wear these hardened superficial horn layers away. To be effective, footbaths have to be used regularly, probably daily.

b) Footbaths quickly become filled with manure and slurry as they are usually placed on the exits of the dairy. This dilutes the concentration of chemical in the footbath, and renders the footbath useless. To maintain concentration, footbaths need to be recharged after the passage of about 100 cows. Where footbath solutions are not replaced for several days in large herds, they have little chance of providing effective treatment for the majority of animals.

c) Where more concentrated solutions are used, and more frequent application is adopted to harden the hoof horn, splashing of chemical can result in skin burns to the lower legs and udder. Footbathing can then cause lameness rather than prevent it.

d) Footbaths are usually placed in the exit races of dairies. This can have the effect of restricting cow flow from the dairy, resulting in unnecessary jostling of cows and rough handling by the operator – factors known to increase rather than decrease the risk of lameness.

e) The need to harden hooves is greatest in wet weather as hoof material softens with increasing moisture. Under wet conditions, as soon as cows leave the exit race and footbath, they usually walk into muddy and wet areas and the applied chemical is quickly washed off the foot.

Construction of a footbath

- Footbaths need to be situated in a race wide enough for the passage of cows in single file, and be approximately 2.5 meters in length to ensure all feet pass through the bath. Do not overfill the footbath – the chemical in most instances should only cover the hoof. Excessively deep baths or concentrated chemicals can result in burns when splashed on the fetlocks, teats or udder.

Recommended footbath solutions

- Solutions of 5% formalin or 5% copper sulfate are the most commonly used chemicals in footbaths. Formalin, in particular, is irritant and dangerous to use. Operators must take great care when pouring formalin concentrate into the footbath. Avoid direct contact with the skin or eyes.

Hoofmats are an alternative to footbaths

- Hoofmats are mats designed to be charged with a footbath chemical such as copper sulfate which is squeezed out around the cow's hooves as she walks on the mat. They can provide an alternative to the use of a footbath. The mats can be placed on the entrance to the dairy rather than the exit. This allows the treatment to soak into the hoof for the duration of milking before the cow walks into dirty and wet conditions again. When regularly recharged and used often (every milking), they can be effective for hardening hooves and perhaps increasing resistance to lameness.

How to apply and remove a glue-on plastic shoe

- reduce pain
- minimise the severity lameness
- protect the injured claw
- hasten return to full production

A number of diseases of the claw – especially sole abscess and sole ulcer – result in loss of the protective layer of sole hoof, exposing the very sensitive and raw underlying soft tissue (the corium).

In the case of sole abscess, the underrun sole may not be exposed until it is treated, or until it lifts away as a flap. In the case of a sole ulcer, or when only a proportion of the sole is underrun, the remaining sole can act as a trap for stones and gravel, further adding to hoof disorders.

Exposure of the corium is important because walking on it causes severe pain and lameness, and secondly, because the protective layer of sole is absent, it is vulnerable to further injury from stones and gravel.

A plastic shoe offers protection for the exposed corium because when correctly applied to the sound claw of the same foot, it lifts the affected claw off the ground, both reducing pressure on the raw surface and lifting it above potentially harmful stones and gravel.

Properly fitted, a plastic shoe reduces the pain of lameness, assists in return of the cow to full performance, and protects the sole from further injury.

Check the sound claw with hoof testers.

The cow will be bearing all the weight of the lame leg on the claw to which the plastic shoe has been applied. If the plastic shoe is applied to a painful claw, the lameness may become more severe.

It is essential to check the hoof to which the plastic shoe is to be applied is sound and able to bear the cow's weight. After cleaning its sole, and checking for hoof defects, check it with hoof testers to make sure that it is sound and pain free.

Prior to fitting a plastic shoe, clean and dry the sound claw thoroughly.

The adhesive relies on a clean, dry and roughened sole and hoof wall surface for maximum bonding to the hoof material. Use a hoof knife to remove excess dirt and manure from the sole, wall and interdigital areas. If necessary, use water and a scrubbing brush for cleaning, then dry

with a cloth or paper towel. Scrape the sole and wall with the hoof knife, “notching” the surface of the sole to act as a key for better adhesion. Pour methylated spirits over the sole surface and allow this to dry. Alternatively use a 4” angle grinder with a paper disc to clean both the sole and hoof wall. The disc edge can be used lightly to create notching in both the sole and the wall.

When properly prepared, the hoof should be spotless and dry. If it is raining, shelter may be required to achieve a dry sole. Do not use power tools in the rain!

Make sure the plastic shoe fits the sound claw.

Large cows (and bulls) may need the hoof wall sanded so that the plastic shoe fits the hoof. Animals with a long claw may also need hoof trimming of the point of the claw for a good fit. In small animals, the inner wall of the plastic shoe may need to be trimmed so that the plastic does not rub on the skin of the interdigital space.

Mix the powder and solvent and apply the plastic shoe to the sound claw.

Gloves should always be worn when handling the powder and solvent as it may be irritant and some people develop a severe allergy to this material.

The plastic shoe is used as a mixing cup for the solvent and powder. Pour the liquid solvent into the plastic shoe, then add powder slowly. Use the supplied wooden stick to make sure that a good mix is prepared. In cool conditions, it is often useful to warm the mix before applying the plastic shoe to the foot – this reduces the setting time. Make sure no dry powder remains within the plastic shoe. Make sure adhesive is spread thickly over the inner sole of the plastic shoe, and smear adhesive over the walls.

Apply the plastic shoe to the sound claw, and press it on firmly. Scoop excess adhesive away with the stick. Make sure no adhesive bulges into the interdigital space where it may irritate the affected claw. Allow sufficient time for the adhesive to cure and harden.

If necessary, remove the plastic shoe when healing is complete.

Most plastic shoes fall off after three to four weeks of use. Occasionally they stay on too long, and irritate the affected claw. Hoof cutters can be used to cut the wall of the plastic shoe, and prise off the device. Also the edge of a 4” angle grinder disc can be used to cut the wall of the plastic shoe. Alternatively a screwdriver can be inserted down the front of the hoof, between the wall and the plastic shoe, to lever the shoe away.