Digital dermatitis: What you need to know

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Digital dermatitis is the most important infectious cause of lameness in dairy cattle worldwide. It is now affecting New Zealand dairy herds. Richard Laven, Associate Professor in Production Animal Health at Massey University, explains.

Key points

- **Digital dermatitis is a bacterial infection on the feet of cattle, commonly seen on the skin directly above the heel**

- **Digital dermatitis is increasing in New Zealand**

- **A new study in Taranaki indicates >60% of herds have at least one case of digital dermatitis**

- **Act now to slow the spread of digital dermatitis:**
  - Identify your herd infection status
  - If uninfected, only purchase cows from other uninfected farms
  - If infected, improve your slurry management, particularly if using a feed or stand-off pad or housing
Digital dermatitis; a global issue now affecting New Zealand dairy herds

Digital dermatitis is the most important infectious cause of lameness in dairy cattle worldwide due to its prevalence, the cost of management and control, and its adverse effect on cow welfare. It was first identified in Northern Italy in 1974, and has now been reported across the world\(^1\). The first New Zealand case occurred in 2004\(^2\), with sporadic reports until around 2011 when the number increased markedly. These reports raised concern with farmers and vets, and a Ministry of Primary Industries investigation was undertaken to establish whether these reports were truly digital dermatitis or misdiagnoses of other lesions\(^2\). The investigation confirmed digital dermatitis as the most likely cause and, since then, the number of reports of digital dermatitis-like lesions has increased significantly. The increase in cases led to a pilot project in North Taranaki in 2015 to determine the actual prevalence of digital dermatitis in dairy herds for that region.

The study found that 143 of 224 visited (66%) herds had at least one cow with digital dermatitis. On average 2% of cows were affected within an infected herd, though one farm had 28% of cows affected (A. Yang, Massey University, personal communication). These data, and many other reports from across New Zealand, indicate that digital dermatitis may already be on most New Zealand dairy farms. Yet, the disease is not showing the rapid spread and a high prevalence within a herd that is characteristic elsewhere in the world, and nor has it been associated with significant herd lameness problems. However, international experience has proved that digital dermatitis is a very adaptable disease; in Chile, for example, digital dermatitis is now a significant cause of lameness even in herds that are never housed\(^3\). Therefore, New Zealand dairy farmers need to be prepared for digital dermatitis; to know how to prevent it getting on farm, and how to diagnose and control it if it does.

**What is digital dermatitis?**

Typically, digital dermatitis is found on the skin just above the interdigital space (see Figure 1); however, it can also be found along the coronary band (Figure 2). Digital dermatitis is most commonly found on the hind feet; fewer than 3% of affected cattle have lesions on the front feet only\(^4\).

**Figure 1.** Typical appearance of digital dermatitis lesions in typical site. A, moist ulcerative lesion; B, chronic proliferative lesion; C, healing lesion with prominent black scab.

The classical lesion of digital dermatitis is a circumscribed moist ulcer (see Figure 1). However, digital dermatitis is a cyclical disease with lesions forming, healing and then returning, so the disease has multiple presentations (stages). The most persistent stage (often called M4\(^5\); see Figure 1B) is a chronic thickening of the skin with proliferative (rapidly spreading) hyperkeratotic growths, which can often resemble hairs (in some countries these are called hairy hoof warts). If the area is persistently irritated (often a response to lengthy periods standing in slurry) the growth can become excessive resulting in a large lesion (see Figure 3). In New Zealand, the most common presentation of digital dermatitis is a small (<1 cm) hyperkeratotic M4 lesion (R. Laven, unpublished data; see Figure 4), but, if looking closely in the interdigital pocket, which is surrounded by the digital dermatitis lesion, small areas of active ulceration can be seen.
Larger lesions, particularly when they are ulcerative, but also when they are growing, tend to be extremely painful. Affected cows will often stand with only the tip of the toe touching the ground with the heel bulb raised, and may shake the infected foot repeatedly, while others might only appear lame when walking. However, many cows with visible digital dermatitis lesions show no sign of lameness and the lesions do not appear to be painful.

**Figure 2.** Digital dermatitis lesion on coronary band showing ulceration and proliferative changes (*photograph courtesy of Neil Chesterton*)

![Digital dermatitis lesion on coronary band](image_url)

**Figure 3.** Large proliferative lesion in a New Zealand dairy cow (*photograph courtesy of Jason Hoyle*)

![Large proliferative lesion in a New Zealand dairy cow](image_url)

**Figure 4.** The most common lesion seen in New Zealand is a small proliferative lesion (*photograph courtesy of Kristina Mueller*)

![The most common lesion seen in New Zealand](image_url)
**What causes digital dermatitis?**

Under the microscope, the top layer of the damaged skin is colonised by a mat of bacteria from several species\(^6\). Infection is also present in the deeper layers of the skin though, in contrast to the surface, the number of bacterial types is significantly fewer, with almost all being spiral bacteria (spirochaetes, also known as treponemes)\(^6\). The current consensus is that treponemes are the primary bacteria responsible for the development of digital dermatitis, though their presence alone does not seem sufficient to produce disease. However, research indicates that development of the lesion is associated with an increasing number of treponemes bacteria within the lesion\(^8\), although, so far, transmission experiments using pure cultures of treponemes have generally failed to produce significant disease. Infection experiments using homogenised digital dermatitis lesions (containing several types of bacteria) have caused infection. It has been necessary to abrade the skin before the homogenate is applied, followed by moist bandaging to keep too much oxygen from the site (somewhat anaerobic)\(^7\). This is clearly not what happens on-farm. Nevertheless, field research indicates that prolonged standing in wet, dirty conditions that result in softened and broken skin on the cow’s heel will increase the risk of digital dermatitis.

Understanding of infection is further complicated as research has identified that several species of treponemes are involved in digital dermatitis, with no one species (or group of species) always being present\(^8\). Digital dermatitis is thus a polymicrobial disease, which has many similarities with periodontal (gum) disease in humans, including treponemes invading after initial damage caused by other bacterial species\(^8\).

**Keeping your farm digital dermatitis-free**

The key risk factor for digital dermatitis to be introduced to the farm is importing infected cattle, including replacement heifers and bulls, with purchased cows significantly increasing the chance of a herd becoming infected. Good biosecurity is vital. Purchased cows should only be bought from farms that are free of the disease, as simply identifying and purchasing cows without visible lesions will miss carriers who are infected but do not have lesions. This is particularly important when purchasing groups of cattle; if one cow has visible lesions then the whole group must be rejected.

Quarantining cattle for two weeks or more may reduce the risk of importing in digital dermatitis, but this can be expensive to achieve and it is easy to miss infected carrier cows, particularly if the quarantine period does not include calving when the risk of clinical infection is at its highest\(^8\).

When purchasing or hiring bulls, the best advice again is to ensure that bulls are sourced from a farm that is free of the disease. It may be easier to obtain disease-free beef bulls than dairy bulls, as the proportion of beef herds affected by digital dermatitis is thought to be considerably lower than for dairy herds. There is no information on the occurrence of digital dermatitis in beef herds in New Zealand; however, data from the UK and US indicate that beef herds have a much lower incidence of digital dermatitis, and beef animals, in general, have much less contact with slurry, which is a key risk factor for disease spread.

Whenever transporting stock between properties or purchasing digital dermatitis-free stock, it is essential to make sure that they do not travel with stock from infected herds or in trucks that have not been cleaned effectively after carrying cattle of unknown status. There is no point in purchasing or transporting animals from a herd free of digital dermatitis if they then get on a truck and are exposed to disease.

Transfer of digital dermatitis can also occur via contaminated knives, ropes, buckets and clothing\(^6\). Hygiene is crucial; ensure that anyone coming on farm is clean, especially their footwear, and that their hoof-trimming equipment, knives and ropes are disinfected before use.
Controlling digital dermatitis for infected herds

The best time of year to assess herd infection status is in October, as at this time of year the incidence of digital dermatitis is likely to be at its highest within an infected herd.

The same strategies to prevent digital dermatitis coming on farm are still important for an affected herd. For example, bringing in uninfected cattle will reduce the proportion of the herd affected by digital dermatitis, as will disinfecting equipment between cows when hoof-trimming.

Other risk factors can significantly increase the proportion of the herd affected by digital dermatitis on infected farms. The most important risk factors are related to the environment. The treponemes found in digital dermatitis lesions are present in the gut of the cow and, therefore, in cattle faeces and slurry. Contact between faeces/slurry and feet is the most important environmental risk factor.

Slurry, which is a mix of urine, water and faeces, is the most potent means of spreading digital dermatitis because it contains both the treponemes and water; the latter moistens the skin and makes bacterial invasion easier. Urea (from the urine) breaks down skin keratin allowing even easier entry for bacteria. Minimising contact with slurry is crucial to reducing the prevalence of digital dermatitis on farm. Cows with clean, dry feet have a lower risk of digital dermatitis.

Cattle loose-housed in straw yards have a lower risk of digital dermatitis than those housed with cubicles (free-stalls), as there is less contact between slurry and feet in loose-housed systems. Cows in cubicle yards with automatic scraping of passageways are at a greater risk of digital dermatitis than when tractors are used to scrape passageways. This may be because automatic scrapers create a slow moving pool of well-mixed slurry that cows invariably stand in, whereas in tractor-scraped yards the faeces and urine remain separate and the scraping usually occurs when cows are being milked.

Cubicle comfort is another factor; if cubicles are too narrow or too short the prevalence of digital dermatitis increases, possibly because cows spend more time standing in the passageway in contact with faeces/slurry.

The risk of digital dermatitis at pasture is significantly less than it is in housed cattle because of the much lower chance of foot contact with faeces and slurry. However, as found in Taranaki, keeping cows on pasture does not eliminate the risk and digital dermatitis is proving to be adaptable overseas. In Chile, where many dairy cattle are kept permanently at pasture, digital dermatitis is now a significant problem with over 50% of cows infected in some herds, and, in Europe, grazing cows on pasture during the summer no longer significantly reduces the prevalence of digital dermatitis.

Housing and feed pads - Impact on New Zealand farms

The number of dairy farms in New Zealand that house cows for a significant proportion of the year is small (~530). Of these farms, about a third house cows in loose housing on bedding; these are likely a lower risk for digital dermatitis. Almost 300 farms use loose housing with a concrete slated floor; such housing is uncommon internationally so the digital dermatitis risk is unknown, though faecal contamination of the feet is common for these systems. There are more than 60 farms using cubicle housing, which is known to have a high risk of digital dermatitis. Farmers using housing for cattle, particularly if they have concrete flooring, should examine the hind feet of all cattle for signs of digital dermatitis during milking at least monthly.

So far the influence of housing on digital dermatitis risk in New Zealand is likely to be minor. However, housed cows can act as incubators for digital dermatitis, building up higher levels of infection that can then spread through transfer of cows between farms. If the number of cows housed in New Zealand increases, the risk of this spread will also increase.

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Although only a small proportion of New Zealand farms use housing, a much higher proportion (24%) use stand-off/feed pad facilities. Slurry control for concrete stand-off/feed pad facilities is often poor, with cleaning of these areas often being less than once a week despite intensive use. If infected cattle are present on such farms then spread of digital dermatitis will occur via the stand-off/feed pad facilities. For infected herds, concrete areas should be cleaned at least once every 12 hours; this will minimise the build-up of slurry and thus the risk of spreading digital dermatitis. Another key feature is drainage; wet slurry, as discussed earlier, increases the risk of
digital dermatitis. If the feed pad is poorly drained, it will need more frequent cleaning. Make good drainage a priority when building a new feed pad.

Slurry management is not just about housing and feed pads; collecting yards can also be an important source of slurry. Ensure that they are cleaned thoroughly after every milking.

**Conclusions**

Digital dermatitis is here in New Zealand, and it is spreading. Experience from abroad suggests it will become a more common cause of lameness irrespective of whether cows are housed or not.

The important steps to take to avoid bringing digital dermatitis onto your farm, or to minimise its impact if already present, are

- Look carefully at purchasing and transporting decisions; try to avoid purchasing cattle from farms with digital dermatitis and ensure transporters disinfect stock crates
- Improve slurry management and focus on reducing faecal contamination of feet
- Check rear feet frequently for signs of digital dermatitis

For more information on practical measures to identify and manage digital dermatitis, go to http://www.dairynz.co.nz/animal/health-conditions/lameness/

**References**