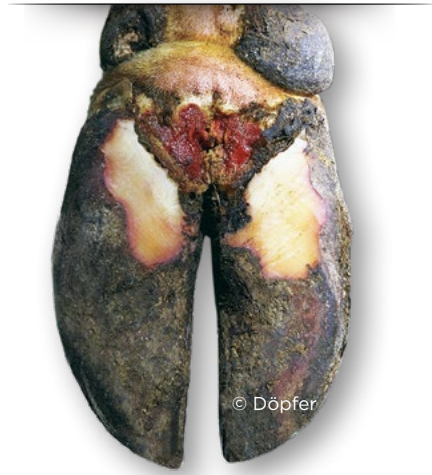


Breaking the Cycle

of Digital Dermatitis

in Dairy and Beef Cattle



Digital dermatitis is often referred to as hairy heel warts and is a common infectious foot disease in dairy and beef cattle herds.

- Digital dermatitis has been reported on 70 percent of all U.S. dairies, and on 95 percent of large operations (500+ cows).^a
- The size and scope of digital dermatitis within the beef industry is undetermined but is a growing concern.
- The disease often leads to lameness, which decreases milk production and fertility in dairy animals. In beef, lameness can account for 70 percent of all sales of non-performing cattle.^b

DESCRIPTION

Raw, bright-red or black circular erosion and inflammation (dermatitis) of the skin above the heel bulbs, with edges forming a white margin and overlong hairs that surround sores or are adjacent to thick, hairy, wart-like growths.

PATHOGENESIS

Weakening of the skin barrier, due to mechanical irritation and maceration by water and chemicals from manure. Poor environmental hygiene results in mixed infection with different bacteria, among them *Treponema* species, in a low-oxygen environment. Infection of the dermis leads to or results in acute inflammation – an ulcerative dermatitis. Acute stage may develop into chronic forms characterized by thickening and proliferation of the epidermis (hairy warts).

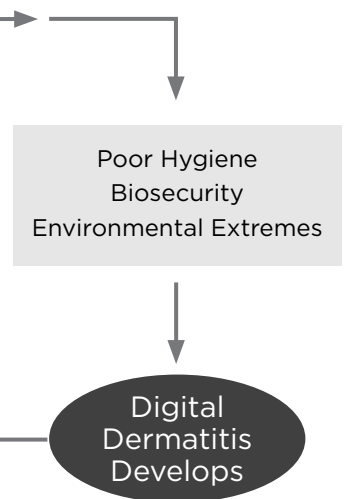
Periodic disruption of heel horn formation due to recurrent DD lesions will result in layered heel horn erosion, increased depth of the caudal aspect of the interdigital space and decreased foot hygiene.

RISK FACTORS

- Introducing new animals into the herd (biosecurity)
- Poor hygiene, such as muddy pens and inadequate footbath programs
- Chemical/physical skin trauma
- Early lactation cows and young cattle

COMPLICATIONS





- Wall and toe abscesses
- Pre-mammary dermal sores
- Layered heel horn erosion and abnormally shaped claws
- Poor hygiene in interdigital space



^a Reference of Dairy Cattle Health and Management Practices in the United States, USDA/National Animal Health Monitoring System report, February 2009.
^b "Lameness in Beef Cattle." The Beef Site, Sept. 17, 2011.

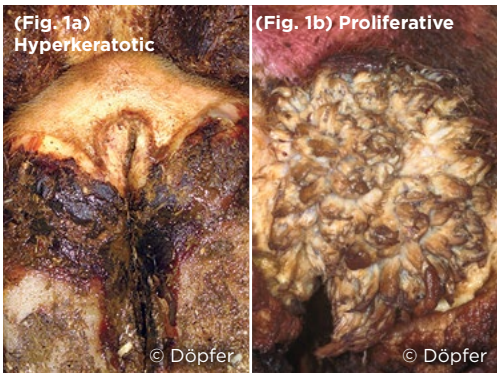
IDENTIFICATION AND PROGRESSION OF DIGITAL DERMATITIS

An understanding of how to identify the presence and severity of digital dermatitis is key to keeping the disease under control. Once the disease is introduced into a herd, it spreads rapidly and prevalence often exceeds 70%. There are five stages of digital dermatitis originally identified by Döpfer *et al.*, 1997.

	DISEASE STAGE	PROGRESSION
 <p>© Döpfer</p>	<p>M0 Healthy Claw</p> <ul style="list-style-type: none"> • Normal digital skin • No signs of dermatitis 	<p>M0 → M1</p> <ul style="list-style-type: none"> • Under pressure from risk factors, lesions begin to develop • Poor hygiene, biosecurity and muddy pens are common factors
 <p>© Gomez</p>	<p>M1 Early/Subclinical</p> <ul style="list-style-type: none"> • Small, circumscribed red to gray epithelial defects • Lesions are less than 0.75 inch (2 cm) in diameter • Can appear in the interdigital space • Can also occur between acute episodes of digital dermatitis lesions or within the margins of a chronic M4 lesion as an intermediate stage 	<p>M0 ← M1 → M2 / M4</p> <ul style="list-style-type: none"> • May develop into M2 or return to M0 • Some animals with M1 lesions never develop M2 (Type 1) • The transformation from early stages (M1) into chronic stages (M4, hyperkeratotic) does not need to go through an observed M2 stage at all times
 <p>© Döpfer</p>	<p>M2 Painful/Acute Ulcer</p> <ul style="list-style-type: none"> • Bright-red active ulcer or red to gray granulomatous digital skin alteration • Lesions are 0.75 inch (2 cm) or greater in diameter • Commonly found along the coronary band at the skin/horn border, in addition to around the dew claws, in wall cracks and occasionally as a sole defect 	<p>M2 → M3 / M4.1</p> <ul style="list-style-type: none"> • When treated effectively, healing (M3) begins • May cycle between M2, M4 and M4.1 • Accumulation of high numbers of M2 lesions starts an outbreak
 <p>© Döpfer</p>	<p>M3 Healing</p> <ul style="list-style-type: none"> • Occurs within one to two days following treatment of an M2 lesion with topical antibiotics • Lesion surface becomes firm and scab-like • In best-case scenario after topical therapy, the lesion appears to be no longer painful 	<p>M2 → M3 → M4 / M0</p> <ul style="list-style-type: none"> • Healing can continue with lesion becoming M0 • May regress to M2 or develop into chronic M4 lesion

DISEASE STAGE

PROGRESSION

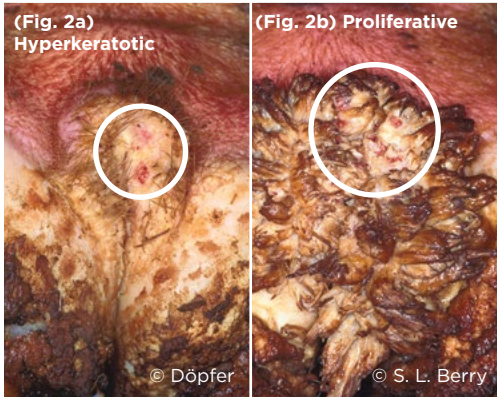


M4 Chronic/Hairy Warts

- Fig. 1a: Hyperkeratosis (thickened epidermis)
- Fig. 1b: Filamentous, scaly or mass proliferations, commonly called “hairy warts”

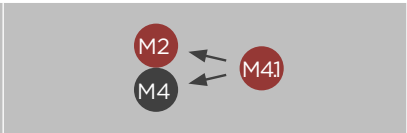


- May return to M0
- May progress to M4.1
- Reservoir of disease from bacteria deep in the epidermis and dermis



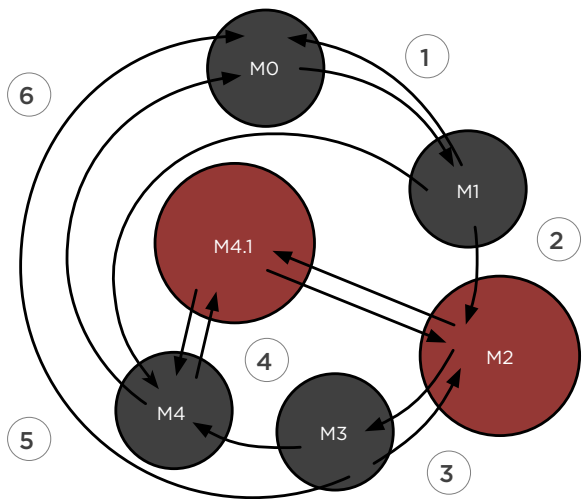
M4.1 Chronically Recurring

- Fig. 2a: Hyperkeratosis and lesion within
 - Fig. 2b: Chronic M4 lesion with an early or intermediate M1 lesion within its perimeter*
- * Reported by Berry et al., 2012



- May return to M4
- May develop into M2
- Reservoir of disease from bacteria deep in the epidermis and dermis (Treponemes in M4 and M4.1 lesions are often encysted)

CYCLE OF DISEASE

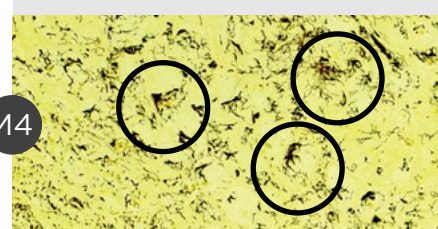


1. “Type 1” animals are never observed to develop M2 lesions and typically represent 10-30% of the animals in an endemically infected herd.
2. “Type 2” animals develop M2 lesions only once and represent about 30-60% of a herd. “Type 3” animals repeatedly develop M2 lesions and represent about 10-30% of a herd.
3. Treat M2 lesions topically with antibiotics.
4. Once treatment begins the lesion may heal, regress to an open ulcer, or become chronic.
5. The disease can lie dormant deep in the dermis and epidermis of M4 and M4.1 lesions, creating a reservoir of infection that serves as the source of new outbreaks when conditions are favorable.
6. The dynamics of digital dermatitis are driven by chronic lesions (M4 and M4.1), not only by acute, active lesions (M2).

SKIN HISTOLOGY



A Steiner stain at 40X magnification shows spiral *Treponemes* on their way down into skin tissue. They migrate along dermal pegs into the depth of the epidermis as far as the dermis.

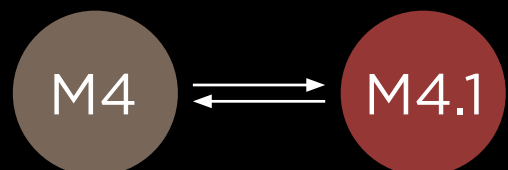


This Steiner stain shows an M4 lesion with encysted *Treponemes* in proliferative skin tissue.

Problem Animals and Chronic Lesions (Type 3)

Chronically affected animals are not only difficult to cure, they also can be used as indicators of future outbreaks in the herd. These animals have more than one M2 lesion within a period of time, and may show visual clues, such as:

- Proliferation of the epidermis (hairy warts)
- Layered heel horn erosion
- Corns in between the claw
- M4.1 lesions



PREVENTION AND CONTROL - FOR ALL PHASES OF LIFE

From calves to heifers and lactating cows to dry cows, there is a need for an Integrated Prevention and Control Strategy that manages risk factors to help control digital dermatitis during all life stages of a cow. This strategy should include the following:

Management

- Biosecurity measures prevent infected animals from being introduced into the herd.
- Regularly inspect hind feet through DD Pen Walks.
- Keep records of lesions on animals for informed decision-making based on their history.
- Identify M2 lesions early and treat promptly.
- Combat risk factors such as abrasive walking surfaces and bad hygiene.
- Address horn formation damage by utilizing functional hoof trimming.

Hygiene

- Too frequent or aggressive hoof baths aimed at improving foot hygiene may result in increased number of chronic lesions that serve as a reservoir of DD causing agents.
- Promote a clean, dry environment, and use disinfecting footbaths customized for the needs of DD dynamics on the farm.

Nutrition

- Prevention of DD in precalving heifers results in a significant reduction of recurrent DD in lactating cows.
- Micronutrient supplementation significantly reduces DD prevalence in precalving heifers when combined with the same risk and hygiene management as implemented in adult cows.



When an M2 lesion is treated, it is too late to prevent disease reservoirs from forming.



Zinpro® Availa® Plus, when fed as part of a specific DD Formula and a well-balanced diet, has been shown to significantly decrease the prevalence and severity of digital dermatitis in non-lactating cattle.

Breaking the Cycle

An Integrated Prevention and Control Strategy requires a greater awareness of digital dermatitis prevalence and a shift in mindset toward prevention of chronic lesions.



Within the Animal

Incidence of painful, active lesions is lowered in an animal, slowing new outbreaks.



DD outbreak



For the Herd

Outbreaks are decreased at all stages of production, resulting in reduced prevalence and better control over time.

This brochure was developed in conjunction with Dörte Döpfer, DVM., Ph.D., University of Wisconsin School of Veterinary Medicine.



For more information:
contact your Zinpro
representative or visit
zinpro.com