

# Digital dermatitis: a description of lesion progression and regression of natural disease in Holstein dairy cattle over two years

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## Introduction

Digital dermatitis is an economically important infectious cause of lameness in dairy cattle as well as beef feedlot cattle. Despite 35 years of research, the etiology and pathogenesis of digital dermatitis has yet to be fully described. The majority of research into the etiology of digital dermatitis has focused on identification of cattle with classic lesions, either during routine foot trims or at slaughterhouses. Unfortunately, this method of monitoring lacks the ability to further classify lesions as acute versus chronic, or incorporate treatment history. A proposed lesion scoring system was developed by Dopfer *et al* to further attempt to classify lesions as acute or chronic. The present study has built on that method by providing further description of lesion development, and identification of changes to the skin of the foot that were consistently recognized weeks to months prior to lesion development and lameness.

## Materials and Methods

In 2010, 40 adult Holstein dairy cattle housed at the university dairy were enrolled in the study and allowed to develop digital dermatitis lesions by diversion from the farm's foot bath and topical treatments. These cattle have now been monitored for up to 26 continuous months, and have been examined and photographed every three to four weeks to document lesion development. As lesions developed, lameness was monitored and topical therapy was administered when cows developed a locomotion score > 4 out of 5. These cows have continued to be monitored for recrudescence or reinfection with digital dermatitis over this same time period. Examination of images prior to development of digital dermatitis has identified a consistent pattern of lesion development such that digital dermatitis can be categorized into stages. As lesions progressed and regressed, biopsies were performed and tissue speci-

mens were obtained at each stage of digital dermatitis development and stored for further characterization of microbiota changes during the pathogenesis.

## Results

Analysis of > 6,000 photos over the course of 26 months resulted in identification of a consistent pattern of lesion development in cows with digital dermatitis. Lesions appear to develop in two distinct patterns. One pattern begins in the interdigital fold as erosion and dermal pitting, followed by thickening of the interdigital fold area. The other pattern begins as focal areas of surface crusts that develop into coalescing crusts in the interdigital fold. Both patterns of development lead to classic digital dermatitis lesions. These classic lesions have been described by Dopfer as M1, M2, and M4 lesions. Our scoring system builds on these concepts and allows for identification of lesions months prior to development of these previously described stages. Through follow up of treated cows, we determined that the interdigital skin of many affected cows does not return to normal following treatment. Instead, these lesions regress to an earlier stage of development and have a high likelihood of recrudescence.

## Significance

Identification of foot lesions months prior to the onset of previously established stages of digital dermatitis has allowed us to study lesions at their earliest developmental stages. Description of these early stages also allows us to better study the efficacy of various treatments and their ability to induce lesion regression to earlier stages or back to normal skin. Through frequent monitoring of these cattle, we have obtained skin biopsy specimens from the feet of cattle at all stages of digital dermatitis development for further study.