

# Does digital dermatitis cause hoof conformation changes in its early clinical stage?

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## Introduction

It is well described how hoof conformation in dairy cattle changes over time because of variation in physiology or production systems. Decreased production and well-being associated with hoof overgrowth has caused a whole hoof-trimming industry to be built, with the objective of reestablishing the optimal balance and claw angle and preventing lameness. The feet of cows with severe clinical digital dermatitis (DD) undergo dramatic transformation that is easily recognizable. It is not uncommon to observe “square feet” on cattle with DD, where the heel has overgrown such that the animal alters its gait and wears down the toe, which decreases the dorsal length of the claw, sometimes to the same length as the heel. Consequently, cattle become painful and lame not only from the ulcerated DD lesion, but also from the extra wear and trauma of the toe or the white line area. Changes in hoof conformation during the early or less severe stages of DD have not been described. The objective of this study was to describe the changes in hoof conformation caused by early clinical DD lesions.

## Materials and Methods

A cohort of 640 pregnant Holstein heifers was evaluated 3 times during a 6-month period at 3-month intervals. For each heifer, clinical DD evaluation was performed and hoof measurements were obtained and included dorsal wall length, total length, depth of the interdigital space, heel height, angle of the hoof, hygiene of the interdigital space (subjectively scored on a scale of 1 to 4 and dichotomized [1-2 vs. 3-4] for statistical analyses), axial overgrowth of the lateral toe at 35 mm, and heel horn erosion (subjectively scored on a scale of 0 to 3 and dichotomized [0-2 vs. 3] for statistical analyses). A deterministic model was constructed to explain hoof conformation changes over time in cows with DD.

Digital dermatitis lesions were classified during clinical assessment by use of the 5-point method described by Döpfer et al (clinical stages, M0, M1, M2, M4, and M4.1). Heifers without a DD lesion identified during the experiment (M0) were used as a reference group for comparison with heifers diagnosed with acute clinical lesions (M2).

## Results

Clinical DD lesions observed in the study had a median size of 24 mm (interquartile range, 21 to 31 mm). These small DD lesions changed the conformation of the hoof significantly, with exception of the dorsal and total length. In particular, DD caused an increment in heel horn erosion of 42% (95% confidence interval [CI], 31% to 52%), an increase in the mean depth of the interdigital space of 4.9 mm (95% CI, 3.7 to 6.0 mm), and increased accumulation of debris in the interdigital cleft in 27% (95% CI, 0.08% to 46%) of affected heifers. The toe angle and heel height were significantly modified for both the medial and lateral claws; the medial toe angle and medial height increased by 1.9° (95% CI, 0.1° to 3.6°) and 4.02 mm (95% CI, 1.5 to 6.4 mm), respectively and the lateral toe angle and heel height increased by 1.5° (95% CI, 0.1° to 3.0°) and 2.64 mm (95% CI, 0.7 to 4.5 mm), respectively.

## Significance

Digital dermatitis causes lameness because of the development of painful ulcerated lesions and hoof conformation changes, even at the very early stages of the disease, which increases the probability of affected cattle developing other hoof diseases such as white line disease or sole ulcers. Thus, early intervention and prevention is the most important strategy for management of the disease.