

# Association between hoof lesions and fertility of lactating dairy cows

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## Introduction

Lameness is an important welfare issue and a serious challenge in the dairy industry. Prevalence of lameness worldwide range from 8 to 55% and is influenced by genetics, housing type, and herd management. Lameness has reduced fertility and hoof lesions (HL) are responsible for over 90% of lameness. Hoof lesions can be non-infectious such as sole ulcer, toe ulcer, white line disease, sole hemorrhage, or infectious digital dermatitis and foot rot. Association between HL and fertility is scarce. Furthermore, information about the association between stage of HL development and fertility in dairy cows is limited. Our objective was to evaluate the association between HL and ovarian cyclicity, and pregnancy in dairy cows. Our hypotheses were that cows with pre-existing HL during early lactation have delayed resumption of ovulation post-partum, longer interval to first service and to pregnancy, and smaller pregnancy hazard. Also, cows that develop new HL have longer interval to pregnancy and smaller pregnancy hazard.

## Materials and Methods

Jersey cows (n=1,639) from a commercial dairy with 3,700 lactating cows in MN were enrolled at 20 ± 3 DIM (d20) and were evaluated for presence of HL and body condition score (BCS). Cows were re-evaluated for presence of HL and BCS at 120 ± 3 DIM (d120). Ovarian ultrasonography was performed at 27 ± 3 (d27) and 41 ± 3 DIM (d41), and cows with a corpus luteum (CL) ≥ 20 mm in at least 1 exam were considered cyclic. After 34 ± 3 DIM, cows were artificially inseminated (AI) using a combination of estrus detection and timed AI programs. Pregnancy was diagnosed 34 and 62 days after AI. Cows were censored for pregnancy at 150 DIM. Cyclicity was analyzed by logistic regression. Interval to first service and to pregnancy was analyzed using Kaplan

Meier curves and Cox's proportional hazard regression. Initial models included lesion status, parity, BCS in early lactation or change in BCS at mid-lactation and season of calving. Variables with P > 0.10 were continuously removed from the model using a backward stepwise elimination method. Lesion status and parity were forced into all final models.

## Results

Compared with healthy cows, cows with pre-existing HL in early lactation had a 49% reduced likelihood of cyclicity. Specifically, cows with sole hemorrhage, non-infectious HL, infectious HL and injury had 41, 58, 68, and 79% reduced likelihood of cyclicity, respectively. Cows with preexisting HL in early lactation had a smaller hazard of first service (HR: 0.81; 95% CI: 0.71 - 0.91; P < 0.01). Mean days to first service were: healthy = 51 d; sole hemorrhage = 56 d; non-infectious = 69 d; infectious = 65 d; and injury = 67 d. Interval to pregnancy according to pre-existing HL at d20 were: healthy = 77d; with lesion = 91 d. Interval to pregnancy according to stage of lesion development were: healthy = 86 days (no HL at enrollment and mid-lactation, n=308); cured = 80 days (HL at enrollment only, n=72); new = 82 days (with HL at mid-lactation only, n=597); and chronic = 103 days (HL at enrollment and mid lactation, n=226).

## Significance

Cows with preexisting HL in early lactation had smaller odds of cyclicity by 41 DIM, longer interval to first service and pregnancy, and reduced hazard of first service and pregnancy compared with healthy cows. Interval to pregnancy and pregnancy hazard did not differ between healthy cows and those that developed new HL. Early diagnosis and management of HL to reduce chronic lesions may benefit lactating dairy cows.