

Early detection of the hoof diseases in Holstein cows using thermovision camera

Tina Bobić, Pero Mijić, Maja Gregić, Ante Bagarić, Vesna Gantner

University of Josip Juraj Strossmayer in Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia

Abstract

Aiming early detection of the tissue changes (sole ulcer - SU, interdigital hyperplasia - IH, dermatitis - D) of the hooves in dairy cows. The measurement of the surface temperature of hooves were conducted by a thermovision camera. The study was conducted in Holstein cows which they did not have any visually noticeable changes in the movement (lameness). Measurement of temperature of coronary band (CB) of the front and rear legs was made. For statistical analysis (ANOVA) program Statistica (2012) was used. After the examination of all the isolated cows suspected of having some tissue changes, it was determined that 63% of cows that had some kind of tissue change on a minimum one hoof, while the 37% of cows were without any changes that is estimates of elevated temperature of the tissue with the thermovision camera gave a negative result. It was determined the 14% of the hooves with SU, 24% IH and the 62% with D tissue changes. Statistically highly significant ($p < 0.05$; $p < 0.0001$) difference in maximum, minimum and mean measured temperature of CB on the hooves of cows were determined between the non-lesion and lesion hooves. Statistically significant ($p < 0.01$) difference in temperature of CB was determined between front and rear legs. Based on the results of this research, the feasibility and usefulness of application of the thermovision camera in early detection of tissue changes on hooves of lactating cows is recognized. Early detection of hoof disease before development of lameness can contribute to production costs reduction and increase of animal welfare.

Key words: infrared thermography, holstein, hoof lesion, coronary band

Material and methods

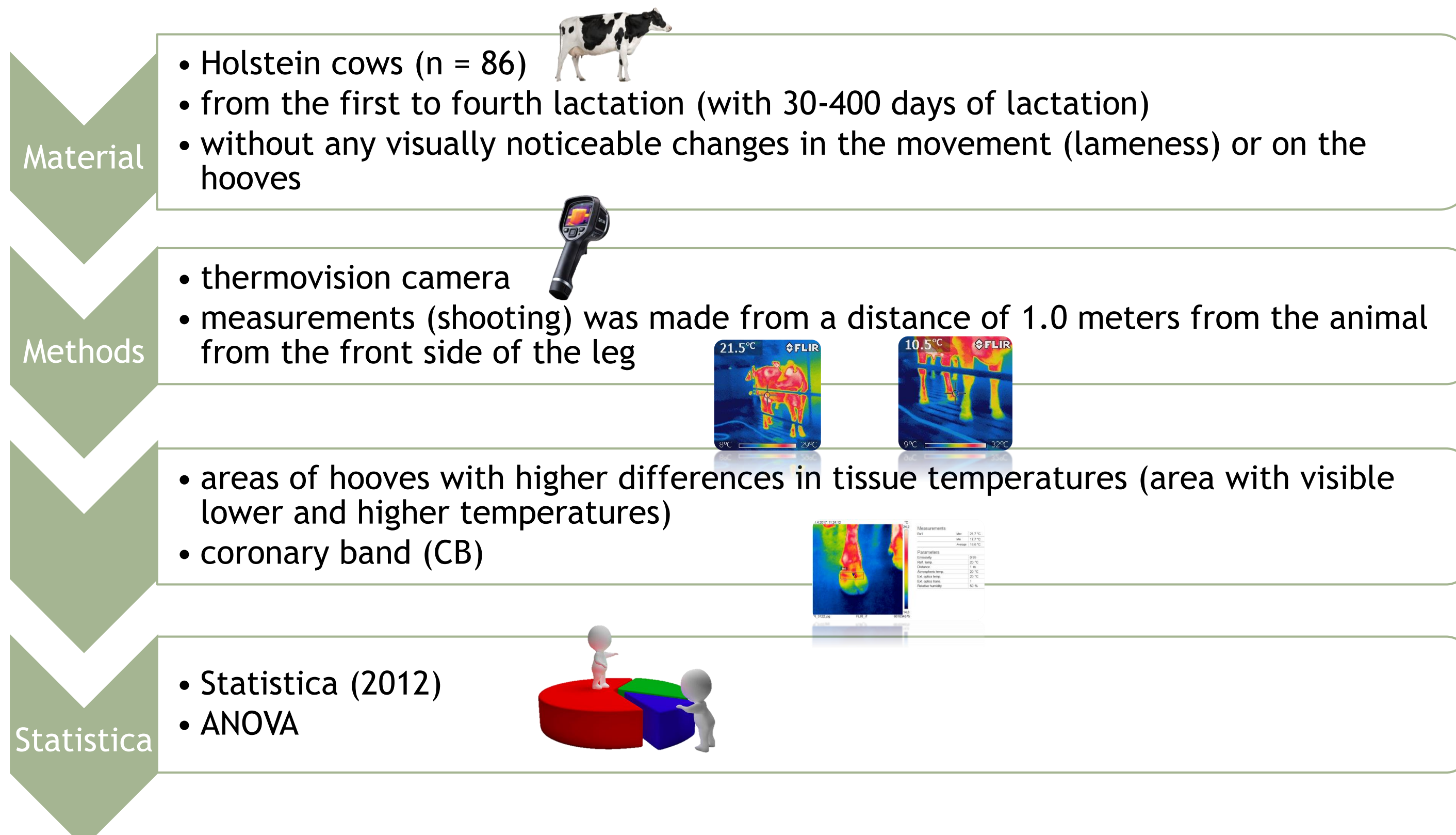


Table 2. Mean values of maximum, minimum and mean measured temperature of coronary band (CB) on the hooves of cows in regard to presence of the lesions

CB	Hooves (n ¹ = 19; n ² = 76)		p
	Non-lesion (n ² = 51)	Lesion (n ² = 25)	
Max	21.35	27.28	p < 0.0001
Min	16.00	18.12	p < 0.05
Mean	18.62	22.76	p < 0.0001

CB - coronary band; n¹ = number of animals; n² = number of hooves; p = level of significance

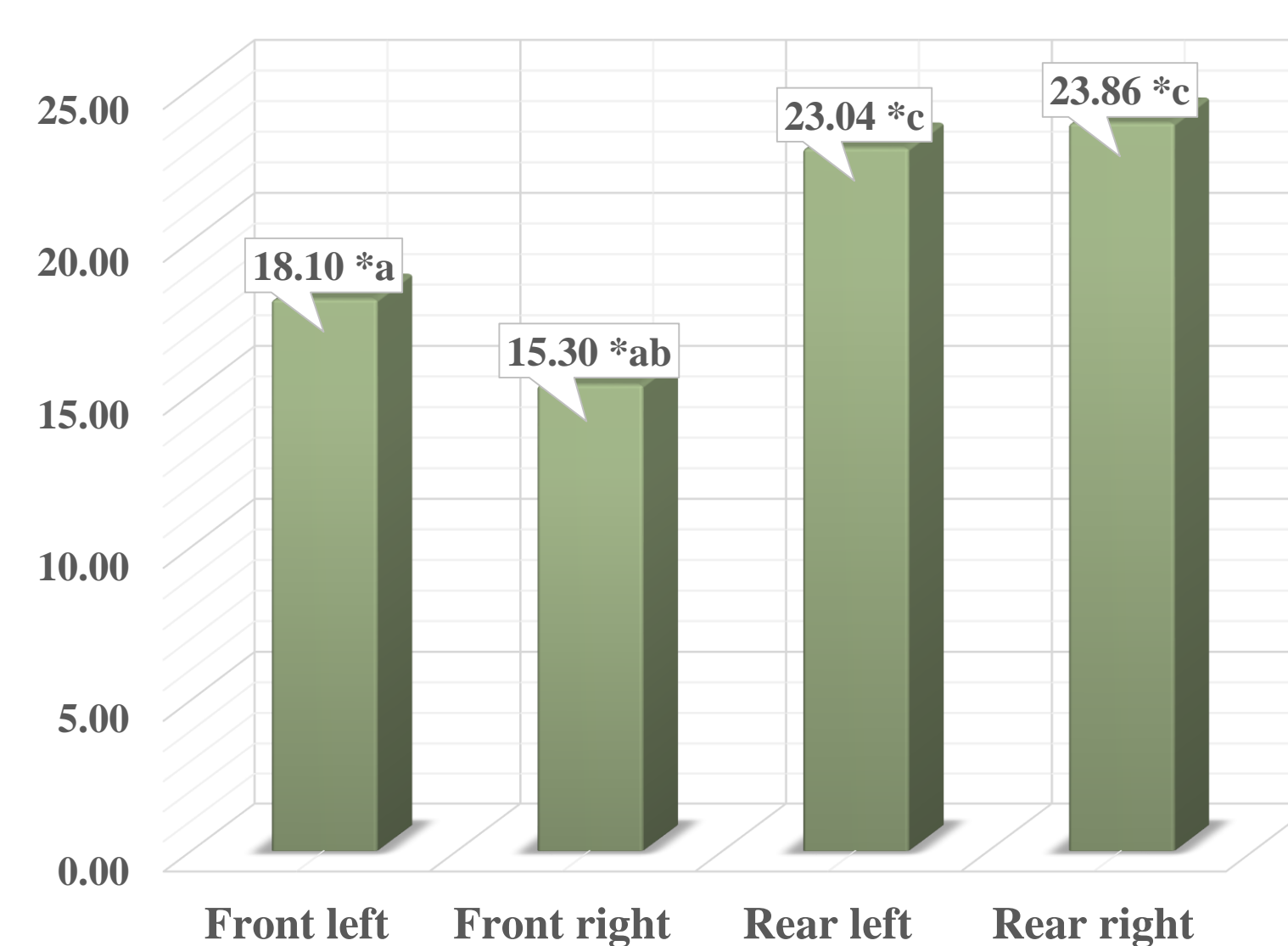


Figure 4. Mean values of measured temperature of coronary band (CB) on the hooves of cows in regard to leg position

Results

- > the 63% (n = 19) was "sick" cows or cows that had some kind of tissue change on a minimum one hoof (Figure 1).
- > the 37% (n = 11) of cows were without any tissue change that is estimates of elevated temperature of the tissue with the thermovision camera gave a negative result.
- > three different tissue change of the hooves of dairy cows legs, namely: sole ulcers (14%), interdigital hyperplasia (24%) and dermatitis (62%) were determined.
- > on rear legs 18 hooves (RL = 8; RR = 10) with dermatitis, 3 hooves (RL = 1 and RR = 2) with the interdigital hyperplasia, and hooves 3 (RL = 1; RR = 3) with ulcer. On the front legs, 2 hooves (FL = 1; FR = 1) with dermatitis and interdigital hyperplasia (FL = 1; FR = 1) were determined, while ulcer was not confirmed.

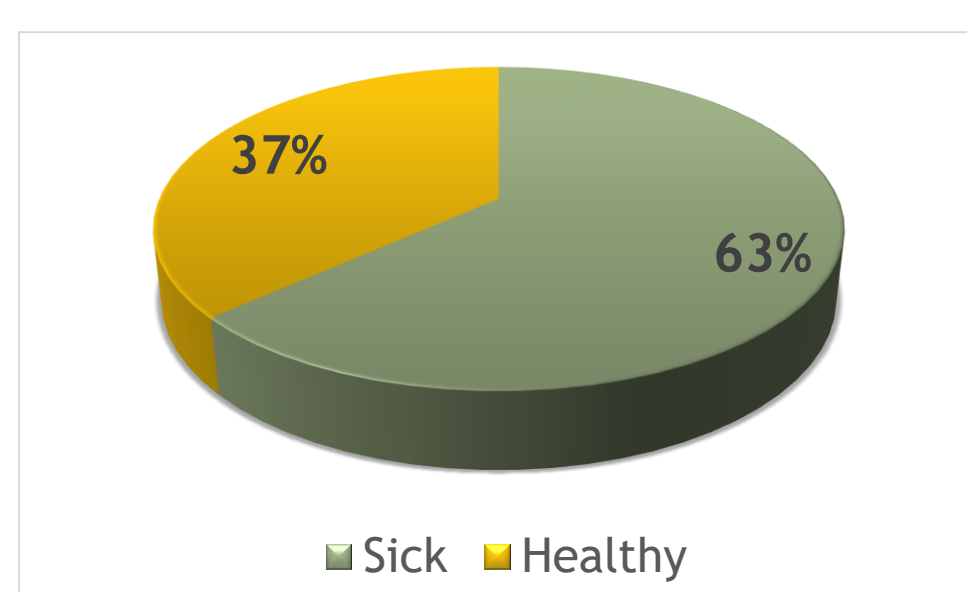


Figure 1. Percentage of healthy and sick cows in the total number of isolated cows suspected to have a tissue change (n = 30)

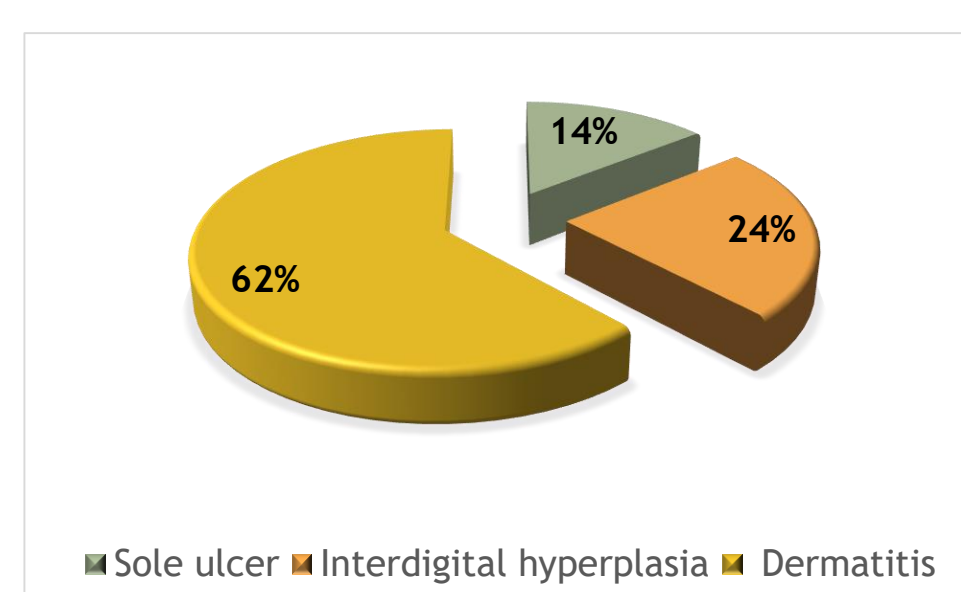


Figure 2. Representation of determined tissue change on cows' hooves (n = 19)

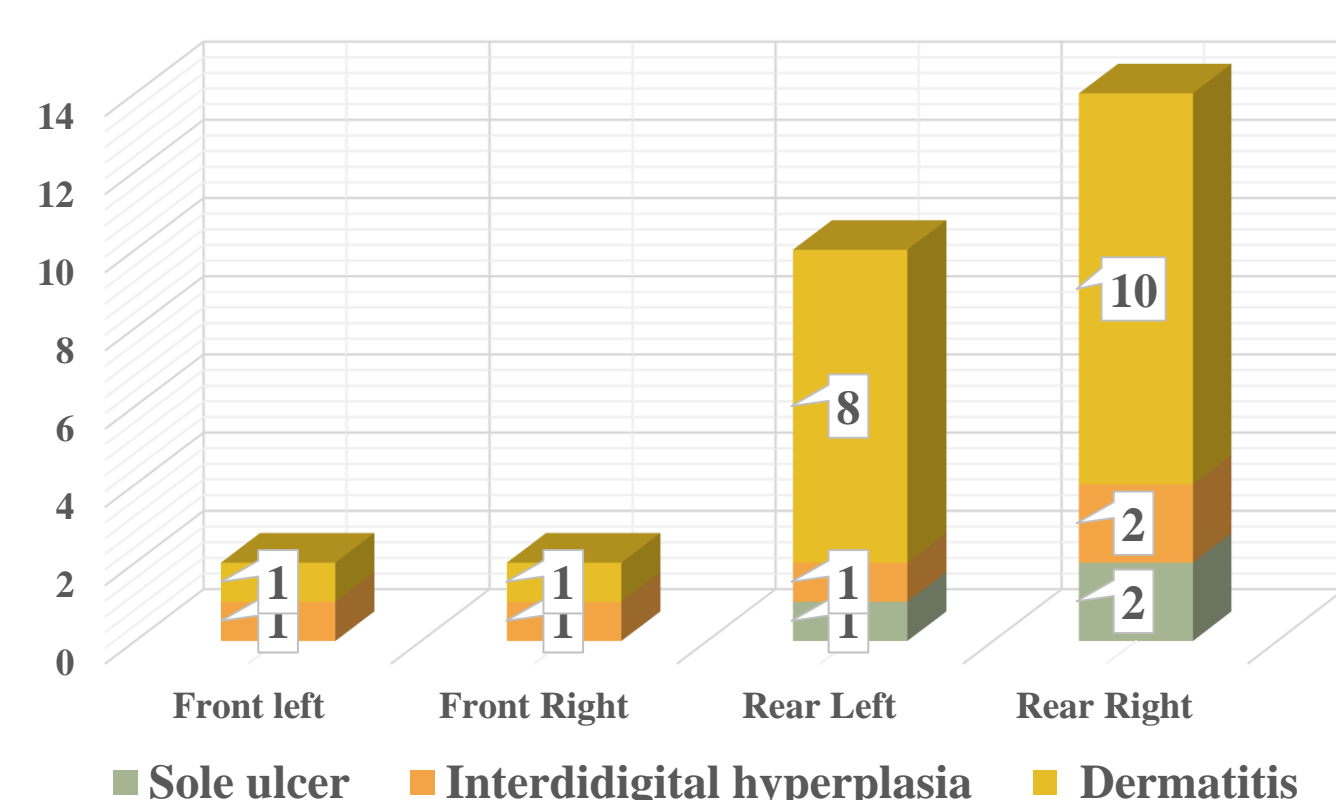


Figure 3. Representation of determined tissue change depending on the position of the legs of cows (n = 19) (D - Dermatitis digitalis/interdigitalis, IH - interdigital hyperplasia, SU - sole ulcer)

Conclusion

Based on the results of this research, the feasibility and usefulness of application of the thermovision camera in early detection of tissue changes on hooves of lactating cows is recognized. Early detection of hoof disease before development of lameness can contribute to production costs reduction and increase of animal welfare.

- > statistically highly significant ($p < 0.05$; $p < 0.0001$) difference in maximum, minimum and mean measured temperature of coronary band (CB) on the hooves of cows were determined between the non-lesion and lesion hooves (Table 2).
- > Statistically significant ($p < 0.01$) difference was determined between front left (FL) and both rear legs (RL, RR), as well as between front right (FR) and both rear legs (RL, RR).