

Genetic Associations for Corkscrew Claw, Interdigital Hyperplasia, Sole Ulcers and Heel Warts

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Lameness is a serious problem in many dairy herds. Several claw disorders are directly or indirectly related to lameness. Genetic predisposition is suspected for the majority of claw disorders, but evidence is limited. Intuitively, corkscrew claw, interdigital hyperplasia, sole ulcers, and heel warts are relatively easier to identify than other claw traits. Whether and how much genetics is involved in the disorders should be useful information for making strategies to reduce economic losses from lameness.

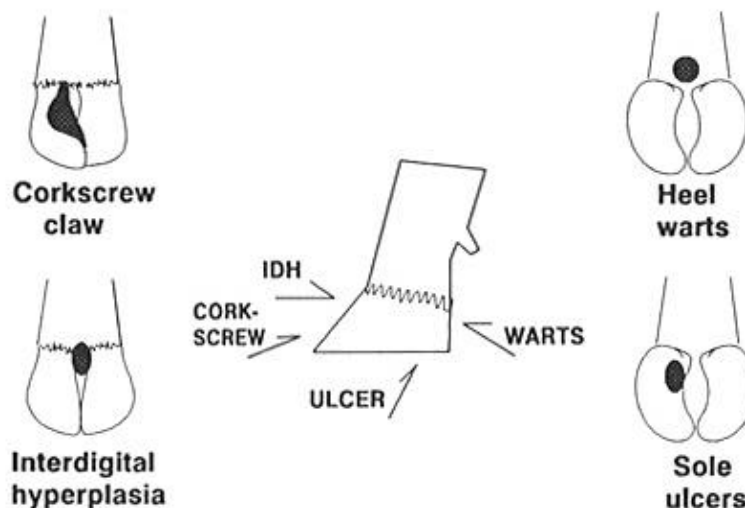


Figure 1. Illustration of common position of claw disorders.

1. Corkscrew claw is a screw like rotation of the tip of the claw in an upward and inward direction which is caused by abnormal growth of horny tissue of hoof. The sole of the claw becomes oblique and a cow's weight is consequently born on the outer wall of the claw.
2. Interdigital hyperplasia(IDH), corn, is a mass of connective tissue projecting downward between the claws. Problems occur as the tissue grows sufficiently large to cause irritation and a bruise between the claws.
3. Sole ulcers display tenderness and evidence of hemorrhage, usually near the sole-horn junction of the outer claw of the hind leg. Sole ulcers is one of the major causes for lameness.
4. Heel warts is a cauliflower like protrusion above the heel. A unique stinking smell is often associated with heel warts and can be used to

distinguish warts from other claw disorders. An illustration indicating the common positions of these disorders is in Figure 1.

MATERIAL AND METHODS

Lowell R. Hanson of CLC, Inc has scored hoof characteristics, from 1983 in the University of Illinois dairy herd. A total of 4718 trimmings were recorded from 1239 cows of 5 breeds, Ayrshire, Brown Swiss, Guernsey, Holstein, and Jersey. Scores of one, perfect, to five, severe, indicate relative degree of claw rotation in corkscrew claw and relative severity of lesions in sole ulcers. Because more than 95 % of interdigital hyperplasia and heel warts were scored 1 or 5, scores above 3 were merged as affected and 2 or below were considered normal. Worst score of cow during her lifetime was used for comparisons among breeds and between daughters and dams.

RESULTS

Risk of the four disorders all increased with age, but peak age of onset was frequently observed as early as 3 years. Sole ulcer and heel warts were found more in winter(Nov to Jan) than during drier summer months. Environmental stress of cold, wet conditions was conducive to greater incidence of sole ulcers and heel warts. Severity of sole ulcers was also related to stage of lactation, with peak severity at 130 to 150 days after freshening. This pattern reflects a lag in expression of hoof disorders following peak stress of lactation. Changes in severity of sole ulcers by days postpartum were more pronounced during first than later lactations.

Table 1. Occurrence of heel warts or interdigital hyperplasia in different breeds				
		Breed		
Disorder	Number	Brown Swiss	Holstein	Jersey
Heel Warts	Cows	69	705	132
	Affected ¹	3	43	4
	Expected ²	3.8	39.1	7.1
Interdigital hyperplasia*	Cows	71	710	136
	Affected	1	38	0
	Expected	2.9	30.5	5.5

¹ Cows with at least occurrence of disorder.
² (cows of the breed/total cows)* total occurrence of disorder.
* Occurrence significantly (p < .05) greater among Holsteins than among Jerseys or Brown Swiss.

Breed differences were detected for corkscrew claw, interdigital hyperplasia and sole ulcers but not heel warts (Table 1 and Figure 2). Jerseys had a lower incidence of claw disorders than the other breeds. Harder hoof texture was one possible explanation. Brown Swiss had higher risk for corkscrew claw. Holsteins had more problems with sole ulcers and interdigital hyperplasia. Incidence of heel warts was not significantly different among breeds. An interpretation is that heel warts occurred randomly, could affect any of the breeds and that no breed had a predisposition to be affected. The breed differences for corkscrew claw, interdigital hyperplasia and sole ulcers support genetics as one cause of the disorders.

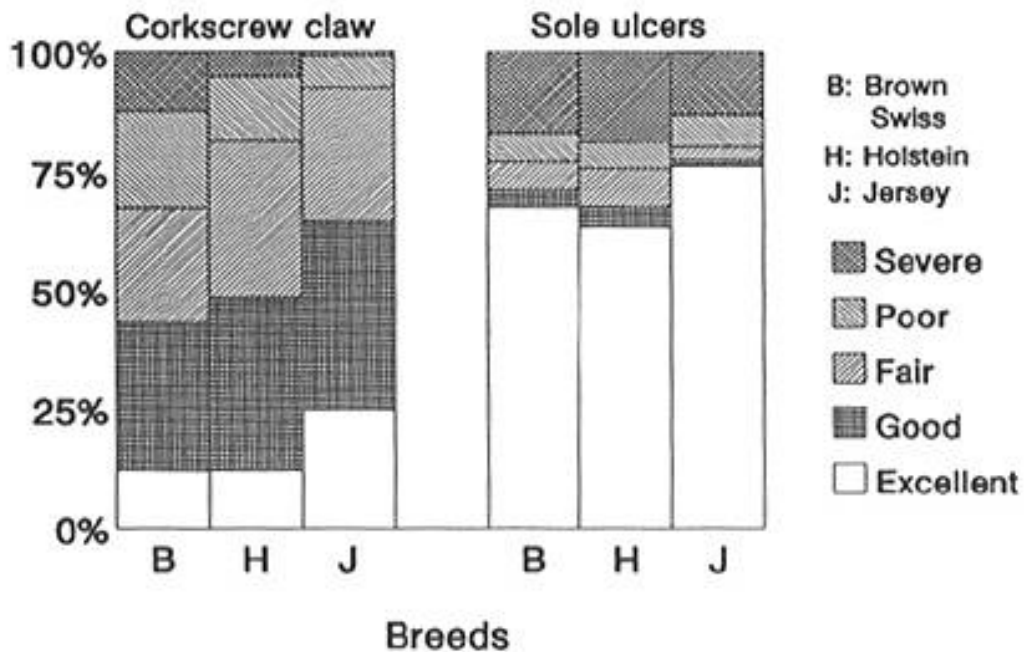


Figure 2. Distribution of scores for corkscrew claw and sole ulcers in 3 breeds.

Frequency of scores for corkscrew claw are in Figure 3. Scores 2 and 3 were most common. Among dams evaluated with a high degree of rotated claws (scores 3, 4, and 5), their daughters had a slightly higher incidence of rotated claws (scores 3, 4, and 5). More observations are needed to verify if this occurrence should be expected in other herds. Frequency of scores for sole ulcers are also in Figure 3. Over 60 % of the cows had no problems with sole ulcers. No clear pattern was found for sole ulcers between daughter-dam pairs. A genetic or maternal component for sole ulcers was not supported.

Daughters of dams affected by heel warts were more frequently affected than daughters of normal dams, but the low incidence of heel warts does not allow a statistical conclusion (Figure 4). Interdigital hyperplasia was 5 times more frequent among daughters of affected dams than daughters of normal dams. A

genetic predisposition was implied for interdigital hyperplasia. Growths between the claws were not occurring randomly, but were found in cow families. Not every affected dam had an affected daughter but dairy producers should expect a greater incidence of interdigital hyperplasia among daughters of affected dams.

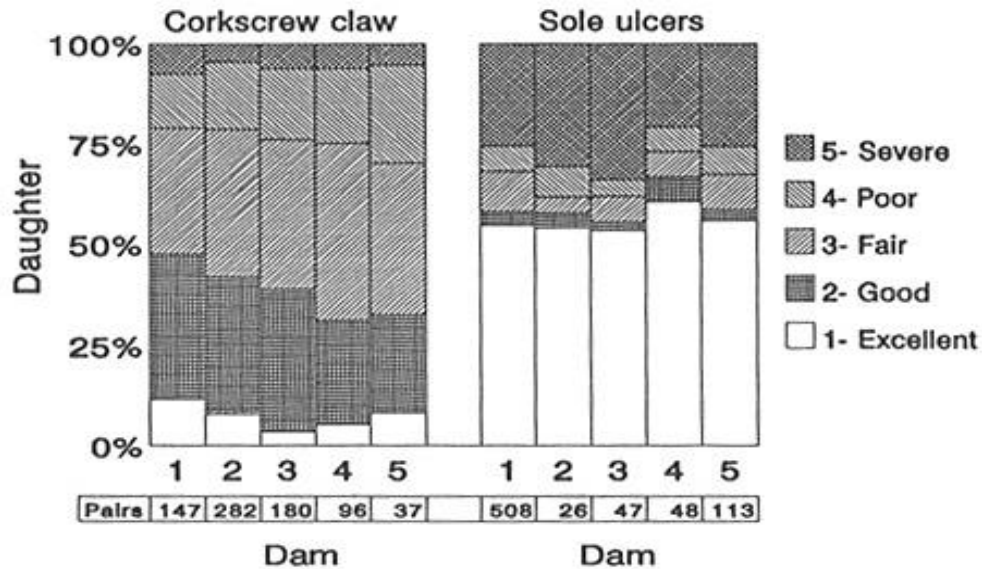


Figure 3. Distribution of frequency for scores of corkscrew claw and sole ulcers by daughter-dam pairs.

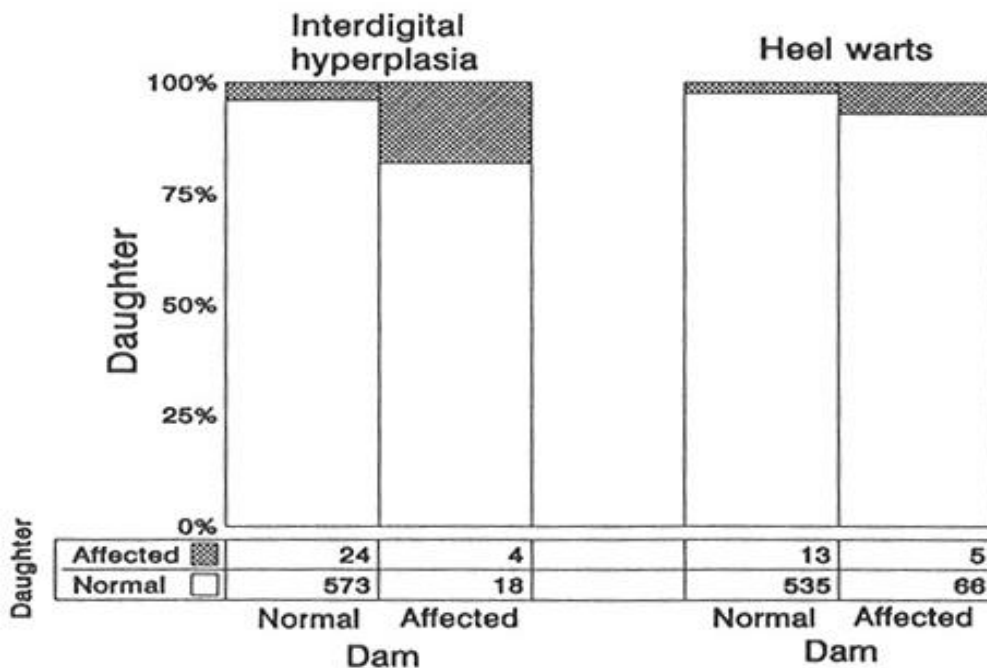


Figure 4. Distribution of frequency for incidence of interdigital hyperplasia and heel warts for daughter-dam pairs.

RECOMMENDATION AND CONCLUSIONS

1. Incidence of interdigital hyperplasia should be reduced through selection.
2. Hoof characteristics of corkscrew claw, sole ulcers, and heel warts have small genetic components. Environmental factors are much more important than genetic factors in reducing incidence of these conditions.
3. Improved management by reducing cow stress and maintaining clean dry stalls are encouraged for reducing sole ulcers and heel warts. Footbaths have also been suggested for control of heel warts, but success has been limited partially because of the increased labor necessary for maintenance of an effective footbath. Genetic selection to reduce heel warts is not expected to be successful.