A Record-Keeping System for Capture of Lameness and Foot-Care Information in Cattle

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Abstract

The American Association of Bovine Practitioners' (AABP) Bovine Lameness Committee met for the first time at the association's annual convention in Rapid City, South Dakota, in September 2000. The committee developed a mission statement and established a series of subcommittees to address specific issues. One sub-committee accepted the challenge to develop a system for recording lameness, trimming and foot care information. Objectives were to devise a system that would be simple to use, compatible with Dairy Herd Improvement Association record-keeping systems or other record-keeping programs, and in agreement with internationally recognized definitions and nomenclature used to describe lameness conditions.

With this system the veterinarian, trimmer or data recorder is required to identify specific lameness conditions through the use of a single upper case letter which serves as the specific code for a particular disorder. In most cases, this letter corresponds to the first letter of the name for the lameness condition in question. If desired, lower case letters may be used as sub-codes to provide more detailed descriptions. Upper case letter codes are combined with numbered claw zones which specify location of the lesion. Whereas nine claw/foot zones were identified in the original diagrams, this system permits identification of lesions in four additional areas, including the interdigital skin, palmar/plantar interdigital cleft and axial wall . Using this system, lameness conditions may be simply and accurately documented by use of the upper case letter and number corresponding to the appropriate zone or region of the claw or foot affected.

Claws, feet and limbs are identified or numbered from left to right beginning with the left front foot; left front lateral claw (LFL) # 1, left front medial (LFM) claw # 2, right front medial (RFM) claw # 3, right front lateral (RFL) claw # 4, left rear lateral (LRL) claw # 5, left rear medial (LRM) claw # 6, right rear medial (RRM) claw # 7, and right rear lateral (RRL) claw # 8. A foot or limb may be designated by use of the appropriate capital letters or both claw numbers; left front (LF) foot or limb # 12, right front (RF) foot or limb # 34, left rear (LR) foot or limb # 56, and right rear (RR) foot or limb # 78. This system provides a flexible yet uniform model for the capture of lameness information that will assist veterinarians, trimmers and others in the evaluation and monitoring of lameness and foot care information in cattle.

Résumé

Le comité sur la boiterie bovine de l'association américaine des praticiens bovins (AABP) s'est rencontré la première fois en septembre 2000 au colloque annuel de l'association à Rapid City, South Dakota. Le comité s'est donné un mandat et a établi des sous-comités pour répondre à des problèmes précis. Un sous-comité a accepté de se pencher sur le développement d'un système de saisie de données sur la boiterie, le parage des onglons et le soin des pieds. Les objectifs étaient de produire un système simple à utiliser, compatible avec le système de saisie du programme d'amélioration des troupeaux laitiers (DHI) ou avec d'autres systèmes, et enfin en accord avec les définitions et la nomenclature reconnues internationalement pour décrire les problèmes de boiterie.

Avec ce système, le vétérinaire, le pareur ou la personne rentrant les données doivent identifier les conditions spécifiques de boiterie avec une seule lettre majuscule qui est associée à un problème particulier. Dans la plupart des cas, cette lettre représente la première lettre du nom de la condition en question. Si tel est le désir, on peut ajouter des lettres minuscules comme paramètres additionnels pour obtenir une meilleure description du cas. Les codes en lettres majuscules sont combinés avec un numéro correspondant à la zone de l'onglon où la lésion se trouve. Bien qu'on avait reconnu initialement neuf zones de l'onglon ou du pied dans les diagrammes, le système permet l'identification de quatre aires additionnelles incluant la peau interdigitée, la division plantaire ou palmaire entre les doigts et la muraille axiale. À l'aide de ce système, la boiterie peut être simplement et précisément décrite avec la combinaison d'une lettre majuscule et d'un numéro correspondant à la zone du pied ou de l'onglon qui est affecté.

Les onglons, les pieds et les pattes sont identifiés ou numérotés de gauche à droite en commensant avec le membre antérieur gauche : l'onglon avant latéral gauche (LFL) #1, l'onglon avant médial gauche (LFM) #2, l'onglon avant médial droit (RFM) #3, l'onglon avant latéral droit (RFL) #4, l'onglon arrière latéral gauche (LRL) #5, l'onglon arrière médial gauche (LRM) #6, l'onglon arrière médial droit (RRM) #7, et enfin l'onglon arrière latéral droit (RRL) #8. Un pied ou une patte peut être représenté par les lettres majuscules appropriées ou les numéros de l'onglon; patte ou pied avant gauche (LF) #12, patte ou pied avant droit (RF) #34, patte ou pied arrière gauche (LR) #56 et patte ou pied arrière droit (RR) #78. Ce système produit un modèle flexible et uniforme pour saisir l'information sur la boiterie. Cette information sera utile aux vétérinaires, aux pareurs et à d'autres pour évaluer et surveiller l'information sur la boiterie et le soin des onglons chez les bovins.

Introduction

Present-day record-keeping for bovine foot problems lacks sufficient definition for recording observed conditions to be useful for identification and/or tracking of lameness disorders and foot-care events. Foot-care data in many operations comes from claw trimmers whose records may or may not lend themselves to convenient conversion into the farm's record-keeping system. Furthermore, data collected by trimmers varies greatly with respect to the amount of information captured and terms used to describe specific conditions. These data management challenges, combined with an overall lack of understanding of lameness conditions by dairymen, has significantly limited collection and use of foot-care information.

Farm records consist of various data and observations that when sorted, categorized, averaged, graphed or otherwise summarized yield information about a particular condition or enterprise that can be used to solve problems, answer questions or identify change. For example, if reduced pregnancy rate is a problem, the underlying causes may be determined by evaluating heat detection or conception rate. The approach to evaluation of lameness in herds is similar. Owners or managers may be aware of an increase in overall herd lameness, but until they know something about the occurrence of specific disorders (e.g. sole ulcers, white line disease, or digital dermatitis) and rates of these conditions, it may be hard to identify potential underlying causes, let alone develop a rational management strategy to address them.

The collection and maintenance of records is time-consuming, and thus represents a significant cost of doing business. It is important, therefore, to keep only information that can and will be used to track progress and/or make changes. In the United States, compatibility with such farm record-keeping systems as Dairy Herd Improvement Association (DHIA), Dairy Comp 305 or other systems is a necessity. This permits data on lameness to be incorporated into the farm's database. Then when summary reports on individual cows or on the herd are retrieved, other pertinent information, such as milk production or reproductive status, may be reviewed as well.

A record-keeping system proposed by the American Association of Bovine Practitioners (AABP) Bovine Lameness Committee has been developed. We believe it meets these: 1)simple to understand and apply; 2) compatible with DHIA, Dairy Comp 305 and other computerized record systems; and 3) compatible with international classification and record-keeping systems. Despite these attributes, we understand that no single approach will serve all needs. For example, specific needs of a researcher will likely differ significantly from that of the veterinary practitioner. The system described herein offers flexibility so that one may record as little or as much information as desired.

Description and Use of the Bovine Lameness Record-Keeping System

Specific conditions or lesions are identified by use of an upper-case letter, which in most cases corresponds to the first letter of the term used for a particular lesion: upper leg (N for non-foot), laminitis (L), ulcers (U), sand or vertical wall cracks (V for vertical), white line disease abscess (A for abscess), white line separation (S for separation), sole hemorrhage (H for hemorrhage), heel erosion (E for erosion), interdigital dermatitis (I for interdigital), interdigital fibroma or corn (K for corn), digital dermatitis or hairy heel wart (D),

foot rot (F), corkscrew claw (C), thin soles (T for thin), and other (O). These codes (Table 1) provide for specific identification of 14 conditions of the claw, foot or leg, not including the "other - O" category which defines conditions not otherwise captured.

Use of the upper case letter along with a claw zone designation (described below) identifies the condition and location of the lesion. For example, U4 (ulcer in zone 4, typical area for sole ulcers) could be used to designate a sole ulcer; U5, a toe ulcer; and U6, a heel ulcer. White line disease abscesses (A) or separations (S) could be identified similarly as A11, A12, A3, A2 and A1, or S11, S12, S3, S2 and S1. Nearly every common condition of the foot could be identified by use of the appropriate letter and claw zone designation.

Others may desire or require a system which provides a more detailed description of lesions. For example, lesions of digital dermatitis may be described as mild, moderate or severe. Since these terms are subjective, assessment is inconsistent from one evaluator to another. Alternatively, digital dermatitis lesions could be described as early (concave to flat surface; De), mature (flat to slightly raised with a terry-cloth towel-like surface; Dm), or chronic (thickened lesions with filamentous epithelial outgrowths; Dc). Use of terms which better describe the nature and/or stage (e.g. chronicity) of the lesion help reduce subjectivity and, presumably, inconsistency amongst evaluators.[1] The use of lower-case letters as lesion descriptors helps distinguish them from the upper-case letter codes used for specific foot disorders. Examples using the lesion codes and sub-codes are shown in Table 2.

While collection of detailed records using sub-codes is generally unnecessary for routine use, such records may apply in situations where greater detail may help with interpretation of an unexpected response to therapy or other parameter of interest. For example, anatomic location and maturity of digital dermatitis lesions is known to influence treatment response.[4] In herds where treatment failure is a recurring problem in spite of accepted treatment procedures, knowledge of specific lesion characteristics may help to explain the lack of response.

Recording Lesions by Designation of Claw Zone Affected

Claw diagrams designating specific zones within the claw and digit were a topic of discussion at the 6th International Symposium on Disorders of the Ruminant Digit which met in Liverpool, United Kingdom, in 1990. At this meeting researchers agreed that zones 1 through 9 (Figure 1) should be used to designate specific claw zones for each foot.[2] A claw/foot/limb numbering scheme has been previously reported (Figure 2), and was adopted for the system described here (left front - 12, right front - 34, left rear - 56, and right rear - 78).[3] For lesions affecting all claws/feet/limbs we propose the number 18 (designating involvement of claws 1-8), or the letter A (designating All). Alternatively, since some may find the claw/foot numbering scheme described above more difficult to learn or remember, the use of letters designating actual name or location of the digit or foot may be more user friendly. For example, claw number 1 is

Table 1. Codes for recording specific foot lesions.

A	=	White line disease, Abscess	L	=	Laminitis
C	=	Corkscrew claw	N	=	Non-foot (upper leg lameness)
D	=	Digital dermatitis, hairy heel wart	O	=	Other condition
E	=	Erosion (heel erosion)	S	=	Separation (white line separation)
F	=	Foot rot	T	=	Thin soles (excessive wear)
H	=	Hemorrhage (sole hemorrhage)	U	=	Ulcers (sole, toe and heel)
I	=	Interdigital dermatitis	V	=	Vertical wall crack (sandcrack)
K	=	Korn (interdigital fibroma)			

Table 2. Lesion codes and sub-codes for specific lesion description.

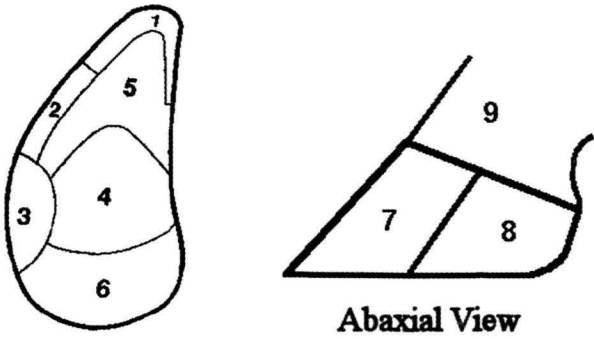|					
De	=	Digital dermatitis early lesion	Ed	=	Erosion diffuse-type lesion
Dm	=	Digital dermatitis mature lesion	Ef	=	Erosion fissure-type lesion
Dc	=	Digital dermatitis chronic lesion	Eu	=	Erosion under-mining lesion
Nh	=	Non-foot lesion - hip	Fs	=	Foot rot - super foot rot designation
Ns	=	Non-foot lesion - stifle			
Nk	=	Non-foot lesion - k for hock			
Nf	=	Non-foot lesion - fetlock			

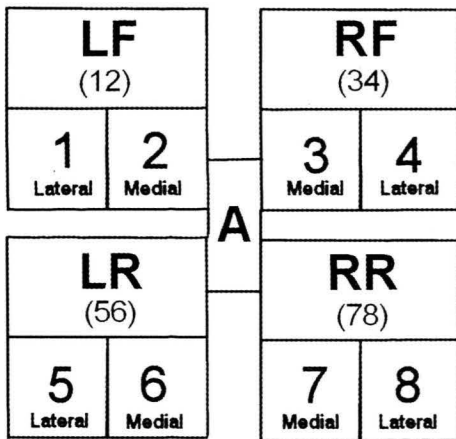**Figure 1.** Numbering system to designate specific claw zones for each foot.[2]

Figure 2. Numbering system to designate specific claw/foot/limb locations.[3]

Figure 3. Comprehensive numbering system to designate specific claw/foot zones for recording lesions.[6]

better known by most as the left front lateral (LFL) claw. Using this system, one may simply identify the left front foot as LF.

Diagrams in Figure 3 show modifications proposed by the AABP Lameness Committee for more comprehensive recording of claw and foot lesions.[6] Zones 0 (interdigital skin), 10 (palmar or plantar interdigital cleft), 11 (anterior-axial wall and white line), and 12 (caudal-axial wall and white line) have been added to provide a more complete system for recording lesions occurring in these regions.

Treatment Codes

Many of the claw problems encountered on dairy farms can be managed by corrective trimming and application of a block to the sound claw to relieve weight bearing, or in some cases, a bandage or wrap. We suggest these actions be recorded as follows: CT - **c**orrective **t**rimming; BLK - foot **bl**oc**k**; and WRP - **w**rap or bandage.[6] Such specific treatments as systemic antibiotic therapy must be recorded to protect 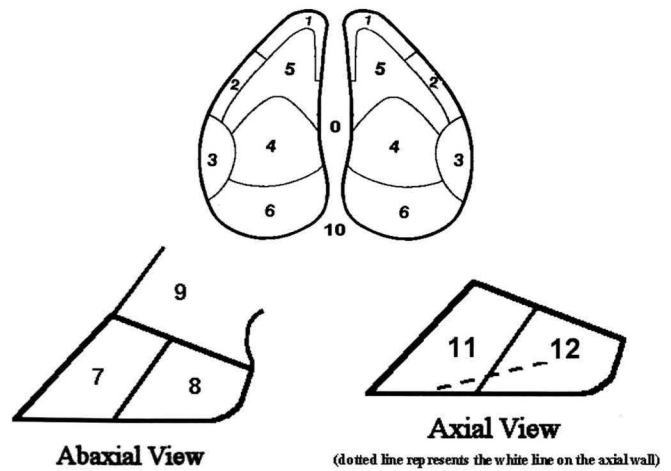the milk supply from violative drug residues. Drugs or other therapeutic agents used to treat specific conditions may be identified by drug name or a number corresponding to the specific drug used (for example: penicillin (1), ceftiofur (2)).[3] Most dairies and trimmers also need a mechanism for recording preventive maintenance trimming events. We propose NT (to distinguish it from T which indicates thin soles) for **N**ormal **T**rim.[6] In some cases, depending upon the type of form used, items such as CT, BLK, WRP, or NT become column headings. In this case, actions are indicated by simply marking the appropriate column with an "X", as done in the example form described later.

These codes will provide sufficient identification of most treatment events. When additional information is required, it can be captured in a comment section of the records.

Locomotion Scoring

Evaluation of locomotion is a useful procedure when assessing individual cows or herd lameness conditions. One of the more popular locomotion scoring systems was devised by Sprecher *et al*[7] (Table 3). Using this system, back posture and gait are visually assessed and scored on a scale of 1 through 5, whereas Score 1 indicates no lameness and 5 indicates severe lameness. Cows with normal locomotion (e.g. locomotion score 1) stand and walk with a flat back. Cows with mild lameness (locomotion score 2) stand with a flat back, but arch their back while walking. Cows with a locomotion score of 3 or higher both stand and walk with an arched back. Lameness in cows with a locomotion score of 3 is generally benign, and best characterized as a short-strided gait. Cows with a locomotion score of 4 have obvious lameness involving one or more legs, and gait is slow and deliberate. Cows with a locomotion score of 5 (se-

Table 3. Locomotion scoring by assessment of back posture and gait abnormalities.[a]

Score	Description	Back	Assessment
1	Normal	Flat	Cow stands and walks with a level back. Gait is normal.
2	Mildly lame	Flat or arched	Cow stands with a level back, but develops an arched back when walking.
3	Moderately lame	Arched	Arched back while standing and walking. Gait is described as short-strided.
4	Lame	Arched	Arched back while standing and walking. Cow favors one or more limbs, and gait is deliberate (one step at a time).
5	Severely lame	Arched	Arched back while standing and walking. Cow exhibits extreme reluctance to bear weight on one or more limbs.

[a]Adapted from Sprecher *et al*, *Therio* 47:1179-1187, 1997.[7]

vere lameness) exhibit an extreme reluctance to walk or bear weight on one or more affected limbs.

Locomotion scores are useful to assess overall herd lameness, monitor recovery of individual animals, to determine the need for other foot health procedures (trimming or examination), and to provide insight into other herd problems, such as reduced dry matter intake or reduced milk production. Locomotion scoring may be used to estimate the economic impact of lameness in herds[5] (Table 4). An example of the use of this system is described later in the "Commercial Use Applications" section. Locomotion scoring is an efficient way to document foot health status, as well as the success of the foot health program.

Recheck and Appropriate Follow-up

A common problem with foot-care programs on dairies is the failure to follow-up on lameness conditions. Depending upon severity, certain claw disorders have the potential to develop serious complications which could lead to deep digital sepsis. Cows identified as candidates to develop complications should be monitored carefully. The record-keeping system shown here offers the opportunity to define a time for re-evaluation of cows that need follow-up observation.

Foot Care/Lameness Data Capture Form

A sample data capture form using this system is shown in Figure 4a. An interpretation of lesions and treatment activities, including use of appropriate codes and claw/foot/limb numbering, is provided so that readers may review application of the system with actual cases (Figure 4b). In addition, photos of the lesions described in the sample form are included in Figure 4c. This, or something similar, is recommended for record-

Table 4. Estimated relationship of locomotion score to reduction in dry matter intake and milk yield.[a]

Locomotion score	Reduction in DM intake (%)	Reduction in milk yield (%)
1	0	0
2	2	1
3	5	3
4	17	7
5	36	16

[a]Adapted from Robinson and Juarez, *Proc Mid-South Nutrition Conference*, Ft. Worth, TX, 2003.[5]

ing foot-care and trimming related information. The last page of this paper is a blank form for those who wish to make copies or use it as a template for designing their own system.

Commercial Use Applications

PocketDairy. The Dairy Records Management Service in Raleigh, North Carolina, has developed a hand-held computer application of the proposed system known as *PocketDairy* (Figure 5). The screen includes the 15 lesion codes, numbered claw zone diagrams, designation of the foot or claw involved, identification of the trimmer/technician, location of the lame cow as "In" or "Out" of the lame herd and the cow's locomotion score.

Data captured in *PocketDairy* may be downloaded into a customized report to allow the trimmer, veterinarian, or other person to summarize foot care and lame-

FOOT-CARE/LAMENESS DATA CAPTURE FORM

Farm: AABP Dairy North America

Service Date: 9-17-03 Trimmer: Mike Trimsalot Veterinarian: Dr. Hatesfeet

Cow #	Lesion code	Claw zone	Foot/claw	Block	Wrap/bandage	Treatment/comment	Re-check
1245	U	4	8	X		CT	30
318	D, E	10,6	56		X	CT, oxytet	
1534	A	3	6	X		CT	30
568	S	3	8			CT	
5248	L		18			Aspirin	7
624	N		78				Sell
782	C		5, 8			CT	120
845	C	5	5	X		CT, toe abscess	7
8765	U	6	8	X		CT	7
846	F	0	78			Naxcel - 3 days	5

Figure 4a. Example of a completed foot-care capture form.

1) Cow # 1245 has a sole ulcer (U) in zone 4 of the lateral claw of the right rear (8) foot. A claw block was applied to the healthy claw and the ulcer treated by corrective trimming (not shown in the figure). The trimmer has requested a recheck in 30 days to remove the block and check progress of the lesion.

2) Cow # 318 has digital dermatitis (D) in the interdigital cleft (10) of the left rear foot (56). There is extensive heel erosion and the heels are elongated as a result of the cow's attempt to walk on the toes to avoid weight bearing at the heels. Although not shown in the figure, the record indicates that the cow was treated by corrective trimming (CT) and topical oxytetracycline under a loose wrap.

3) Cow # 1534 has a white line disease abscess (A) that occurred in zone 3 on the medial claw of the left rear (6) foot. The healthy claw was blocked and the lesion was treated by corrective trimming. The trimmer has identified the cow for recheck in 30 days. At that time the block may be removed or a new one applied, depending upon recovery progress.

4) Cow # 568 has a white line separation (S) in zone 3 of the lateral claw of the right rear (8) foot. It has been treated by corrective trimming (CT) of the lesion as the lesion did not extend to the corium and therefore did not result in white line disease with abscess formation; the lesion is best described as white line separation.

5) Cow # 5248 has laminitis (L). All claws/feet (18) are affected. The cow has been treated with aspirin and will be re-evaluated in seven days. Actually, the cow will likely be evaluated more frequently, and a decision on her final disposition may be necessary on day 7.

6) Cow # 624 has a non-foot (N) related lameness problem affecting the right rear leg (78). Cow has a lesion on the inner aspect of the hock (caused by poor stall design and bedding maintenance). The cow has been lame for the past couple days. Owner was informed and marked her to sell.

7) Cow # 782 has corkscrew claw (C) affecting the lateral claws of both the left (5) and right rear (8) claws (right rear claw not shown). Treatment is corrective trimming (CT) with a recheck (for re-trimming) scheduled for 120 days.

8) Cow # 845 has corkscrew claw (C) with a toe abscess and pathologic fracture of P_3 (trimmer is holding the bone fragment). The toe abscess involves zone 5 of the outside claw of the left rear foot (5). A foot block was applied to the healthy claw and the lesion treated by corrective trimming (CT - removal of all loose, damaged or necrotic horn tissue). The trimmer requests a recheck in seven days.

9) Cow # 8765 has a heel ulcer (U) in the lateral claw (8) of the right rear foot that was treated with a foot block and corrective trimming (CT). She is listed for recheck in seven days.

10) Cow # 846 has foot rot (F) with a severe lesion in the interdigital skin (zone 0) of the right rear foot (78). She was treated with Naxcel for three days. The cow is scheduled for recheck in five days.

Figure 4b. Interpretation of table contents using lesion codes, claw/foot diagrams and numbering system.
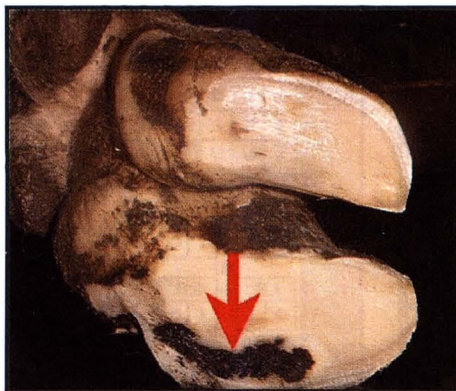
#1245 Sole Ulcer

#318 Digital Dermatitis
Extensive heel erosion

#1534 White Line Disease
Abscess

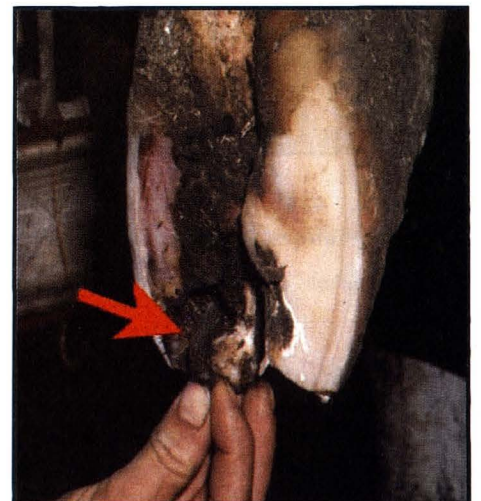**#568** White Line Separation

#5248 Laminitis
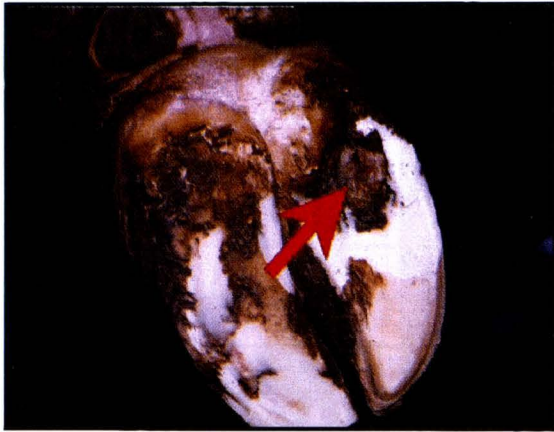

#624 UpperLeg Lameness

#782 Screw Claw Moderate
Ventral View

#845 Cork Screw Claw/Toe Abscess

Figure 4c. Photos corresponding to cows and conditions described on the record-keeping form (Figures 4a, b).

#8765 Heel Ulcer

#846 Foot Rot

| BarnN	Date	Cndtn	Loc	Actn	Lame	Lame#	DIM	TD Mlk	Grp	Repro
1128	02-04-2002	Abcss	03		I		129	65.0	3	H
	02-06-2002	Abcss	01	W	O		129	65.0	3	H
	02-18-2002	Septn	03	W	I	2	129	65.0	3	H
	02-19-2002	VertC					129	65.0	3	H
1222	02-04-2002	Corks		W	I	2	86	51.0	3	
	02-04-2002	DDerm	00	W	O		86	51.0	3	
1250	02-01-2002	DDerm	10		I	4	366	70.4	2	P
	02-06-2002	Hmorg	05	W	I		366	70.4	2	P
	02-07-2002	DDerm	09	W	I	2	366	70.4	2	P
	02-08-2002	Other	03	W		2	366	70.4	2	P
1253	02-04-2002	Erosn	06	W	I	4	257	53.8	3	B
	02-12-2002	Erosn		B	O		257	53.8	3	B
1292	02-03-2002	FtRot	00	C	I	1	282		9	P
	02-07-2002	Other	08	W	I	3	282		9	P
	02-11-2002	ThinS	02	W	I	4	282		9	P
1309	02-01-2002	Hmorg	04	W		4	239	52.7	2	P
	02-07-2002	Hmorg	06	B	I	3	239	52.7	2	P
	02-19-2002	Hmorg			O		239	52.7	2	P
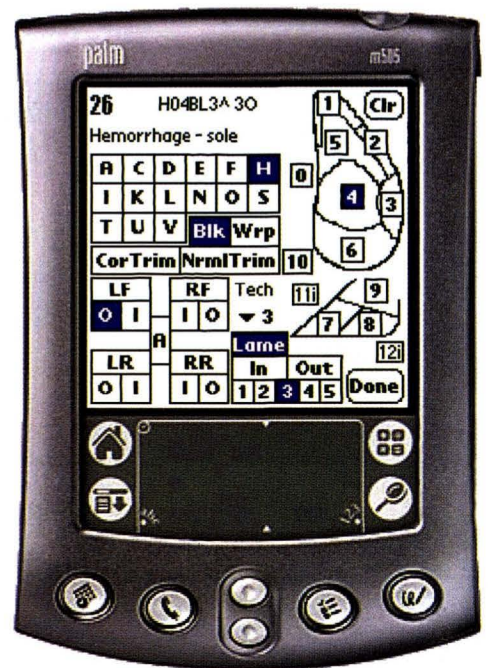
Figure 5. An example of the hand-held computer application of the proposed foot-care and lameness information system developed by the AABP Bovine Lameness Committee.[a]

[a]This hand-held computer application system, *PocketDairy*, was developed by The Dairy Records Management Services in Raleigh, NC.

ness events by stage of lactation, parity, performance, or other criterion of interest. The system permits the user to collect as much or as little information on foot care and lameness events as desired.

Dairy Comp 305 has also adopted portions of the system described herein, and is testing it with several users. It is hoped that other processing centers will adopt portions, if not all, of the system described above.

Conclusions

For the past three years the Bovine Lameness Committee has been developing a system to capture lameness and foot-care information in cattle. The described system has evolved to include use of an upper-case, and if desired, lower-case letter for detailed description of lesions. Specific anatomic location may

be defined by appropriate claw/foot/limb letter designation or a numbering system that provides the information with little additional effort. Suggestions are also offered for recording trimming and treatment information as well. Combined with herd records, this information has broad application for decision-making in management of individuals, groups of animals or the herd in general.

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FOOT-CARE/LAMENESS DATA CAPTURE FORM

Farm: _____ Service Date: _____

Trimmer: _____ Veterinarian: _____

	Lesion Code	Claw Zone	Foot/Claw	Block	Wrap/ Bandage	Treatment/ Comment	Recheck