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How to Locomotion Score Dairy Cows to Estimate Herd Lameness Prevalence

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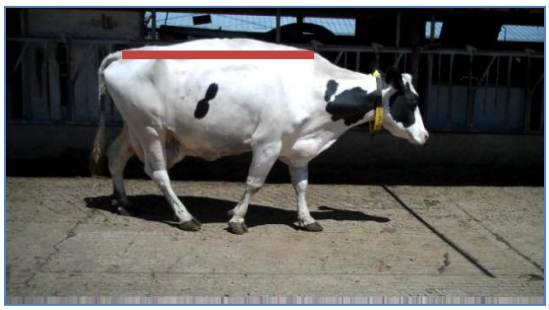
The first step to remediation of dairy herd lameness is to determine if a problem exists or not. Ideally, ALL the cows should be examined to find those that need attention or treatment. However, to get started with a herd, particularly a large one, getting a representative sample of cows to evaluate might be enough to trigger the next steps – investigation of the likely causes of a herd lameness problem and intervention. This factsheet provides details on locomotion scoring and sampling to estimate a dairy herd's lameness prevalence.

Assigning a locomotion score

Score	Means	Description
1	Normal	The cow walks and stands with a flat back. She walks normally.
2	Slightly abnormal gait	The cow stands with a flat back but arches* her back while walking. She walks normally.
3	Moderately lame	The cow stands with an arched back and walks with an arched back. She short-steps* while walking.
4	Lame	The cow stands with an arched back and walks with an arched back and walks with decreased weight bearing on one limb (limps).
5	Severely lame	The cow stands and walks with an arched back and refuses to bear weight on a limb.

***Definitions:** **Arched back**: an arched back is one that is convex from the withers to the tail head rather than being flat. If you drew a straight line from the withers to the tail head, would you see the cows back arched above the line?



Short-step (or short-stride) is a decrease in the duration and/or distance of the stride of one or more legs. A single stride for one hoof is defined as the distance and time for the same hoof to contact the ground again. Short-stride of a hind limb results in the cow not tracking-up. Tracking-up is the placement of the hind hoof in or adjacent to the footprint of the front hoof on the same side.

Key points for Accuracy: Locomotion scoring is easiest if you can see the cow walking and standing but you don't always have this opportunity. Taking note of short-stepping is important because it distinguishes between score 2 and 3 (not lame and lame) if you did not see the cow standing. However, a cow may appear to be short-stepping due to udder fill so keep this in mind for cows with large udders. If the short-stepping is symmetric, affecting both hind limbs equally, it is likely udder fill and the cow should be assigned a score of 2. The place you are locomotion scoring should be flat and have good traction. Walking downhill or on slippery surfaces can make the cow arch her back more, and may make a score 1 look like a score 2.

How to determine sample size

A sampling strategy has been validated for accuracy in which a calculated sample of cows across the herd, weighted by pen and distributed evenly within the pen, is locomotion scored.

Calculations: (a table for these calculations is included below)

1. Determine sample size based on total number of lactating cows in the herd using the table below.

2. Weight sample by pen: Some pens have more cows in them then other pens, so more cows in these pens should be locomotion scored. To calculate this for each pen, divide the number of cows in that pen by the total lactating herd size. This gives you the proportion of the herd in each pen.

3. For each pen, multiply the proportion in the pen (from step 2) by the calculated sample size (step 1). This gives you the **number of cows to score in each pen**.

4. For each pen, divide the total number of cows in the pen by the number of cows you will score in that pen (from step 3). This gives you the **number of cows to count in between the cow to score, we'll call this number 'n'**. When you go through the pen, you will score every n^{th} cow. For example, if there are 100 cows in the pen and you need to score 20, 100/20=5, so you will score every 5^{th} cow you see. This counting of cows ensures that the sample is distributed evenly across the pen to decrease bias. For example, if more lame cows were closer to the parlor and you only scored the cows on that side of the pen, your prevalence estimate is likely to be biased.

5. Locomotion scoring cows: Score every n^{th} cow in the pen until you have scored the number of cows calculated for that pen.

Sample Size Table							
Herd Size	Sample size	Herd Size	Sample size	Herd Size	Sample size	Herd Size	Sample size
20	17	**140**	57	**270**	71	**900-950**	87
30	23	**150**	59	**280-290**	72	**1000-1100**	88
40	28	**160**	60	**300**	73	**1150-1300**	89
50	33	**170**	62	**350**	76	**1350-1550**	90
60	37	**180**	63	**400**	78	**1600-1900**	91
70	41	**190**	64	**450**	79	**1950-2450**	92
80	44	**200**	65	**500**	81	**2500-3000**	93
90	47	**210**	66	**550**	82	**3500-5500**	94
100	49	**220**	67	**600**	83	**6000-16500**	95
110	52	**230**	68	**650**	84	**17000 & up**	96
120	54	**240**	69	**700-750**	85		
130	55	**250-260**	70	**800-850**	86		

Calculations for Estimation of Lactating Herd Lameness Prevalence

Dairy:_____

1. Herd size (lactating cows)_____
2. Sample size (always round up) *from table*_____
3. Calculate:

	(A)	(B)	(C)	*n*
Pen number	**Number of lactating cows in pen**	**(A)/herd size = proportion of cows per pen**	**(B) * sample size = number to score per pen**	**(A) / (C) = *n.* Score every n^{th} cow**
Example (herd size 400)	*100*	*100/400 = 0.25*	*0.25 * 78 = 20*	*100/20 = 5*

4. Score every n^{th} cow.
5. Calculate lameness prevalence

$$Lameness\ prevalence = \frac{(\text{score } 3 + \text{score } 4 + \text{score } 5)}{\text{Total number locomotion scored}}$$

Ways you could score:

- During herd check or time the cows are locked-up, have assistant release every n^{th} cow for you to locomotion score
- Watch cows as they exit the milking parlor and record locomotion score of every n^{th} cow.
- Walk through the pens, counting cows (both lying down and standing) in the order that you see them, and locomotion score every n^{th} cow.

Locomotion score – check box or enter cow ID for each cow scored									
1		**2**		**3**		**4**		**5**	
Total:		Total:		Total:		Total:		Total:	
Total 1&2 :				Total 3&4&5:					
Total cows scored:									

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