Council on Dairy Cattle Breeding Industry Meeting

Hoof Health & Lameness: Overview of data collection and genetics

Kristen Parker Gaddis, CDCB Geneticist

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Outline

Introduction

Data Collection

Genetics

Possibilities

Photo: Progressive Dairy

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INTRODUCTION

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Why lameness?

Production

- About 50% of cows will experience a hoof health event during their productive life
- Increased labor, increased costs, decreased production, decreased fertility
- Average cost ~$150 due to lost milk, treatment, and reduced fertility (Cha et al., 2010)

Societal

- Lameness is a clearly visible health event – easy for the general public to understand and identify with
- Reducing hoof health events can reduce the use of antibiotics

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Why not lameness?

- CDCB introduced genetic evaluations for 6 health events in April 2018
- Lameness was not included at that time due to data inconsistency and low heritability

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Noisy?

Straightforward trait - DAs

- Can be clearly diagnosed
- Limited number of ways to refer to the event
- Usually due to anatomy

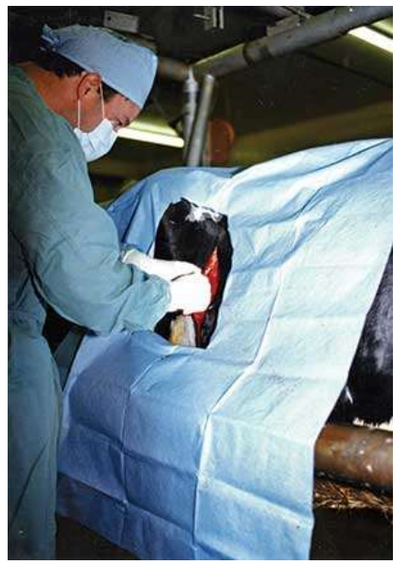

Photo: Hoard's Dairyman

"Noisy" trait - Lameness

Photo: thecattlesite.com

- Different people will have different definitions of lameness
- Numerous ways to refer to lameness (e.g., LAME, LOCO, HOOF, FTRT, FEET, LEGS, TRIM, etc., etc.)
- Numerous different causes of lameness – physical trauma, infectious, metabolic, etc.

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DATA COLLECTION

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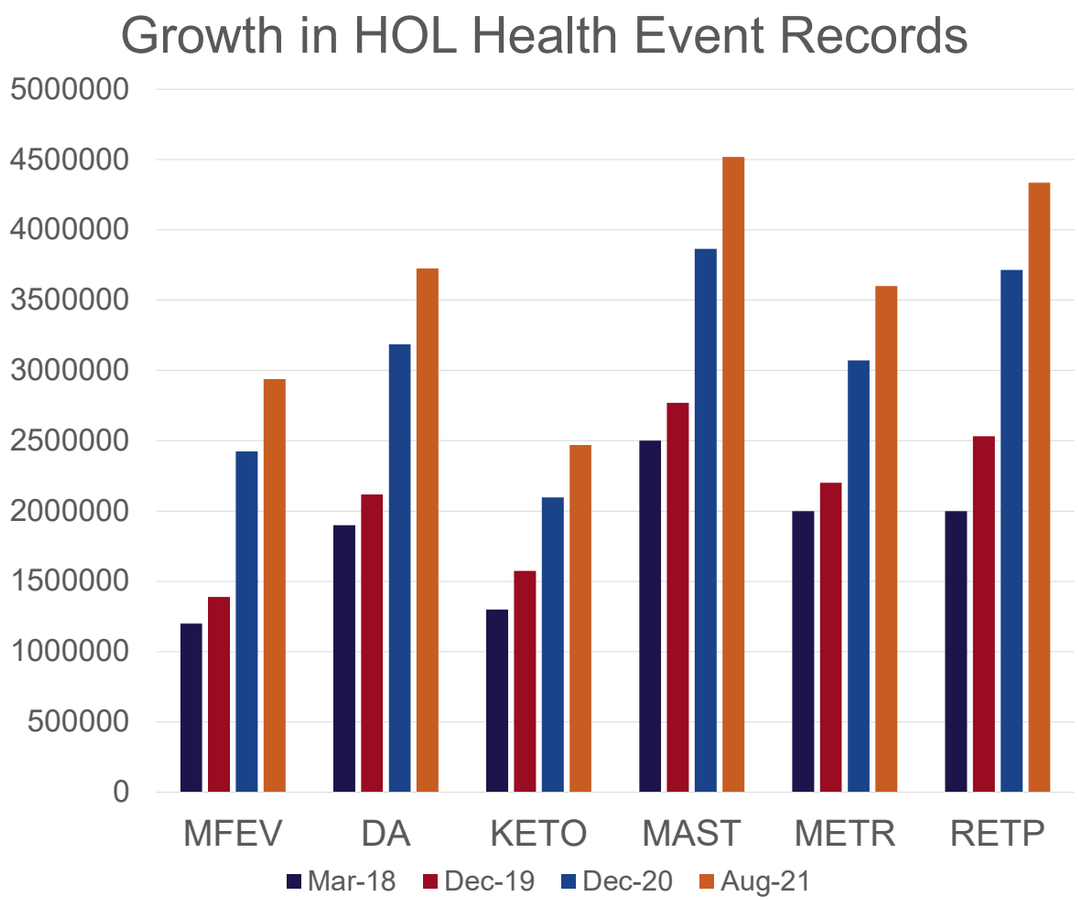
Importance of data collection

- Cannot address a problem without information
- CDCB receives health information as Format 6 records
- Record growth continues for health traits with genetic evaluations



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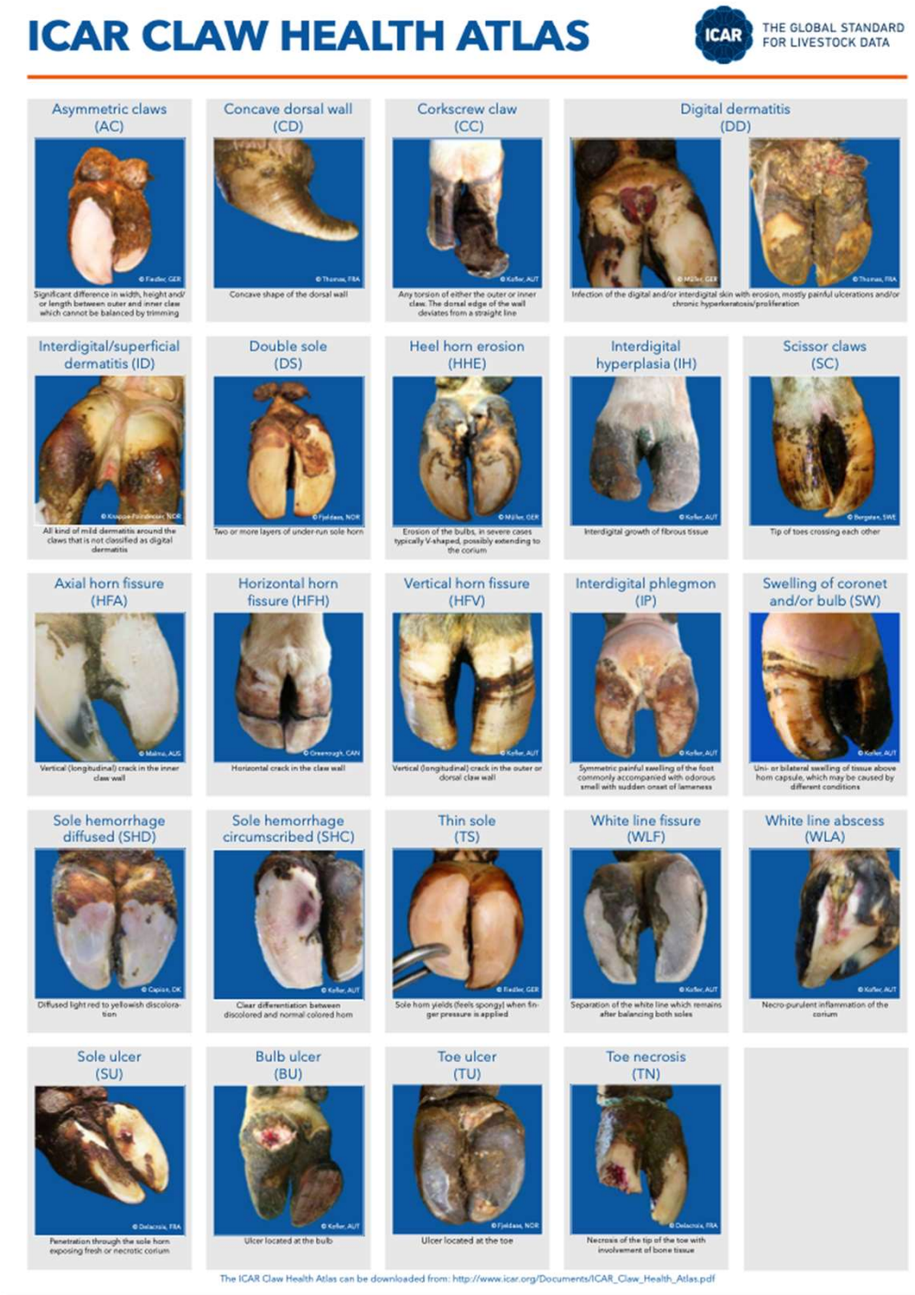
ICAR Claw Health Atlas

- First released in 2015 with the 2nd revision released in January 2020
- Describes best practices for data recording
- Standardization and harmonization of data recording



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Format 6 & Hoof Health

- Includes health event code for lameness (LAME) and management code for locomotion score (LOCO) within Format 6
- Difficult to identify consistent recording of animals with a true hoof health event

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Updates to Format 6

Expanded in 2017 to include details as described in the ICAR Claw Health Atlas

- Detail section allows for the identification of general causes of lameness
  - *Infectious (I)*
  - *Noninfectious / metabolic (M)*
  - *Noninfectious / other (O)*
- Adopt many of the hoof health events as described by the ICAR Claw Health Atlas under each general cause of lameness

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Cause	Abbreviation	Synonymous Terms
Infectious	**I**	
Abscess	AB	
Digital dermatitis	DD	Hairy heel wart
Interdigital/superficial dermatitis	ID	
Heel erosion	HE	Slurry heel
Interdigital phlegmon	IP	Foot rot
Noninfectious / Metabolic	**M**	
Sole hemorrhage	SH	
Sole ulcer	SU	
Toe ulcer	TU	
White line disease	WL	
Noninfectious / Other	**O**	
Corkscrew claw	CC	
Horn fissure	HF	
Interdigital hyperplasia	IH	Corns
Physical trauma	PT	
Thin sole	TS	
Other	OO	

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Current status

- Data currently available at CDCB
  - HOL: Approximately 2 million LAME records + healthy contemporaries; average incidence = 7%
  - JER: Approximately 400k LAME records + healthy contemporaries; average incidence = 4%
  - No detailed information
  - No locomotion records

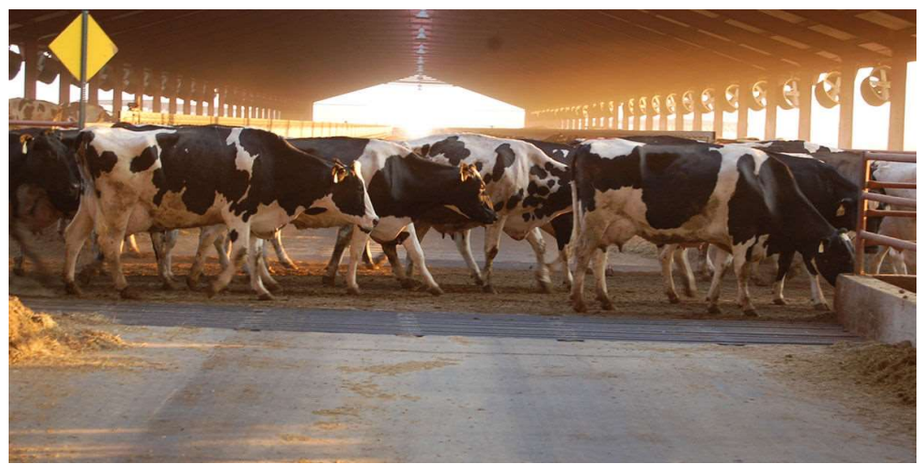

Photo: Zinpro

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GENETICS

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Previous U.S. research

- Research with producer-recorded data – lameness typically has the lowest heritability of those researched (~2 to 6% with threshold models)
  - Zwald et al., 2004
  - Parker Gaddis et al., 2014
  - Vukasinovic et al., 2016
- Is there a way to better define lameness data?
- Incorporation of specific hoof health events with producer-recorded lameness resulted in higher heritability (~7 to 14% with threshold models)
  - Dhakal et al., 2015

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More hoof health research

Photo: Zinpro

- CAN research using specific hoof health events recorded by hoof trimmers (Malchiodi et al., 2017)
- Heritability ranged from 6 to 19% with threshold models
- Lactanet introduced genetic evaluation for digital dermatitis in 2017
- CAN currently provides a hoof health index evaluation with 8 hoof lesions

- Hoof health events included:
  - Digital dermatitis
  - Interdigital dermatitis
  - Interdigital hyperplasia
  - Sole hemorrhage
  - Sole ulcer
  - Toe ulcer
  - White line disease
  - Heel horn erosion

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Main take-aways

- We need more information than 0/1 lameness data
- Inclusion of specific hoof health events results in higher heritabilities
- Genetic improvement using specific hoof health events may be a feasible way to make permanent improvement of dairy cow hoof health

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POSSIBILITIES

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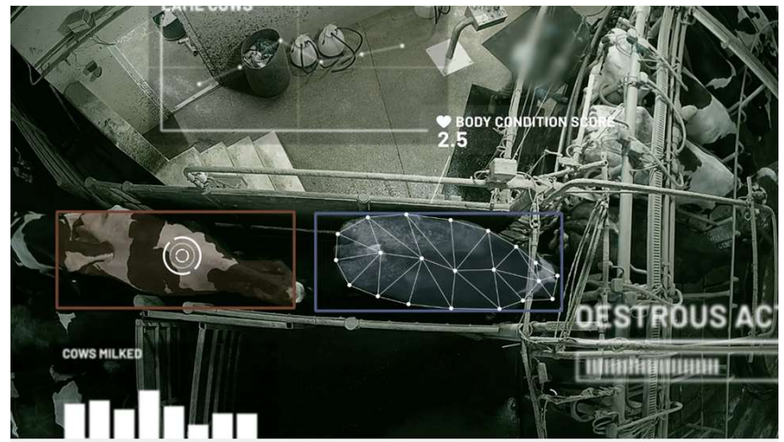
Current project

"Reducing lesion-related lameness using a combination of epidemiological, genomic and extension approaches"

- Train hoof trimmers to identify and record specific hoof lesions consistently
- Create integrated framework of hoof trimmer data and on-farm records
- Allow these data to flow to CDCB to incorporate with on-farm records, as well as pedigree and genotypic data
- Develop a hoof health index that will allow genetic selection for improved resistance to hoof health events

Going further

- How can we make this process more streamlined and consistent?
- Can technology be used to identify cows for further examination?
  - Video Analytic Platform to routinely identify lame animals based on their locomotion
  - Reduce the labor and subjectivity involved in identifying lame animals
  - Increase the number of animals being phenotyped



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