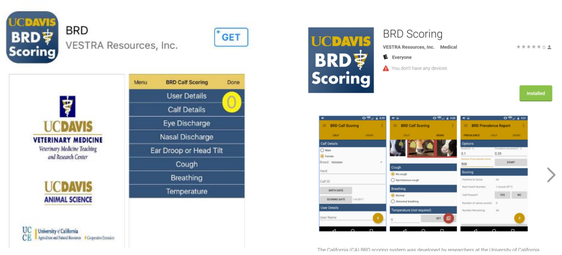

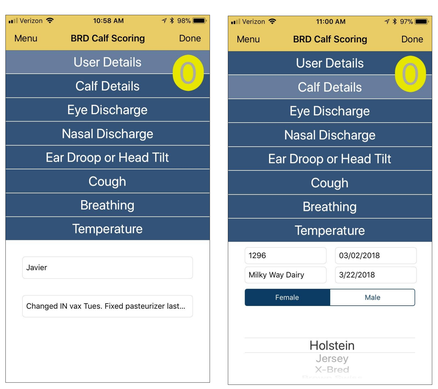

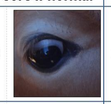

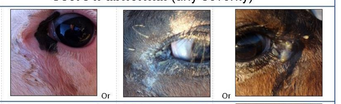

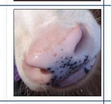

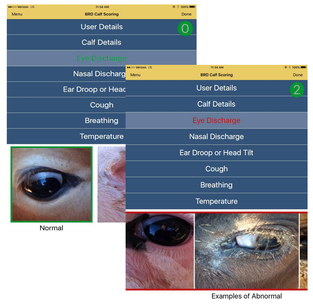

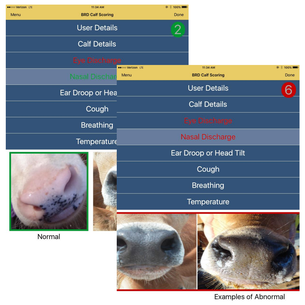

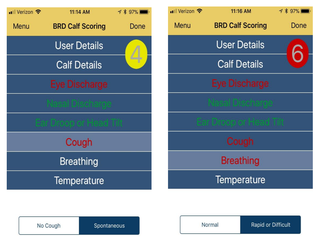

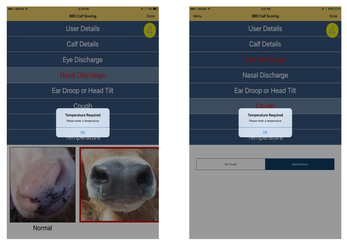

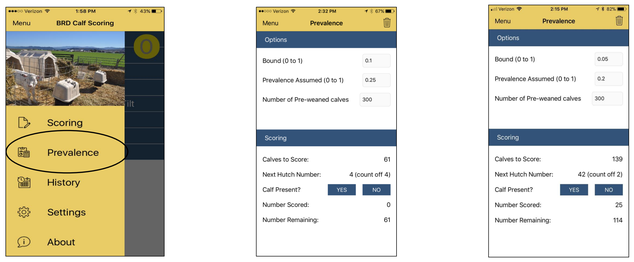

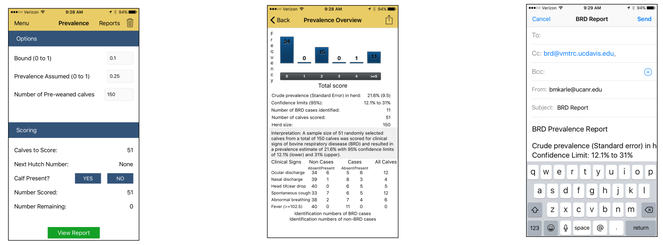

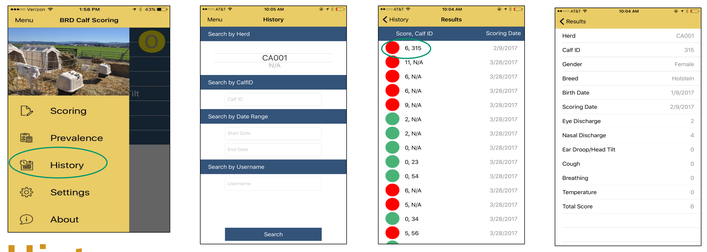

There's an app for that:
Monitoring bovine respiratory disease in dairy calves

Betsy M. Karle[1], Sharif S. Aly[2, 3], Deniece R. Williams[2], Jeffery W. Stackhouse[4], Alison L. Van Eenennaam[5], Terry W. Lehenbauer[2, 3]

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Introduction

Bovine respiratory disease (BRD) accounts for 22% of pre-weaned dairy calf deaths. Dairy calf feeders frequently inaccurately diagnose or track the incidence of BRD in pre-weaned calves. During the evaluation of BRD prevalence on 100 dairies in California, the research team identified the need for a mobile application to automate the prevalence estimation process to benchmark a herd's BRD status. Additionally, the need for a self-reporting feature to share information and history was identified. Without accurate records on BRD prevalence, calf caretakers cannot effectively evaluate changes in management.

Objectives

- Estimate the sample size required to survey a herd of pre-weaned dairy calves for BRD
- Develop a user-friendly mobile application interface to aid calf caretakers, dairy producers, veterinarians, and consultants in accurate diagnosis of BRD using the CA BRD Scoring System
- Provide a platform to benchmark BRD prevalence in calf herds
- Encourage adoption of improved BRD control measures by maintaining history of BRD status to evaluate management changes
- Make tool widely accessible by integrating multiple languages.

The California (CA) BRD scoring system was developed by researchers at the University of California

The mobile application is currently available free of charge in English and Spanish on the iOS App Store and Google Play. Chinese and Arabic versions will be available soon.

BRD Scoring

Users can enter user details (name and notes), and calf details including herd, identification number, birthdate, breed, and sex.

Javier

Changed IN vax Tues. Fixed pasteurizer last...

1296

03/02/2018

Milky Way Dairy

3/22/2018

Clinical sign	Score if normal		Score if abnormal (any severity)[2]	
Eye discharge	0		2	Or Or
Nasal discharge	0		4	Or Or
Ear droop or Head tilt	0		5	Or Or
Cough	0	No cough	2	Spontaneous cough
Breathing	0	Normal	2	Rapid or difficult breathing
Temperature	0	< 102.5° F	2	≥ 102.5° F

Add scores for all clinical signs, if total score is ≥ 5, calf may be positive for bovine respiratory disease

To determine a BRD score, users select "normal" or "abnormal" for each sign by selecting pictures in an option (eye and nasal discharge and ear droop or head tilt). The severity within each sign is given equal weight- any "example of abnormal" results in a numerical score. As each selection is made, the score will update.

All fields are optional. User can stop scoring at any time or assign a score to every sign. The exception: if the cumulative score is 4, the user will be prompted to enter a rectal temperature. A score of 5 or greater indicates BRD.

The background color of the numerical score will display yellow if no scores are selected or temperature is required, green if the calf is negative for BRD (< 5), and will change to red if the calf is positive for BRD (score ≥ 5). The text of each sign will display green (normal), red (abnormal), or white (no value selected).

When the user selects "Done," they are prompted to confirm that no other signs are observed, if any have been skipped. Notification of positive or negative BRD score follows.

Prevalence Estimation

	2:32 PM	2:15 PM
Bound (0 to 1)	0.1	0.05
Prevalence Assumed (0 to 1)	0.25	0.2
Number of Pre-weaned calves	300	300
Calves to Score:	61	139
Next Hutch Number:	4 (count off 4)	42 (count off 2)
Calf Present?		
Number Scored:	0	25
Number Remaining:	61	114

The app automates the prevalence estimation random sample based on a user-specified bound (width of the confidence interval), assumed prevalence and total number of pre-weaned calves on site. The app identifies a random sample of calves to score and indicates the hutch number to start scoring (in this case, hutch number 4). If a calf is present, select "yes" to advance to the scoring page. If the hutch is empty, the app will recalculate the hutch number.

As the user continues scoring, the next randomly selected hutch number to advance to is revealed, listing both the next hutch number and the number of calves to count off from last hutch in order to advance to the appropriate hutch. The number of calves that have been scored and the number remaining to be scored will update as each calf is scored.

Bound (0 to 1): 0.1

Prevalence Assumed (0 to 1): 0.25

Number of Pre-weaned calves: 150

Calves to Score: 51

Next Hutch Number: None

Calf Present?

Number Scored: 51

Number Remaining: 0

Crude prevalence (Standard Error) in herd: 21.6% (9.5)

Confidence limits (95%): 12.1% to 31%

Number of BRD cases identified: 11

Number of calves scored: 51

Herd size: 150

Interpretation: A sample size of 51 randomly selected calves from a total of 150 calves was scored for clinical signs of bovine respiratory dieseae (BRD) and resulted in a prevalence estimate of 21.6% with 95% confidence limits of 12.1% (lower) and 31% (upper).

Clinical Signs	Non Cases Absent	Non Cases Present	Cases Absent	Cases Present	All Calves
Ocular discharge	34	6	5	6	12
Nasal discharge	39	1	8	3	4
Head tilt/ear drop	40	0	6	5	5
Spontaneous cough	33	7	6	5	12
Abnormal breathing	38	2	7	4	6
Fever (>=102.5)	40	0	11	0	0

Identification numbers of BRD cases

Identification numbers of non-BRD cases

To:

Cc: brd@vmtrc.ucdavis.edu,

Bcc:

From: bmkarle@ucanr.edu

Subject: BRD Report

BRD Prevalence Report

Crude prevalence (Standard error) in h

Confidence Limit: 12.1% to 31%

After the designated sample number of calves is evaluated, the app generates a report indicating the estimate and 95% confidence limits for prevalence of BRD in the calf herd.

The report includes descriptive analyses, several data depictions in histogram format and identification numbers of cases and non-cases are reported (if entered). The report can be self-emailed or shared with a consultant. Previous reports can be found under Reports.

CA001

N/A

Score, Calf ID	Scoring Date
6, 315	2/9/2017
11, N/A	3/28/2017
6, N/A	3/28/2017
6, N/A	3/28/2017
9, N/A	3/28/2017
2, N/A	3/28/2017
2, N/A	3/28/2017
0, N/A	3/28/2017
0, 23	3/28/2017
0, 54	3/28/2017
6, N/A	3/28/2017
5, N/A	3/28/2017
0, 34	3/28/2017
5, 56	3/28/2017

Herd	CA001
Calf ID	315
Gender	Female
Breed	Holstein
Birth Date	1/9/2017
Scoring Date	2/9/2017
Eye Discharge	2
Nasal Discharge	4
Ear Droop/Head Tilt	0
Cough	0
Breathing	0
Temperature	0
Total Score	6

History

Users can review the history of BRD status results with the ability to review the data collected for each calf at each sampling session, and for consultants, by herd and scoring date.