Comparative case of Automated Health Monitoring and Health Scoring systems for dairy suckling calves.

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INTRODUCTION

Calf health control is one of the biggest challenges for dairy farms.

Dairy producers now have access to new technologies to monitor the health of suckling calves, improving proper health management.

OBJECTIVE

The aim of the following trial was to compare the efficacy of an automated health monitoring system vs an intensive standardized health scoring system in a US dairy nursery.

MATERIALS AND METHODS

- For 9 months, a total of 586 female calves were monitored from 1-2 days of age until day 90, at weaning.
- The animals were reared in single hutches and were nipple fed. An ear monitoring tag (SenseHub® Dairy) was applied to automatically monitor the health of each calf. The tag monitors the calf's behavior on a minute-by-minute basis and uses a proprietary algorithm to calculate an individual health index every hour. The health index values range from 40 to 100. The lower the value, the more severely sick the calf is.
- All monitored calves were also evaluated daily using a modified Wisconsin scoring system. Data on milk refusals, treatments, and mortalities was also captured. Rectal temperature was additionally measured for calves with one or more of the following: milk refusal, a total respiratory score equal or greater than 4, a fecal score of 2 or 3. Based on the collected health records, each Sickness Event evaluated with the modified Wisconsin scoring system was classified as mild, moderate, or severe. Mild cases were not considered for treatment.
- Farm and trial personnel were blinded to all data calculated by the automated monitoring system (SenseHub® Dairy).

Results indicate that AMS (Sensehub® Dairy) can be used as an efficient solution for health screening assistant, enabling to reduce the dependency on skilled labour. The Health Index value reflects the calf's disease severity. Thus, providing another tool to improve health management and decision making.

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RESULTS

From the standardized health scoring evaluation, 522 calves (89%) had at least one sickness event, and 265 calves (45%) had at least one moderate or severe sickness event.

Average length of sickness events was 2.6 days. According to the AMS, average of the minimal daily Health Index (HI) was 97.51±0.02 for healthy days. Average of the minimal daily HI was 85.54±0.40, 82.03±0.52, and 78.76±1.65 for mild, moderate, and severe sickness events, respectively. **(Fig1)**.

As the user can tune the desired sensitivity, the performance of the AMS was evaluated using a HI score of 86 as a low sensitivity threshold for sickness (86-T), and 90 as a high sensitivity threshold (90-T).

HI 86 and HI 90 sensitivity and specificity are shown in **Table 1**.

Detection time (requiring continuous alert by the system) relative to treatment time by the farmer was 11 and 16 hours earlier for 86-T and 90-T, respectively **(Tables and Figures 2 and 3)**.

Severe cases detection time relative to treatment time by farmer was 27 and 37 hours earlier for 86-T and 90-T, respectively.

FIGURE 1. Health Index according to disease severity.

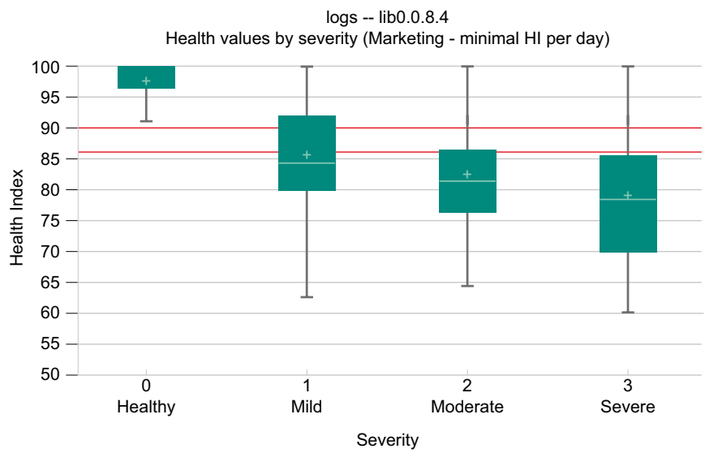


TABLE 1. AMS sensitivity and specificity.

Threshold / Parameter		Estimate	95 CI	
			Lower	Upper
HI 86	Sensitivity (Se)	63.60%	60.10%	66.90%
	Specificity (Sp)	96.20%	96.70%	97.10%
HI 90	Sensitivity (Se)	75.70%	72.50%	78.60%
	Specificity (Sp)	92.40%	92.10%	92.70%

TABLE AND FIGURE 2. AMS detection time relative to treatment with HI 86 as threshold.

Observation	Average (h)	Median (h)
Moderate (S2)	-7	-1
Severe (S3)	-28	-16
All	-11	-4

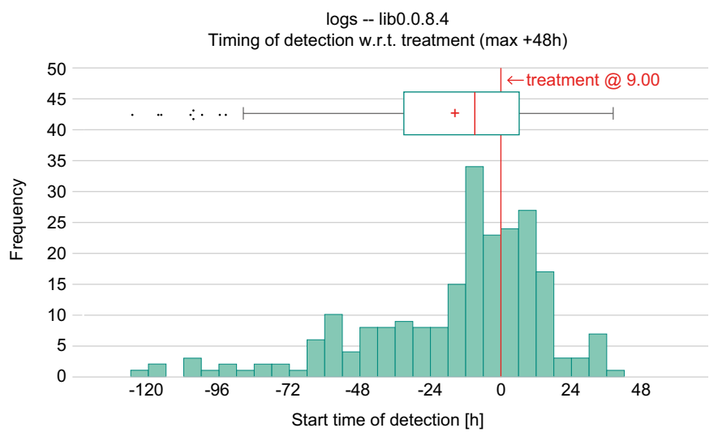
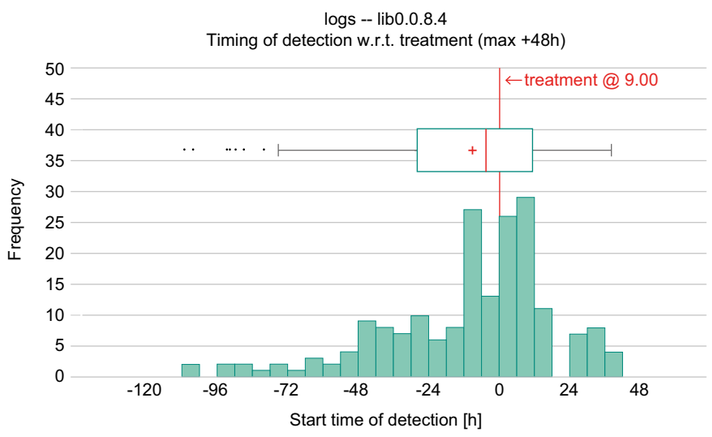


TABLE AND FIGURE 3. AMS detection time relative to treatment with HI 90 as threshold.

Observation	Average (h)	Median (h)
Moderate (S2)	-12	-8
Severe (S3)	-39	-26
All	-16	-10



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