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Smartphone-connected thermal camera as tool for evaluating locomotion disorders in cattle

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Abstract:

The use of thermal imaging to evaluate a variety of medical diseases in both humans and animals has been proven to be an approach that is expedient, inexpensive, and non-invasive. In recent years, it has also been utilized in the quest to determine the health status of livestock, specifically horses and cattle, in tandem with other approaches that are considered to be more conventional. The findings of the current research indicate that thermal imaging is a tool that has the potential to be very helpful and dependable for assessing potential locomotor disorders in cattle. This method of imaging is now cost-effective for use in all fields of medicine and by all practitioners, due to the recent advancements in thermal imaging technology. Additionally, the price of diagnostically useful thermal imaging machines has dropped significantly, and their size has shrunk significantly as well.

Keywords: *thermal camera; locomotion disorders; thermography; dairy cattle*

• Introduction

In recent years, there has been a rise in the employment of infrared thermography for the diagnosis of lameness in cattle. This is mostly attributable to the non-invasive nature of the technique, together with its simplicity of automation and ongoing cost reductions. Thermography can be used to identify and determine thermal anomalies in animals by characterising an increase or decrease in the surface temperature of their skin. This can be accomplished by identifying an increase or decrease in the temperature of the animal's body surface.

It is possible to detect inflammation or injury linked with disorders such as foot lesions by analysing the variation in superficial temperature patterns that is caused by variations in blood flow in particular. Not just as a diagnostic technique, but also for assessing the standard management practises of farms, thermography has been utilised.

The purpose of this study was to evaluate the efficacy of smartphone-connected thermal camera as tool for evaluating locomotion disorders in cattle. This was accomplished by comparing the hindfeet temperature difference collected by the camera to the mobility score of the cow.

• Material and method

❑ This study was carried out between September 2022 and March 2023, in a dairy farm located in the North-East of Romania, in accordance with the European Union's Directive 2010/63/EU on the protection of animals used for scientific purposes. Data were collected from 23 cows Romanian Black and White Spotted cows.

❑ A FLIR One Pro camera, connected to a smartphone, was used to assess the limbs of dairy cows. At each point in the data gathering process, the temperature and humidity of the surrounding environment were recorded, and the IRT device was calibrated appropriately. During the morning milking, thermograms of the target region of each cow were taken from a distance of 0.5 metres using both cameras. The target area consisted of the heel bulbs and the area below in the hind leg.

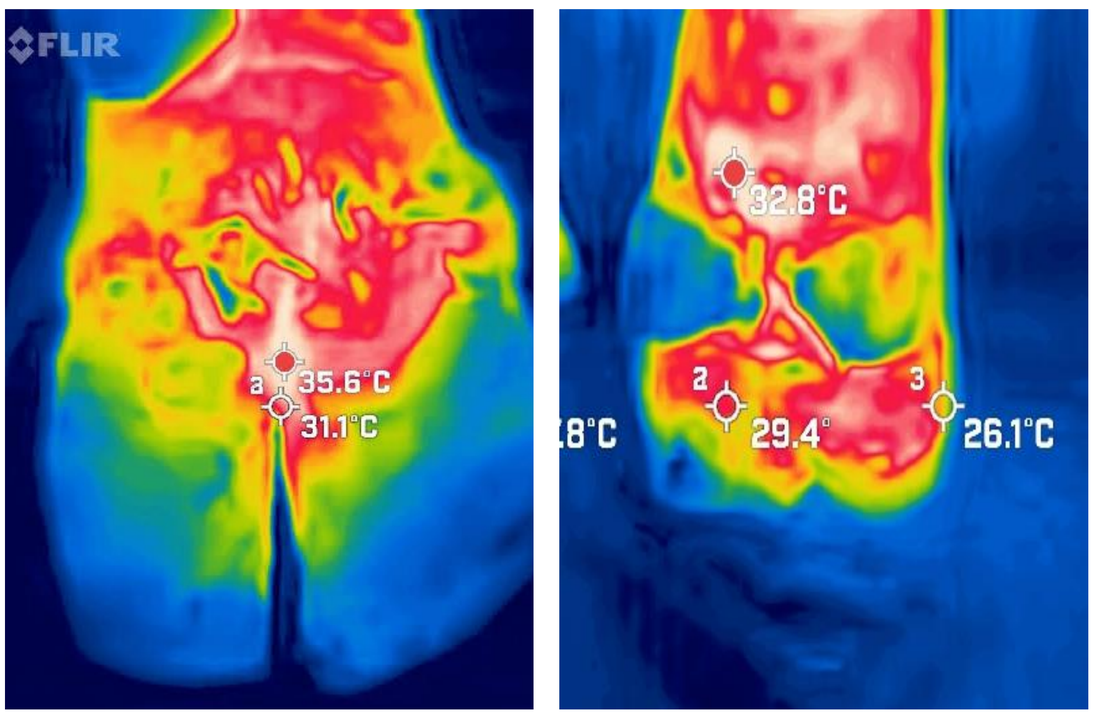
❑ After leaving the milking parlour, each cow was evaluated using the AHDB four-point scale and the data was recorded accordingly.

• Results and discussions

A significant correlation was observed between the locomotion score and the temperature from the targeted area.

Lameness in cattle is an important concern for the worldwide dairy sector in terms of lower productivity as well as compromised animal well-being. This is because lameness may lead animals to suffer from pain and discomfort. The majority of cases of lameness in cattle are due to anomalies in their claws.

Thermography has the ability to detect variances in skin temperature with an accuracy of 0.1 °C, which may emerge prior such changes can usually be identified by direct physical palpation. This is because thermography uses infrared light. This sensitivity helps veterinarians diagnose foot lesions in animals before the animal exhibits any indications of discomfort, such as lameness.



Thermogram captured by the FLIR One Pro and processed with FLIR Thermal Studios showing the point of maximum temperature, labelled by the red marker. The maximum temperature value transferred for statistical analysis from this thermogram was 35.6 °C , respectively 32.8 °C

• Conclusions

- ✓ The efficacy of thermography in detecting the temperature differences and maximal foot temperature on areas of interest was demonstrated.
- ✓ A vital consideration should be given for a supervised setting environment before carrying out the thermal imaging scanning.