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Use of infrared thermography for predicting the infectious etiology of subclinical bovine mastitis in a robotic milking system using machine learning

L. F. Zafalon[1], R. C. M. Santana[1], M. V. Santos[3], T. C. Alves[1], A. R. Garcia[1], S. C. M. Niciura[1], F. D. Caracuschanski[2]
[1] Embrapa, Embrapa Southeastern Livestock, 13560970 São Carlos, Brazil, [2] São Paulo State University, FCAV, 14884-900 Jaboticabal, Brazil, [3] University of São Paulo, Department of Nutrition and Animal Production, 13635-900 Pirassununga, Brazil

This study assessed the potential of infrared thermography for predicting bacterial pathogens causing subclinical mastitis in pasture-raised cows using machine learning techniques in an automatic milking system. Eighty-nine lactating cows underwent thermographic analyses of their mammary glands over six months. Values (°C) corresponding to the mean, minimum, and maximum temperatures of the udders were recorded. Supervised machine learning techniques were used to predict mastitis and its infectious etiology using infrared thermography. Mixed binomial and multinomial logistic regression models were utilized . Staphylococcus chromogenes was the most frequently isolated microorganism (36.3%), followed by S. aureus (13%) and Streptococcus dysgalactiae (13%). The multinomial logistic regression technique showed high sensitivity (>0.95) in the identification of S. aureus, S. uberis, and S. dysgalactiae species. The AUC ROC for predicting the infectious etiology of subclinical bovine mastitis using infrared thermography was 0.90. Moreover, the SCC was significant in predicting mastitis caused by S. aureus, S. uberis, and S. dysgalactiae species. Infrared thermography demonstrated potential as a predictor of subclinical bovine mastitis due to S. aureus, S. uberis, and S. dysgalactiae in extensive cow rearing, a style traditionally seen as incompatible with robotic milking. The use of combined machine learning logistic models can optimize the identification of pathogens causing mastitis in bovine herds. Grant 2020/16240-4, São Paulo Research Foundation (FAPESP).

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Prevalence and characterization of rib injuries in dairy cows: a neglected welfare issue of dairy production

J. M. Pankratz[1], I. C. Colaço Bez[1], J. L. Sviech Ratim[1], D. A. Duarte Santana[1], R. D. Ollhoff[1]
[1] Pontificia Universidade Católica do Paraná, Graduate Program of Animal Science, School of Medicine and Life Science, Imaculada Conceição street, 1155, 80215-901 Curitiba, Brazil

Overcrowded feeding areas, cramped stalls, inadequate cubicles, and slippery floors may lead to rib fractures in dairy cows. Despite the pain, these injuries are often overlooked by managers and technical staff. This study sheds light on this neglected injury to promote greater awareness within a context of animal welfare and the interaction of dairy holstein cattle with their environment. Data were collected in a dairy cattle farm, Gralha Azul Experimental Farm of the Pontifical Catholic University of Paraná – PUCPR, located at Fazenda Rio Grande, in the state of Paraná, southern Brazil. A description of the anatomic localization of the bone callus (affected side, rib, and position on the rib) was provided. A cohort of 72 cows, with an average age of 3.8 years and 2.7 lactations, underwent examination through palpation. Remarkably, 59.72% (n=43) of the cows exhibited rib fractures. Correlations were found for: age, regarding left medial fractures (R=0.306, P=0.007), and right ventral fractures (R=0.229, P=0.045); and lactations, regarding right (R=0.236, P=0.0395) and left (R=0.293, P=0.010) medial injuries. Additionally, a correlation was identified between right (R=0.245, P=0.032) and left (R=0.245, P=0.032) ventral injuries. Lesions were predominantly observed in cows with an average of 2.9 lactations. There was no correlation found between: dorsal and ventral fractures; nor dorsal and ventral injuries individually; nor age. Rib fractures, often unnoticed, impact cows' welfare over time. Older cows, more susceptible to fractures, face an increased risk of hipocalcemia and claw lesions, exacerbated by slippery floors, leading to falls and additional rib fractures.