Infrared thermography of goat udders during the evolution of subclinical mastitis induced by *Staphylococcus warneri*

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Goats are homeothermic mammals raised for production and their milk has hypoallergenic properties and special organoleptic characteristics. Mastitis is an intramammary infection (IMI) and is mainly caused by bacteria. *Staphylococcus warneri* can cause subclinical mastitis that is difficult to detect. IMI is a complex disease, as milk harbors a diverse microbiota. Infrared thermography (IRT) has been researched as a biotechnological technique for monitoring and diagnosing diseases in animals and humans. We conducted a supervised experiment in which we induced IMI in healthy animals using *S. warneri* and observed changes in udder temperature as IMI progressed. Eight goats were used; six were infected and two served as controls. Of those that were infected, only the right side of the udder (R.I.) was infected, and the left side remained healthy as an internal control (L.C.I.). Control animals remained healthy on both the right (R.H.) and left (L.H.) sides of the udder. Temperature was measured in degrees Celsius by a FLIR E60 infrared camera. The experiment was subdivided into three periods: P0 (two days before inoculation), P3 (two days after infection) and P8 (seven days after infection). Statistical tests, ANOVA, were performed using GraphPad Prism V10. Significant differences were found between P0 vs. P8 (P=0.0024) and between P3 vs. P8 (P=0.0013), all of which were negative. Thus, the temperature variations between the periods were: **R.I.:** -0.36°C (P3-P8) and -0.03°C (P0-P8). **L.C.I:** -0.67°C (P3-P8) and -0.44°C (P0-P8). **R.H.:** -0.80°C (P3-P8) and -0.50°C (P0-P8). **L.H.:** -1.03°C (P3-P8) and -0.27°C (P0-P8). Between P0-P3 we found positive variations in both infected and control animals, with greater variation observed on the infected side (R.I.) than on the contralateral internal control (L.C.I.). Our results indicate that R.I. maintained a higher and more constant temperature than the others, probably due to the infection and blood supply to the mammary gland for milk production. Therefore, although our investigation revealed that the overall udder temperature remained relatively constant, temperature plays a key role in IMI, and IRT combined with other techniques can aid in diagnosis.

Key words: Bacteria; Infrared; Mastitis.

Termografia por infravermelho de úberes de caprinos durante a evolução do quadro de mastite subclínica induzida por *Staphylococcus warneri*

Nesse estudo induzimos a mastite em cabras sadias, com *S. warneri* e mensuramos as alterações de temperatura do úbere no desenvolvimento da infecção intramamária (IMI). Foram utilizados dois animais controles e seis infectados. Apesar da temperatura geral dos úberes se manterem relativamente constantes, foi observado média de temperaturas maiores no úbere infectado. Assim, nossa investigação revelou que a temperatura desempenha um papel fundamental na IMI, e a termografia infravermelha associada a outras técnicas podem auxiliar no diagnóstico.

Palavras-chave: Bactéria; Infravermelho; Mastite.

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