Infrared thermography of teats in French Alpine dairy goats: A promising tool to study the interaction between animal and machine during milking, but not to detect mastitis'

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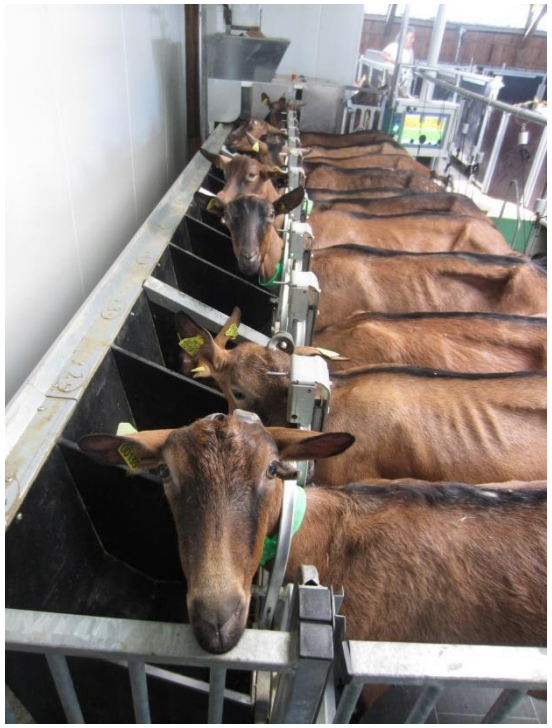
Aims of the study

- Evaluate the influence of the milking machine on teat temperature using IRT in French Alpine goats
- Analyze the influence of udder imbalance and teat shape using IRT
- Verify whether IRT in dairy goats is suitable for evaluating the degree of inflammation

Farms and animals

- 4 farms – Britany region in France – Alpine goat breed
- 2 ecological and 2 commercial farms

- Side by side parlor with a low milk line
- Milking machine vacuum 37 or 38 Kpa,
- 80 pl/min and 60/40 ratio
- In total 810 goats on all farms (50, 200, 240 and 320)

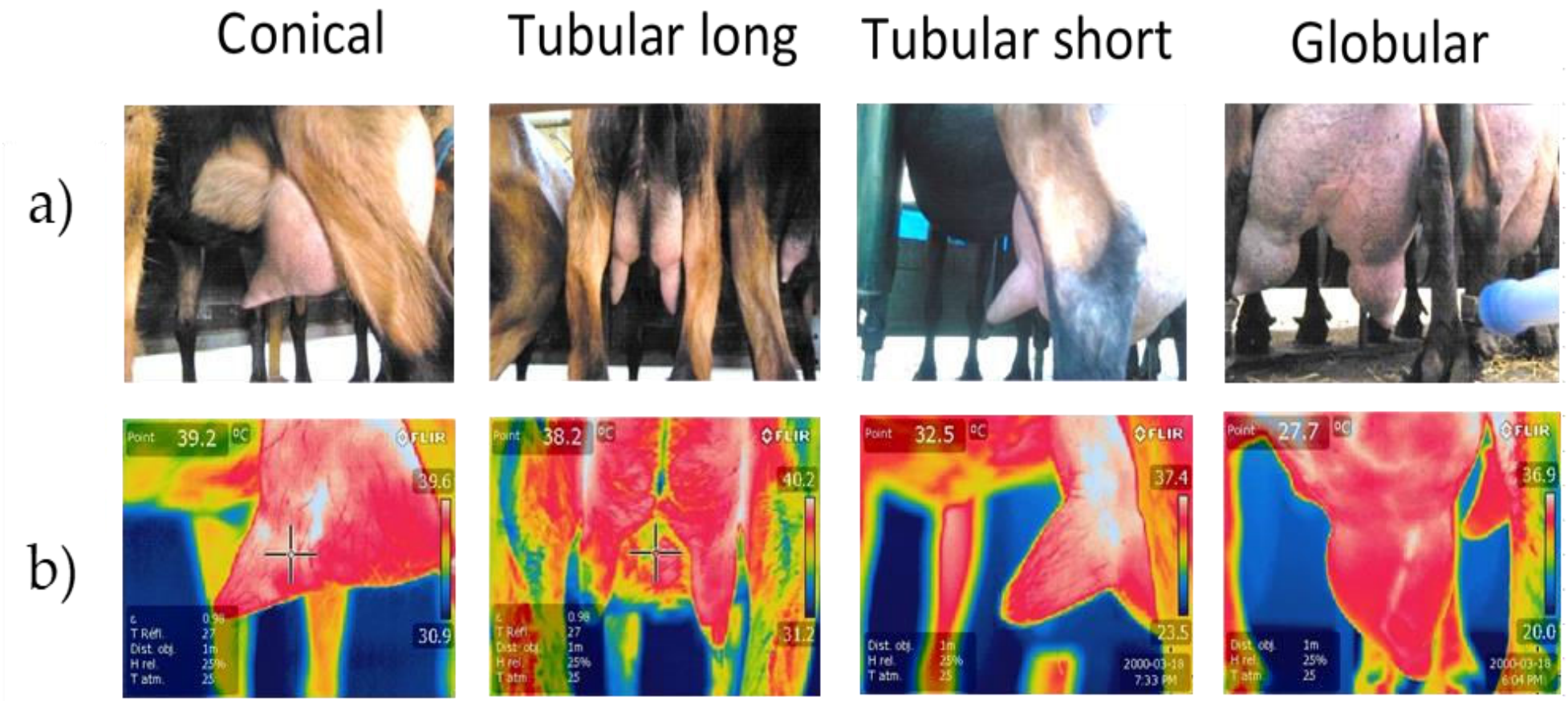


Imbalance – before (a) and during (b) milking

morphological

functional

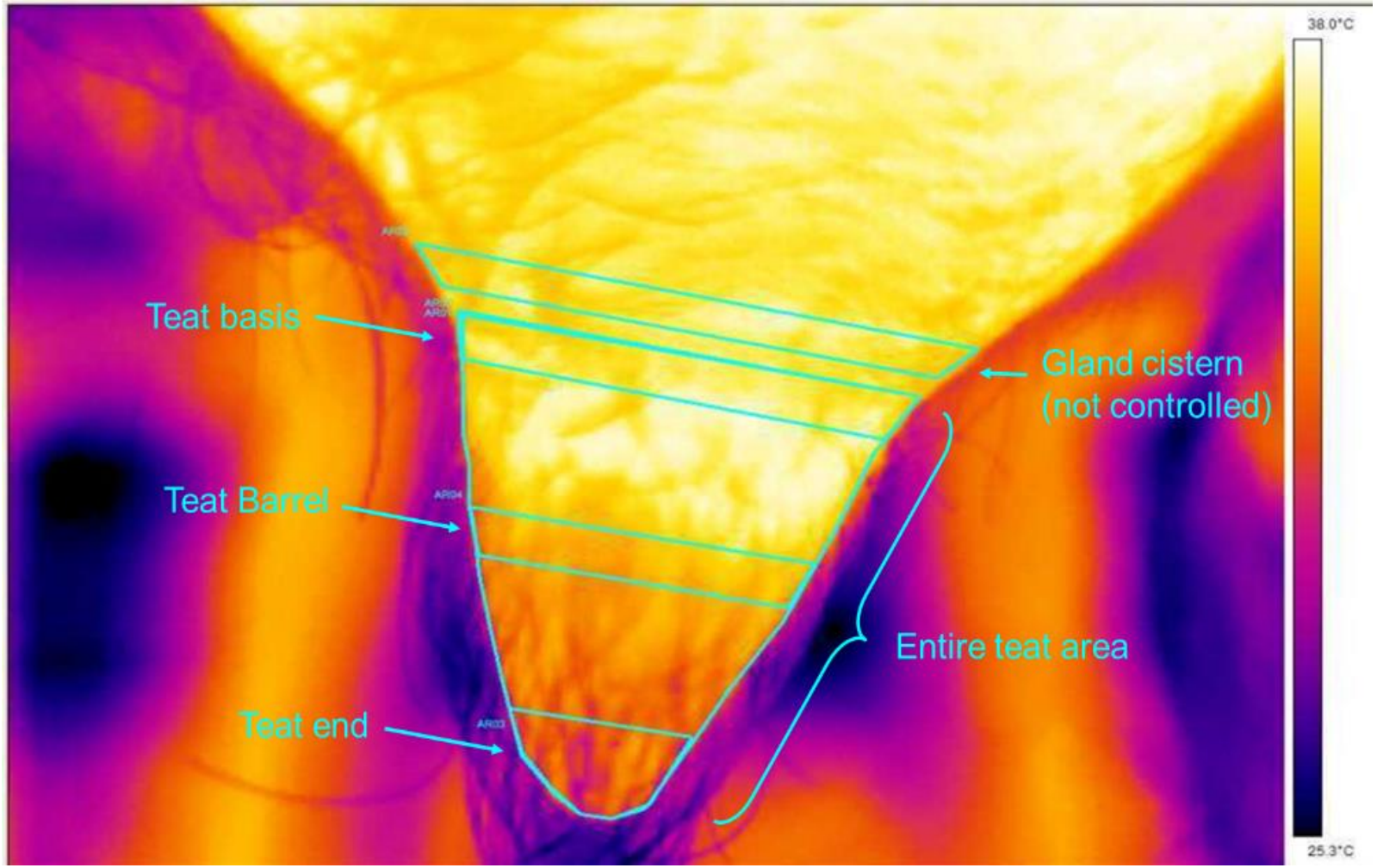
Teat shape



digital photographs

IRT images

Different teat areas assessed with the IRT



2 x morning
and
2 x evening
milking

Effect of milking on temperature variations of different teat areas of goats

Teat Areas	Temperature Difference [1] °C
Teat basis	-0.63 ± 0.05 [b]
Teat barrel	-0.37 ± 0.05 [c]
Teat end	-1.06 ± 0.05 [a]
Total teat area	-0.61 ± 0.05 [b]

[1] Temperature difference = temperature after milking−temperature before milking. [a,b,c] Different letters in the same column indicate significant differences between the rows ($p < 0.05$).

Effect of milking on temperature variations of different goat teat areas - teat shapes

Teat Areas	Temperature Difference [1] °C			
	Teat Shapes			
	Conical	Globular	Tubular Short	Tubular Long
Teat basis	−0.50 ± 0.09 [b]	−0.52 ± 0.09 [b]	−0.81 ± 0.09 [b]	−0.67 ± 0.14 [b]
Teat barrel	−0.47 ± 0.09 [b]	−0.32 ± 0.09 [b]	−0.58 ± 0.09 [c]	−0.13 ± 0.14 [c]
Teat end	−0.93 ± 0.09 [a]	−1.07 ± 0.09 [a]	−1.13 ± 0.09 [a]	−1.10 ± 0.14 [a]
Total teat area	−0.62 ± 0.09 [b]	−0.53 ± 0.09 [b]	−0.79 ± 0.09 [bc]	−0.49 ± 0.14 [bc]

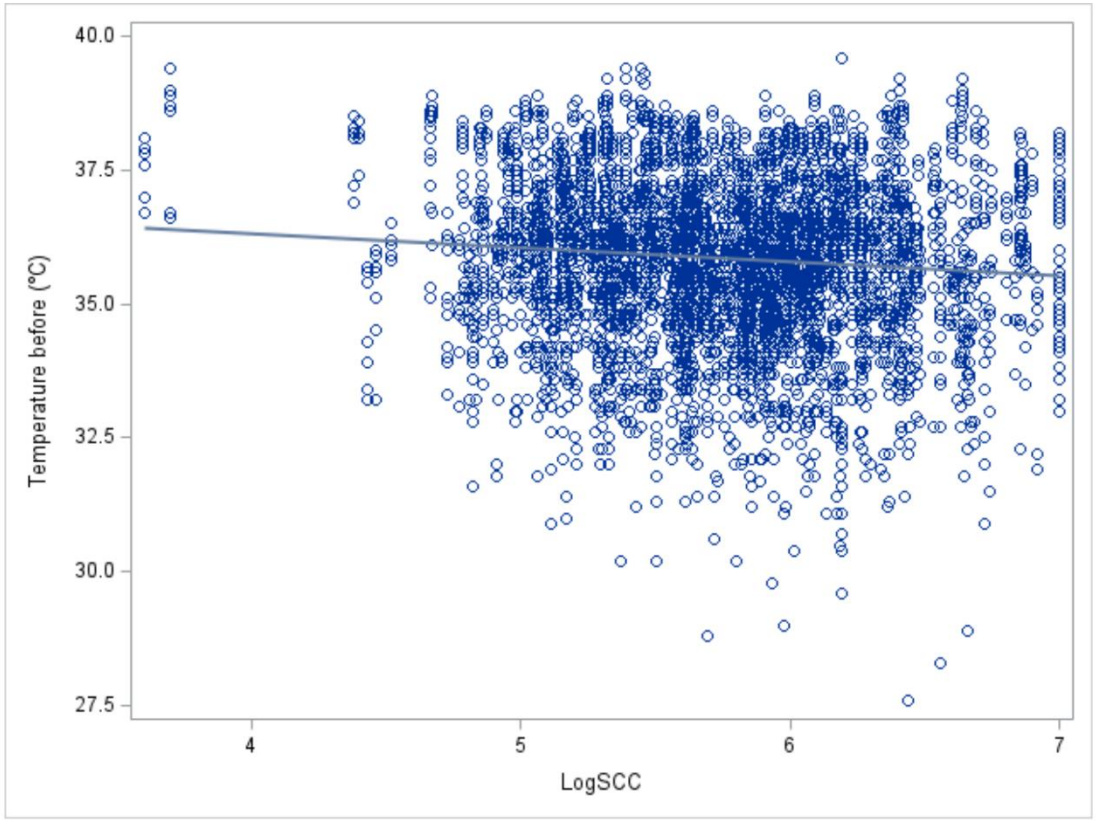
[1] Temperature variation = temperature after milking−temperature before milking. [a,b,c] Different letters in the same column indicate significant differences between the rows ($p < 0.05$).

Effect of milking on temperature variations of different teat areas in balanced and unbalanced udder goats

	Temperature Difference [1] °C	
Teat Areas	**Unbalanced**	**Balanced**
Teat basis	-0.62 ± 0.08^{b}	-0.63 ± 0.06^{b}
Teat barrel	-0.31 ± 0.08^{c}	-0.44 ± 0.06^{c}
Teat end	-1.10 ± 0.08^{a}	-1.02 ± 0.06^{a}
Total teat area	-0.57 ± 0.08^{b}	-0.65 ± 0.06^{b}

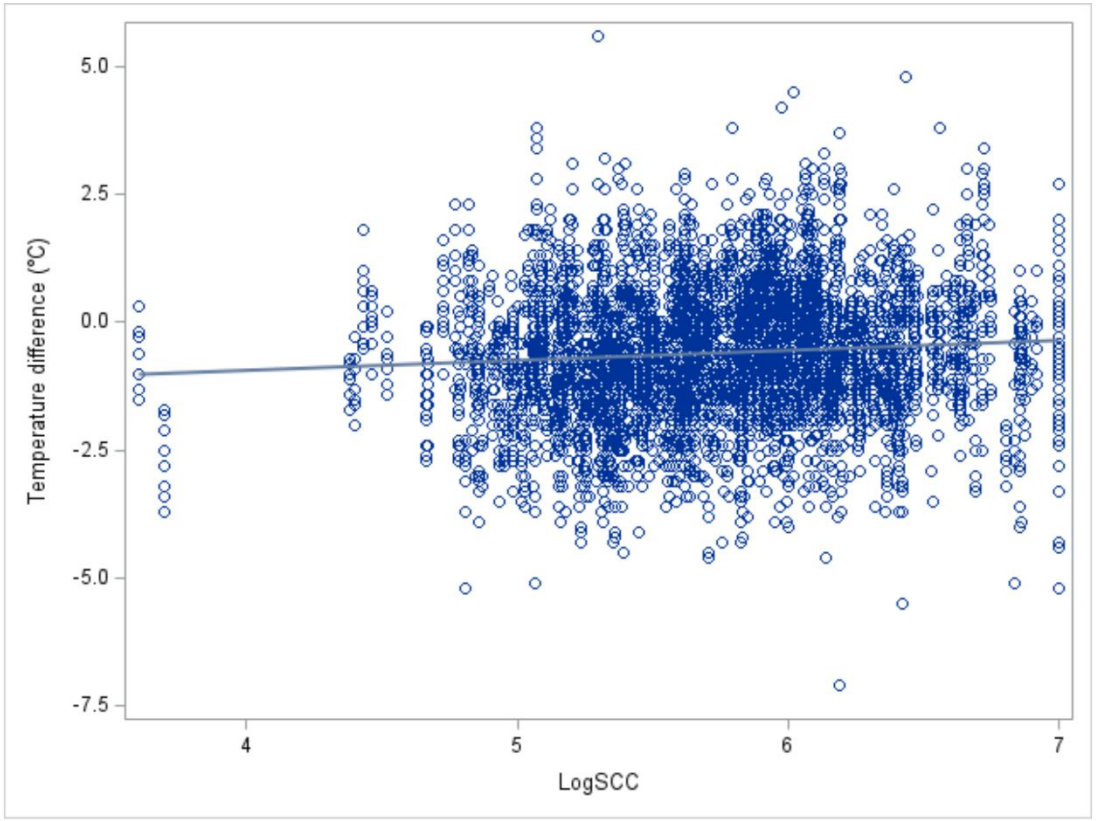
[1] Temperature difference = temperature after milking−temperature before milking. [a,b,c] Different letters in the same column indicate significant differences between the rows ($p < 0.05$).

Linear regression between logSCC and IRT measurement



(**a**)

Before milking



(**b**)

Difference (after-before)

Conclusions

- Normal milking reduces teat temperature in Alpine goats
- The tip of the teat was always colder than the other parts of the teat
- Udder imbalance contributes to an overmilking and increasing teat temperature except for the teat tip
- The regression coefficient between SCC and thermographic data was low indicating a lack of relation between milking machine action and udder inflammation
- Consequently, thermography appears as a promising tool to study teat/machine interactions but is not a good tool for early detection of mastitis in Alpine goats

Questions?

animals

MDPI

Article

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