
Non contact thermometry in the milk removal process

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The temperatures of mammary glands of tested dairy cows were evaluated by a multifactor analysis of variance. The time and place of measuring were statistically significant on the significance level 0.05. The F-test value for the factor of time was 12.342, with probability 0,0007. The F-test value for the place of temperature measuring was 1061.979, probability 0.0000. Among the equations of curves of the dependences of teat end temperature on the milking time, the closest seemed to be the logarithmic function with determination index $R^2 = 0.7404$.

Key words: *Temperatures, non-contact thermometer, mammary gland, milking house*

The milking of cows in milking houses is carried out under different conditions than in stables. Recent research shows that milking was improved especially by the influence of construction elements, which was verified under laboratory and operational conditions by many researches (Karas, 1996; Galik, 2001; Tancin et al., 2001; Fryc, 2002).

Kejik and Maskova (1989) pointed out that one of the possibilities how to determine the response of the organism to milking conditions is to use thermovision, measuring surface temperatures of the udder during milking.

The following parameters were monitored in the milking house during 24 hours in one-hour intervals, using a non-contact thermometer RAYNGER ST-6 with laser:

- temperature of udders before and after milking (°C)
- temperature of teats at the base before and after milking (°C)
- temperature of teats in the middle part before and after milking (°C)
- temperature of teats at the end before and after milking (°C)
- time of milking of the experimental cow group (min)

Summary

Introduction

Materials and methods

Results and discussion

Basic statistical processing of measured temperature values of mammary gland before and after milking is shown in table 1. The highest average temperature before milking was measured on udders (30.14 °C), at the base (29.55 °C) and in the middle part (28.59 °C); the lowest one was measured at teat ends (7.1 °C). After milking, the temperature on the udder increased on average by 0.31 °C, at the base by 0.82 °C, in the middle part of the teat by 1.47 °C and at teat ends by 2.68 °C.

Table 1. Basic statistical assessment of measured temperatures of mammary gland.

Place of measurement	Winter season - temperatures (°C)										
	Before milking - statistical value					After milking - statistical value					
	\bar{x}	max.	min.	s	v	\bar{x}	max.	min.	s	V	
UDDER	30.1	31.3	28.6	0.919	3.048	30.4	32.1	28.7	1.302	4.276	
T E A T S	at base	29.5	30.8	28.3	0.903	3.055	30.3	31.3	28.8	0.806	2.656
	in the middle part	27.1	29.8	27.3	0.889	3.112	28.5	30.6	27.6	1.047	3.564
	at teat end	7.1	8.8	4.9	1.426	20.089	9.7	15.6	5.1	3.397	34.730
	Milking time of twelve tested cows (min)					8.7	12.1	5.2	2.114	24.453	

\bar{x} = arithmetic mean max - maximal value in the set
s = decisive aberration min - minimal value in the set
v = coefficient of variation

It is very difficult to determine immediate responses of cows to the environmental conditions. One of the possibilities how to monitor changes in mammary gland temperatures is to use thermovision. Thermovision AGA 782 uses an inbuilt display system to create a „temperature“ picture of the object. The developed picture - a thermogram distinguishes isothermal areas by means of colours. The paper of Kejík and Mašková (1989) investigated the influence of teat liners made of various materials on the udder and teats as well as the influence of washing, drying and first milk on the temperature of mammary gland and its monitoring by means of thermovision.

The authors of thermograms further claimed that the field of udder and teat temperatures before milking was different for individual cows; the udder temperature before milking reached approximately the value of 33 °C, the teat temperature was lower, reaching approximately 27.5 °C in the summer season.

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