Possibilities of mastitis detection by measuring the electrical conductivity of sheep's milk.

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INTRODUCTION

Measurement of electrical conductivity (EC; mS/cm) is a method often used in dairy cows during milking in milking parlours, but especially in robotic milking as a low-cost mastitis detection method.

AIM OF STUDY

The aim of this study was to evaluate the relationship between somatic cell count (SCC) and EC of milk in sheep reared in Slovakia as factors for monitoring subclinical mastitis on the basis of a bacteriological examination of udder health.

MATERIAL AND METHODS

- Samples were collected individually from both halves of the udder from 295 sheep of different breeds from eight farms during evening milking, aseptically after cleaning the teats, especially teat-ends with antibacterial wipes .
- Started with the right udder half, the first 2 strips placed separately.
- Next 10 mL for EC measurement (Fig. 1)
- 1 mL aseptically gathered into sterile test tube for cytobacteriological analysis.
- 50 mL for somatic cell count and a basic components analysis.
- Immediately after removal stored in a portable refrigerator at 5-15° C.
- Milk samples (inoculum 10 µl) streaked onto selective culture medium PM test (LabMediaServis s.r.o., CZ) were incubated at 37°C for 24 h. Isolated strains of pathogens were then verified by typing with BBL Crystal® (Becton, Dickinson & Co., New Jersey, USA). Somatic cell count was determined using a Somacount 150 (Bentley Instruments, Inc., Chaska, Minnesota, USA), milk composition was determined by MilkoScan FT120 (Foss, Hillerød, Denmark).
- Based on SCC, the samples (n = 590) were divided into classes (SCC < 200.000, 200.000 ≤ SCC < 400.000, 400.000 ≤ SCC < 600.000, and SCC ≥ 600.000 cells/mL), (SCC < 700.000 and SCC ≥ 700.000 cells/mL) and (SCC < 100.000 and SCC ≥ 100.000 cells/mL) respectively.

RESULTS

Based on the presence of pathogens in the udder halve, they were classified as “without pathogens”, “minor” and “major” pathogens. The presence of a pathogen had a significant effect on the increase in EC (Tab. 1), LogSCC (Tab. 1) and protein content (Tab. 2) and also decrease in content of lactose (Tab. 2). Significant correlation between ES and SCC was found (Tab. 3) when all data were analysed together (r = 0.531). In the first classification, a significant difference in EC by SCC was only between SCC ≥ 600 000 and SCC <200 000 classes. In the second and third classification, we found significant differences in both cases (Tab. 3).

Table 1: Descriptive statistics of EC (mS/cm) and LogSCC (log cells/mL) by type of pathogen

category	N	EC				LogSCC			
		Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
without pathogens	415	4.63^{B}	0.76	3.1	10.3	4.90^{C}	0.58	3.48	7.00
major pathogens	14	5.88^{A}	1.69	2.9	9.6	6.50^{A}	0.91	4.34	7.59
minor pathogens	161	5.29^{A}	1.24	3.5	11.5	5.85^{B}	0.76	3.95	7.45

Note: A,B – means with different letters are significant (p <0.001), SD – standard deviation.

Table 2: Descriptive statistics of lactose (%) and protein (%) by type of pathogen

category	N	lactose				protein			
		Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
without pathogens	415	4.97^{A}	0.48	1.15	6.13	5.66^{B}	0.68	3.94	7.74
major pathogens	14	4.10^{B}	0.80	2.80	5.70	6.55^{A}	1.43	4.82	9.97
minor pathogens	161	4.59^{B}	0.80	1.79	6.06	5.82^{AB}	0.97	3.87	9.95

Note: A,B – means with different letters are significant (p <0.001), SD – standard deviation.

Table 3: Spearman correlation coefficients and descriptive statistics of EC (mS/cm) by different SCC classes (cells/mL).

SCC class	r	N	Mean	SD	Min.	Max.
first classification						
SCC < 200 000	0.214***	392	4.50^{A}	0.54	2.9	7.9
200 000 ≤ SCC < 400 000	0.036^{NS}	34	4.78^{A}	0.63	3.5	6.7
400 000 ≤ SCC < 600 000	-0.138^{NS}	21	4.78^{A}	0.60	3.8	6.2
SCC ≥ 600 000	0.403***	143	5.81^{B}	1.38	3.5	11.5
second classification						
SCC < 700 000	0.270***	456	4.54^{A}	0.56	2.9	7.9
SCC ≥ 700 000	0.382***	134	5.87^{B}	1.40	3.5	11.5
third classification						
SCC < 100 000	0.136*	301	4.46^{A}	0.54	2.9	7.9
SCC ≥ 100 000	0.557***	289	5.24^{B}	1.19	3.1	11.5
all data	0.531***	590				

Note: * $p < 0.05$, *** $p < 0.001$; A,B – means with different letters are significant (p <0.001), SD – standard deviation.

Figure 1: Milk Checker N-4L (Oriental Instruments Co., Ltd., Japan) .

CONCLUSION

We can assert that for the detection of mastitis in sheep we can use also the method of measuring the EC of sheep's milk. EC can be useful in detecting animals with level of SSC greater than 600 000 (cells/mL), but we cannot estimate a threshold for healthy animals yet.

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