THE EFFECT OF STRESSFUL TREATMENT BEFORE AND DURING MILKING ON MILKABILITY OF DAIRY EWES

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Summary. The objective of this study was to evaluate the reaction of ewes (Improved Valachian, Tsigai and Lacaune breed) to some breeding interventions during machine milking through their milking characteristics. Two treatments were tested. Both treatments were done during two consecutive morning milking in cross over design. First one represented the testing of presence of an unknown person in front of the ewes heads. Second treatment represented omitting of the concentrate food during milking. Control milking in both treatments represented the usual milking process. Ewes were milked twice per day at the milking parlour designed for 24 animals and equipped with 12 standard milking units. The equipment for graduated electronic milk recording in jar was used and the computer was recording the level of milk in jar in the one second intervals. There were evaluated in total of 164 milk flow curves. These curves were divided into four groups: 1 peak (1P), 2 peaks - bimodal curves (2P), plateau I (PLI, peak flow over 0.4 l/min) and plateau II (PLII, peak flow under 0.4 l/min). There was observed higher total milk yield, machine milk yield, milk yield in 30 s and in 60 s in control treatment as compared to presence of an unknown person. This corresponded to higher machine stripping yield and percentage of machine stripping in the group of ewes treated by the presence of an unknown person. No differences in milking characteristics were found in the treatment with omitting of concentrates during milking. Obtained results indicated that milking characteristics in ewes were more affected by presence of unknown person than by omitting of concentrates during milking.

Keywords: ewes, milk flow, stress.

STRESĄ SUKELIANČIŲ DIRGIKLIŲ ĮTAKA MELŽIAMŲ AVIŲ PIENINGUMUI

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Santrauka. Atliktas bandymas norint nustatyti avių (pagerintos Valachian, Tsigai ir Lacaune veislių) reakciją į šalutinius dirgiklius vykstant mechaniniam melžimui. Rytinio melžimo metu atlikti du tyrimai. Pirmasis tyrimas buvo atliekamas, kai nežinomas asmuo stovėjo priešais melžiamą avį. Antrasis tyrimas buvo atliekamas neduodant įprasto koncentruoto pašaro avies melžimo metu. Kontrolinės avys buvo melžiamos įprastomis sąlygomis. Avys buvo melžiamos du kartus per dieną 24 vietų melžimo aikštelėje, kur buvo 12 melžimo agregatų. Išmelžto pieno kiekis buvo fiksuojamas elektroniniu būdu ir užrašomas kompiuteryje. Įvertintos 164 melžimo schemos, suskirstytos į keturias grupes: 1 − didesnis kiekis (1P), 2 − padidėjęs kiekis (2P), didžiausias kiekis I (PLI > 0,4 l/min) ir didžiausias kiekis II (PLII < 0,4 l/min). Nustatytas bendras pieno primilžis, vieno aparato primilžis, primilžis per 30 s ir per 60 s palyginti su kontrole. Nustatyta, kad esant pašaliniam asmeniui avis buvo sunkiau melžti, jos buvo neramios. Tuo tarpu koncentratų nebuvimas melžimo metu avims įtakos neturėjo. Tyrimo rezultatai parodė, kad svetimas asmuo melžimo metu darė ženklesnę įtaką avių pieningumui, nei koncentratų nebuvimas melžimo metu.

Raktažodžiai: pieningumas, stresas, avių melžimas.

Introduction. The productivity and profitability of dairy animals could be improved by increasing the amount of removed milk and possibly by decreasing the time of milking. Producers have to select animals for increased milk production and eliminate animals expressing behaviour that impairs the efficiency of milk removal.

Milk within the udder of dairy sheep can be divided into two fractions: the cisternal fraction, which has already been transferred from alveoli to the cistern during interval between milkings and is immediately obtainable by machine without milk ejection and the alveolar fraction (milk stored in the alveoli), which can be removed from the udder only when milk ejection occurs during the milking (Marnet and McKusick, 2001; Castillo et al., 2008). Therefore the kinetic of milk flow could be useful tools to evaluate the response of dairy animals to milking technology and manipulation (Tančin et al., 2007; Vorobjovas et. al.,2010).

In dairy cows there are many factors of milking management that induce the partial or total inhibition of milk ejection (Tančin and Bruckmaier, 2001). The milk ejection reflex, essential for maximal milk collection, is inhibited by stress via the release of catecholamines such as adrenaline and noradrenaline (Silankove et al., 2000; Ne-

grao and Marnet, 2003; Barowicz, 1979). These hormones prevent the milk ejection reflex at the level of udder (Bruckmaier et al., 1993) and brain level (Sibaja and Schmidt, 1975).The inhibition of the milk ejection reflex impairs milk production because, without it, only the cisternal fraction of milk is removed at milking and the alveolar fraction is left behind as residual milk (Labussière, 1988; McKusick et al., 2002; Bruckmaier et al., 1997). In dairy ewes due to higher amount of milk stored in cistern there is more difficult to detect milk removal disturbances and especially in breeds with higher percentage of one emission of milk like Tsigai and Improved Valachian are (Mačuhová et al. 2007; Tančin et al. 2011). In ewes with only one emission of milk one could expect that under the stress condition of milking there will be only small changes in milk flow kinetics and milk production as compared with two emissions or plateau milk flow.

The aim of the trial was to measure the effect of the presence of an unknown person touching the heads of ewes, and omitting of the concentrates shortly before and during milking on their milkability.

Material and methods: Animals. The experiment was carried out at an experimental farm of the Animal Production Research Centre Nitra in Trenčianská Teplá in May. 43 dairy ewes (13 pieces Improved Valachian - IV, 15 Tsigai - T, 15 Lacaune – LC breeds) were tested for presence of an unknown person and 39 (15 IV, 13 T, 11 LC) were tested by omitting of the concentrates during milking. Data were collected during two consecutive morning milkings for first and second treatment resp. In both treatments 10 ewes were the same. To see the effects of both treatments only animals with higher milk production as the average of the flock were selected for experiment. The animals were kept on the pasture and only at milking time they were brought into the stable. During control milking, each ewe received concentrate. Ewes were routinely milked twice a day at the milking machine designed for 24 animals and equipped with 12 standard milking units.

In each trial only one of the treatments was done during two consecutive morning milking in cross over design. First one represented the testing of presence of an unknown person in front of the ewe's heads. After taking the position of ewes in parlour the unknown person was touching the heads of the ewes, trying to disturb them 30 s before the cluster was attached and during the whole milking. Second treatment represented the milking without offering the concentrate before the milking started. Thus the ewes were milked out without concentrate intake. Control milking in both treatments represented the usual milking process.

Milk flow curves. Milk flow curves were evaluated according to Mačuhová et al. (2008) and divided into four types [1 peak (1P), 2 peaks (2P), plateau I (PLI), plateau II (PLII). 1P represents milk flow curves with one peak of milk flow before stripping. 2P type of milk flow has two clearly separated milk flow peaks with decreasing of the milk flow of first emission to 0 l/min before second emission started. PLI represents milk flow by ewes with larger emission curves and maximal milk flow rate > 0.4 l/min without clear differences between peaks. Plateau II (PLII) represents also milk flow curves with steady milk flow during milking, but at very low milk flow level (maximal milk flow rate ≤ 0.4 l/min). Because no PLII flows were found, only PL instead PLI was used in whole article.

Milk flow was continuously recorded by graduated electronic milk collection jar for ewe milking. Milk flow kinetics were recorded individually using four electronic jars (1.5 l) collecting total milk produced at the milking. Within each jar there was a 2-wire compact magnetostrictive level transmitter (NIVOTRACK) (NIVELCO Ipari Elektronika Rt, Budapest, Hungary) connected to the computer, which continuously recorded signals once per second. Using four jars it was possible to milk out four ewes at the same time.

Milk flow data was calculated using the following formula:

milk flow rate (l/min) = (L_n-L_{n-4}) x 15

L – milk yield in litres,

n – time in s, n > 3 s.

During experimental measurements the clusters were attached immediately without any udder stimulation or pre-dipping and kept on teats for 70 s since the attachment, even if no milk flow was detected (no increment of milk level in the jar), or longer if milk level in the jar was slightly increased. Afterwards, the machine stripping was performed with hand massage of the udder before the teat cup removal. The time of 70 s was expected to be sufficient to record the second emission of milk release when milk ejection occurred.

The following milking characteristics were evaluated: machine milk yield (MMY) - (the amount of milk obtained by the machine from time 0 s to time when the milk flow ceased), machine stripping (MS) - (the amount of milk obtained by the milker during machine stripping), machine stripping percentage (MS%) - (percentage of machine stripping from total milk yield (TMY) - (machine milk yield + machine stripping), maximum milk flow rate (MMF) - (the maximum flow rate recorded during machine milking for a period at least 3 s.), time to maximum milk flow (TMFT), milk flow latency time (LT) - (the lag time between the attachment of teat cups and reaching of 0.03 l of milk in the jar), milking time (MT – time from cluster attachment until milk flow ceased), milk yield of the 1st emission (MY1stE), milk yield in 30 s (MY30) and milk yield in 60 s (MY60) - (the amount of milk obtained in 30 s or 60 s). Milk yield in 60 s was the same as machine milk yield if the time of milking was less than 60 s. In bimodal curves the time when the second emission started (BT) was also recorded. Obtained data was evaluated by Student pair test. Data is presented as mean ± standard error.

Results. Altogether a total of 164 milk flow curves were evaluated in both treatments. There was observed significant effect of the presence of an unknown person on some measured milking characteristics and milk production parameters in ewes. There was observed significantly higher TMY, MMY, MY 30 s and MY 60 s in control treatment as compared to treatment with the presence of an unknown person (Table 1). MS and MS% was

higher in the group of ewes treated by the presence of an unknown person compared to control milking.

The differences in milking characteristics were not found in the treatment with omitting of concentrate during milking as shown in table 2.

Table 1. **Effect of unknown person presence on milking characteristics**

traits	control		man presence		P <
	mean	standard error	mean	standard error	
TMY (l)	0.69	0.18	0.64	0.13	*0.016*
*MMY (*l)	0.53	0.17	0.46	0.14	0.002
MS (l)	0.16	0.08	0.17	0.09	0.040
MS (%)	23	11.60	28	14.48	0.003
MT (s)	80	25.66	78	24.60	0.308
LT (s)	14	4.22	15	6.61	0.188
MMF (l)	0.98	0.41	0.99	0.42	0.360
TMFT (s)	27.85	19.44	31.38	24.37	0.197
MY30 (l)	0.19	0.08	0.16	0.09	0.050
MY60 (l)	0.41	0.13	0.36	0.13	0.004
BT (s)	43	12.04	46	13.75	0.322
MY1stE (l)	0.29	0.07	0.25	0.10	0.496

TMY- total milk yield, MMY- machine milk yield, MS – machine stripping, MS% - machine stripping percentage, MT- milking time, LT- latency time, MMF- maximum milk flow, TMFT – time to maximum milk flow, MY30 – milk yield in 30 s, MY60- milk yield in 60 s, BT – bimodality time, MY1stE – milk yield of the 1st emission

Table 2. **Effect of omitting of the concentrate food during milking on milking characteristics**

traits	control		food absence		P <
	mean	standard error	mean	standard error	
TMY (l)	0.55	0.13	0.57	0.13	0.087
MMY (l)	0.43	0.14	0.45	0.14	0.255
MS (l)	0.12	0.08	0.13	0.09	0.149
MS (%)	22	14.33	22	14.78	0.380
MT (s)	72	20.97	71	19.83	0.347
LT (s)	14	4.77	14	3.87	0.361
MMF (l)	0.91	0.38	0.97	0.34	0.106
MMFT (s)	29.30	18.26	27.58	18.65	0.279
MY30 (l)	0.17	0.10	0.17	0.07	0.497
MY60 (l)	0.35	0.13	0.35	0.12	0.411
BT (s)	46	14.66	44	8.52	0.189
MY1stE (l)	0.23	0.13	0.22	0.09	0.340

For abbreviation see table 1.

In both treatments the highest occurrence of different milk flow type was observed in PL and the lowest in 1P. For the presence of an unknown person treatment the frequency of different milk flow types in control milking represented: 5 % (1P), 31 % (2P), 64 % (PL) and in group of ewes that were disturbed by the presence of an unknown person the frequency changed to 10 % (1P), 38 % (2P), 52 % (PL). Within the breeds there were only 2 TS ewes (15 %) having 1P flow type during control milking. The occurrence of 1P increased to 3 TS ewes (23 %) 1 IV ewe (7 %) during the unknown human presence. There were not 1P flows in Lacaune in both milking.

For the omitting of concentrate treatment the frequency of different milk flow types in control milking is represented: 5 % (1P), 37 % (2P), 58 % (PL) as compared to milking with omitting of concentrate: 2 % (1P), 47 % (2P), 51 % (PL). Within the breeds there was only 1 TS ewe (7 %) and 1 IV ewe (8 %) having 1P flow type during control milking. The occurrence of 1P decreased to 0 TS ewes and did not change 1 IV ewe (7 %) during the omitting of concentrate. There were not 1P flows in Lacaune in both milking.

The example of the effect of the presence of an unknown person on the milk flow is shown in figure 1. There is possible to see a delay of second emission occurrence probably due to the disturbance of oxytocin release.

Discussion. There was a higher milk production and more suitable distribution of milk flow kinetics observed in measured flock as it was published earlier in the same farm and breeds (Mačuhová et al., 2007, Tančin et al.,

2011) or in less producing breed (Rovai et al., 2002) due to selection criteria of the experiment causing higher amount of milk yield. Therefore only few ewes showed 1P flow type in TS and IV ewes.

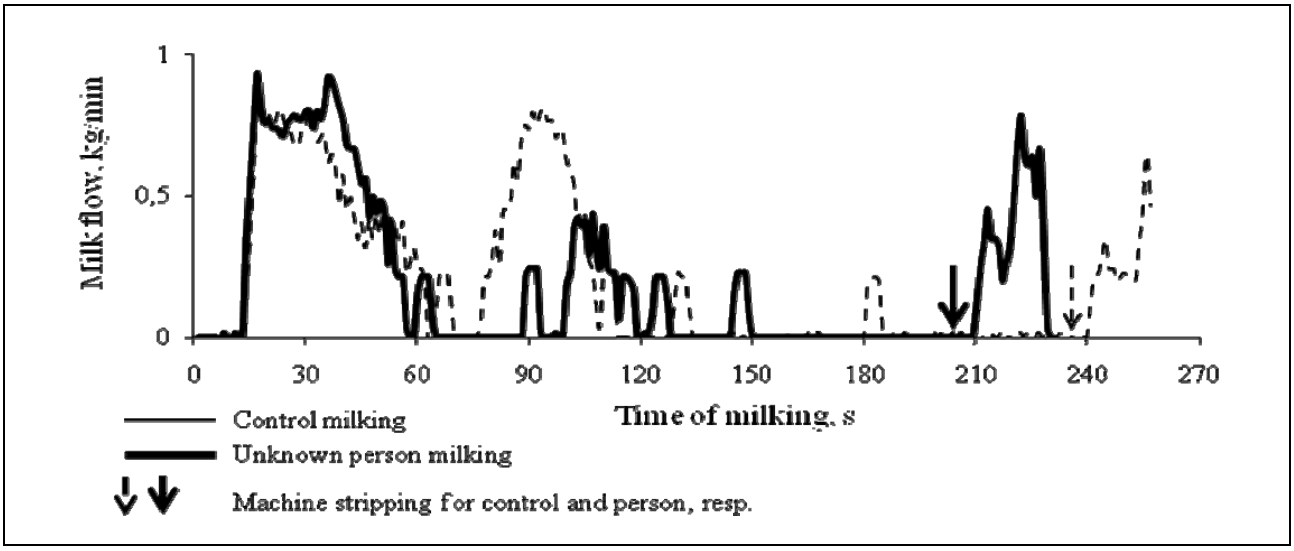

Figure 1. **Differences in milk curves caused by presence of unknown person during milking**

The milk yield parameters (TMY, MMY, MY 30s and MY 60s) were lower and the MS an MS% were higher in treatment with the presence of an unknown person before and during milking as compared to control treatment. The fact that milk yield decreased and MS and MS% increased in response to the presence of an unknown person could be caused by stress induced shortly before and during milking due to milk ejection disturbances. Also the effect of the human presence could be clearer under practical conditions because our animal are from the experimental farm, where many other treatments are performed and perhaps animals are less sensitive to human presence. Our findings correspond with results found by Rushen et al. (1999) and in our earlier study by Mačuhová et al., (2008) in dairy cows. However Munksgaard et al. (2001) didn't find any differences in milk yield and residual milk in cows when an unfamiliar person was present during milking.

Decrease in frequency of PL and increased 2P milk flow curves was found during milking in both treatments; with an unknown person presence and concentrates omitting. Ewes with PL could have a milk ejection but second emission is masked probably due to filling cistern by alveolar milk before milk from cistern is removed (Marnet et al., 1998). PL milk flow could be also seen in ewes with no oxytocin release where teat canal limits the milk flow. Decreasing of occurrence of PL milk flow in both treatments could be the direct effect of stressful conditions causing a disturbing the release of oxytocin. Thus in ewes with PL milk flow the milk flow changed to 2P due to delay of oxytocin release or to 1P due to inhibition of oxytocin release. We assume that the first one is more observed in food omitting treatment and the second one in human presence. In the treatment with the presence of an unfamiliar person, there was observed an increase in 1P milk flow curves. A similar problem with ejection while an unfamiliar or aversive milker was presented during milking of cows was also observed by Rushen et al. (1999).

Conclusion. Obtained results indicate that milking characteristics in ewes are more affected by the presence of an unknown person than by omitting of concentrate during milking. There is still more research needed to be done to know more about how ewes react to different breeding interventions during milking.

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