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THE EFFECT OF TEMPERATURE IN THE STABLES ON RESTING BEHAVIOR OF CZECH FLECKVIEH COWS

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Abstract

The aim of study, the effect of temperature in the stables on resting behaviour of czech fleckvieh cows was evaluated. The frequency of standing cows and cows lying on the right and left side (laterality) was determined. Experiment was conducted in farm GenAgro Ricany a. s. (49°12´30.370´´N, 16°23´43.092´´E). Observation was carried out at weekly intervals from 8. 6. 2011 to 30. 5. 2012, at 10.00 AM (48 observations). The objective of monitoring was one section - one quarter of stable (n = 98 cows). The temperature in the stables was recorded by HOBO data loggers and divided into 8 temperature zones (< -5.0 °C to 25.1 < °C). A total of 4 704 observations were analysed. In case of the temperature in stables, high statistically significant difference ($p < 0.01$) was found between standing (inside and outside the cubicle) and lying (on the left and on the right side) cows. Furthermore, it was found that lying cows had favor left side more than the right. In the group of temperatures from - 4.9 to 5 °C was proved highly statistically significant difference ($p < 0.01$). In the group of temperatures from 10 to 20 °C was found only statistically significant difference ($p < 0.05$) and in the group of temperature from 5.1 to 10 and 20.1 to 25 °C was not proved statistically significant difference ($p > 0.05$). Based on the results can be stated that, the temperature in the stables had a great influence on resting behaviour of Czech Fleckvieh cows.

Keywords: cows, laterality, standing, lying, temperature in the stables

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Introduction

Although the process of domestication brought about a number of important, or even essential, changes in farm animal performance or exterior, their environmental requirements remained relatively invariable throughout their phylogenesis. The impact of environmental factors on domesticated animals is extremely complex and difficult to define. The more altered the original environmental conditions, the greater responsibility of the breeder to provide adequately for animals' needs (*Chládek*, 2004).

Barn microclimate is, together with nutrition, type of housing and animal handling, one of the main factors affecting an animal organism. It affects cows' welfare and performance and consequently herd profitability. The barn microclimate is defined by air temperature, relative

humidity, air velocity and content of various components –gasses, dust, microorganisms (*Matějka*, 1995). According to *Bílek* (2002) barn temperature is the most influential factor. A negative impact of high temperature is enhanced by air humidity *Koukal* (2001). With increasing relative humidity, heat tolerance and stress resistance of cows decreases (*Doležal et al.*, 2003). Temperature-Humidity Index (THI) accounts for the combined effects of temperature and relative humidity (*West*, 2003). In order to maintain good welfare of cows it is essential to analyse their behavioural responses to barn microclimate changes.

Materials and method

The aim of study, the effect of temperature in the stables on resting behaviour of czech fleckvieh cows was evaluated. The frequency of standing cows and cows lying on the right and left side (laterality) was determined. Experiment was conducted in farm GenAgro Ricany a. s. (49°12´30.370´´N, 16°23´43.092´´E). Observation was carried out at weekly intervals from 8. 6. 2011 to 30. 5. 2012, at 10.00 AM (48 observations). The objective of monitoring was one section - one quarter of stable (n = 98 cows). A total of 4 704 observations were analyzed. Barn airspace temperature represents the average of the temperatures in the control days and divided into 8 temperature zones (< -5.0 °C to 25.1 < °C). It was measured every 15 minutes by 3 sensors with HOBO data logger (Onset Computer). To the resulting program was used MS Office Excel 2003 and Statistic 10.0.

Results and discussion

All dairy cows (n = 4 704) were divided into 8 temperature zones. Most of individual monitoring was in the group with temperature between 15.1 – 20 °C (n = 980), least in the group with temperature lower than -5 °C (n = 196). From *Table I.* is evidently, that there is high statistically significant difference between lying and standing cows ($p < 0.01$). At temperature from -4.9 to 25,1 < °C there were statistically significant more lying dairy cows than those, who were standing ($p < 0.01$). At temperature < -5 °C there was similar trend in preferation, but the difference was´t statistically significant ($p > 0.05$). When the preferation of left side and right side (laterality) was compared, we find out, that from overall count of lying cows (n = 3 138) 1 733 was lying on the left side and 1 405 on the right side. This difference was high statistically significant ($p < 0.01$). There was also high statistically significant difference in temperature zone from -4.9 to 5 °C, when more cows were lying on the left side ($p < 0.01$). In temperature zones from 10.1 to 20 °C and in the zone 25 < °C, there was again bigger part of cows lying on the left side and this difference was statistically significant ($p < 0.05$). The difference in other zones was´t statistically significant ($p > 0.05$).

The combination of lying behavior and the barn temperature revealed that the cows standing in hot days produced the highest quantity of milk ($p < 0.05$) while in cold days the lowest. An increase in barn temperature and humidity causes a decrease in dry matter intake (DMI) and thus also in milk production (*West*, 2003). Cows spend on average 13 h/d lying down (Houpt, 1998). Tucker et al. (2004) specified the range between 9.4–14.7 h/d, with an average lying bout of 0.9–1.4h. The proportion of cows lying down (CCI) should exceed 85% in free stall barns with adequate management (*Grant*, 2009; *Rae*, 2012). We found out a considerably lower number of lying cows (CCI = 58 %) which could probably be related to high temperatures. At

temperatures exceeding 20 °C the number of cows lying down decreases, thus affecting CCI values (*Zejdová et al*., 2011). It is generally acknowledged that the body of a standing cow offers a much greater surface for heat loss than that of a lying cow. This corresponds with the fact that our cows standing in the hot period produced more milk than those standing in the cold period.

A non-significant tendency towards a left-side preference was also found by *Hrouz et al.* (2007) where 53–70 % of their experimental animals preferred the left side to rest on. *Tucker et al*. (2009) observed a left-side laterality in free-housed dry cows; however, the authors admited that cows in pens or on pasture may exhibit no laterality. Although the cows show no overall laterality as a group, they still may have a strong preference as individuals (*Gibbons et al*., 2012). *Zejdová et al*. (2011) found out that older cows (lactation 4 and older) preferred left side more often than younger cows (lactation 2 and 3). In our experiment, the cows preferring the left side had a higher milk production. We speculated that this was due to the anatomical differences in the left and right lung. A greater respiration capacity of the right lung allowed better lung ventilation in cows lying on their left side.

Table I.: **The effect of temperature in the stables on resting behavior**

monitored aktivity				Temperature zones (°C)								∑
				< -5	**-4.9 to 0**	**0.1 to 5**	**5.1 to 10**	**10.1 to 15**	**15.1 to 20**	**20.1 to 25**	**25.1 <**	
amount of cows				196	392	392	882	686	980	784	392	4704
aktivity	**place**											
lying	**in box**	**left**	**	47	180^{A}	160^{A}	360	266^{a}	318^{a}	259	143^{a}	1733^{A}
		right	**	52	112^{B}	107^{B}	311	218^{b}	259^{b}	237	109^{b}	1405^{B}
	out of box	**left**	NS	0	0	0	0	0	0	0	0	0
		right	NS	0	0	0	0	0	0	0	0	0
standing	**in box**		**	83	83	96	182	156	323	236	108	1267
	out of box		**	14	17	29	29	46	80	52	32	299
lying overall			**	99	292^{A}	267^{A}	671^{A}	484^{A}	577^{A}	496^{A}	252^{A}	3138^{A}
standing overall			**	97	100^{B}	125^{B}	211^{B}	202^{B}	403^{B}	288^{B}	140^{B}	1566^{B}

*Values within the row differ if marked with * (P < 0.05) and ** (P < 0.01) or difference is not significant (NS)*

Values within the column differ if marked with different letters a, b (p< 0.05); A, B (p< 0.01) or difference is not significant (NS)

Conclusion

It was confirmed, that the temperature inside the stables has influence on the resting behavior of dairy cows. At the temperature from 5 to 20 °C more cows were lying. The cows tended to rest lying down rather than standing but not quite to the extent quoted in literature. The barn temperature had effect on the proportion of lying and standing cows.

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