# RESISTANCE OF EARLY POSTNATAL LAMBS FROM FOUR GENETIC TYPES TO COLD ENVIRONMENT AND RAIN

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## Introduction

Cold resistance affects directly lamb survival whenever severe weather conditions, such as cold, wind or rain, cause lamb mortality. Newborn lambs are more likely to be at risk from cold exposure (Slee, 1978) and the lamb mortality by hypothermia is the main source of wastage in most sheep production systems (Robinson et al., 1986; Stott and Slee, 1987). However Muller and McCuttcheon (1991) or Slee et al. (1991) indicate significant breed differences in cold resistance.

The objective of this study was to observe and compare thermal insulation of birthcoat and rectal temperature in 3 days old lambs of four genetic types (Merinolandschaf – M, Suffolk x Merinolandschaf – SFxML, Šumavská sheep – S, Suffolk x Sumavska sheep) exposed to cold environment and to simulation rain.

## Material and methods

An experiment was conducted in a climatic chamber with controlled air temperature. A total of 7 lambs of Merinolandschaf (ML), 7 lambs of Suffolk x Merinolandschaf (SFxML), 7 lambs of Šumavská sheep (S) and 7 lambs of Suffolk x Sumavska sheep (SF x S) were used. The air temperature, relative air humidity and air flow amounted to 4.08±1.82 $^{o}$C, 64.4±6.53 % and 0.09±0.07 m.s$^{-1}$. On day 3 after birth the lambs were individually subjected to a rain simulation (water temperature 5.4±0.43 $^{o}$C, the flow rate of 1.5 l.m$^{-1}$ through a nozzle, at a distance 30 cm, time of application 30 min) which potentiated the cold stress. Surface temperature on the body (BST) and rectal temperature (RT) were measured prior, after and 60 min after rain. Surface temperature was assessed by thermographic method using thermographic camera AGA 570 DEMO, special computer software Irwin 5.3.1. was used to analyse the thermograms. The obtained values were statistically evaluated by the procedure ANOVA (Statistica.cz, StatSoft, USA).

## Results

The responses to the potentiation of cold stress are shown in Table 1

Table 1: The changes of body surface temperature and rectal temperature of lambs exposed to cold environment and rain simulation

| Item | | Groups | | | |
|---|---|---|---|---|---|
| | | ML | SF x ML | S | SF x S |
| Number of lambs | | 7 | 7 | 7 | 7 |
| BST /°C/ | prior | 18.62±1.06[a,A] | 22.83±1.27[c,A,B,C] | 16.89±2.42[e,B,D] | 19.21±2.56[g,C,D] |
| | after | 13.01±2.18[a,b,E] | 11.68±2.27[c,d] | 11.78±1.52[e,f] | 10.24±2.15[g,h,E] |
| | 60 min after | 16.20±1.79[b,F] | 21.28±1.22[d,F,G,H] | 16.28±2.84[f,G] | 18.03±2.17[h,H] |
| RT /°C/ | prior | 39.81±0,26[*a*] | 39.65±0.42[*c*] | 39.79±0.22[*A*] | 39.0±0.30[*e,A*] |
| | after | 40.51±0.25[*a,b*] | 40.29±0.73[*c,d*] | 40.13±0.35 | 40.45±0.41[*e,f*] |
| | 60 min after | 39.88±0.19[*b*] | 39.52±0.27[*d*] | 39.72±0.17 | 39.59±0.29[*f*] |

BST: a,b,c,d,e,f,g,h – within breed (P<0.05);  A,B,C,D,E,F,G,H - between breeds (P<0.05)
RT: a,*b,c,d,e,f,g* - within breed (P<0.05);  *A* - between breeds (P<0.05)

The lowest BST was found out in S (P< 0.05) before the potentiation of cold stress. After the potentiation BST decreased (P< 0.05) in all treatment groups, SFxS and SFx ML showed the highest decline in BST, the lowest change was recorded in S. After 60 minutes BST in S showed the lowest difference compared to initial BST and all treatment groups. Comparing the groups, RT was significant (P< 0.05) between S and SFx S and ML and SF x S before the potentiation. After the potentiation of cold stress a significant decline in RT was recorded in Ml, SF x ML and SF x S but S did not show the significant change. After 60 minutes RT was reverted to initial RT in all treatment groups.

## Discussion

The results showed that cold resistance is influenced by breed. It confirms the studies of Slee et al. (1987, 1991) or Muller and McCutcheon (1991). After the potentiation of cold stress by cold environment and rain simulation RT was significantly increased in ML, SF x M and SF x S. This thermoregulatory response is important to the maintenance of homeothermy in severe conditions (Slee et al, 1987; Stott and Slee, 1987). But rectal temperature in S was not changed significantly by cold and rainy environment. This result relates to birthcoat quality. The type of coat has an important share in cold resistance (Slee, 1978; Slee et al., 1991). Increased cold resistance is resulted from changes in heat loss (thermal insulation) and heat production (metabolic rate) (Stott and Slee, 1987). In our experiment the lowest heat loss from birthcoat was recorded in S lambs. Thermal isolation of their birthcoat can be allowed to be very good.  But during cold and rainy weather hypothermia may be recorded because external wetting of the skin shifts the zone of thermal neutrality of lambs especially in poorlyinsulated animals (Poczopko, 1984; McArthur and Ousey, 1994). After rain simulation the lowest changes in heat loss were recorded again in S. The highest changes showed crossbreeds.

## Conclusion

The results showed that cold resistance is influenced by breed, birthcoat character respectively and that the S breed is the best adapted to cold and rainy conditions than ML, SF x ML and SF x S. Based on the data, Suffolk breed deteriorates significantly cold resistance.

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