Weight loss and liver proteomics profiling in three tropical sheep breeds

The objective was to determine differential protein expression in the liver of three different sheep breeds of sheep that show different levels of adaptation to SWL: Australian Merino (highly susceptible), Damara (tolerant) and Dorper (intermediate). Liver samples were obtained from both control and underfed, weight-losing animals of the three breeds using two-dimension electrophoresis and identification by mass spectrometry. Expression patterns of Gluthathione S-transferase (merino groups only), carbonic anhydrase 3 (2 fold increase of expression in control animals) and carbonyl reductase (present in all groups except Damara underfed and Dorper control) are of interest as a consequence of their role: detoxification of endogenous compounds and acid/base balance, respectively.

Concluding Remarks

Weight loss significantly affects production parameters and biochemical/physiological profiles in domestic animals. The study on how does SWL affect Nitrogen metabolism plays a key role in farm animal selection, particularly concerning adaptation to SWL. Our research has established several biomarkers of tolerance/adaptation to weight loss that in conjunction with genomics and transcriptomics will play an important role in selection.

Acknowledgements

Authors thank FCT for research funding. Contributions of JPC greyling, LM Schwalbach, HO de Waal (UFS, Bleomfontein, South Africa), the T Kilminster, T Scanlon, J Greef and C Oldham (DAFWA, Perth, Australia) and A Campos, R Francisco, AV Coelho (ITQB, Portugal) are acknowledged.

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doi:10.1017/S2040470010000099

Thermoregulatory response and relationships with performance of Large White growing pigs reared in tropical humid climate

Jean-Luc Gourdine†, Maryse Cyrille and David Renaudeau

INRA, UR143, Unité de Recherches Zootechniques, 97170 Petit Bourg, Guadeloupe, France

Introduction

Ambient temperature (T) is one of the factors affecting performance of pigs. When T is elevated, growing pigs reduces metabolic heat production by decreasing their voluntary feed intake in order to maintain homoethermia (Renaudeau *et al.*, 2004). Several studies show the consequences of heat stress in growing pigs (Collin *et al.*, 2000; Quiniou *et al.*, 2000). However, most of these studies were performed in controlled conditions with two or several levels of T. Studies performed in semi-open buildings subjected to the natural changes of tropical climate are rare. This study was conducted to evaluate the thermoregulatory responses and their relationships with performance and feeding behaviour in a total of 63 Large White growing pigs reared during the warm season in a tropical humid climate. The study was also carried out to evaluate to what extent the phenotyping of heat tolerance in pigs is routinely feasible in semi-open conditions.

Materials and Methods

The data used concerned a contemporary group of 63 Large White growing pigs (33 females and 30 barrows), raised at the INRA experimental herd of Duclos in Guadeloupe (16°N latitude, 61°W longitude). The data covered the BW range from 26.9 ± 3.6 to 84.2 ± 9.1 kg (mean ± SD) from March to May 2010. Thirty-two pigs housed in rooms with automatic feed dispensers (DAC) (4 rooms with 8 pigs each) allowing to feed pigs and to measure their feeding behavior automatically; 31 other pigs were fed together (3 rooms with 10–11 pigs). The rectal temperature (RT) and the cutaneous temperature (CT) were measured twice daily (between 07:00 and 09:30 and between 12:00 and 14:30), every 15 days until the end of growth. Body weight (BW) and lengths of the back were measured in the morning. Ambient

† E-mail: Jean-Luc.Gourdine@antilles.inra.fr

temperature (T) and relative humidity were collected in the building from climatic probes. During the experiment, daily ambient temperature averaged 23.8 and 29.3°C at 05:00 and at 14:00, respectively. A thermal circulation index TCI = (CT–T)/(RT–T) was calculated as an indicator of blood and heat transfer from the core to the surface to a particular area of skin under steady-state thermal conditions. For the statistical analysis, hourly ambient temperatures were ranked into 4 balanced classes (<27.5°C, 27.5 to 28.5°C, 28.5 to 29.5°C and ⩾29.5°C). Correlation analyses were carried out to study the relationships between thermoregulation parameters and growing performance (ADFI, ADG, F:G). Linear mixed models (proc Mixed, SAS©) were used to study the fixed effects of T, sex, feeding management and body weight as covariate on RT, TCI, CT. The mean growth performance and feeding behaviour parameters were analysed by an analysis of variance (proc GLM, SAS©) including the fixed effects of T, sex and BW as covariate. Finally, hourly values of feed intake were calculated and analysed with the same effects and the effect of hour.

Results

The average amplitude of daily T was 5.5°C (from 23.6 to 29.3°C), suggesting that animals suffer from heat stress during the day. When T increased between 24 and 30°C, CT significantly increased by 0.12°C ° C^{-1} ($P < 0.01$). There was no significant relationship between TCI and T when T was lower than 28.5°C ($P = 0.08$). However, when T was above 28.5°C, TCI decreased by about 0.2 points ($P < 0.01$). RT remained constant when T did not exceed 29.5°C, and thereafter, RT significantly increased. The differences between the two body temperatures measured during the day were on average 0.5 and 0.1°C, for CT and RT, respectively with higher CT and RT values in the afternoon. A reduction of feed intake was observed when daily T was higher than 28.5°C (-50 g day^{-1} $°C^{-1}$, $P < 0.01$). This reduction of appetite is associated with a reduction of the number of meals (-2 meals day^{-1} from T < 27.5 to T > 29.5°C; $P < 0.01$). The increase of BW was associated with an increase in the rate of feed intake (2 g min^{-1} kg^{-1} of BW gain, $P < 0.05$). The ingestion time was affected by elevated ambient temperature (-15 min day^{-1} from T < 27.5°C to T > 29.5°C, $P < 0.05$). When T increased, growing pigs dedicated less time to feed ingestion (15 min day^{-1} when T > 29.5°C). In this way, animals reduce their metabolic heat production. Hourly feed intake peaked twice a day, with the first and the second peaks observed on average 03:00 and 10:00 and between 13:00 and 18:00, respectively. The kinetics of hourly feed intake was not affected by sex, T or BW. Moderate phenotypic correlations were obtained between RT and BW (0.33), TCI and BW (-0.42) and F:G and the average difference between the two RT was measured during the day (-0.31). Whatever the day of measurements, an important individual variability was found for thermoregulatory responses, as the variance accounted for by differences between pigs represented 88 to 99% of the total variance.

Conclusion

This study suggests that thermoregulatory responses depend on the magnitude of the elevated temperatures. The high variability between pigs suggests that thermoregulatory responses to heat stress can differ between individuals. It is important to make two measurements at different times of the day, in order to be able to discriminate differences in thermoregulatory responses between pigs. In semi-open breeding conditions, where pigs are subjected to fluctuation in T (daily and across days), it is important to realize a maximum of measurements on the parameters of adaptation to heat, in order to discriminate responses between animals.

doi:10.1017/S2040470010000105

Adaptive traits of Sanga cattle: Their importance in meeting the challenges associated with climate change in the tropics and sub tropics

Keith Ramsay†

Department of Agriculture, Forestry and Fisheries, PB X138, Pretoria 0001, South Africa

Sanga is the collective name for a group of indigenous cattle of Southern Africa that includes, amongst others, the Nguni and Afrikaner of South Africa, the Landim of Mozambique, the Sanga of Namibia and the Mashona, Nkone and Tuli of Zimbabwe and the Nguni of Swaziland and Zambia.

While the size of the various ecotypes differs according to the available nutrients in the ecosystems where these animals are found, they all have common traits that enable them to survive and reproduce in biomes that are characterised by high temperatures, high humidity, often limited water resources and vegetation and a range of diseases and conditions that make it impossible for exotic breeds to survive without costly interventions that include supplementary feeding, shelter and herd health programs.

† E-mail: keithr@daff.gov.za