Concurrent Session 15: Metabolism

Weight loss and telomere length

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Background – Telomeres are composed of long hexamer (TTAGGG) repeats that protect against spontaneous DNA damage, such as telomere end-fusions which lead to chromosomal instability and increase the risk for cancer. During each cell division telomere is lost; when telomeres become too short the cell senesces. Shortened telomeres cause genome instability and have been observed in many carcinomas.
Objective – The purpose of this study was to investigate the telomere length of mid-rectal biopsy samples and to determine if weight-loss influences telomere length.
Design – Mid-rectal biopsies were collected by sigmoidoscopy forceps. Appropriate consent was obtained from volunteers. Telomere length was measured by determining the number of TTAGGG hexamer repeats using quantitative real-time PCR. We modified the Cawthon assay to obtain an absolute measurement of telomeric repeats. Mid-rectal biopsies were taken at three time points throughout the study; week 0, week 12 and week 52 during programmed weight loss.
Outcomes – Telomere length was correlated with BMI ($r=-0.13$, $p<0.05$). Weight loss occurred on either a high protein high red meat diet or a high carbohydrate diet. The results indicate that telomere length is increased after 12 weeks and 52 weeks on the weight loss diets ($P<0.0001$). Furthermore, weight loss was correlated with change in telomere length ($r=0.7$, $p<0.01$).
Conclusion – Weight loss diets appear to increase telomere length in mid-rectal biopsies. These preliminary data suggest that weight loss may contribute to the prevention of telomere shortening which is an important event in carcinogenesis. The significance of these results may become clearer once the mechanism for the observed telomere length increase is elucidated. Possible mechanisms include reduced cell division and oxidative stress.

Effects of endophyte-infected perennial ryegrass intake on performance of Merino ewes

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Background – Perennial ryegrass toxicity (PRGT) can affect livestock grazing perennial ryegrass (PR) infected with the endophyte *Neotyphodium lolli*. This endophyte produces two major classes of toxins harmful to livestock, ergot alkaloids (e.g ergovaline) and indole-diterpenes (e.g lolitrem B); affects include tremors and hyperthermia, and potentially reduced animal performance. Most research has focused on grazing studies in which toxin intake is not known and/or on clinical cases of PRGT. There has been very little research on quantifying whole animal physiological affects of a known toxin intake in sheep, particularly at the sub-clinical level.
Objective – To investigate some physiological and production responses of Merino ewe weaners given two different levels of endophyte infected PR seed (analysed for ergovaline and lolitrem B) under thermoneutral conditions.
Design – Eighteen Merino ewes (16 mo; 48 ±0.9kg) were housed indoors at 22ºC. Sheep were allocated to three dietary treatments (1.5 maintenance): Control (C), roughage plus barley; Alkaloid 1 (A1), C plus PR seed with ergovaline and lolitrem B at 50 and 22 µg/kg LW, respectively; and Alkaloid 2 (A2), C plus PR seed with ergovaline and lolitrem B at 100 and 44 µg/kg LW, respectively. Feed intake, respiration rate and rectal temperatures (AM and PM) were recorded daily and liveweights weekly. Oxygen consumption was measured at the beginning and end of the experimental period.
Outcomes – Rectal temperature (ºC) increased ($P<0.05$) in a dose dependent manner ($P<0.005$) (39.0, 39.3, 39.7; C, A1, A2 respectively, sed=0.11); there was no difference between A1 and C. Respiration rate (breaths per minute) was only significantly higher ($P<0.05$) in A2 compared with control (66, 93, 123; C, A1, A2 respectively, sed=13). There were no significant differences for weight gain or feed intake. Change in oxygen consumption (mls/kg $LW^{0.75}$) was variable but tended ($P<0.10$) to be higher in A1 (3.4±2.4) compared with C (-3.9± 1.2).
Conclusion – Short term feeding of endophyte alkaloids under thermoneutral conditions increases respiration rate and rectal temperature in a dose-dependant manner in Merino ewes without adversely affecting performance.