



## **Effect of feed quality on particle size in faeces from different ruminant species fed high and low quality forage**

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## Session 09

**Relationships between body surface thermographs with rumen pH, rumen and vaginal temperature in lactating dairy cows fed a control or an acidogenic diet and challenged with *E. coli* lipopolysaccharide**  
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Infrared thermography is a non-invasive technology that has been applied in the assessment of physiological processes and pathological conditions associated with productive performance in livestock. The objectives of this study were to compare telemetry readings of and rumen temperature and also records of the rumen pH and vaginal temperature to thermographs concomitantly taken from different body locations (e.g. flank, test, forehead and eyeball) in healthy or febrile cows under dietary treatments. Eight lactating Holstein cows (586±37 of BW, 166±18 DIM), were arranged in a latin-rectangle design with four cows receiving either a control or a acidogenic diet and two cows in each dietary group receiving an intramammary injection of *E. coli* lipopolysaccharide (LPS) in each of the four 21 d periods. Devices were placed into the rumen through a ruminal fistula for continuously measuring pH and temperature. Vaginal temperature was monitored using a data logger. Thermal images were taken every 1 h between 08.30 and 21.30 h. The complete dataset is being summarized in order to obtain the average of the telemetry and vaginal temperature readings around a latin-rectangle design with repeated measures over time and the least square means for each trait within the time (+2 min.) that each of the thermographs was taken. The summarized dataset will be analyzed as a latin-rectangle design with repeated regression and correlation analysis. Preliminary analysis of the time of the day will be used for performing regression and correlation analysis. Preliminary analysis of the thermographs showed an increase of 1 to 2 °C in the rear area and a decrease of 3 to 4 °C in feet 5 to 6 h after the LPS injection (fever peak response). The complete evaluation of our dataset will help to clarify the strengths and potential complementarity of these technologies to ensure health and optimal productive performance in ruminant production systems.

## Session 09

**Influence of rubber flooring on claw growth and health of lactating dairy cows in southeastern Sicily using infrared thermal imaging**  
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Thirty lactating dairy cows (137±60 DIM; 38.26±6.8 kg/d milk) in a Sicilian herd were grouped based on parity number, milk yield level, and lactation stage. Cows in each group were randomly assigned to 2-level treatment of floor (concrete vs rubber) in the barn and observed in March, July and November 2009. Hoof trimming and claw length measurement were performed at each control day. Foot lesions and claw palmar surface were classified according to American Association of Bovine Practitioners. Thermal images of the dorsal front hoof and palmar surface of each claw for all cows were acquired before and after trimming. The database comprised 801 trimming hoof records and 360 images. Claws growth was significantly higher ( $P<0.05$ ) in rubber compared to concrete flooring group (65 vs 29 mm in July and 12 vs 0 mm in November). The incidence of foot lesions for rubber and concrete flooring, respectively, was as follows: laminitis lesions, 0.3%, 1.2%; digital dermatitis, 6.5%, 9.8%; deformity of claw, 15.1%, 13.3%; sole ulcers, 0.3%, 0%; interdigital dermatitis, 5.4%, 3.7%; heel erosion, 16.1%, 13.3%; sole hemorrhage, 28.0%, 34.2%; white line separation, 28.5%, 24.4%. Although no significant difference was found between rubber and concrete flooring, probably due to a high management level, a higher incidence of sole hemorrhage, digital dermatitis and laminitis was found in concrete compared to rubber flooring. Thermal images were processed through binarization using ImageJ software. Preliminary results showed that surface temperature was higher in presence of foot pathology, indicating that thermal imaging could be recommended as a non-invasive detection tool for dairy industrial use.

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## Session 09

**Improved sow longevity and welfare with a chelated mineral blend**

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The objective of this study was to examine the benefits of feeding sows a chelated trace mineral blend (OTM, Mintrex®, Novus International Inc.) on sow longevity and welfare. Two sister sow farms with a common grandparent farm were fed either an inorganic control (ITM) or an OTM blend (Zn, Mn, and Cu), which replaced 50% of the ITM, with target levels of Zn, 16.5ppm, Cu, 16.5ppm, and Mn, 38.5ppm supplemented to the diets. Treatment was initiated at weaning and continued into the breeding herd. Gilts fed OTM had lower removal rates (8.4% vs. 7.5%,  $P=0.03$ ) than gilts fed ITM from first service to first farrowing. Higher numbers of replacement females fed OTM remained within the herds to Parity 4 compared to those fed ITM (68.4% vs. 61.2%, respectively,  $P<0.001$ ). The involuntary removal rate and relative removal rate due to locomotion (leg problems) were significantly reduced with OTM supplementation. In gilts, removal rate due to locomotion and involuntary removal rate were 7.4% vs. 14.3% and 17.5% vs. 26.5% for the OTM and ITM groups, respectively ( $P<0.001$ ). Similar results were observed in sows in that removal rates due to locomotion (12.6% vs. 19.4%,  $P<0.01$ ) were reduced in sows fed OTM compared to sows fed ITM, and the observation was consistent across each parity. Results suggest OTM is beneficial for maintaining sow skeletal health and improving welfare assessed by higher survival rates to parity 4 and lower removal rates due to locomotion.

## Session 10

**Effect of feed quality on particle size in faeces from different ruminant species fed high and low quality forage**

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The aim of this study was to compare particle size distribution in faeces from different small ruminant species. The experimental design included ad libitum feeding with two forage types to three ruminating species during two periods in a balanced block design. The species included six adult non pregnant female llamas (L), Danish Landrace goats (G) and Shropshire ewes (E) with mean body weights of 140, 45 and 75 kg, respectively. The forage included green hay (GH) and grass seed straw (GSS). The content of CP, NDF and ADL in the DM was 15, 58 and 4% for the GH, and 7, 81 and 8% for the GSS, respectively. The content of in sacco un-degradable NDF in the GH and GSS was 1.4 and 30% of the NDF, respectively. Daily mean DM intakes were 1.8, 1.1, 0.7 kg and 1.0, 1.3, 0.7 kg for L, E and G in the GH and GSS, respectively. Faeces was collected over four days, washed in nylon bags with a pore size of 10 µm and freeze dried before being sorted into six sieving fractions with square holes of 2.36 (O), 1.0 (M), 0.5 (S), 0.212 (D), 0.106 (C) mm and a bottom bowl (B). The area, length and width of particles in sub-samples from each fraction were measured using image analysis software, ImageProPlus. The overall faecal arithmetic mean particle length (APL), the 95 percentile of particle length (95PL) and width values (95PW) were 1.1, 1.0, 3.2, 2.5 and 0.6, 0.6 mm at the GH and GSS, respectively. The proportions of particles in the B, C, M and M+O fractions were significantly affected by forage type, species and their interactions ( $P<0.001$ ). The 95% of faecal particles was shorter than 0.45, 0.42 and 0.30 mm in L, E and G, respectively. In conclusion, feeding higher digestible forage greatly affects the proportion of large and small particles in washed faeces from ewes, goats and llamas, and this correlation is greater in llamas than in ewes and especially when compared with goats.

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