M347 Energy expenditure and methane emission in dairy heifers using the face-mask method. Carlos Alberto Alves Oliveira Filho[1], Fernanda Samarini Machado[2], Alexandre Lima Ferreira[2], Luiz Gustavo Ribeiro Pereira*[2], Thierry Ribeiro Tomich[2], Mariana Magalhães Campos[2], José Augusto Gomes Azevêdo[3], Rogério Martins Maurício[4], Alexandre Vieira Chaves[5], and Camilla Flávia Portela Gomes Silva[6], *[1]Universidade Estadual do Sudoeste da Bahia, Itapetinga, Bahia, Brazil, [2]Embrapa Dairy Cattle, Juiz de Fora, Minas Gerais, Brazil, [3]Universidade Estadual de Santa Cruz, Ilhéus, Bahia, Brazil, [4]Universidade Federal de São João Del Rei, São João Del Rei, Minas Gerais, Brazil, [5]Faculty of Veterinary Science, Sydney, New South Wales, Australia, [6]Instituto Federal de Educação, Ciência e Tecnologia Baiano, Santa Inês, Bahia, Brazil.*

The aim of this study was to evaluate the effect of feeding levels (FL) and breed (B) on energy expenditure as heat production (HP) and methane emission in dairy heifers using the face-mask method. Twenty-four heifers, 8 Holstein, 8 Gyr and 8 Holstein-Gyr crossbreed (F_1) with average live weight (LW) of 440 ± 88 kg and average age of 27.5 ± 0.8 mo, were housed in tie stall and randomly distributed to the treatments in a 2 × 3 factorial design (feeding level of 1.17% LW or 1.46% LW, on dry matter (DM) basis and breed). The diet was offered as a total mixed ration (700g/kg of corn silage and 300g/kg of concentrate, on DM basis). O_2 consumption, CO_2 production and CH4 emission data were measured using Sable System (Sable Systems, Henderson, NV) coupled with a face-mask for 30 min per day, for 3 d. Heart rate (HR) (beat/min) was registered over 72 h using Polar Equine transmitter (model RS800CX G3, Polar Electro Enc.). Three measurements of oxygen pulses (O2P) (mL O_2/beat) were registered. Total daily O2 consumption (L/d) was calculated as O2P times daily mean HR. Daily HP was calculated as total daily O_2 consumption times the constant 20.47 KJ/L of O_2. Data were subjected to ANOVA and means were compared by Student-Newman-Keuls test ($P < 0.05$). No effect of the interaction between B and FL was observed for any of the variables analyzed. HR, O2P and HP (kcal/kg $LW^{0.75}$) did not differ among B and FL. F_1 heifers presented higher DM intake (DMI) and higher daily mean gain (DMG) in comparison to Holstein and Gyr breeds (6.18, 5.36 and 4.14 kg DM/d; 674.3, 480.8 and 435.4 g/d, respectively). Animals fed at 1.46% LW level presented higher DMI, DMG, BW and methane emission (g/d). Methane emission was higher for F_1 animals (161.3 g/d), but did not differ from Holstein breed (141.1 g/d). Animals from Gyr breed fed at 1.17% LW presented lower DMI, DMG and BW as well as inferior CH4 production (98.3 g/d). This research project was funded by FAPEMIG, CAPES, CNPq and Embrapa.

Key Words: greenhouse gas, heat production, zebu

M348 Methane production in dairy cows consuming corn milling co-products. K. G. Saathoff*[1], C. J. R. Jenkins[1], S. C. Fernando[1], D. Hostetler[2], and P. J. Kononoff[1], *[1]Department of Animal Science, University of Nebraska-Lincoln, Lincoln, NE, [2]The School of Veterinary Medicine and Biomedical Sciences, University of Nebraska-Lincoln, Lincoln, NE.*

A study using 4 multiparous Holstein dairy cows, which were 93.5 ± 22.2 DIM, was conducted to determine the effect of conventional and corn milling co-products, specifically dried distillers grains and solubles (DDGS), on milk production, composition, and methane production. A 4 × 4 Latin square was utilized and included 4 treatments, namely a zero control (C) and diets that contained 30% of the diet DM as either conventional DDGS (ConDG), or 15% reduced fat DDGS (RFDG) or a mixture (Mix) of 15% conventional DDGS and 15% reduced fat DDGS. In all 3 treatment diets, DDGS were included in replace of corn and soybean meal. Cows were housed and fed in individual stalls and fed once per day and milked twice per day for 4–28 d periods. During the last 2 d methane production was measuring using indirect calorimeters. Cows consuming DDGS consumed more ($P = 0.05$) feed (22.7, 24.8, 26.4 and 27.3 ± 1.57 for the C, RFDG, Mix and ConDG respectively). Likely in response feed intake, milk yield was also increased ($P < 0.01$) by feeding DDGS (29.4, 39.4, 38.2, and 38.0 ± 3.22 for the C, RFDG, Mix and ConDG respectively). The concentration of fat in the milk was not affected ($P = 0.47$) by treatment and averaged 3.41 ± 0.29%. In comparison, protein in milk was higher ($P = 0.05$) in consuming DDGS (2.74, 2.85, 2.95 and 2.91 ± 0.12 for the C, RFDG, Mix and ConDG respectively). Although total methane was not different ($P = 0.69$) across treatments averaging 443.8 ± 20.6 L/d, cows consuming DDGS produced less ($P = 0.01$) methane per unit of milk produced (14.6, 11.3, 12.1 and 12.1 ± 0.84 kg milk/kg feed for the C, RFDG, Mix and ConDG respectively). Results of this study further support the notion that corn milling co-products may be used to replace both corn and soybean meal in dairy rations and also suggest that doing may also result in less methane per unit of milk produced.

Key Words: methane, dried distillers grains and solubles

M349 Implementing multi-variate statistical process control to detect variability on a commercial dairy farm. Robb W. Bender*[1,2], James A. Barmore[2], David E. Cook[1], and David K. Combs[1], *[1]University of Wisconsin-Madison, Madison, WI, [2]GPS Dairy Consulting LLC, Calmar, IA.*

The objective of this study was to characterize variability in both individual animal and pen data in data streams on a well-managed commercial dairy farm. Additional objectives were to assess the effect of outside events on the variability of data streams and utilize multivariate statistical process control (SPC) to improve detection time of out-of-control data streams. A 1,400-cow dairy in Eden, Wisconsin, was equipped with milk meters and rumination/activity collars to record individual cow milk production, rumination, physical activity, and pen-based feed intake. Data were collected over a 3 mo period. Milk production was analyzed for out-of-control data points via the Shewhart procedure, and rumination, physical activity and feed intake were analyzed multivariately via the MVP procedures of SAS. On this dairy, milk production averaged 45.1 kg, with a standard deviation of 1.3 kg among days within a pen, 11.5 kg among individual cows within a pen, and 20.1 kg among days within individual cows. Rumination (min per day) averaged 441.6 min, with a standard deviation of 14.0 among days within a pen and 120.7 min among individual cows within a pen. Physical activity (measured in arbitrary units) averaged 489.2, with a standard deviation of 17.1 among days within a pen, 103.4 among individual cows within a pen. Feed intake (DMI kg/cow/d) averaged 26.6 kg, with a standard deviation of 1.8 kg among days within pens. Multi-variate SPC increased sensitivity when compared with individual single-variate SPC analyses. Out-of-control milk production values were preceded by a deviation from normal variance in the multi-variate analysis of rumination, physical activity, and feed intake. Thus, multivariate SPC could be used as an early determinant of extreme variability in data streams on a commercial dairy.

Key Words: statistical process control, variation, dairy