

**Effect of heat stress on metabolic and antioxidant responses in periparturient dairy cows**

R. Turk<sup>1</sup>, N. Rošić<sup>2</sup>, S. Vince<sup>1</sup>, Z. Flegar-Meštrić<sup>3</sup>, S. Perkov<sup>3</sup>, L.J. Barbić<sup>1</sup> and M. Samardžija<sup>1</sup>

<sup>1</sup>Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia, <sup>2</sup>Veterinary Practice Jastrebarsko, Trešnjevka 61, 10450 Jastrebarsko, Croatia, <sup>3</sup>Merkur University Hospital, Zajčeva 19, 10000 Zagreb, Croatia; [rturk@vef.hr](mailto:rturk@vef.hr)

Global warming greatly affects performance and production of dairy cows having a significant impact on dairy industry. Exposure to heat stress decreases feed intake of cows compromising energy metabolism and immune system which might reduce disease resistance and production potential. The objective of this study was to evaluate metabolic and antioxidant responses to heat stress during summer in periparturient dairy cows. The study was conducted on 24 Simmental dairy cows kept in a barn with favourable air flow condition. The cows were assigned into two groups according to season: summer (S group, n=12) and autumn (A group, n=12). Blood samples were taken on days -21, -7, 8, 16, 24, 32 and 40 relative to parturition. Serum nonesterified fatty acids (NEFA),  $\beta$ -hydroxybutyrate (BHB) and macro mineral (Ca, K, Na, Cl) concentrations were assayed spectrometrically by commercial kits (Randox, UK). Serum superoxide-dismutase (SOD) activity was assayed by the quantitative ELISA method while paraoxonase-1 (PON1) activity was measured spectrometrically by the method of hydrolysis of paraoxon. The heart and respiratory rates and rectal temperature were monitored at each sampling time. The average temperature-humidity index (THI) was statistically higher in summer (78.9) than in autumn (58.6) indicating moderate heat stress in the S group. Rectal temperature and the respiratory rate were significantly higher in the S group (39.1 °C and 50, respectively) than in the A group (38.7 °C and 27, respectively) while the heart rate was not affected. Serum SOD was significantly lower in summer (24 U/ml) than in autumn (39 U/ml) while PON1 activity was only slightly lower in summer. Serum NEFA was not affected while BHB was significantly lower in summer. Electrolyte balance was altered as well. The results indicated that dairy cows responded to heat stress by complex metabolic adaptation affecting metabolic homeostasis and antioxidant protection aiming to counteract detrimental effects of reduced nutrient and energy intake.

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**Effect of breed and pre-weaning diet on the response of beef calves to abrupt weaning**

I. Casasús<sup>1</sup>, S. Yuste<sup>2</sup>, J. Ferrer<sup>1</sup>, A. De Vega<sup>2</sup>, M. Fondevila<sup>2</sup> and M. Blanco<sup>1</sup>

<sup>1</sup>CITA Aragón-IA2, Montañana 930, 50059 Zaragoza, Spain, <sup>2</sup>Universidad de Zaragoza-IA2, Miguel Servet 177, 50013 Zaragoza, Spain; [icasasus@aragon.es](mailto:icasasus@aragon.es)

The stress response to weaning and start of intensive fattening were studied in thirty female calves of two breeds (15 Parda de Montaña, PM, and 15 Pirenaica, PIR) subjected to three different feeding strategies during lactation (milk only, MO; milk+hay, MH; milk+concentrate, MC; supplements offered *ad libitum*). At 150 d of age, calves were abruptly weaned from their dams, placed in an adjacent barn and fed on *ad libitum* concentrate and barley straw. Blood was collected at -24 (basal), +6, +24 and +168 h from weaning for analysis of cortisol, fibrinogen, creatine-kinase, leukogram, haematocrit, erythrocyte count and haemoglobin content. Data were analysed with mixed linear models, where interactions between diet or breed and sampling time were never significant. A typical stress response was observed, with increasing fibrinogen, creatine-kinase and cortisol concentrations after weaning (highest values at +6 or +24 h), and return to basal values at +168 h (except for fibrinogen). The leukogram showed a transient neutrophilia and lymphopenia observed at +6 h, and monocytosis and erythrocytopenia that had disappeared by +168 h. The pre-weaning diet affected plasma cortisol and leukocyte populations, MH calves showing the highest values (10.7, 16.1 and 13.3 ng/ml for MO, MH and MC, P=0.02) but the lowest neutrophil:lymphocyte ratio (0.49, 0.33 and 0.59, respectively, P<0.001). Unsupplemented calves during lactation had the lowest haematocrit (32.7, 35.5 and 37.8% P<0.001) and haemoglobin content (11.5, 12.2 and 12.9 g/dl, P<0.001), but clinical anemia was not observed. Breed influenced concentrations of creatine-kinase (231 and 372 IU/ml in PM and PIR, P=0.01) but not those of fibrinogen and cortisol nor the leukogram. Parda calves had lower erythrocyte count (10.5 and 11.3  $10^6 \times$  cells/ $\mu$ l in PM and PIR, P=0.01) and haemoglobin content (11.8 and 12.5 g/dl, P=0.04), with larger cells but lower corpuscular haemoglobin concentrations. Providing supplements prior to weaning improved overall health but did not affect the pattern of stress response of calves from both breeds.