How does peri-implantational subnutrition affect red blood cell parameters in two beef breeds?

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Undernutrition is common in extensive beef cattle farming systems at some stages of the production cycle. A poor nutrient diet during the peri-implantation period can interfere with the correct foetal development. The aim of this study was to analyse the effects of peri-implantational undernutrition on red blood cell parameters in dams and calves of two beef breeds. Seventy-four lactating Parda de Montaña (PA) and 40 Pirenaica (PI) multiparous cows were artificially inseminated and randomly allocated to a control (CONTROL, n=52) or nutrient-restricted (SUBNUT, n=62) group, which were fed at 100 or 65% of their estimated energy requirements during the first 82 days of pregnancy, and thereafter received a control 100% diet until parturition. Red blood cell count (RBC), haemoglobin content (HGB) and haematocrit (HCT) were determined on day 19 post artificial insemination and one month before parturition for dams, and once on the first days of life (between 1 and 11) for calves. At the beginning of pregnancy, PI dams showed higher values than PA dams for RBC (6.8 vs 6.1×10^6 counts/mm^3, for PI and PA respectively, P<0.001), HGB (12.6 vs 10.8 g/dl, for PI and PA, P<0.001) and HTC (37.2 vs 32.1%, for PI and PA, P<0.001). These differences were maintained one month before parturition for RBC (6.41 vs 5.7×10^6 counts/mm^3, for PI and PA, P<0.01), HGB (11.5 vs 10.3 g/dl, for PI and PA, P<0.01) and HTC (33.2 vs 30.2%, for PI and PA, P<0.05). No differences in haematological profiles were found due to undernutrition (P>0.05). In calves, neither breed nor feeding treatment influenced the red blood series profiles (P>0.05). A negative correlation between calf age and haematological parameters was observed only in CONTROL calves (R^2=-0.37 for RBC, P=0.069; R^2=-0.47 for HGB, P<0.05; R^2=-0.52 for HTC, P<0.01), suggesting an earlier maturation of the haematopoietic system in these calves. More studies during gestation and other phases of calf development are needed to assess the effects of undernutrition during the peri-implantation period.

Plasma and muscle responses to pre-slaughter mixing of suckler bulls

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Meat colour is an important influence on the purchase decision of the consumer; 'bright red' is preferred. Dark, firm, dry beef with ultimate pH (pHu)>5.9 is typically ascribed to pre-slaughter stress but the relationship between animal interactions pre-slaughter and dark beef is uncertain. The objective was to determine the impact of mixing unfamiliar bulls, the day before slaughter, on stress-related plasma variables and beef pH and colour. Prior to mixing, Charolais-sired suckler bulls (mean (SD) live weight 671 (71.6) kg and age 17.4 (2.01) months) were housed indoors in 7 slatted floor pens (4 to 5 bulls/pen, 2.5-3.0 m^2/bull) and offered a barley-based ration and grass silage *ad libitum*. Two pens of 5 bulls were chosen as controls. From the other pens, 18 bulls were selected and moved to a single new pen (outdoors, bedded with wood chip, 6 m^2/bull) 18 h before slaughter. Bulls were then transported (45 min) without further mixing to an abattoir and slaughtered on arrival. Blood was collected for plasma preparation and muscle pH was recorded periodically post-mortem. At 48 h post-mortem, the left half of the carcass was cut at the 5/6th rib interface and muscle pH and lightness (L*) measured. Muscle was collected for measurement of glycolytic potential (GP) and drip loss (DL). Data were analysed by one-way ANOVA. Mixing increased plasma creatine kinase activity (14,556 vs 145 U/l, P<0.01) but cortisol, lactate and creatinine concentrations were not affected. Muscle GP was decreased (84 vs 179 µmol lactate equivalents/g, P<0.001) and pH at 1.5, 3, 4.5 and 6 h post-mortem increased (P<0.05) by mixing. Muscle from mixed bulls had higher pH (5.98 vs 5.55, P<0.05), was darker (lower L*; 25.5 vs 39.9, P<0.05) and had lower (P<0.05) DL (g/kg). While the maximum pH in muscle from control bulls was 5.60, six mixed bulls had muscle pH≤5.60. It is concluded that mixing of bulls increased some stress-related plasma indicators. That not all mixed bulls had high muscle pHu illustrates the complexity of the relationship between pre-slaughter stress and muscle biochemistry.