Book of Abstracts

of the 76th Annual Meeting of the European Federation of Animal Science

EAAP · EUROPA · FEZ · EVT · EAX

Book of Abstracts No. 39 (2025)
Innsbruck, Austria
25 - 29 August, 2025

EAAP

European Federation of Animal Science

The European Federation of Animal Science wishes to express its appreciation to the Ministero dell'agricoltura, della sovranità alimentare e delle foreste (Italy) and the Associazione Italiana Allevatori (Italy)
for their valuable support of its activities.

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Rome (Italy)
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ISBN: 979-12-210-6769-9

First published, 2025

High dietary cation and anion ration: Reconsidering the formulation for ruminants fed under high ambient temperature

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It is well known that dairy cows and goats fed under high ambient temperature (HTa) have limited capacity for milk synthesis. There are evidences that the HTa condition influences the animal well-being and that ruminants living under the natural HTa of tropical conditions are at the stage of heat stress. We have investigated the nutritional strategy to mitigate the negative effect of HTa and hypothesize that this strategy should be implemented as the biological coolant for dairy ruminants fed under HTa conditions. This biological coolant is the solution that contains a high degree of cation and anion difference (CAD). We have demonstrated that high dietary CAD (hDCAD) could increase evaporative heat dissipation in dairy goats via increasing respiratory rate (control: 124±10 vs. hDCAD: 148±10 bpm; $p<0.05$) and that the percentage increment of rectal temperature was lowered (control: 0.76±0.06% vs. hDCAD: 0.43±0.05%; $p<0.05$). High DCAD increases nocturnal drinking behavior (control: 6±2 vs. hDCAD: 32±4 mL/kg BW; $p<0.05$) and tends to increase daily eating behavior (control: 33±2 vs. hDCAD: 37±2 g/kg BW; $p<0.05$) as well. Under 8 weeks of hDCAD, the ruminal volatile fatty acid and total tract digestibility (control: 74±0.9% vs. hDCAD: 79±0.8%; $p<0.05$) were improved. Finally, hDCAD shifted the acid-base balance to the alkaline side within 4th week of treatment and the balance was restored when the treatment was prolonged (within the 8th week of treatment). The later acid-base homeostasis was mainly controlled via kidney functions by increasing the excretion of bicarbonate together with sodium and potassium. We conclude that hDCAD as the biological coolant might be implemented for dairy ruminants living in tropical countries during summer to improve animal well-being and production.

Effect of melatonin implants during the dry-off period on blood variables in pregnant dairy goats

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This study aims to evaluate different dry-off strategies based on melatonin implants and milking frequency on blood variables in dairy goats. On day (d) -75 relative to expected parturition, 24 Majorera dairy goats were subcutaneously treated with a 1 mL of saline (SAL group) or with a melatonin (MEL) implant (MEL group). From d -75 to d -60 relative to expected parturition, animals were milked daily. From d -60 to d 0 relative to parturition, animals were not milked. From d -75 to d -52 relative to parturition, blood samples were collected to determine white cells concentrations as well as albumin, B-hydroxybutyrate (BHB), calcium, glucose, free fatty acids (FFA), total protein and urea concentrations. The data was analysed using the PROC MIXED procedure of SAS including implant (IMP; saline vs. melatonin), time (T) and the interaction between both (IMP×T) as fixed effects. The significance was set as $P < 0.05$. Leukocyte concentrations increased (PIMP×T = 0.010) in the SAL group compared to the MEL group on d-60 relative to parturition (14.59±1.15 and 10.63±0.99 $\times 10^3$ cells/µL, respectively). These changes were caused by monocytes and granulocytes (PIMP×T < 0.006) and no changes in lymphocyte concentration were observed (PIMP×T = 0.222). Neither albumin, BHB, LDH, FFA nor urea concentrations were affected by either implant ($P > 0.101$) or the IMP×T interaction ($P > 0.34$). Calcium, glucose and protein concentrations were higher (PIMP < 0.048) in the MEL group (8.4±0.20 mg/dL, 58.9±3.34 mg/dL and 7.5±0.17 g/dL, respectively) than in the SAL group (7.6±0.20 mg/dL, 53.8±3.34 mg/dL and 6.8±0.17 g/dL, respectively). In conclusion, using MEL implants during a 15-day dry-off period promotes a smoother transition from late lactation to the dry period in dairy goats. This study was funded by the project PID 2020-113056RA-I00/AEI/10.13039/501100011033.