



**Book of Abstracts of the
8th EAAP International Symposium on
Energy and Protein Metabolism and Nutrition
(ISEP 2025)**

15 – 18 September 2025

Rostock-Warnemünde, Germany

Edited by the Local Organizing Committee of ISEP 2025

The abstracts were peer-reviewed and edited to maintain the scientific standards set by the EAAP International Scientific Committee of ISEP. Contents of all contributions are the responsibility of the authors and do not reflect views of the committees involved in the organization of this symposium.

Increasing the energy and lysine content of sow transition diets can improve litter performance and modulate colostrum composition and miRNA expression

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The transition period from 7 days before parturition to 4 days after parturition is a critical period for the sow due to physiological changes and nutritional requirements. A balanced diet in terms of energy and amino acids (AAs) could improve reproductive performance, colostrum quality and piglet growth. The aim of this study was to evaluate the efficacy of a sows transition diet with higher energy and AAs quantity, compared with a standard diet, on the composition and quality of colostrum and on sow and piglet performance. A total of 100 sows, balanced for body condition score (BCS), muscle and backfat depth and parity, were divided into the CO and TRT groups 7 days prepartum. The CO diet had 2950 kcal metabolized energy (ME) and 0.70% SID lysine (Lys) and a TRT diet had 3100 kcal ME and 0.85% SID Lys. The AAs/SID Lys ration was maintained in both diets. Diets were administered from day 6 prepartum to day 4 postpartum. The duration of farrowing, the interval between births and the vitality of piglets were recorded for 12 sows/group. Performance and colostrum data (20 sows/group) were collected at farrowing (d0), day 6 (d6) and weaning (d24). Colostrum was analysed for proximal, immunoglobulins, somatic cell count (SCC), metabolomic composition (NMR analysis) and microRNA (miRNA; 10 sows/group) abundance. The diet did not affect feed intake, BCS, backfat and muscle loss of the sows. Farrowing duration and piglet birth intervals did not differ. The TRT group tended to have a higher number of live births ($P=0.066$), a lower number of stillbirths ($P=0.002$) an increase in piglet weight at weaning ($P=0.032$) and average daily gain d0-d24 ($P=0.080$) compared with the CO group. Piglet mortality during the suckling period did not differ. Colostrum from the TRT group tended to have a higher SCC ($P=0.07$) and had a higher fat% ($P=0.036$) and a different metabolomic profile, mainly characterised by a higher concentration of UDP-gluconate and carnitine and a lower concentration of citrate ($P<0.05$), highlighting the effect of diet on the energetic metabolism of the sow. A total of 208 miRNA were detected in colostrum and 13 were differentially expressed between the 2 groups ($P<0.05$). The TRT group had a higher ssc-miR-143-3p expression, which is associated with increased phagocytosis by myeloid and granulocytic cells, which may explain the increased SCC. In addition, ssc-miR-143-3p was associated with reduced inflammation and oxidative stress. This, together with the increase in fat and specific metabolites, could potentially benefit piglet performance. In conclusion, the results suggest that a transition diet consisting of 3,101.08 Kcal EM and 0.85% SID Lys is capable of improving sow parturition performance (fewer stillbirths) and lactation performance by modifying sow energy metabolism and colostrum quality.

Funding

Research supported by SustainableHeavySuis Project (J33C23002980002) - L.R. n. 17/2022-DGR 165 del 06/02/2023, Emilia Romagna Region, Italy. The authors thank Gruppo Veronesi Srl for the support in managing the *in vivo* trial.