

MATERNAL ARGININE SUPPLEMENTATION DURING LACTATION ON SOWS AND PIGLETS' PERFORMANCE

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Resumo: Por meio de diversas vias metabólicas relacionadas com a fisiologia e função da glândula mamária, a suplementação de arginina (Arg) na dieta de lactação pode melhorar o desempenho da matriz suína e contribuir para satisfazer as necessidades de Arg do leitão lactente para máximo crescimento e sobrevivência. Portanto, avaliou-se o efeito da suplementação de Arg durante a lactação no desempenho da fêmea e sua leitegada. Foram utilizadas 44 fêmeas PIC1050 (252±16kg) de ordem de parto entre 1 e 3, distribuídas em dois tratamentos em um delineamento experimental em blocos casualizados. As dietas consistiram de uma ração de lactação a base de milho e farelo de soja (~1% Arg digestível estandardizada) sem e com suplementação de L-Arginina (0.5%) do 110º dia de gestação até o desmame (~21 dias pós-parto). A suplementação de Arg não influenciou as características da leitegada ao nascimento, porém aumentou a capacidade de sobrevivência dos leitões (redução da mortalidade pré-desmame em 48%). Como resultado, as porcas suplementadas desmamaram mais leitões (12,6 vs. 13,8, P<0,05), com o mesmo peso e ganho de peso dos leitões ao desmame. Portanto, a suplementação de 0,5% de Arg na dieta de matrizes suínas lactantes melhora o desempenho da fêmea e a capacidade de sobrevivência dos leitões.

PalavrasChaves: aminoácido funcional; fêmeas hiperprolíficas; mortalidade pré-desmame; nutrição; suínos.

SUPLEMENTAÇÃO MATERNA DE ARGININA DURANTE A LACTAÇÃO NO DESEMPENHO DAS PORCAS E LEITÕES

Abstract: Through multiple pathways related to mammary gland physiology and function, arginine (Arg) can improve lactating sow performance and contribute to meeting suckling piglet Arg requirement for maximum growth and survivability. Therefore, this study investigates the effect of dietary Arg supplementation on performance of sows and their offspring during lactation. A total of 44 females PIC 1050 (252 ± 16 kg; parity 1 - 3) were used in a randomized complete block design and assigned to one of 2 dietary treatments from d110 of gestation until weaning (~ 21 days post-farrow): a corn-soybean meal control diet (~ 1% standardized ileal digestible Arg) and an Arg supplemented diet (control + 0.5% L-arginine). Dietary supplementation of 0.5% Arg did not affect litter characteristic at birth but increased piglet survivability (pre-weaning mortality reduced by 48%). As a result, Arg supplemented sows weaned more pigs (12.6 vs. 13.8, P < 0.05) while maintaining similar pig growth and BW at weaning. In conclusion, dietary supplementation of 0.5% Arg in lactating sows' diet improve sow performance and piglets' survivability.

Keywords: functional amino acid, hyperprolific females; pre-weaning mortality; nutrition; swine.

Introdução: Large litter sizes from modern high prolific sows are associated with lower birth weights, increased within-litter weight variability, and increased pre-weaning mortality, which represents a challenge for swine producers (Theil et al., 2023). Arginine (Arg) is precursor of nitric oxide, a vasodilator and angiogenic factor, and polyamines, which are key regulators of protein synthesis (Wu, 2010). These Arg metabolites has been associated with improved lactating sow performance by enhancing the development of the mammary gland and its uptake of nutrients (Blavi et al., 2021). Also, Arg is considered an essential amino acid for young pigs. However, Arg intake from sow's milk is low relative to meet the need for maximal weight gain in suckling piglets (< 40% of the daily requirement; Wu et al., 2004). Therefore, this study investigates the effect of maternal Arg supplementation during lactation on performance of sows and their offspring.

Material e Métodos: A total of 44 females (PIC1050; parity 0 to 3; 252 ±16 kg body weight [BW]) in two blocks were used in a randomized complete block design and assigned to one of 2 treatments based on parity, BW, and back fat (BF). Dietary treatments included a corn-soybean meal diet (~1% standardized ileal digestible Arg) and an Arg supplemented diet (0.5% of L-arginine) provided from d110 of gestation until weaning (~21 days post-farrow). An automated feeding system was used to record and calculate feed intake. Female BW and BF were recorded at d108 of gestation, day 2 of lactation, and weaning. At farrowing, females were supervised by a trained technician and camaras to determine total farrowing duration (time elapsed between the birth of the first and last piglet). Number of total-born, live-born, stillborn, and mummies for each litter, and their respective weights within 24h of birth, were recorded. Cross-fostering occurred within 48 h post-farrowing within maternal treatment groups and litter size was standardized to 14-16 piglets per sow at d2 post-farrow. Pig BW was recorded at weaning and 2 weeks post weaning to assess piglet growth performance. Piglet mortality was recorded for calculation of pre-weaning mortality rate. Milk production was estimated (Noblet & Etienne, 1989). Data were analyzed using PROC TTEST procedure of SAS, considering dietary treatment as main effect, farrowing group as block, and sow and their litter as experimental unit. Mortality data were analyzed using PROC FREQ. Significant differences were reported at P<0.05 and tendencies at 0.05 = P = 0.10.

Resultado e Discussão: Arginine supply in the supplemented diet was 34% greater than CON. No differences (P>0.05) were detected for sow lactation feed intake or BW and BF at d105 of gestation, d2 post-farrow, and weaning. Supplementing 0.5% of Arg from d110 until weaning did not affect litter characteristic at birth or farrowing duration. Sow fed ARG weaned one

more piglet than CON-fed sows (12.6 vs. 13.8, $P < 0.05$) maintaining the same gain of piglets and similar BW at weaning. As a result, pre-weaning mortality was reduced ($P = < 0.0001$) by 48%. Postweaning growth performance remained unaffected. Benefits of Arg supplementation on suckling pig performance were also reported by Mateo et al. (2008) and Wessels et al. (2022), who observed improved growth of piglets when females were supplemented with 0.83% and 0.35% Arg, respectively. In this study, the benefits of Arg were more evident in the reduction of pre-weaning mortality than piglets gain or BW at weaning potentially due to litter size where the number of pigs after cross-fostering averaged 15 compared with 10 and 13 piglets in the previous cited authors, respectively. The improvement in growth and survivability following maternal Arg supplementation can be associated with increased milk production (tendency for increased calculated milk production in ARG-fed females in this study, $P = 0.062$) and potentially enhanced milk nutritional composition, as previous literature reported higher concentrations of protein, fat, Arg, and other AA in the milk when Arg was supplemented between 0.7 and 0.83% (Mateo et al., 2008; Moreira et al., 2018).

Conclusão: Supplementation of 0.5% Arg in corn-soybean meal-based diets fed to highly prolific lactating sows has the potential to increase piglet survivability and consequently the number of weaned pigs per sow, increasing overall sow productivity.

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Referências Bibliográficas: BLAVI, L. et al. Management and Feeding Strategies in Early Life to Increase Piglet Performance and Welfare around Weaning: A Review. *Animals*, v. 11, n. 2, p. 302, Jan. 2021. DOI: 10.3390/ani11020302. MATEO, R. D. et al. Effects of dietary arginine supplementation during gestation and lactation on the performance of lactating primiparous sows and nursing piglets. *Journal of animal science*, v. 86, n. 4, p. 827-835, Apr. 2008. DOI: 10.2527/jas.2007-0371. MOREIRA, R. H. R. et al. Arginine improves nutritional quality of sow milk and piglet performance. *Revista Brasileira De Zootecnia*, v. 47, e20170283, 2018. DOI: 10.1590/rbz4720170283. NOBLET, J.; ETIENNE, M. Estimation of sow milk nutrient output. *Journal of animal science*, v. 67, n. 12, p. 3352-3359, Dec. 1989. DOI:10.2527/jas1989.67123352x. THEIL, P. K. et al. Feeding the modern sow to sustain high productivity. *Molecular reproduction and development*, v. 90, n. 7, p. 517-532, Jul. 2023; DOI: <https://doi.org/doi:10.1002/mrd.23571>. WESSELS, A. G.; SIMONGIOVANNI, A.; ZENTEK, J. Impact of dietary supplementation of l-Arginine, l-Glutamine, and the combination of both on nursing performance of multiparous sows. *Translational animal science*. v. 7, n. 1, txac169, Dec. 2022; DOI:10.1093/tas/txac169. WU, G.; KNABE, D. A.; KIM, S. W. Arginine nutrition in neonatal pigs. *The Journal of nutrition*. v. 134, n.10, p. 2783S-2790S, Oct. 2004; DOI:10.1093/jn/134.10.2783S. WU, G. Functional amino acids in growth, reproduction, and health. *Advances in nutrition (Bethesda, Md.)*. v. 1, n.1, p. 31-37, Nov. 2010. DOI:10.3945/an.110.1008.