

1. **Dietary arginine supplementation of primiparous sows during early gestation increases litter size and alters fetal muscle fiber development** (Die Zufuhr von Arginin während der frühen Trächtigkeit von Erstlingsauen erhöht die Wurfgröße und verändert die fetale Muskelfaserentwicklung). J. Bérard, J.-Y. Denu and G. Bec* - Posieux

Arginine is a common substrate in the pathway of nitric oxide and polyamines. Growing evidence such as unusual abundance of arginine in porcine allantoic fluid during early gestation suggests that both, nitric oxide and polyamines, are key regulators of angiogenesis and embryogenesis as well as placental and fetal growth. The potential of arginine for improving the reproductive performance of sows was recently shown as elevated dietary L-arginine provision throughout gestation increased the number of pigs born alive by 22% and live litter birth weight of piglets by 24%. However, it is unclear whether myogenesis is affected by the elevate numbers of piglets in utero. Thus, the aim of the study was to determine the effect of dietary L-arginine supplementation to primiparous gilts on litter size, fetal weight (FW) and myogenesis at d 75 of gestation.

Methods: For the experiment 20 Swiss Large White gilts were used. At the day of mating they were randomly allocated to either the control (C) or the arginine treatment (A). All gilts were offered daily 3 kg of a standard diet from mating to d 75 of gestation. Additionally, A-sows received from d 14 to 28 daily 25 g L-arginine. Because of non-pregnancy 3 C-gilts were excluded from the trial. At d 75 of gestation the remaining sows were sacrificed, the weight of all fetuses and the number of fetuses, mummies and yellow bodies of both ovaries were assessed. From each litter the lightest, heaviest, and the ones with an average FW from both genders were selected and the semitendinosus (ST) muscles were excised. The cross-sectional area of the ST and the number of primary (P) and secondary (S) fibers and the S/P ratio were determined after actomyosin ATPase and immunohistochemistry staining. In the same samples the relative mRNA expression of embryonic, perinatal and type I myosin heavy chain (MyHC) isoforms was quantified by real-time PCR (1). Data were analyzed with the PROC MIXED of SAS (v9.1, SAS Inst. Inc., Cary, NC). The model used included the sow treatment, FW, gender and the 2- and 3-way interactions as fixed and litter as random effects.

Results: Compared with the control group, L-arginine supplementation increased the number of fetuses by 39% (13.0 vs. 9.3; $P = 0.04$) and total weight of fetuses by 31% (4822 vs. 3686 g; $P = 0.03$) whereas no ($P \geq 0.23$) differences were observed in the numbers of yellow bodies and mummies. More P fibers (17699 vs. 16477; $P < 0.04$) and lower S/P ratio (20.3 vs. 21.5; $P < 0.07$) were found in the ST of fetuses originating from A-sows. In accordance, relative expression of embryonic MyHC was greater (93 vs. 90%; $P < 0.01$) and that of MyHC type I was lower (3.4 vs. 5.5%; $P = 0.01$) in the ST of fetuses from A- than C-sows. Regardless of the sow treatment, the ST cross-sectional area was larger (28.4 vs. 23.7 mm²; $P < 0.01$) and the number of S fibers (384389 vs. 340471), the S/P fiber ratio (21.6 vs. 19.5) and the total fiber number were greater (401975 vs. 357193; $P < 0.05$) in fetuses with a high compared with a medium or low FW.

Conclusions: The greater number of fetuses and the lacking differences in the ovulation rate imply a positive impact of short-term dietary arginine supply on embryo implantation rate. The greater embryonic and lower type I MyHC mRNA expression together with the larger number of P fibers suggest a lower degree of maturity of the ST at d 75 of gestation in fetuses originating from A- compared with C-sows. Apparently, these effects were similar between FW groups and gender as no interactions were found among these factors.

- 1) DA COSTA, N., BLACKLEY, R., ALZUHRI, H., CHANG, K. C. (2002). J. Histochem. Cytochem. 50, 353-364.

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