

61. **Relationship between average litter birth weight and intra-litter weight variability on organ weight development and myogenesis in pigs** (Beziehung zwischen dem durchschnittlichen Wurfgewicht und der Variabilität innerhalb Wurf auf die Organentwicklung und die Myogenese beim Schwein). C. Pardo-Mariño*, M. Kreuzer and G. Bee – Posieux/Zürich

It is well established that in pigs, intra uterine crowding due to increasing litter size has a direct negative effect on fetal growth resulting in lower average litter birth weight (BtW) and larger variation in BtW within a litter. Genetic selection for greater litter size in sows increased the percentage of low BtW piglets but also in common litter sizes (10-15 piglets) a higher variability in total litter BtW weight has been reported. For instance, sows can give birth to litters of similar size, which differ in the average BtW by more than 500 g. Based on these findings it has been hypothesized that limitations in uterine efficiency may affect the development not only of low BtW pigs but also of the entire litter. Thus, the aim of the experiment was to elucidate the relationship between average litter BtW and intra litter variability on myogenesis and internal organs weight development.

Methods: From a population of multiparous Swiss Large White sows (parity 2-6), seven litters with a high (H: >1.7 kg) and seven litters with a low (L: <1.3 kg) average litter BtW were selected. At farrowing, from each litter, two females were sacrificed: from the H-sows those with the medium (HM) and lowest (HL) BtW and from the L-sows those with the medium (LM) and highest (LH) BtW. From these piglets, internal organs, brain and semitendinosus muscles (ST) were collected. The immunohistochemistry staining using slow myosin heavy chain antibody and the mATPase staining after pre-incubation at pH 10.2 was used to identify the muscle cross-sectional area (CSA), total number of fibers (TNF), number of primary (P) and secondary (S) fibers and S/P ratio of the dark (STD) and light (STL) portion of the ST. The other piglets of the H- and L-sows remained with the dams until weaning. Average daily gain during lactation and body weight at weaning were determined for each gender. Data were analyzed with PROC MIXED of SAS. The model used included treatment (HM, HL, LM and LH) as fixed and litter as random factor. For statistical comparison of BtW groups three orthogonal contrasts were established: HM vs. LM and LH, respectively, and HL vs. LH.

Results: The number of piglets born per litter was 13.3 and 14.8 and the average litter BtW was 1.74 and 1.23 kg in H- and L-sows, respectively. From farrowing to weaning, at 28 d of age, female, but not male, progeny from L-sows grew slower (0.236 vs. 0.293 kg/day, $P < 0.01$) resulting in a lower ($P < 0.04$) body weight (8.54 vs. 10.34 kg) at weaning compared to female progeny from H-sows. The selected HM-piglets were heavier than LM-piglets (1.62 vs. 1.27 kg; $P < 0.05$) and HM-piglets tended to be heavier (1.73 vs. 1.57; $P < 0.07$) than LH-piglets. The BtW of HL- and LH-progeny did not differ (1.42 vs. 1.57 kg; $P < 0.15$). The organ and brain weight development was also affected by the average litter BtW, being lower ($P < 0.05$) in absolute weight in LM- than HM-piglets, whereas no differences were observed among HL- and LH- or HM- and LH-piglets. The ST and STL, but not the STD, from HM piglets was larger (CSA: ST= 85 vs. 67 mm²; STL= 58 vs. 44 mm²; $P \leq 0.05$) and tended to have more TNF (ST= 540 vs. 467×10³; STL= 380 vs. 308×10³; $P < 0.10$) than the ST and STL of LM-piglets. Neither muscle size of the ST nor myofiber characteristics of the STD and STL differed ($P > 0.27$) among HL- and LH- or HM- and LH-progeny.

Conclusion: Progeny with a medium BtW within a litter originating from sows with a low gestation performance in terms of litter BtW are more affected in their organ and muscle development than medium BtW offspring from sows with a greater gestation performance. Thus, one can conclude that low gestation efficiency resulting in a lower total litter BtW not only affects the development of low but also of medium BtW offspring. However, female piglets with a similar BtW originating from litters with different average litter BtW did not differ in the parameters measured in this experiment. Interestingly, female progeny from L-sows grew slower during lactation than those from H-sows.

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