

58. Intrauterine crowding affects organ weight development and myogenesis in pigs
(Intrauterines Crowding beeinflusst die Entwicklung der Organe und der Muskelfaserbildung beim Schwein) J. Bérard*, C. Pardo-Mariño, M. Kreuzer and G. Bee – Posieux/Zürich

High prolificacy of sows and increased fetal survival leads to greater incidence of intra uterine crowding, which then may affect pre- and postnatal development of the progeny. The aim of the study was to assess the impact of intra uterine crowding, using unilaterally hysterectomized-ovariectomized primiparous gilts (U), on organ and muscle development of their progeny at birth.

Methods: The study used 7 U and 7 intact (C) Swiss Large White gilts. At farrowing, if available, 3 male and 3 female progeny with a low (> 0.8 and < 1.2 kg), high (> 1.6 kg) and medium (≈ 1.4 kg) birth weight (BtW) were sacrificed. Internal organs and brain were weighed and semitendinosus (ST), psoas major (PM) and rhomboideus (RH) muscles were collected. Histological analyses were performed in the PM, RH, dark (STD) and light (STL) portion of the ST muscles using mATPase staining after pre-incubation at pH 10.2. The histochemical method used allowed the determination of the cross-sectional muscle area, the number of primary and secondary myofibers as well as the calculation of the secondary to primary myofiber ratio and total number of myofiber in the muscle. Using SDS-PAGE gel electrophoresis the fetal, type I and type II (sum of IIa, IIx and IIB) myosin heavy chain isoforms were determined. The abundance of the individual isoform was expressed as the percentage of the isoform abundance to the total abundance of all isoforms. Data were analyzed using the PROC MIXED of SAS. The statistical model for the data on reproductive performance of the sows included the treatment as fixed and litter and sire as random effects. Data obtained from the low, medium and high BtW female and male progeny from U and C sows were analyzed using sow treatment, BtW-class, gender and the two- and three-way interactions as fixed effects. The least square means were separated using the PDIFF option. Differences with probability levels of $P < 0.05$ were considered significant.

Results: In half of the uterine space, litter size was only 35% smaller ($P < 0.01$) in U- compared to C-gilts. Total litter mass originating from U-sows tended to be lower ($P = 0.06$) than total litter mass of C-sows. By contrast, average BtW of the selected piglets did not ($P = 0.17$) differ between the 2 sow groups whereas PM and kidneys tended to weigh less ($P < 0.07$) in U- than C-progeny. Compared to C-progeny, the PM and STD of U-progeny had fewer ($P \leq 0.05$) secondary and total myofibers as well as numerically fewer ($P \leq 0.15$) primary myofibers. In contrast, in the RH, the secondary to primary myofiber ratio was lower ($P < 0.01$) in U- than C-progeny whereas the total number of myofibers was not affected ($P > 0.96$) by intra uterine crowding. The relative abundance of fetal MyHC was lower ($P = 0.02$) and that of type I MyHC was greater ($P = 0.09$) in U- than C-offspring. With increasing BtW, organ and brain weights increased ($P < 0.01$) whereas no ($P > 0.19$) changes were observed in myofiber hyperplasia. Female progeny had fewer ($P < 0.08$) primary and secondary myofibers in the STD and RH than male progeny.

Conclusion: In conclusion, regardless of BtW, intra uterine crowding resulted in decreased weight of the kidney and PM and reduced hyperplasia of both secondary and primary myofibers. The lower myofiber number at birth induced by IUC might ultimately impair postnatal growth and carcass characteristics.

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