

The Effects of Uterine Crowding on Placental and Fetal Development in the Pig

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In high parity sows from modern "prolific" dam-lines, high ovulation rates (25 to 30 oocytes) can be associated with high embryonic survival through the implantation period (≥ 20 embryos in utero at d 28). A substantial number of developing embryos are then lost post-implantation because embryo number exceeds uterine capacity, resulting in a final litter size of approximately 12-14 pigs. As a consequence of this change in the dynamics of prenatal loss, developing embryos are subjected to high levels of uterine crowding during early gestation, resulting in poor placental development and reduced embryo size. This suggests that when placental growth is limited there are serious implications for fetal development, piglet birth-weight and postnatal growth capacity. A common feature of uterine crowding, or intra uterine growth restriction (IUGR), is that brain growth is protected, while growth of other less "critical" organs such as the liver and muscle tissues are adversely affected. Brain:liver weight ratio is therefore used as a measure of IUGR, and should reflect changes in muscle development.

In the current study, relationships between levels of uterine crowding, placental size and various aspects of neonatal development were examined. Genex Manor Hybrid F1 pregnant gilts (n=23) underwent midline laparotomy at d 30 of gestation, ovulation rates were recorded and using ultrasound, embryo number was determined *in utero*. At farrowing each piglet born was matched with its placenta using an umbilical tagging procedure. Piglet birthweight and placental weight were recorded and the ratio of piglet weight:placental weight used as a measure of placental efficiency. Representative day old piglets from these litters (n=45) were necropsied, organ weights recorded and muscle tissue collected. Based on brain:liver weight ratio, "brain sparing" occurred in neonates from crowded litters. The postnatal development of littermates is currently being analyzed and techniques to study muscle development at birth are being developed.

Implications: Detrimental effects of uterine crowding on fetal muscle tissue development are an important economic concern for the swine industry.