

Associations between Birth Weight and Fetal Programming in Commercial Sows

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In a litter-bearing domestic species like the pig, the number of offspring born is an important economic trait. The components of litter size (ovulation rate, embryonic survival and uterine capacity), and effects on prenatal development and variation in postnatal growth performance, are of considerable interest to the pork industry. It has been suggested that when the number of embryos exceeds 14, intrauterine crowding is a limiting factor for litter size born and the birth weight of the litter. Intrauterine growth retardation (IUGR) in the pig also has important consequences for lifetime health outcomes and early postnatal survival.

In a recent study, total litter size, litter sex ratio and individual pig weights were measured in 586 multiparous litters on a commercial farrow to wean facility. Stillborn pigs from a subset of litters (n=52) in the midrange of litter sizes (10-15 total pigs born) were subjected to necropsy to obtain data on body weight, and weight of the semitendinosus muscle (STM), heart, liver and small intestine. These data were used to estimate brain sparing effects as a measure of prenatal programming. The body weight of the stillborn pig dissected represented the average weight of the birth litter ($r = 0.80$; $P < 0.001$). Liver ($r = 0.89$), STM ($r = 0.80$) and small intestine ($r = 0.87$) weights were highly correlated to body weight ($P < 0.001$). In contrast, brain weight was less affected by body weight ($r = 0.57$; $P < 0.001$). This suggests that at lower mean litter birth weights (1.0 kg) brain sparing occurs, with potential negative consequences on post-natal growth as measured by lower STM and small intestine weights.

Implications: These data provide further support for the suggestion that one of the major causes of variation in postnatal growth performance is between-litter variation in average birth weight.