

Relationships between weight, head morphology-assessed IUGR status and survival in commercial piglet production

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Production improvements in the global swine industry have been partly produced by increasing selection for hyperprolific sows, resulting in larger litter sizes while also increasing the variation in piglet birthweight. This has increased the number of small and/or undersized piglets, which have been exposed to differing degrees of intrauterine growth restriction (IUGR). Most IUGR piglets are classified as being of low birth weight, however, there is large variation in weight of both non-IUGR and IUGR piglets. The aim of this study was to look at the relationship between weight, IUGR status assessed from head morphology and survival.

All piglet births (n=8507) were recorded for a 20 week period in a population containing 650 Landrace sows crossed with either White Duroc sires (WD; 6) or Large White sires (LW; 13), with data gathered at first processing (18-24 hours after birth) on piglet weight, gender, head shape, and date and reason for any death. All piglets remained in their birth litters until processing, but were fostered thereafter. All gilts were tagged with individual identification but boars were left untagged and were unidentifiable after processing. The degree of intrauterine growth restriction (IUGR) was assessed visually from head morphology and piglets were classified as normal (1), slight IUGR (2) or IUGR (3; steep, dolphin-like forehead and wrinkles perpendicular to the mouth).

Significant effects (GLM model) on weight were head shape ($P<0.001$) and sire breed ($P<0.001$). Piglet sex was not significant although the interaction between head shape and sex was significant ($P=0.003$). Head shape 1 piglets were heaviest (fitted means \pm SE; n=7184, 1562g \pm 3.7), then head shape 2 (n=1108; 982g \pm 3.0), and head shape 3 were lightest (n=215; 677g \pm 21.3). The proportion of piglets dead at birth (0.05, 0.10, 0.14), dead between birth and processing (0.03, 0.07, 0.15), and between processing and weaning (0.04, 0.05, 0.20) were all significantly ($P<0.001$) associated with head morphology score (head shape 1,2,3 respectively). Binary logistic regression showed significant influences of weight ($P<0.001$), breed ($P<0.001$), sex ($P<0.001$) and head morphology score ($P=0.039$) on the probability of surviving to processing.

In conclusion, head morphology explains variance in piglet survival to weaning in addition to birth weight and the genetic contribution to these indicators is being assessed. The interactive effects of birth weight and head morphology on piglet survival require more detailed anatomical and physiological investigation. This research was funded by the EU FP7 Prohealth project (no. 613574).