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Gestational diabetes of sows negatively affects neonatal piglet survival in a season-dependent manner

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Improving neonatal piglet survival is a key driver for improving pig production and enhancing animal welfare. Gestational diabetes is a risk factor for neonatal morbidities in humans, such as hypoglycaemia and respiratory distress⁽¹⁾. There is limited knowledge on the association of gestational diabetes with neonatal survival in commercial pigs. An early study suggested that the diabetic condition of late-gestating sows was positively correlated with the first-week newborn piglet mortality⁽²⁾. Genetic selection in recent decades for heavier birth weight may have increased the prevalence or severity of gestational diabetes in pigs, considering the positive correlation between gestational diabetes and birth weight. We hypothesised that the diabetic condition of late gestating sows positively correlates with the neonatal piglet mortality rate in sows with modern genetics. Mixed-parity sows (1.5 ± 1.6 parity for mean \pm standard deviation (SD); Large White \times Landrace) from a commercial piggery in Australia were randomly selected and participated in an oral glucose tolerance test (OGTT) during two seasons (118 sows in winter and 118 sows in summer). On the d109 day of gestation, sows were fed 3.0 g dextrose per kg of metabolic body weight after fasting overnight. Tail blood glucose concentrations were measured using a glucometer (Accu-Chek®, Roche Diabetes Care Australia Pty) at -10, 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 105, 120 minutes relative to dextrose feeding. The glucose increment (2.5 ± 1.29 mM for mean \pm SD) during OGTT was calculated using the maximum concentration subtracting the fasting concentration of blood glucose. The 24-hour piglet mortality rate ($5\% \pm 8.8\%$ for mean \pm SD) was calculated as the ratio between piglets that died during the first 24 hours and the total number of born alive on a litter basis. The effect of sow glucose increment, season (winter vs summer), glucose increment \times season, number of piglets born alive, and sows parity on the 24-h piglet mortality rate as analysed using a Generalised Linear Model (SPSS 27th Version, IBM SPSS Statistics, Armonk). Results showed that the 24-hour piglet mortality rate was numerically higher in winter than in summer although insignificant (5.7% vs 4.2%, $p = 0.41$). The glucose increment of gestating sows was positively correlated with the 24-hour piglet mortality rate during winter but not summer, as evidenced by an interaction trend between glucose increment and season ($p = 0.059$). The regression coefficient suggested that every extra unit (mM) of glucose increment during OGTT corresponded to a 1.4% increase in the 24-hour piglet mortality rate in winter. In conclusion, the diabetic condition of late-gestating sows is a risk factor for neonatal piglet mortality in winter. Developing nutritional strategies to mitigate the diabetic condition of late-gestating sows may benefit neonatal piglet survival.

References

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2. Kemp B, Soede NM, Vesseur P *et al.* (1996) *J Anim Sci* 74, 879–885.