

The effect of increased maternal dietary fat intake during pregnancy on glucose tolerance near term and on offspring birth weight

K. Almond¹, P. Bikker², M. Lomax¹, M. Symonds¹ and A. Mostyn¹

¹University of Nottingham, Nottingham, UK and ²Schothorst Feed Research, Lelystad, The Netherlands

Diabetes during pregnancy in human subjects has been linked to adverse effects on the offspring such as fetal macrosomia and impaired glucose tolerance and obesity in later life⁽¹⁾. Previous studies in pigs have shown that high-fat feeding during late gestation can reduce glucose tolerance at term⁽²⁾, but the long-term effects on the offspring are not known. The present study examines whether increased fat intake during pregnancy influences glucose tolerance near to term and offspring birth weight.

Pregnant sows were fed one of four isoenergetic diets (Table) that differed only in composition and quantity fed during the first and final trimester of gestation. Sows fed on a low–high feeding scheme were fed 2.7 kg/d between day 0 and day 70 of gestation and 3.5 kg/d between day 70 and day 110 of gestation. Sows fed on a high–low feeding scheme were fed 3.5 kg/d between day 0 and day 40 of gestation and 2.7 kg/d between day 40 and day 110 of gestation. On day 108 of gestation glucose (0.5 g/kg; intravenous) was administered via a catheter inserted into the sow’s ear and regular blood samples were taken for 1 h. Blood samples from each time point were tested using an indicator stick (Medisense Precision Xtra Plus; Abbott Laboratories, Abbott Park, IL, USA) and an automated glucose reader (Medisense Precision Xceed, Abbott Laboratories), in order to determine the rate of glucose clearance.

Diet	High starch (low–high; n 8)		High fat (low–high; n 5)		High starch (high–low; n 7)		High fat (high–low; n 8)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Basal glucose (mmol/l)	4.14	0.17	4.06	0.09	4.13	0.12	4.06	0.13
Glucose AUC (mmol/min)	113 ^a	6.53	141 ^b	3.65	135 ^a	10.8	166 ^b	11.5
Mean birth wt of offspring (kg)	1.20	0.06	1.28	0.06	1.23	0.09	1.21	0.06

^{a,b}Values in the same row with unlike superscript letters were significantly different (Mann-Whitney U test; $P < 0.05$). AUC, area under the curve.

Gestational diet had no effect on basal glucose concentrations, but resulted in glucose intolerance in mothers, irrespective of the timing of the additional fat. Birth weight was unaffected by gestational diet or sow glucose tolerance.

Feeding a high-fat diet throughout gestation impairs glucose tolerance without any immediate effects on birth weight. The prospective findings from this ongoing study will inform further on the long-term effects that impaired maternal glucose tolerance may have on her offspring.

1. Dabelea D, Knowler WC & Pettit DJ (2000) *J Matern Fetal Neonatal* **9**, 83–88.
2. van der Peet-Schwering CMC, Kemp B, Binnendijk GP *et al.* (2004) *J Anim Sci* **82**, 2964–2971.