Dairy cow energy status early in pregnancy does not affect the reproductive performance of primiparous female progeny

D. P. Berry[1], P. Lonergan[2], S.T. Butler[1], A.R. Cromie[3] and A.O.C. Evans[2]

[1]Dairy Production Department, Teagasc, Moorepark, Fermoy, Co. Cork, Ireland
[2]School of Agriculture, Food Science & Veterinary Medicine, University College Dublin, Dublin, Ireland
[3]Irish Cattle Breeding Federation, Highfield House, Bandon, Co. Cork, Ireland

1. Introduction

- Substantial evidence in humans, rodents and sheep suggesting that perturbations during fetal life are associated with hypertension, vascular dysfunction, dyslipidaemia and insulin resistance
- Hypothesis:
  - Exposed to poor uterine condition, the foetus becomes adapted, through altered gene expression (e.g., DNA methylation or histone acetylation), to maximise uptake and utilisation of nutrients. Favourable postnatal conditions challenge the individual's homeostatic mechanisms
- Only one previous study in dairy cattle which was of limited size (Pryce et al., 2002) – no effect of dam performance on offspring performance

2. Objective

- To determine, using a large national dataset of Holstein-Friesian dairy cows, if dam energy status affects female progeny reproductive performance

3. Materials and Methods

- Calving dates and test-day milk production extracted from Irish Cattle Breeding Federation from 1995 to 2005
- Dam energy status
  - Milk net energy output
  - Milk fat to protein ratio
  - Milk fat concentration
  - Milk protein concentration

  } Averaged 0 to 6 weeks and 6 to 12 weeks post-conception
- Progeny reproductive measures
  - Age at first calving (days)
  - Interval from first to second calving (days)
- Analysis included 22,237 dam-offspring pairs
- Analysis
  - Linear mixed sire-maternal grandsire model
  - Dependent variable = progeny reproductive performance
  - Fixed effects
    - Contemporary group
    - Holstein proportion of progeny
    - **Dam parity / dam energy status**
  - Random effects
    - Sire of progeny
    - Maternal grandsire of progeny
    - Residual
- Additional analyses included a random maternal effect in a animal linear mixed model that also included a cytoplasmic and permanent environmental effect of the dam as well as relationships among animals through the use of a numerator relationship matrix

4. Results and Discussion

- Dam parity did not significantly affect progeny age at first calving and calving interval between first and second lactation
- Dam milk yield and composition did not significantly affect progeny age at first calving and calving interval between first and second lactation
- No detectable maternal genetic variance in either of the two traits

5. Conclusions

- Neither dam parity nor milk production in the 6 weeks or 6 to 12 weeks post-conception significantly affected age at first calving and calving interval from first to second parity in the female progeny
- Further analyses revealed significant maternal variation in milk production, somatic cell score and survival after accounting for additive genetic and cytoplasmic effects

6. Acknowledgements

- Financial support from the Research Stimulus Fund (RSF-06-328) is gratefully acknowledged

7. References

- Pryce, J.E., G. Simm, and J.J. Robinson. 2002. *Animal Science* 74:415-421