

Dietary manipulation of local versus systemic progesterone
and effects on embryo survival and litter size in gilts

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ABSTRACT

Progesterone is an important driver of endometrial function and as such plays an important role in early embryo development, implantation and survival. High feeding levels during early pregnancy in gilts usually result in a decrease in the concentration of progesterone in systemic blood circulation, through an increase in hepatic metabolism, and have as a consequence been associated with a reduction in embryo survival. However, effects of feeding level on embryo survival have been equivocal with some studies finding no, or even, positive effects of an increased feeding level on embryo survival. This paradox may be due to an underestimated supply of 'local' progesterone (directly from the ovary to the uterus), which may be enhanced at a higher feed level. This thesis proves the importance of the contribution of this local source of progesterone for embryo survival, using a unilateral ovariectomy model, and that progesterone concentrations in the venous drainage from the reproductive organs actually increases at higher feeding levels.

Across all studies presented in this thesis a high feed level was not detrimental to embryo survival and was actually beneficial in some studies. Ovarian production of progesterone may also be increased in animals on a high feed level, and therefore progesterone transferred directly from the ovary to the uterus may add considerably to systemic progesterone supplied to the uterus, and counteract a reduction in systemic progesterone when gilts are fed at a high feed level. Furthermore, a high feeding level also seemed to be beneficial in terms of growth rate which is important in gilts as they are still growing towards their mature body weight and a higher growth rate was also positively correlated to pregnancy rate.

DECLARATION

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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- Athorn, R.Z., Stott, P., Bouwman, E.G., and Langendijk, P. (2013). Feeding level and dietary energy source have no effect on embryo survival in gilts despite changes in systemic progesterone levels. *Animal Production Science* 53, 30-37.

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Athorn, R.Z., Stott, P., T.Y. Chen., Bouwman, E.G., Kennaway, D.J., and Langendijk, P. Effect of feeding level on luteal function and progesterone concentration in the vena cava during early pregnancy in gilts. *Reproduction, Fertility and Development*, in press.

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