PLASMA INSULIN-LIKE GROWTH FACTOR–I (1GF-I) LEVELS IN PASTURE–FED LACTATING HOLSTEIN-FRIESIAN COWS DURING THE POST-PARTUM PERIOD

F.Y.OBESE^A, A.RABIEE^B, K.L. MACMILLAN^B, S. HUMPHRYS^C AND A.R.EGAN^A

^A School of Agriculture and Food Systems (ILFR), University of Melbourne, VIC 3010

^B Faculty of Veterinary Science, University of Melbourne, 250 Princes Highway, Werribee, VIC 3030

^C Primegro Ltd, 28 Dalgleish St, Thebarton, SA 5031

Insulin-like growth factors (IGF-I and IGF-II) regulate cell growth, differentiation and differentiated cell function by interacting with three cell surface receptors (IGF-IR, IGF-IIR, and insulin-R), which is inturn, modulated by six binding proteins (IGFBP-1-6). IGFs are synthesized and secreted by many tissues and act as autocrine, paracrine and/or endocrine factors. IGFs and IGFBPs may be involved in mediating the effects of nutrition on the reproductive system. Research in Europe and North America using intensive feed-lot cattle systems has established a relationship between circulating IGF-I concentration and changes in energy balance in high genetic merit dairy cows fed total mixed rations. This study aims to evaluate the effect of dry matter and/or energy intake on plasma IGF-I concentrations in Australian pasture-fed lactating dairy cows in early lactation.

Thirty-two Holstein-Friesian cows, 4-5 weeks post-partum, were randomly assigned to four treatment groups (2x2 factorial design). Cows in the four groups received daily rations of dry matter (DM) and metabolisable energy (ME) (Low-Low: 16.6kg DM and 174 MJ ME; High-Low: 17.3kg DM and 181 MJ ME; Low-High: 15.4 kg DM and 211.5 MJ ME ; High-High: 17.9 kg DM and 215.9 MJ ME) for five weeks (3-week adaptation period, followed by 2 weeks of data collection). Blood samples were collected from a coccygeal vein of cows and plasma_IGF-I measured using the DSL-10-2800 ActiveTM Non-extraction IGF-I Enzyme–linked Immunosorbent Assay (ELISA) (Diagnostic Systems Laboratories, Inc, Webster, Texas, USA). The ELISA was validated against IGF-I radio-immunoassay of de-fatted plasma samples extracted by size-exclusion chromatography (HPLC) under acid conditions to separate IGFs and IGFBPs.

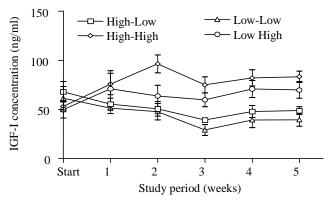


Figure 1. Nutritional effects on plasma IGF-I concentration

Mean IGF-I concentrations over the five-week study ranged from 29.1- 96.4 ng/ml (Figure 1). Dietary treatment influenced IGF-I levels, with concentrations reflecting ME intake to a greater degree than DM intake. Temporal patterns of IGF-I during the five-week period (Figure 1) indicated stabilization in plasma IGF-I levels for cows on all treatments after the 3-week period of adaptation and showed that inter-animal variation was greater than within animal variation (Figure 1). The effects of nutrition on plasma IGF-I were significant (P=0.015) as analysed using repeated measures ANOVA. ME intake increased circulating IGF-I levels to a greater degree than DM intake. This is consistent with earlier research showing high plasma IGF-I concentrations in dairy cows (Lucy et

*al.*1992) and heifers (Armstrong *et al.* 2001) offered high-energy diets compared to counterparts on low energy diets. Therefore, IGF-I concentrations may be used to monitor energy balance and with diet management alleviate the problem of negative energy balance accompanying early lactation in the dairy cow. In conclusion, IGF-I levels in pasture-fed lactating dairy cows reflected nutritional status.

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Email: fyobese@hotmail.com