

Pre- and post-calving plasma-free amino acids in high-yielding dairy cows

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Glutamine, glutamic acid, methionine, and phenylalanine are thought to be limiting amino acids in early lactating animals. A possible approach to estimate the amino-acid requirements of the very high-producing dairy cows is the measurement of the plasma-free amino-acid concentrations during early lactation. The objective of this work was to study plasma-free amino-acid concentrations in late pregnancy and early lactation in high-yielding dairy cows.

Six Italian Friesian cows averaging 47.2 kg/d of milk produced (at 45 d of lactation) were used in this experiment. Blood samples were collected from jugular vein at 08:00 h at day 15 and 5 before calving (late pregnancy), at calving, and every 5 d for the first 45 d of lactation. Plasma was harvested and analyzed for free amino-acid concentration using a Carlo Erba analyzer by the standard lithium buffer system.

Plasma-free amino-acid concentrations were lowered at calving. However, only glycine, arginine, glutamic acid, and ornithine concentrations were significantly different in early lactation (first 15 d) compared to the late pregnancy period (see

table I). During the first 15 d of lactation, plasma glutamate concentration was 26% lower, whereas lysine, ornithine and arginine concentrations were higher (39%, 21% and 15%, respectively) compared with the later pregnancy period. A trend for a decreased concentration in glutamine ($P < 0.12$) and phenylalanine ($P < 0.15$) was observed. No significant difference was observed for plasma methionine concentration. Late pregnancy levels of almost all amino acids were restored after 25 d of lactation. In particular plasma concentrations of lysine, histidine and alanine were increased in the period from 15 to 45 d *post partum*. For ornithine and branched-chain amino acids, as expression of body protein catabolism, a positive trend was also observed ($P < 0.14$). In early lactation, the decrease in the glutamine concentration observed by Meijer was not confirmed.

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Meijer GAL, Van Der Meulen J, Van Vuuren AM (1992) *Proc Biology of Lactation in Farm Animals*, Madrid (Spain), 11-12 September

Table I. Plasma-free amino-acid concentrations in late pregnant and early lactating dairy cows.

| Amino acid (mg/l) | Late pregnancy | Lactation | |
|-------------------|----------------|------------------|-----------------|
| | | Calving - day 15 | day 20 - day 45 |
| Met | 2.81 | 3.35 ± 0.25 | 3.30 ± 0.10 |
| Lys | 8.45 | 9.15 ± 0.60 | 11.70 ± 0.10** |
| Gln | 43.15 | 49.28 ± 2.26 | 45.60 ± 1.11 |
| Glu | 9.62 | 7.15 ± 1.20* | 6.70 ± 0.11** |
| Gly | 20.38 | 20.28 ± 1.32 | 25.98 ± 2.87*** |
| Arg | 10.13 | 11.64 ± 0.95** | 13.00 ± 0.52** |
| Orn | 4.39 | 5.30 ± 0.37* | 9.50 ± 0.21** |
| His | 7.46 | 9.02 ± 0.68 | 9.40 ± 0.12** |
| Ala | 16.49 | 15.82 ± 1.25 | 20.80 ± 0.91** |
| Phe | 8.39 | 7.06 ± 1.03 | 6.80 ± 0.11** |
| Val | 23.98 | 22.61 ± 2.72 | 33.90 ± 1.10** |
| Ile | 14.89 | 15.27 ± 2.76 | 19.90 ± 3.24 |
| Leu | 16.19 | 13.90 ± 1.68 | 18.70 ± 1.78 |
| Asn | 8.49 | 8.35 ± 0.78 | 9.30 ± 1.21 |

Significantly different from late pregnancy (paired *t* test): * $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$.