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Evolution of intake capacity of dairy cows in early lactation

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The prediction of dry matter intake (DMI) of dairy cows in early lactation is still not very accurate. The aim of this work is to study the respective part of precalving characteristics (body reserves, energy intake) and lactation features (energy requirement, concentrate intake) in the evolution of DMI in early lactation.

A weekly database was built using data on 617 early lactations (183 primiparous and 434 multiparous) of Holstein cows calving between 1984 and 1992 at the research station of St-Gilles. The study, only used data for the 12 first weeks of lactation, with maize based diets given *ad libitum*. DMI multiple regressions were calculated each week to study the evolution of the regression coefficients for pre- and post-calving covariates. Body condition score 2 weeks before calving (BCS₂) (only 268 lactations) and daily body weight gain during dry period (BWG_{dp}) (351 lactations, no primiparous) were used to describe cow characteristics at calving. Milk production, concentrate intake and body weight were available for all cows to describe the characteristics evolution of lactating cows. Different groups of cows were considered according to the number of lactation (L1, L2 and L3 respectively for cows in first, second or later lactation) and age at the first calving (A2 before 850 days, A3 after).

The table summarizes the evolution of partial regression coefficients in young (L1A2) and adult cows (L3). Evolution coefficients in second lactation cows show intermediate values. The effects of BWG_{dp} and concentrate intake are very significant in the first week of lactation and decrease later. Both are related to the level of energy intake in late pregnancy. This could indicate that higher energy intake before calving permit higher DMI in early lactation. High values of BCS₂ markedly reduce DMI of primiparous cows, but not adult cows. The BCS₂ coefficient in L1A2 group increases with the advance of lactation from -1.1 to -3.8 kg of DM/BCS₂ point and is always significant (n = 32). The effect of milk production increases with the advance of lactation. The body weight present similar evolution to milk production in adult cows but has not effect in primiparous cows, probably due to high negative effect of BCS₂. After the first month of lactation, coefficient of concentrate intake is in good agreement with the values of the substitution rates reported in the literature.

The variations of DMI can mainly be explained in the first weeks by criteria related to energy intake in late pregnancy (BWG_{dp} and concentrate intake) and later by energy requirements (milk production and body weight) except for primiparous cows, where the effect of BCS₂ is very significant.

Partial regression coefficient	First calving 2 years old (L1A2, n = 101)				Third lactation and more (L3, n = 204)			
	1st wk	5th	9th	12th	1st	5th	9th	12th
Milk yield	0.05 ^{ns}	0.03 ^{ns}	0.09*	0.14**	0.09**	0.15**	0.21**	0.25**
Live weight 1st week	0.91*	0.51 ^{ns}	0.20 ^{ns}	0.28 ^{ns}	0.44 ^{ns}	0.33 ^{ns}	0.68**	1.18**
Concentrate intake	1.08**	0.44*	0.51**	0.53**	1.06**	0.54**	0.42**	0.20*
BWG _{dp}	not available				1.85**	0.73*	0.33 ^{ns}	0.04 ^{ns}
RSD ¹ (kg DM/d)	1.50	1.59	1.31	1.72	2.08	1.75	1.55	1.78

¹ RSD : residual standard deviation.

^{ns}, *, ** : P level of covariate coefficient >0.05, <0.05 and <0.01 respectively