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Effects of two different feeding strategies at dry - off on metabolism and milk production*

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ABSTRACT

In an experiment with 22 primi- and multiparious cows the effects of two different feeding strategies at dry-off were tested. One group was fed straw *ad libitum,* while the other group was fed silage (4 kg DM) and straw *ad libitum.* Plasma NEFA increased significantly at dry-off, especially in the straw group. Plasma insulin and beta-hydroxybutyrate decreased in both groups. Milk fat percentage increased during dry-off as well as protein content. The metabolism of cows in the silage group were not as affected by the dry-off procedure as the cows in the straw group.

KEY WORDS: dry-off, metabolism, milk production

INTRODUCTION

From a physiological point of view, the dry-off period is probably the most demanding period for the high yielding dairy cow, with the exception of the period around parturition. Skidmore et al. (1997) stated that large changes in the nutrient supply might lead to metabolic disorders within cows yielding more than 20 kg milk per day at dry-off point. Metabolic stress and its correlation to health disorders are well documented around parturition (Emanuelson, 1988; Pryce et al., 1998; Knight et al., 1999), but there is a lack of information about metabolic stress around the dry-off period.

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Dry-off normally takes place around eight to nine weeks before parturition. Milk production should be rapidly reduced in order to prevent milk leakage, since it might affect the udder health in a negative way (Dingwell, 2001). Dry-off is also facilitated by a reduced nutrient supply, therefore farmers often feed their cows only with straw, minerals and vitamins for a few days. This strategy combined with omitted milking will help to dry-off the mammary gland quicker and reduce milk leakage.

The aim of this study was to investigate the metabolic response and also the effect on milk secretion in cows subjected to two different feeding strategies during dry-off. The cows where fed straw only, or straw and small amount of silage during dry-off. We determined the plasma concentration of insulin as well as the concentration of blood plasma metabolites.

MATERIAL AND METHODS

Twenty-two primi- and multiparous cows of the Swedish Red and White Breed held in individual tie-stalls were used. Prior to dry-off the cows were fed silage and concentrates according to their requirements (Spörndly, 1999). Feed refusals were registered every day.

The experiment started one week before the decided dry-off day and lasted during three weeks into the dry period, a total of four weeks. The dry off day, referred to as day 1, was 67±15 (mean±SD) days prior to parturition. The cows were randomly assigned to two different dry-off treatments. Both groups had a dry-off period of five days. The cows where fed two different diets during these five days. One group (straw, n=11) was fed straw *ad libitum* and the other group (silage, n=11) was fed 4 kg DM silage and straw *ad libitum*. One cow from the silage group was eliminated from the experiment due to abortion. From day 6 to 12 all cows were adapted to the dry period feed ration consisting of 6 kg DM silage and 1 kg DM concentrate per day.

The cows were milked twice a day the week before dry-off. During the dry-off period all cows were milked twice, i.e. in the mornings on day 3 and 5. Milk samples were collected at these milkings and the composition of fat, protein, and lactose were determined.

Blood samples were collected at day -5, -4, -2, 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 15, and 19 and analysed for Non-Esterified Fatty Acids (NEFA), glucose, insulin and beta-hydroxybutyrate (BHB).

RESULTS

Data are presented as means with their standard errors. Milk production decreased at dry-off in both groups (Table 1). The milk fat content increased about

twofold at dry-off in both groups. The protein content also increased, while the lactose content decreased over time, but did not differ between groups.

Table 1. Daily milk yield (kg) and composition (% of fat, protein an lactose) before, and at day five of dry-off

	Straw (n=11)		Silage (n=10)	
	mean	SE[1]	mean	SE
Yield before dry-off, kg/day	16.8	0.8	17.3	0.8
Yield, day 5, kg	2.3	0.3	4.2	0.6
Fat before dry-off , %	4.7	0.3	5.2	0.2
Fat day 5 , %	13.2	1.4	11.4	0.9
Protein before dry–off, %	3.7	0.07	4.1	0.09
Protein day 5, %	6.6	0.5	6.7	0.3
Lactose before dry-off, %	4.7	0.06	4.7	0.03
Lactose day 5, %	2.5	0.3	3.1	0.2

[1] standard error

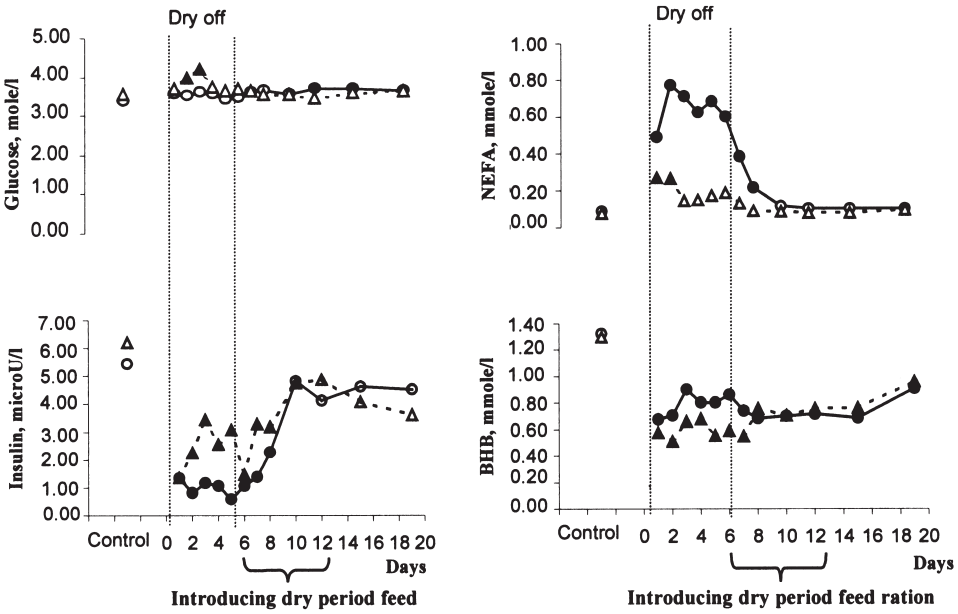

Figure 1. Mean concentrations of glucose, insulin, NEFA and BHB in plasma around dry-off. The symbols represent cows from the two treatment groups, straw (O) and silage (Δ) respectively. Values that differ significantly ($P<0.05$) from the control value before dry-off (mean from three samples) within group are filled

Plasma levels of glucose, insulin, BHB and NEFA are shown in Figure 1. There was a significant drop in plasma insulin in both groups after dry-off. The

drop was most pronounced in the straw group. After the introduction of the dry period feed ration the insulin level returned to the level observed prior to dry-off. NEFA increased markedly after dry-off, especially in the straw group. Plasma glucose was not significantly affected by the dry-off in any of the two treatments. BHB decreased significantly in both groups at dry-off, but no marked difference between the groups were observed.

CONCLUSIONS

These results indicate that the addition of silage to the straw diet during dry-off ameliorated the catabolic effects of the dry-off procedure. The two dry off treatments appeared to be similarly efficient in reducing milk production.

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