

The Effects of Shortening Dry Period on Colostrum Quality and Holstein Calves Performance

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ABSTRACT

There is limited information available about the relationship between dry period shortening and calves health and their performance. One-hundred twenty Holstein cows and their calves were used to evaluate dry period length on colostrum quality and calves health. Treatments were arranged in a 3×2×2 factorial design that included dry period (30-d, 42-d and 56-d), parity (primiparous or multiparous) and BCS (BCS<3.2, BCS≥3.2), and calves were blocked by sex. First milking after parturition was collected and its density was recorded. Calves were fed first colostrum meal in nipple-bottles within 1.2 h of birth. Maternal colostrum was fed in amounts of 1.5 L/meal for first two meals. Thereafter, pooled transitional milk was fed for the next four meals. Any calf which did not receive maternal colostrum from first milking were removed from the study. Calves were weighed at 0 h, 42, and 90 d. Fecal and health scores was estimated every day by method of Larson. No significant differences due to dry period length were detected for colostrum density (1.0636±0.0086, 1.0582±0.0161, 1.0673±0.0128 gm/ml for 30, 42 and 56 d treatments, respectively), and calves ADG (0.474±0.094, 0.516±0.060 and 0.479±0.152 kg/d, respectively), health, and incidence of diarrhea. Although, colostrum protein and SNF content were affected by dry period shortening ($P<0.01$). Data indicated that a short dry period can reduce colostrum quality but its effect on calf health and performance is not significant.

Key Words: dry period, colostrum, calf

INTRODUCTION

The importance of colostrum in determining calf health and survival is well established. Timely, adequate colostrum intake is the single most important management factor affecting morbidity and mortality in preweaned calves (Wells et al., 1996). Lactation number, breed, and length of the dry period influence volume and quality of colostrum. Recently interest in dry period shortening has received much attention. Possible advantages of reducing length of dry period include increased income from milk production, simplified dry cow management, decreased metabolic disorders, and alleviation of overcrowded dry cow facilities (Grummer et al, 2004). Recent research has demonstrated no production losses for cows given a 30-d dry period (Gulay et al, 2004). The effect of reducing DP on colostrum composition has rarely been reported (Grummer et al, 2004). Eckles and Pamer (1916) reported there was little effect of continuous milking on the colostrum fat fraction but a noticeable reduction in the concentration of heat-coagulable proteins (containing immunoglobulins). More recent data of Rémond et al. (1992) shows that colostrum

true protein content of cows that were continuously milked or given a 60-d DP contained 11.8 or 15.2% true Protein. The decision of whether to shorten the DP must be based on economic returns. Therefore, consequences of a shortened DP on colostrum quality and calves health status must be considered. This study was conducted to determine dry period length influence on colostrum quality and calves health.

MATERIALS AND METHODS

One-hundred twenty Holstein dairy cows were assigned to evaluating the effects of shortened dry period on colostrum quality and calves health status. Treatments were arranged in a $3 \times 2 \times 2$ factorial design that including; Dry period (1- Traditional (T) dry period (56 day) 2- Moderate (M) dry period (42 day) and 3- Short (S) dry period (35 day)) parity (primiparous or multiparous) and BCS ($BCS < 3.2$, $BCS \geq 3.2$). Twenty-four calves which did not receive maternal colostrum from first milking and their dams were removed from the study and a total of ninety-six calves were included for statistical analyses. First milking after parturition was collected and its density and pH was recorded. Colostrum samples were frozen at -20°C and afterwards analyzed for fat, protein, non-fat solids and lactose, using an infrared technique (Milkoscan 133B, Foss Electric, Denmark). Also it analyzed for IgG content by Human IgG Kits, but no cross reaction was observed (single radial immunodiffusion (SRID) and turbidometric (TIA) assays). Calves were fed first colostrum meal in nipple-bottles within 1.2 h after birth. Maternal colostrum was fed in amounts of 1.5 L/meal for first two meals. Thereafter, pooled transitional milk was fed for the next four meals. Calves were weighed at 0 h, 42, and 90 d. Calves were monitored during each feeding and for the duration of the study for signs of health problems. All problems and treatments were recorded in a daily logbook. In addition, fecal scores were evaluated once daily using a three-point scale (0 = firm, 1 = loose, and 2 = watery). Clinical health was scored based on ability to stand and presence or absence of suckle reflex. The score had a maximum of 2 points, 1 for each category (does not stand = 0, stands = 1 plus suckle reflex absent = 0, suckle reflex present = 1) as describe by Jones et al. (2004). Body temperature also was measured at birth, 12, 24, and 36 h. Health and fecal score were tested by performing Chi square tests in Proc FREQ of SAS. Colostrum compositions and calves ADG data was analyzed with mixed procedure of SAS. (v.8.2 SAS, 1999).

RESULTS AND DISCUSSIONS

Colostrum Quality

No significant differences due to dry period length were detected for colostrum density (1.0636 ± 0.0086 , 1.0582 ± 0.0161 , 1.0673 ± 0.0128 gm/ml for S, M and T treatments, respectively), pH (5.61 ± 0.699 , 5.83 ± 0.546 , 5.00 ± 0.487 for S, M and T treatments, respectively). Although, M and T treatments colostrum pH difference tend to be significant ($P=0.14$, Table.1) Concentrations of fat (3.83 ± 2.842 , 2.91 ± 3.082 , 2.92 ± 2.212 for S, M and T treatments, respectively) and lactose (0.78 ± 0.964 , 0.62 ± 0.560 , 0.91 ± 0.908 for S, M and T d treatments, respectively) in colostrum were not significantly different among treatments. But protein (12.37 ± 6.848 , 17.73 ± 4.111 , 18.77 ± 5.014 for S, M and T d treatments, respectively) and SNF (0.78 ± 0.964 , 0.62 ± 0.560 , 0.91 ± 0.908 for S, M and T treatments,

respectively) concentrations difference were markedly influenced by dry period shortening.

Enhanced protein and Ig concentrations in colostrum are believed to be the result of an accumulation of secretion in udder prior to calving (Wheelock et al., 1965; Rémond et al., 1997). Decreased colostrum protein and SNF in this study can be due to a short secretion-accumulation phase. Hence, immunoglobulins productions is expected be lower in S group, which is going to be determined in early future. These results are consistent with Rémond et al. (1992) findings.

Calves Growth and Health

Fecal score was independent of treatment; the distribution of fecal scores was similar for all treatments. Four calves died during the course of experiment. Couple of mortalities were attributed to obstruction of intestine, confirmed by necroscopy that revealed this defect was present at birth. Incidences of death and health problems were not different among treatment groups. Failure of passive transfer is associated with increased risk of morbidity and mortality in preweaned calves. Although, Hancock (1985) reported that calves with the same serum IgG concentration had different mortality risk depending on the mortality rate of the herd. Calves with low IgG born in herds with a low mortality rate were more likely to survive than calves with the same IgG concentration born in a herd with high mortality. This remains after serum electrophoresis and IgG determination analysis. Thus, these conflicting results can be due to farm management and sanitation system.

Calves Performance

Data indicate that a dry period between 35 and 56 day does not markedly influence the birth body weight (39.38 ± 3.962 , 40.75 ± 2.989 and 41.89 ± 5.302 for groups S, M and T, respectively), weaning weight or average daily gain (0.474 ± 0.094 , 0.516 ± 0.060 and 0.479 ± 0.152 kg/d, for groups S, M and T, respectively) (Table 2). S group calves birth body weights were relatively lower. According to Roy (1990) it can not be due to maternal nutritional condition during dry period. In consistent with present study Farries et al (1989) and Rastani et al. (2003) reported that dry period shortening has no effect on calf birth weight. Olson et al (1981) suggested that maternal nutritional status effect on colostrum Immunoglobulins concentrations, calf weaning weight, and ADG is not significant.

CONCLUSION

The two most important factors affecting preweaned calves are the time of first feeding and the quality of colostrum. There are limited resources about the effects of short dry periods on health status and performance of calves. The results of this study indicated that a short dry period (35-d) has not affected birth body weight, weaning weight, ADG and calf health status, but it can reduce colostrum proteins concentrations. Indeed, if colostrum Ig concentrations in cows with shortened DP are reduced, the use of colostrum supplements to achieve desired Ig concentrations would be necessary.

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Table 1. Least square means of milk composition, pH and density.

Variable	Least square means				Differences of Means		
	S	M	T	SEM	S minus M	S minus T	M minus T
Fat (%)	3.82	2.91	2.91	0.82	0.908	0.906	-0.002
Protein (%)	13.09	17.95	19.23	1.49	-4.855*	-6.135**	-1.280
Lactose (%)	0.68	0.57	0.85	0.23	0.106	-0.173	-0.278
TS (%)	20.44	22.93	24.64	1.37	-2.488	-4.198*	-1.710
SNF (%)	16.63	20.02	21.73	1.21	-3.396*	-5.104**	-1.708
pH	5.59	5.80	5.79	0.15	-0.211	-0.203	0.008
Density (gm/ml)	1.063	1.057	1.065	0.004	0.006	-0.002	-0.008

T=Traditional dry period (56 day); M =Moderate dry period (42 day); S=Short dry period (35 day)

* $P<0.05$.

** $P<0.01$.

Table 2. Least square means of calves birth weight, 42-d weight and ADG

Variable	Least square means				Differences of Means		
	S	M	T	SEM	S minus M	S minus T	M minus T
Birth weight (kg)	39.93	41.00	42.51	1.41	-1.075	-2.586	-1.511
42-d weight (kg)	53.40	56.76	57.61	2.60	-3.361	-4.214	-0.853
ADG (kg)	0.33	0.38	0.37	0.05	-0.050	-0.042	0.008

T=Traditional dry period (56 day); M =Moderate dry period (42 day); S=Short dry period (35 day)

* $P<0.05$.

** $P<0.01$.