



## RESEARCH ARTICLE

### Effect of Long Term Administration of Frozen and Fermented Colostrums of Vaccinated Cows on Performance and Prevention of Neonatal Calf Diarrhea

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#### ABSTRACT

Diarrhea in calves under 30 days of age is one of the most common syndromes. In order to present a useful and convenient method for reduction of calf diarrhea, thirty newborn Holstein calves, with normal parturition, were divided randomly into three equal groups (T1, T2 and Control (C)). Calves weighing 31-40 kg and more than 40 kg at birth were respectively offered 2 and 2.5 kg of vaccinated cow's colostrum immediately after birth and the same amounts 4-6 hours later. All calves were fed milk twice daily. Both groups T1 and T2, were fed once daily, 0.8-1 kg of respectively thawed and natural fermented colostrums diluted with 1-1.2 kg cow milk from 2<sup>nd</sup> to 30<sup>th</sup> day of their life. Ten calves of Group C were fed only 1.8-2.5 kg warm milk in each meal everyday. Calves were weighed at 0, 10<sup>th</sup>, 20<sup>th</sup> and 30<sup>th</sup> day after birth. Incidence and severity of diarrhea were recorded based on current landmarks. Totally 143 cases of diarrhea recorded. The cumulative incidence rate of diarrhea was significantly ( $P < 0.05$ ) lower in group T1 (27.9%) and group T2 (29.35%) when compared with group C (42.8%). Little differences in average daily weight gain were recorded and weight gain for 0-30 days, were similar for two treatments. The calves given colostrum daily were less affected by squirt. Not only incidence but also severity of diarrhea in groups T1 and T2 was significantly less than in group C ( $P < 0.05$ ). Although the incidence of scours in group T1 was less than group T2, this difference was not significant ( $p > 0.05$ ).

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#### INTRODUCTION

Neonatal calf diarrhea is one of the most common problems, which large animal clinicians encounter in practice (Diggle, 2007; Nasir *et al.*, 2009). Laiblin *et al.* (1989) after 6 years investigation in the "Klinik für Klauentierkrankheiten" reported the incidence of the disease varied each year between 19% and 48% with a mortality rate up to 3%. Svensson *et al.* (2003) reported that incidence rate of diarrhea in calves of dairy herds in the south-west of Sweden was 3.5%, cases per calf-months at risk. Acha *et al.* (2004) in a survey in Mozambique reported nevertheless, overall prevalence of diarrhea was low (5.1%) but 2 farms had high prevalence (13 and 21%). It is appeared bovine rotavirus and coronavirus to be the major cause of neonatal calf diarrhea (Murakami, 1986; Archambault *et al.*, 1988; Besser and Gay, 1993; Duman and Aycan, 2010). Diarrhea is still the

significant cause of economic losses in cattle herds (Wyatt *et al.*, 2010). Larson and Pierce (1998) revealed that calves which involved with diarrhea before 28<sup>th</sup> day of life weighed 16.0 kg less than calves that remained healthy. Salman *et al.* (1991) reported that diarrhea morbidity in calves during period of birth to weaning had a mean of 28.8%. They considered various diarrhea morbidity rates for different farms varied from 0.1 to 59.6% of calves (mean: 14.5%). Since calves are -from the moment just after birth- on exposed to these environmental pathogenic agents, passive immunity through colostrum is of major importance to protect them from diarrhea (Quigley, 2007). Newborn calves have very low concentration of serum immunoglobulins (Igs) at birth, but have the ability to absorb Igs from the colostrum during the first 24h of life (Besser and Gay, 1993). The present study was undertaken to provide a useful and convenient method for prophylaxis and/or reduction of

diarrhea by daily feeding of natural frozen colostrum during the first month of calves life.

## MATERIALS AND METHODS

This study was carried out from July to September on Rezaei Farm, Tehran, Iran. Thirty apparently healthy newborn Holstein calves randomly were divided into three equal groups (T1, T2 and control). Calves with 31-40 kg and >40 kg at the birth time were fed with 2 and 2.5 kg of colostrum, respectively (immediately after birth and the same amount 4-6 hours later). First time colostrum was fed by bottle. The calves were taken away from their dams and kept individually on cubicles. All received 1.5-2 L cow milk twice daily for first week, and then it increased slowly to 2-2.5 L per meal reaching to 4<sup>th</sup> week.

From 14<sup>th</sup> day, calf starter and fresh water were also available ad libitum to animals. All cows were vaccinated one and two weeks before parturition with "scour guard" vaccine manufactured by Beecham Animal Health Smithkline, America (included: inactive Rotavirus and Coronavirus and Escherichia coli k99 bacterin). Ten days before trial begins, first, second and third colostrum were collected from all cows (except cows with mastitis or retained placenta). Collected colostrum was divided into 2 L containers and placed in -20°C freezers and kept at least for 10 days. All frozen colostrums were thawed, warmed to 37°C before feeding to group T1. For group T2 collected colostrum allowed to be naturally fermented at environmental temperature for 1 week before using. Both groups T1 and T2, were fed once daily, 0.8-1 kg of respectively thawed and natural fermented colostrums diluted with 1-1.2 kg cow milk from 2<sup>nd</sup> to 30<sup>th</sup> day of their life. Ten calves of Group C were fed only 1.8-2.5 kg warm milk in each meal everyday. Calves were weighed at 0, 10<sup>th</sup>, 20<sup>th</sup> and 30<sup>th</sup> day after birth. Cumulative incidence and severity of diarrhea were recorded according to the parameters such as consistency of feces, duration of diarrhea (from first sign of diarrhea to recovery), skin fold (for evaluation of degree of dehydration) and ability to stand and suck (for metabolic acidosis assessment). Treatment of diarrhea was similar across groups, depending on the clinical condition of calves. If deemed necessary, calves were treated with electrolytes and /or antibiotics. Severity of diarrhea was categorized to: Mild: standing, strong sucking reflex and clinical dehydration (0-5%); Moderate: standing, weak suck reflex and 5-10% dehydration; Severe: recumbency (sternal or lateral) and >10% dehydration. Statistical analysis was made by T-test for comparison of gained weight and test of independence for cumulative incidence and severity of diarrhea (SPSS for Windows, Version 15.0).

## RESULTS

A total of 143 cases of diarrhea were recorded. The cumulative incidence rate of diarrhea was significantly ( $P<0.05$ ) lower in group T1 and group T2 when compared with group C. The average duration of diarrhea in group C ( $3.5\pm 1.3$  days) was significantly higher than both experimental groups ( $P<0.05$ ) (Table1). Severity of

diarrhea in group T1 had the lowest percentages of cases among all groups ( $P<0.05$ ) (Table 2).

**Table 1:** Incidence rate and duration of diarrhea in calves from birth to 30<sup>th</sup> day of life

Groups	Incidence of diarrhea (%)	Duration (day)
T1	27.9*	2.8±1.5*
T2	29.3*	2.6±0.9*
C	42.8	3.5±1.3

\* $P<0.05$  (vs. control)

**Table 2:** Percentage of diarrhea Severity in different groups, from birth to 30<sup>th</sup> day of life

Groups	Mild	Moderate	Severe
T1	22.1*	5.8*	0*
T2	23.2*	6.1*	0*
C	32.5	8.1	2.3

\* $P<0.05$  (vs. control)

Little differences in daily average weight gain were recorded and weight gain for 0 to 30<sup>th</sup> day, were similar for three groups. The weights of all calves at the birth were about 37.7-38.5 kg (SD: 1.8-3.4). Although body weight gain in each three times (10<sup>th</sup>, 20<sup>th</sup> and 30<sup>th</sup> days) especially on days 10 and 20, is higher for groups T1 and T2, in comparison with group C, the differences were not significant.

## DISCUSSION

Humoral immunity to infections with enteropathogens such as bovine rotavirus, is limited to the intestinal epithelium, requires the presence of specific antibody in the intestinal lumen of neonatal calves (Besser, 1993; Trotz-Williams *et al.*, 2008). Serum derived antibodies generally play a minor role, and there is usually little correlation between serum antibodies and infection (Donovan *et al.*, 1998). Although, Besser (1993) demonstrated that proteolytic enzymes in the intestinal lumen degraded all of the intestinal IgG-1 (after 12 hr) but it is mentioned that there is no change in the level of colostrum Igs after freezing (Klobasa *et al.*, 1998; Holloway *et al.*, 2001; Argüello *et al.*, 2003). Therefore, because prolonged administration of frozen colostrum is practical, economical and reliable it may assist in reducing the incidence and severity of infectious diarrhea because of local immunity. The fact that viral-induced diarrhea develops infrequently before but it is common after 5th day of life, in this time concentration of antibodies declines to the point that calves are not protected by maternal antibodies. Even cows that have high amount of colostrum antibodies at parturition are deficient by day 5 or 6 after parturition (Larson and Pierce, 1998; Poulsen *et al.*, 2010). Therefore, continued ingestion of colostrum containing adequate levels of specific antibodies, provides sufficient local intestinal immunity against neonatal diarrhea for as long as colostrum is fed (Berge *et al.*, 2009; Parreñoa *et al.*, 2010). Administration of colostrum as soon as possible after birth could prevent diarrhea caused by enterotoxigenic *E. coli* while prolonged administration will protect from rota and coronavirus diarrhea as well (Ozpinar *et al.*, 1996; Larson and Pierce, 1998; Parreñoa *et al.*, 2010). Body weight gain follow

passive protection from diarrhea via prolonged feeding of colostrum or purified Ig, is a controversial issue among the researchers. Our results, in accordance with Foley and Otterby (1979) and Maidment (1981), indicate no significant difference in body weight gain between calves given frozen and fermented colostrums and controls fed on milk. Furthermore, Saif and Smith (1985) reported that daily consumption of colostrum may provide an increase in local passive immunity of intestine but weight gain was not affected by this method. On the other hand, Erhard *et al.* (1993) and Ozpinar *et al.* (1996) and Ikemori *et al.* (1997) reported the calves which received Egg-yolk antibodies during the first 14 days of life, showed significant improvement in body weight gain.

It could be concluded that long term administration of both frozen and fermented colostrum of vaccinated cows are of benefit in reducing the incidence rate of diarrhea and reduction of economic costs of treatment and management. So the results of this study are also of great value for undeveloped countries with poor hygienic conditions where undifferentiated diarrhea is fairly common and that may have difficulties in providing enough financial resources.

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