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Short Article

Therapeutic Effect of Fermented Colostrum on Calf Diarrhea Syndrome

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ABSTRACT

Diarrhea in newborn calves under 30 days of age is one of the most significant cause of economic losses and pervasive concern in veterinary industry all around the world and infectious agents are the most commonly detected causes of calf diarrhea. In order to present a useful and convenient method for treatment of calf diarrhea, we evaluate the therapeutic effect of fermented colostrum on calf diarrhea syndrome. Thirty newborn Holstein calves, with diarrhea, were divided randomly in two equal groups (test and control). Both group of calves were received routine treatment protocol in the farm, furthermore calves in test group were fed once daily to 3 days, 300 mL naturally fermented colostrum. Vital signs (heart rate, respiratory rate and rectal temperature) and clinical scores (demeanour, mobility, dehydration, suckle reflex, feed intake (appetite) and stool consistency) were checked in all calves for 4 days. The results of the present study showed that the use of fermented colostrum along with treatment protocols can accelerate the return of fecal consistency and feed intake of calves with diarrhea to normal and relieving dehydration.

Keywords: Calves, Diarrhea, Fermented colostrum

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INTRODUCTION

Diarrhea in newborn calves under 30 days of age is one of the most significant cause of economic losses and pervasive concern in veterinary industry all around the world and infectious agents especially Rotavirus, Coronavirus and *Escherichia coli* are the most commonly detected causes of calf diarrhea (Constable *et al.,* 2017). Numerous observational studies have been carried out to document morbidity and mortality rates of calf diarrhea in different parts of the world (Salman *et al*., 1991; Svensson *et al*., 2003; Acha *et al*., 2004). In Iranian Holstein dairy herds, disorders of the digestive tract as the first most frequent, accounted for 58% (95% CI: 52–64%) of deaths of calves under 90 days of age (Azizzadeh *et al.,* 2012). Concentration of serum immunoglobulins in newborn calves is very low, but they have the ability to absorb immunoglobulins from the colostrum during the first 24h of life (Besser, 1993). As calves are on exposed to these environmental pathogenic agents from the moment just after birth, passive immunity through colostrum plays a vital role to protect them from diarrhea (Quigley, 2002). Today, in the dairy industry, the production of large amounts of postpartum colostrum is one of the problems. Fermented colostrum is a special form of colostrum that due to its abundant lactobacilli, significant amount of immunoglobulin and acidic pH can reduce the risk of diarrhea and weight gain in calves (Pourjafar *et al.,* 2011; Saalfeld *et al.,* 2013). The aim of this study was to evaluate the therapeutic effect of this fermented product on calf diarrhea syndrome.

MATERIALS AND METHODS

This study was carried out on Taliseh Nemuneh farm, Shahriar, Tehran, Iran (Latitude: 35°39'32" N; Longitude: 51°3'28" E; Altitude (elevation), in meters: 1159). Thirty newborn calves less than one month suffering from diarrhea, randomly were picked out and divided in two equal groups (test and control groups). Calves with 28-48 Kg at the birth time were fed 4-6 Kg Colostrum during 6 first hours after birth. These calves were given 5-8 Kg cow milk, twice a day and from 5th day, calf starter and fresh water were also available. 15 L colostrum with density 1.45 from 7 cows were collected. Then colostrum was divided in two equal volumes in two containers and allowed to be fermented naturally at environmental temperature (away from direct sunlight, temperature: 5-25 Cº, relative humidity: 71-86%) for two weeks before using. Both group of calves were received routine treatment protocol (as soon as seeing diarrhea in calves), on the first day the amount of milk a day was halved, about 2 liters of oral rehydration solution (ORS) composition was placed in animal bucket of water and 5 cc and Vitamin AD3 & E intramuscularly and 25 cc Sulfadimidine 33.3% orally were used. Sulfadimidine was used for 3 days and if there is no improvement, injectable antibiotics such as enrofloxacin were used. furthermore, calves in test group were fed once daily to 3 days, 300 mL fermented colostrum. Vital signs (heart rate, respiratory rate and rectal temperature) and clinical scores (demeanour, mobility,

dehydration, suckle reflex, feed intake (appetite) and stool consistency) which ranges from 0 to 18 (Table 1; adapted from Dillane *et al.,* 2020)., were checked in all calves for 4 days. Clinical scores were categorized to: 0: clinically normal, 1: mild, 2: moderate and 3: severe condition. All data presented as mean (±SEM) and were compared between groups with an independent-samples t test using the SPSS 21.0 program. Values of $P < 0.05$ were considered significant.

Table 1: Registration table of clinical scores for neonatal calf diarrhea

Score	0 Clinically normal	1 Mild	2 Moderate	3 Severe
Demeanour	Bright, alert, responsive	Dull, fairly responsive	Dull, depresses, less responsive	Dull, markedly depresses, unresponsive
Mobility	Active mobile and able to stand by itself	Standing up and walking independently after encouragement	Capable of standing and walking after lifting	Sternal recumbency (Lying down but unable to stand)
Dehydration	Clear bright eyes	Eyes slightly sunken	Eyes Moderately sunken	Eyes sunken
Suckle reflex	Strong suckle reflex	Diminished suckle reflex	Weak suckle reflex	Chewing suckle reflex
Feed intake (Appetite)	Feeding well	Slow to drink and may not finish what is offered	Reduction in feed intake (not finishing what is offered)	Not feed intake (not taking any of what is offered)
Stool Consistency	Normal	Semi-formed, pasty	Loose but stays on top of bedding	Watery, sifts through bedding

RESULTS AND DISCUSSION

As we know, this is the first study which evaluates the therapeutic effect of fermented colostrum on calf diarrhea syndrome. Based on our results, no significant differences were observed between groups for the vital signs including the mean heart rate, respiratory rate and rectal temperature (Table 2). The mean stool consistency, feed intake, dehydration and demeanour scores were lower in test compared with the control group but only the mean stool consistency was significantly different in the day 4 (P <0.05, Table 2). Also the score of sucking reflex was 0 in two groups every four days (Table 2).

As can be seen, calves that were fed with fermented colostrum in addition to treatment protocols had fewer clinical scores than the control group in days 2,3 and 4 (significantly different in the day 4, P <0.05, Figure 1), which could indicate the

positive effect of using fermented colostrum as a lactobacilli and immunoglobulin source along with treatment protocols.

Table 2: The clinical scores and vital signs (Mean ± SEM) in control and test group in the days 1, 2, 3 and 4

Parameter	Group	1st day	2nd day	3rd day	4th day
Demeanour	Test	0.8±0.2	0.4±0.16	0.13±0.09	0.0±0.0
	Control	0.8±0.2	0.8±0.2	0.46±0.16	0.06±0.06
Mobility	Test	0.2±0.08	0.06±0.06	0.0±0.0	0.0±0.0
	Control	0.2±0.08	0.06±0.06	0.0±0.0	0.0±0.0
Dehydration	Test	0.93±0.06	0.4±0.13	0.26±0.08	0.06±0.06
	Control	1.0±0.11	0.73±0.15	0.46±0.16	0.2±0.09
Suckle reflex	Test	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
	Control	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
Feed intake (Appetite)	Test	0.66±0.12	0.33±0.09	0.0±0.0	0.0±0.0
	Control	0.73±0.18	0.53±0.11	0.33±0.08	0.06±0.06
Stool Consistency	Test	1.86±0.9	0.86±0.16	0.4±0.16	0.8±0.2
	Control	1.8±0.1	1.1±0.13	0.8±0.24	0.46±0.16
Heart rate	Test	126.8±2.9	128.8±3.3	126.4±2.1	121.8±2.0
	Control	128.7±3.5	130.3±4.8	126.7±3.7	125.8±2.3
Respiratory rate	Test	36.8±1.2	37.0±1.4	31.7±0.7	30.9±1.0
	Control	35.4±1.7	39.3±2.6	32.1±1.4	30.3±1.2
Rectal temperature	Test	39.3±0.8	39.1±0.5	39.0±0.5	38.9±0.4
	Control	39.2±0.7	39.1±0.5	39.0±0.7	39.0±0.5

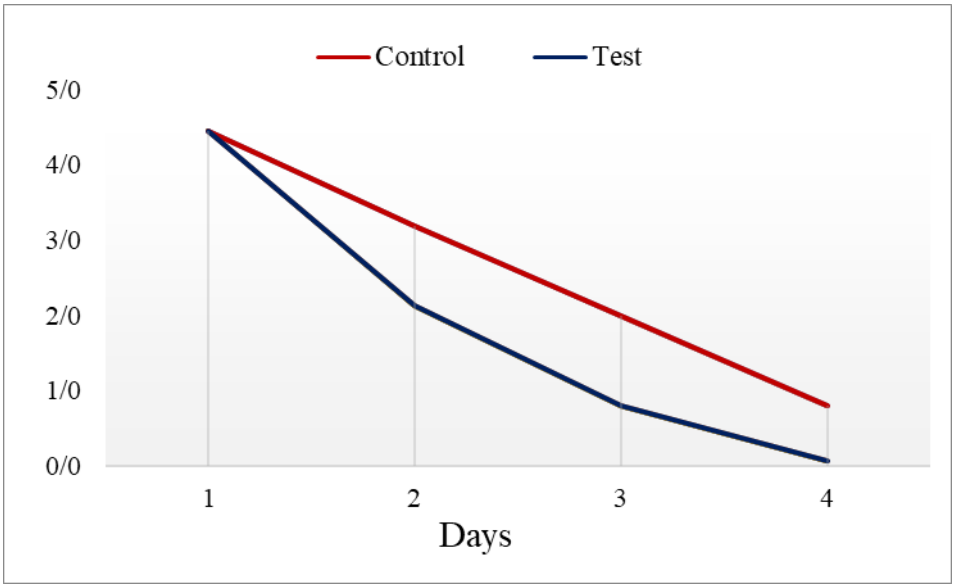

Figure 1: ***Changes in clinical scoring*** **(Mean)** ***of calves with diarrhea*** **in control and test group in the days 1, 2, 3 and 4.**

In young calves, *Lactobacillus*, is the most important genus found in the gastrointestinal tract and faeces (Rada *et al.,* 2006) and have the ability to inhibit the growth of gram-positive and gram-negative pathogens such as *Salmonella* spp. and *Escherichia coli* (Saalfeld *et al.,* 2016) which are the most frequent bacterial etiologic agents in calf scours during the first week of life (Millemann, 2009). The use of probiotics in young calves can prevent pathogen colonization of the digestive tract (Fuller, 1989) and so, significantly reduce the incidence of diarrhea in young calves (Signorini *et al.,* 2012). On the other hand, oral administration of colostrum might provide local immunity in the gastrointestinal tract of calves, thereby reducing frequency and/or preventing the occurrence of diarrhea (Chung *et al.,* 2018). In 2011, Pourjafar et al. examined the effect of fermented colostrum on growth status and the rate of diarrhea prevention in Holstein calves. In this study, it was found that the use of fermented colostrum in calf nutrition can significantly prevent diarrhea and reduce the consistency of feces. The results of the present study showed that the use of fermented colostrum along with treatment protocols can accelerate the return of fecal consistency and feed intake of calves with diarrhea to normal and relieving dehydration.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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