Int.J.Curr.Microbiol.App.Sci (2022) *11*(06): 304-307

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 11 Number 06 (2022)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2022.1106.034

Efficacy of Multigluconeogenic Precursor Supplementation on Augmenting Blood Glucose and Milk Yield in Postpartum Dairy Cattle

Deepak Kumar* and Sumit Singh Chauhan

Carus Laboratories Pvt. Ltd, Karnal, Haryana, India

**Corresponding author*

Keywords

Glucose, Gluconeogenic precursors, Postpartum, Milk Yield

Article Info

Received:
03 May 2022
Accepted:
28 May 2022
Available Online:
10 June 2022

A B S T R A C T

The objective of present study was to evaluate the efficacy of multi-gluconeogenic precursor supplementation (Bovicharge®**,** M/S Carus Laboratories Pvt. Ltd., contains multi-gluconeogenic precursors namely propylene glycol, glycerol and sodium propionate) on blood glucose concentrations and milk yield in postpartum cross bred cows. Ten days prior to expected calving, 20 cows were randomly assigned to either control group (n=10) orthe treatment group (n=10). Cows in the control group were fed ration without any supplementation, while ration of cows enrolled in the treatment group were supplemented with 400 ml of the mixture of multi-gluconeogenic precursors **(**Bovicharge®**)** on the day of calving and thereafter 200 ml once orally per day for three consecutive days after calving. Blood samples by jugular venipuncture were obtained from each cowat one week prior to the expected day of calving, on the day of calving and on 2nd, 4th and 6th days postpartum for estimation of blood glucose. Daily milk production was also recorded on the day of calving, and on 2nd, 3rd, 5th and 7th days after calving. It was observed that treatment group cows (Bovicharge®treated cows) had higher blood glucose levels at all the postpartum observations. The milk production on 7th day of calving was significantly higher in cows of the treatment group compared to control group. Hence, it is concluded that feeding of recommended dosage of mixture of multi-gluconeogenic precursors at the time of calving improved blood glucose level and the milk production, and may also help in prevention of ketosis in postpartum dairy cows.

Introduction

The transition period is the most critical stage for dairy cattle due to its relevance in health, production & cow profitability. During this period, the feed intake decreases due to reduced rumen capacity during late gestation period owing to rapid fetal growth, low post-calving appetite. On the other hand, there is an increased nutrients requirement for colostrum and milk synthesis. These predisposes the transition cows to negative energy balance (NEB) condition. In order to minimize the NEB, the supplementation of gluconeogenic precursors in transition cows diets has received a great attention. Gluconeogenic precursors can stimulate gluconeogenesis, increase plasma glucose level, decrease lipolysis. Glycerol is an effective gluconeogenic precursor depending upon its absorption rather than ruminal fermentation to propionate and butyrate (Remond *et al.*, 1993).

Propylene glycol is another gluconeogenic product which is fermented to propionate in the rumen or absorbed and metabolized by the liver (Studer *et al.,* 1993). Propionate is the primary glucogenic substrate in the dairy cow (Drackley *et al.,* 2001). Conversion of propionate to glucose depends upon conversion to succinyl co-A before entering the Krebs cycle (Herdt, 2000). As a result, each of these compounds has a different route of conversion to glucose. Therefore, combination of gluconeogenic products may be best utilized by taking advantage of the different pathways to synthetize glucose. Propylene glycol and glycerolare used as gluconeogenic precursors. There are various studies which have investigated the effect of individual gluconeogenic precursors but limited study has been done in combination of these gluconeogenic precursors. It is hypothesized that the type, amount and duration of feeding of gluconeogenic precursors can affect the productive performances of dairy cattle. Hence, the present study was conducted to assess the efficacy of supplementation with mixture of gluconeogenic precursors (propylene glycol, glycerol and sodium propionate) on milk yield, circulatory glucose profiles in dairy cattle.

Materials and Methods

Twenty cross bred close-up healthy pregnant cows belonging to a dairy farm in Karnal district, Haryana were selected for the experiment and kept on ad-libitum chaffed, green maize and concentrate feedas per the standard nutritional requirements (ICAR, 2013). All cows were dewormed with Oxefendazoleplus Ivermectin combination anthelmintic (Havimec OX®, Carus laboratories Pvt.Ltd., India) before the start of experiment. The cows were divided into two groups viz. Treatment Group (T group, n=10) and Group control (C group, n=10). The cows of Group C were fed with standard ration without any supplementation whereas cows of Group T were drenched with formulated gluconeogenic precursors (Bovicharge®) @ 400 ml / animal/ once per day on the day of calving (after parturition); followed by 200 ml Bovicharge®per day after calving for three consecutive days. Blood samples by jugular venipuncture were obtained from each cow at one week prior to the expected day of calving, on the day of calving and on 2^{nd}, 4^{th} and 6^{th} days postpartum for estimation of blood glucose.

Daily milk production was also recorded on the day of calving, and on 2^{nd}, 3^{rd}, 5^{th} and 7^{th} days after calving. The statistical analysis of experimental data was done for calculation of results.

Results and Discussion

The blood glucose level and milk production of the 2 groups are presented in Table 1 and 2, respectively. The blood glucose levels (mg/dl) after 0, 2, 4 & 6 day of calving was found as 51.20, 52.30, 55.30 & 57.90 for control group while treatment group had 50.70, 62.60, 72.30 and 72.40. The treatment group showed significantly higher blood glucose levels. The average milk production (kg/day**)** recorded on day of calving as well as day 2, day 3, day 5 and 7^{th} day postpartum was 15.00, 15.70, 16.10, 16.50 and 17.00 for control group cows while treatment group was 16.5, 17.31, 17.95, 18.65 and 20.40. It was observed that cows supplemented with Bovicharge®had higher blood glucose levels from day 2 postpartum onwards. The milk production of Bovicharge®treated animals improved significantly on 7^{th} day of calving as compared to control.

The blood glucose levels (mg/dl) on 0, 2, 4 and 6th day of calving were found to be higher in the supplemented group by 19.69%, 30.74% and 25.04%in comparison to the control group, respectively. The higher blood glucose in the treatment group is due to the gluconeogenesis of the multi gluconeogenic precursors given to the cows as reported in previous studies (Harper *et al.,* 1979; Grummer *et al.,* 1994; Mikula *et al.,* 2020) which indicated that supplementation of propylene glycol increases circulatory glucose profiles in dairy cows.

Table.1 Blood glucose concentrations (Mean±SEM; mg/dl) in dairy cows.

Day of sampling	Control (n=10)	Treatment (n=10)
One week prior to expected day of calving	56.60±2.97	55.30±2.31^{a}
Day of calving	51.20±2.37	50.70±2.27^{a}
Day2postpartum	52.30±1.86^{A}	62.60±1.95^{bB}
Day 4postpartum	55.30±1.18^{A}	72.30±2.52^{cB}
Day 6postpartum	57.90±2.17^{A}	72.40±1.75^{cB}

a:b (P<0.05) indicate significant difference between days of sampling
A:B (P<0.05) indicate significant difference between groups

Table.2 Daily milk production (Mean±SEM; kg/day) of dairy cows.

Day of sampling	Control (n=10)	Treatment (n=10)
Day of calving	15.0±1.00	16.5±0.85^{a}
2days after calving	15.7±1.03	17.31±0.80^{ab}
3 days after calving	16.1±0.89	17.95±0.88^{ab}
5 days after calving	16.5±0.92	18.65±0.86^{ab}
7 days after calving	17.0±0.83^{A}	20.4±0.79b^{B}

A: b (P<0.05) indicate significant difference between the days of sampling.
A: B (P<0.05) indicate significant difference between the groups.

In the present study, milk production increased significantly in the cows of treatment group by 10%, 10.25%, 11.49% and 20% compared to the control group on days of calving, day 2, day 3, day 5 and the day 7 postpartum, respectively. This finding corroborates with earlier observation of higher milk production (2.0 kg/day) by supplementation of combination of multi-gluconeogenic precursors (calcium propionate, propylene glycol and glycerol) compared tonon-supplemented cows (Melendez *et al.*, 2018).

The milk production of cows in the present study after 7 days of calving increased by 23.63% in the treatment group compared to the 13.33% in control group. This indicates that the supplementation of the multi-gluconeogenic precursors group leads to peak in lactation earlier than control group. This may be due to their combined interaction effects. Propylene glycol modifies ruminal fermentation by decreasing acetate to propionate ratio which indicates production of propionic acid (Christensen *et al.*, 1994; Grummer *et al.*, 1994).

The formulated gluconeogenic precursorsis effective incountering the negative energy balance condition. Supplemented ration with formulated gluconeogenic precursors (Bovicharge) during the transition period could be effective strategy for improving milk production in dairy animals. In conclusion, Bovicharge with three gluconeogenic precursors improved milk yield and maintained a moderate energy status during the transition period of crossbred dairy cows.

References

Christensen J O, Grummer R R, Rasmussen F E, Bertics S J. 1997. Effect of method of delivery of propylene glycol on plasma metabolites of feed-restricted cattle. J Dairy Sci. 80:563–568.

Drackley J K, Overton T R, Douglas G N. 2001. Adaptations of glucose and long-chain fatty acid metabolism in liver of dairy cows during the periparturient period. J Dairy Sci. 84(E. E100–E112.

Grummer, R. R., J. C. Winkler, S. J. Bertics, and V. A. Studer. 1994. Effect of propylene glycol dosage during feed restriction on metabolites in blood of prepartum Holstein heifers. J. 77:3618.

Herdt T H. 2000. Ruminant adaptation to negative energy balance. Influences on the etiology of ketosis and fatty liver. Vet Clin North Am Food AnimPract. 16:215–230.

Mikuła, Robert & Pruszyńska-Oszmałek, Ewa & Kołodziejski, Paweł and W., Nowak. (2020). Propylene Glycol and Maize Grain Supplementation Improve Fertility Parameters in Dairy Cows. Animals. 10. 1-11. 10.3390/ani10112147.

Remond B, Souday E, Jouany J P. 1993. *In vitro* and *in vivo* fermentation of glycerol by rumen microbes. Anim Feed Sci Tech. 41:121–132.

Studer V A, Grummer R R, Bertics S J, Reynolds C K. 1993. Effect of prepartum propylene glycol administration on periparturient fatty liver in dairy cows. J Dairy Sci. 76:2931–2939.

How to cite this article:

Deepak Kumar and Sumit Singh Chauhan. 2022. Efficacy of Multigluconeogenic Precursor Supplementation on Augmenting Blood Glucose and Milk Yield in Postpartum Dairy Cattle. *Int.J.Curr.Microbiol.App.Sci.* 11(06): 304-307. doi: https://doi.org/10.20546/ijcmas.2022.1106.034