Indian Journal of Animal Sciences **93** (3): 276–278, March 2023/Short Communication
https://doi.org/10.56093/ijans.v93i3.124297

Evaluation of health status of Kankrej cattle using mini compton metabolic profile test and correlation with production status

ANKIT PRAJAPATI[1]✉, HARSHAD PANCHASARA[2], ABHINAV SUTHAR[1], ARTH CHAUDHARI[1], SARITA DEVI[1] AND RAMESHCHANDRA PATEL[1]

Kamdhenu University, Sardarkrushinagar, Gujarat 385 506 India

Received: 27 May 2022; Accepted: 6 February 2023

Keywords: Cattle, Kankrej, Mini compton metabolic profile, Production

Production disease around parturition in cattle remains collective issue all the time. Per parturient diseases have high influence in impairment of dairy performance (Chapinal *et al.* 2012, Van Saun 2016). High production and recent intensive husbandry practices are dynamic criteria for development of metabolic diseases in cattle (Haq *et al.* 2016). Metabolic profiling of particular animal and particular herd is need of the hour to diagnostic process for screening to support in endorsing herd disease process (Bhadauria *et al*. 2020). The compton metabolic profile test (CMPT) was designed by Payne *et al*. (1970) to monitor the metabolic health of the herd. CMPT is a traditional approach for metabolic profiling of representative sample from the herd. The main objective of CMPT is to indicate whether a herd is sensitive to production disease or not. CMPT can give signal of primary cause in the herd with high incidence of production diseases (Payne *et al.* 1970). The test was designed to monitor the metabolic health of cows in dairy herds in relation to husbandry, nutrition, milk production and disease incidence, and to assist in the diagnosis of metabolic problems. To overcome this problem, mini compton metabolic profile (MCMP) was developed by Blowey (1972). MCMP is a modified test used to measure less parameters to evaluate the health status in herd. Cost of the test is also less (Blowey 1975). Blood metabolites have direct impact on milk production of dairy animals. The test is carried out to assess the adequacy of protein and energy intake, and to optimize nutrition for maximum production (Blowey *et al.* 1973).

Kankrej breed of cattle was previously used as draught purpose. Now-a-days, it has been adopted for milch purpose also. There is mearge documentation about metabolic profiling of indigenous breed. So, the present study was aimed to determine the metabolic status of Kankrej cattle and correlation of metabolic status with production performance after adaptation from draught to milch purpose. Present study was conducted at Livestock Research Station, Sardarkrushinagar. Blood samples were collected from 60 advanced pregnant Kankrej cattle aged between four to seven years. Blood was collected aseptically early in the morning between 06:00 AM to 08:00 AM. Two milliliter blood was collected in K_2EDTA vial for estimation of different parameters as per Blowey (1972). Blood collection was done thrice at dry period, early lactation and mid lactation. Additionally beta hydoxy butyric acid (BHBA) was measured from six animals. Statistical analysis was done using one way repeated measure ANOVA in Graphpad v 9.3.1.

Transition period is most critical in dairy cows from late gestation to early lactation. Most of metabolic adaptation occurs during this period. Seven parameters at three different intervals from blood and serum were estimated (Table 1). Values of packed cell volume, hemoglobin and red blood cells decreased significantly after parturition and returned near to normal at mid lactation period (Supplementary Figs 1-3). Decrease in these values was due to loss of fluid and blood during parturition. White blood cells deviates around parturition which is a common physiological phenomenon with multiple contributing factors (Arbib *et al*. 2016). Increased level of white blood cells was observed immediately after parturition which further reduced and came near to normal during mid-lactation period (Supplementary Fig. 4). High white blood cells count might be due to more susceptibility of animal towards infection during this period.

Energy balance is one of the most critical nutritional factors impacting on animal health and lactation. Glucose can be considered as an indicator of energy status in early lactation or in mid lactation period (Van Saun 2006). Glucose is also used in process of milk production. In present study, glucose level decreased significantly in early lactation period due to utilization of glucose in milk production (Fig. 1). Further reduction in glucose value was observed in mid-lactation period. Reduction of glucose

Present address: [1]College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat. [2]Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. ✉Corresponding author email: ankitprjpt1@gmail.com

Table 1. Changes in various parameters in dry period, early lactation and mid lactation period of Kankrej cattle

Parameter	(n=60)						
	PCV (%)	Hb (g/dl)	RBC (10^6/µL)	WBC (10^3/µL)	Glucose (mg/dL)	BUN (mg/dL)	Albumin (g/dL)
7-10 days before parturition (DP)	32.13±0.60^b	11.44±0.21^b	6.85±0.15^b	8.55±0.41^a	69.12±1.12^c	26.02±2.82^c	3.17±0.07^c
10-20 days after parturition (EL)	29.65±0.42^a	10.44±0.16^a	6.33±0.10^a	10.49±0.64^b	64.07±1.44^b	25.20±2.72^b	2.95±0.06^b
50-120 days after parturition (ML)	35.17±1.08^c	11.11±0.31^b	7.15±0.22^c	8.33±0.24^a	60.60±1.92^a	13.88±0.54^a	2.77±0.04^a

Superscript with different value vary significantly, $p<0.005$.

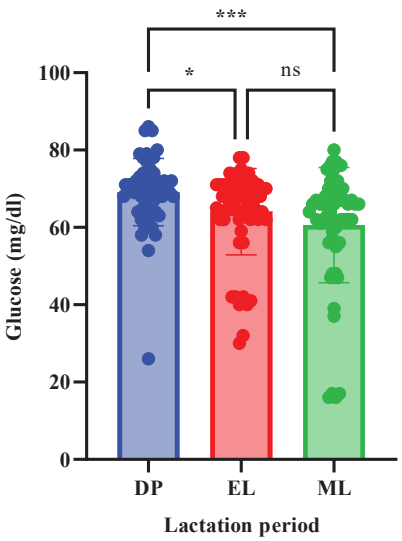

Fig. 1. Alteration in glucose level in DP, EL and ML period.

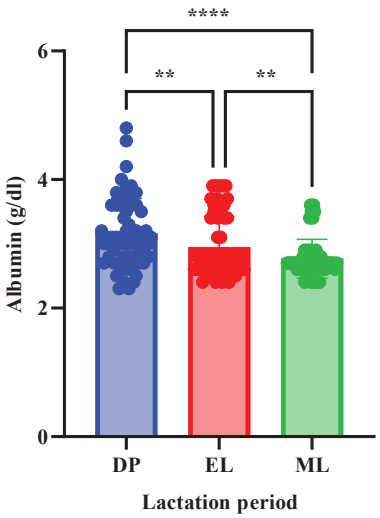

Fig. 2. Alteration in albumin level in DP, EL and ML period.

level in this period might be due to peak milk production in animals. There are a number of non-nutritional factors that elevate the glucose levels like stress excitement, severe cold and other therapy (Lohrenz *et al.* 2010, Parmar *et al.* 2015). Glucose level in all three lactation period was slight higher than the normal value which shows the superior genetic make-up of indigenous cattle. Similar findings were also reported by Prakash *et al.* (2018) and Das *et al.* (2014).

Another parameter useful in assessing energy status is ketone body concentration. The ketone body β-hydroxybutyrate (BHBA) is synthesized in the liver from fatty acids and represents an essential carrier of energy from liver to peripheral tissues when the supply of glucose is too low for the body's energy requirements, such as during prolonged exercise, starvation, or absence of dietary carbohydrates (Newman and Verdin 2017). Non-significant increase was observed in early lactation period (Supplementary Fig. 5). However, during different lactation period, BHBA value was within the normal range which shows efficiency of Kankrej cattle to regulate the glucose metabolism even at stress condition.

Albumin value indicate the long term protein status in animal and associated with disease process. Reduction in albumin level was noted in early lactation period as well as mid lactation period (Fig. 2). Reduction in albumin level indicates great stress on cows for milk production (Piccione *et al.* 2011). Albumin level plays an important role in determining animal health since it decreases when inflammation occurs and also can be affected by liver disease (Rossato *et al.* 2001). Regmi *et al.* (2020) reported similar findings from jersey cattle. Further study can be done to estimate other parameters like total proteins, α1-globulins, β-globulins, γ-globulins and albumin/globulin ratio to know more information regarding dehydration, plasma volume expansion and hepatic function occurring during the peri-

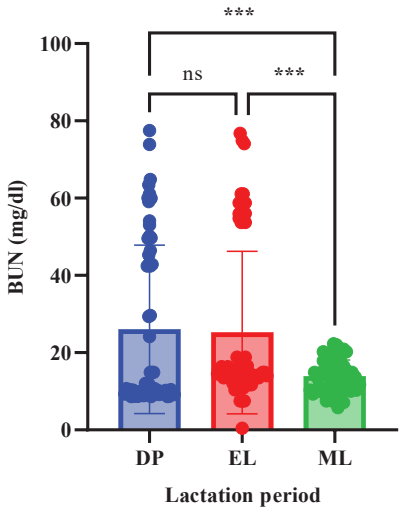

Fig. 3. Alteration in blood urea nitrogen level in DP, EL and ML period.

partum period in dairy cows. Blood urea nitrogen is used to measure the efficiency of kidney functions like water and electrolyte balance. Significant decrease in blood urea nitrogen was observed in the present study during early and mid-lactation (Fig. 3). BUN level and its association with milk production is still controversial. Blood urea nitrogen is a good indicator of concentration of rumen ammonia, and this is related closely to intake and solubility of the nitrogen-containing compounds fed (Sulieman *et al*. 2017).

Data of milk production was also recorded at the time of blood collection on the same day. Production values at early lactation and mid lactation was compared with the blood metabolite i.e. glucose, blood urea nitrogen and albumin (Supplementary Table 1). Albumin and blood urea nitrogen showed negative correlation whereas glucose showed positive correlation with milk production during early lactation period. However, the correlation was non-significant. In mid lactation period, significant positive correlation was observed with albumin and blood urea nitrogen whereas significant negative correlation was observed with glucose value and with milk production.

SUMMARY

The present study aimed to assess the changes in metabolite after adaptation of Kankrej breed of cattle from draught to milch purpose. The result showed the resistance power of alteration in metabolic values even after adaptation. Metabolic parameters can be measured to evaluate the health status of individual animal in herd by using mini compton metabolic profile test. Feeding management can be adjusted as per the data of metabolic profile to avoid incidence of metabolic diseases. Indigenous cattle breed is tough enough which resist the alteration in different metabolic parameters.

ACKNOWLEDGEMENT

Author acknowledge the Principal of Veterinary College, Sardarkrushinagar for providing necessary facilities for the present study.

REFERENCES

Arbib N, Aviram A, Gabbay Ben-Ziv R, Sneh O, Yogev Y and Hadar E. 2016. The effect of labor and delivery on white blood cell count. *Journal of Maternal-Fetal & Neonatal Medicine :Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians* **29**(18): 2904–08.

Bhadauria P, Lathwal S S, Jadoun Y S and Gupta R. 2020. Metabolic profiling of normal and lame Karan fries cows and its association with lameness during transition period. *Journal of Animal Research* **10**(3): 375–82.

Blowey R W. 1972. Metabolic profiles-some aspects of their interpretation and use in the field. (Eds) Grunsell and Hill. *The Veterinary Annual*, pp. 21–30.

Blowey R W. 1975. A practical application of metabolic profiles. *Veterinary Rec*ord **97**: 324–27.

Blowey R W, Wood D W and Davis J R. 1973. A nutritional monitoring system for dairy herds based on blood glucose, urea and albumin levels. *Veterinary Record* **92**: 691–96.

Chapinal N, Leblanc S J, Carson M E, Leslie K E, Godden S, Capel M, Santos J E, Overton M W and Duffield T F. 2012. Herd-level association of serum metabolites in the transition period with disease, milk production, and early lactation reproductive performance. *Journal of Dairy Science* **95**(10): 5676–82.

Das H, Lateef A, Panchasara H, Sanap M J and Haque N. 2014. Seasonal effect on major blood biochemical parameters in kankrej cattle at different level of their productivity. *Indian Journal of Field Veterinarians* **9**: 12–15.

Haq Z, Sharma R K, Rastogi A and Khan N. 2016. Nutrition and metabolic diseases in dairy cattle-A review. *International Journal of Agricultural Sciences* **8**: 1154–59.

Payne J M, Dew S M, Manston R and Faulks M. 1970. The use of a metabolic profile test in dairy herds. *Veterinary Record* **87**(6): 150–58.

Lohrenz A K, Duske K, Schneider F, Nürnberg K, Losand B, Seyfert H M, Metges C C and Hammon H M. 2010. Milk performance and glucose metabolism in dairy cows fed rumen-protected fat during mid lactation. *Journal of Dairy Science* **93**(12): 5867–76.

Newman J C and Verdin E. 2017. β-Hydroxybutyrate: A signaling metabolite. *Annual Review of Nutrition* **37**: 51–76.

Parmar V L, Panchasara H H, Prajwalita P T, Sutariya T V, Sadhu D B and Prajapati H B. 2015. Synergism of vitamin E and selenium on oxidative stress during transition period in kankrej cattle. *Indian Journal of Veterinary Science and Biotechnology* **10**(3): 1–3.

Piccione G, Messina V, Schembari A, Casella S, Giannetto C and Alberghina D. 2011. Pattern of serum protein fractions in dairy cows during different stages of gestation and lactation. *Journal of Dairy Research* **78**(4): 421–25.

Prakash M, Pathan M, Arya J S and Lunagariya P. 2018. Assessment of glucose, total protein, albumin and cholesterol level and its correlation with milk production during different stages of lactation in indigenous and crossbred cows. *International Journal of Current Microbiology and Applied Sciences* **7**(4): 1248-56.

Regmi B, Shah M K and Pande K R. 2020. Metabolic profile of lactating jersey crossbred cattle- an evaluation study. *Intas Polivet* **21**(2): 360–62.

Rossato W, González F H D, Dias M M, Ricco D, Valle S F, Rosa V L, Conceicao T, Duarte F and Wald V. 2001. Number of lactations affects metabolic profile of dairy cows. *Archives of Veterinary Science* **6**(2): 83–88.

Sulieman M S, Makawi S E and Ibrahim K E. 2017. Association between postpartum blood levels of glucose and urea and fertility of cross-bred dairy cows in Sudan. *South African Journal of Animal Science* **47**(5): 595–605.

Van Saun R. 2006. Metabolic profiles for evaluation of the transition period. *Proc. Am. Assoc. Bov. Pract* 39.

Van Saun R J. 2016. Indicators of dairy cow transition risks: Metabolic profiling revisited. *Tierarztliche Praxis. Ausgabe G, Grosstiere/Nutztiere* **44**(2): 118–27.