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Metabolite Status of Bali Cows during the Last Trimester of Pregnancy

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Abstract. The objective of this study was to present the metabolite status especially glucose, blood urea nitrogen (BUN), and creatinine of Bali cows during the last trimester of pregnancy. The study was conducted in smallholder farms in Bantaeng. A total of 21 Bali cows in the late gestation period were enrolled in the present study. Blood samples were collected twice at two months interval from all cows in the morning via jugularis vein into evacuated vacuum tubes. After collection, a drop of sample were taken for glucose test, then the samples were kept at 4 ℃ and were centrifuged within 4 h at 1500 x *g* for 15 min to collect plasma. The plasma was then stored frozen at -20 ℃ until analyzed for BUN and creatinine. The results of this study showed that there was no significant different (P=0.5944) concentration of glucose (56.95±18.41 mg/dL vs 53.73±9.32 mg/dL) between two months interval blood collections. Similarly, concentrations of BUN and creatinine did not showing significant different (13.85±4.23 mg/dL vs 11.69 ± 6.14 mg/dL; P=0.3495), and (1.61±0.32 mg/dL vs 1.51±0.17 mg/dL; P=0.3920), respectively. In conclusion, metabolite status of Bali cows in late pregnancy was in normal line.

Keywords: Bali cows, Glucose, Blood urea nitrogen, Creatinine, Late pregnancy

1. Introduction

The late gestation diet has been shown to play a critical role in modulating a cow's predisposition to periparturient health disorders [1]-[3]. Moreover, specific nutrient imbalances in the diet of late gestation cows have been related to increased prevalence of milk fever, hypomagnesemic tetany, retained placenta, downer cow syndrome, mastitis, udder edema, ketosis, hepatic lipidosis, and displaced abomasum in dairy cows. Fetal size during the last trimester of gestation may depend on two factors: the genotype of the fetus [4] and [5] and the nutritional state of the dam [6] and [7]. It has been also stated in dairy cows that nutrient requirement for the late pregnant, nonlactating cow are only slightly higher than maintenance that are tended to similar in beef cow, approximately equivalent to energy and protein required. These differences represent changes in nutrient requirements over a period of only a few days and highlight the tremendous metabolic alterations necessary to adequately support lactation both in dairy and beef cattle [8]. Consequently, if these metabolic changes are not effectively enacted, metabolic disease and infertility problems may result during pre- and postpartum periods.

For nutritional and most management purposes, production cycle for the beef cow can be divided into 4 phases: pre-calving, postpartum, lactating and pregnant, and gestation. These phases are physiologically unique and each has its own set of nutritional requirements [9]. Pregnancy consists of a series of small, continous physiologic adjustments that affect the metabolism of all nutrients [10]. In regard to the late

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pregnant cow, glucose is the primary nutrient for conceptus growth and milk synthesis [11] that is required by both mammary gland and gravid uterus for metabolism [8]. Moreover, low levels of blood sugar may occur with several disorders, including liver problems, severe infection, malnutrition, etc.

Several previously studies have shown metabolite status of cows during gestation, but lacked detailed characterization of metabolite status in Bali cows. Therefore, it is necessary to describe the metabolite status of Bali cows during the last trimester of pregnancy. The objective of this study was to present the metabolite status especially glucose, blood urea nitrogen (BUN), and creatinine of Bali cows during the last trimester of pregnancy.

2. Materials and Methods

2.1. Animals and Management

A total of 21 Bali cows in the late gestation period were enrolled in the present study. The cows are mainly raised by the farmers concurrently with all their cattle in the same management. Likewise, the cows were managed without any different treatment including nutritional requirements during pre-calving, postpartum, lactating and pregnant, and gestation. The animals were sent out to the field in the day-time and housed in the nigh-time. Feedstuffs consisted of grass and rice straw; sometimes they were fed also rice bran without any concentrate and mineral supplements.

2.2. Reproductive Management

Under smallholder raising cattle, the farmers have no special management for reproduction including recording, estrous induction/synchronization, heat detection aid. However, mainly farmers could recognize the animal in estrus, especially standing estrus. When the animal showing estrus, the farmers are usually inform to the inseminator for artificial insemination (AI) or natural mating by bull if available or seek by request to the neighbor bull for mating.

2.3. Blood Collection

Blood samples were collected twice at two months interval from all cows in the morning between 08:30 and 10:00 am via jugularis vein into evacuated vacuum tubes containing K_3-EDTA. After collection, a drop of sample were taken for glucose test using Easy Touch® GCU, then the samples were kept at 4 ℃ and were centrifuged within 4 h at 1500 x *g* for 15 min to collect plasma. The plasma was then stored frozen at -20 ℃ until analyzed for blood urea nitrogen (BUN) and creatinine.

2.4. Data Analyses

Data were tabulated and statistically analyze using Microsoft Excel, 2007. All data were presented as mean ± standard deviation (SD). These parameters were compared using analysis of variance (ANOVA).

3. Results and Discussion

A total of 21 Bali cows during the last trimester of pregnancy were examined in the present study. The metabolite status of these cows especially glucose, blood urea nitrogen (BUN) and creatinine at first and second collections are shown in Table 1 and Table 2, respectively.

At the first blood collection, concentration of glucose in pregnant Bali cows was 56.95 ± 18.41 mg/dL, ranging from 31 to 107 mg/dL (Table 1). Likewise, at second collection (two months later) concentration of glucose was 53.73 ± 9.32 mg/dL, ranging from 37 to 67 mg/dL (Table 2). There was no significant different glucose concentration between these two blood collections (Table 3). This might due to that ruminants/cows are obligate herbivores whose evolutionary success has, in large part, resulted from their pregastric, fermentative mode of digestion [11]. Furthermore, they also stated that ruminants must depend almost exclusively on gluconeogenesis in liver and to a lesser extent, kidneys for their tissue glucose requirements.

Evaluation of BUN and creatinine in the present study provides opportunity to expect the healthy production in animals. This is known as blood profile test [12]. The results of this study showed that concentration of BUN for two times of collection in Bali cows during the last trimester of pregnancy were 13.85 ± 4.23 mg/dL and 11.69 ± 6.14 mg/dL, respectively. There was no statistically difference (P=0.3495)

have shown between the two blood collections (Table 3). This indicated that plasma urea in Bali cows during the late gestation did not change, however individual differences in plasma parameter concentrations among cows indicate that the concentration among cows appear to be varied from one cow to another, as they are also reflective of body metabolism and the level of food consumption [12].

Table 1. Concentration of glucose, blood urea nitrogen (BUN) and creatinine in Bali cows during the last trimester of pregnancy (1st collection)

Parameter	Mean	SD	Range	Min	Max	CI (95.0%)
Glucose (mg/dL)	56.95	18.41	76.0	31	107	8.88
BUN (mg/dL)	13.85	4.23	13.7	6.6	20.3	2.84
Creatinine (mg/dL)	1.61	0.32	0.94	1.06	2	0.22

Table 2. Concentration of glucose, blood urea nitrogen (BUN) and creatinine in Bali cows during the last trimester of pregnancy (2nd collection)

Parameter	Mean	SD	Range	Min	Max	CI (95.0%)
Glucose (mg/dL)	53.73	9.32	30.0	37	67	6.26
BUN (mg/dL)	11.69	6.14	20.6	6.6	27.2	4.13
Creatinine (mg/dL)	1.51	0.17	0.50	1.32	1.82	0.12

It has been stated by Van Saun [13] that assessing protein status is a bit more difficult than energy balance, therefore a combination of metabolite parameters need to be utilized, including BUN, creatinine, total protein, albumin and Ck. One of these parameters, in Table 1 and Table 2 are showed concentrations of creatinine at two months interval of Bali cows during the late gestation. The concentrations were 1.61 ± 0.32 mg/dL and 1.51 ± 0.17 mg/dL, respectively. These concentrations did not differ (P=0.3920) between the two blood collections times (Table 3).

Table 3. Differences of glucose, blood urea nitrogen (BUN) and creatinine concentrations in Bali cows during the last trimester of pregnancy for two times blood collections

Parameter	Mean ± SD		P-Value
	1st blood collection	2nd blood collection	
Glucose (mg/dL)	56.95 ± 18.41	53.73 ± 9.32	0.5944
BUN (mg/dL)	13.85 ± 4.23	11.69 ± 6.14	0.3495
Creatinine (mg/dL)	1.61 ± 0.32	1.51 ± 0.17	0.3920

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