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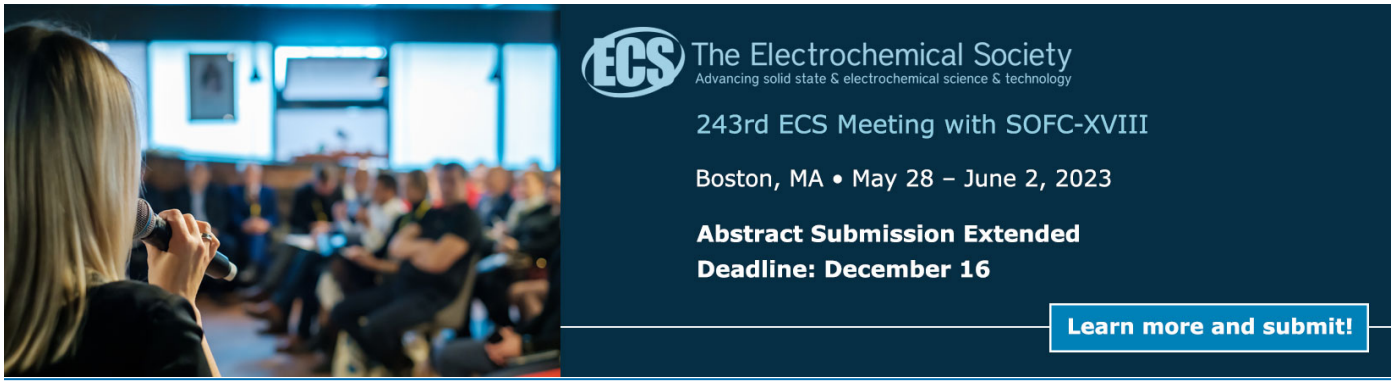

The blood plasma profile of Bali Cattle with different resting statuses before slaughter

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Abstract. Physiological response is a good indicator to determine the status of transport stress in cattle. This study aimed to determine the physiological response of Bali cattle on recovery of stress transportation with resting treatment. The experiment was conducted in Tamangapa Slaughterhouse, Makassar. The research is based on a completely randomized design with two treatments, namely a resting and without resting, each treatment consisted of 20 replicates. Venous blood samples were collected immediately after arriving for the 20 cows in the cattle group without resting, while in the group of cows resting blood samples were collected after 12 hours of rest. Blood plasma physiological parameters were analysed by Cobas C111 instrument. The variables measured were glucose, cholesterol, uric acid and blood plasma triglyceride levels. The results showed that levels of glucose, cholesterol, and uric acid were 113.679 mg / dL, 100.476 mg / dL, and 0.403 mg / dL, respectively, higher than normal levels, while triglycerides 14.647 mg / dL were lower than normal values. These changes indicate that Bali cattle in Tamangapa Slaughter Houses are under stress after 8 hours of transportation. Rest for 12 hours reduced blood plasma glucose, cholesterol and uric acid levels by 43%, 24% and 17%, respectively, while triglycerides increased 32% to 19.440 mg / dL. Concluded that Bali cattle show the plasma parameters changes well in responded due to transportation stressor.

1. Introduction

Bali cattle are the popular cattle in Indonesia as working and breeding cattle, and widely used in cattle fattening, because their high adaptability and resistance to extreme climate. Good adaptability shown by Bali cattle is the ability to consume low-quality feed from various types of plants that contain anti-nutrients [1]. Bali is also known for its better capability in reproduction, in the tropical environment, Bali cattle are able to maintain the level of reproductive efficiency [2,3].

In the supply of meat for consumers, transportation is upstream to downstream chain that would determine the final quality of the final product. Disruption during the trip such as shocks, air circulation and density in transportation equipment can cause stress that can be used effects the health and even the quality of meat produced later [4–6]. The resulting loss of quality happens when meat, slaughtered cattle that has not recovered from the state of stress he suffered during the trip [7]. The ability of cattle to restore their normal physiological conditions are very varied and determined by genetics (breed), sex [8] and environmental management at slaughter house [9]. However, transportation gave more effects to increase of stress hormones activities during transportation [10] and varied behavioral changes [11]. In transportation process, some of disturbance were happen, such us unfamiliar environments, temperatures, vibrations, etc. [6]. Most expert agree that transportation time more than 30 minute was a chronic stressors and has detrimental effects on animal [12].

Stress is a part of life and is not inherently bad. All life forms have evolved mechanisms to cope with the stresses of their lives. In fact we frequently seek stress, and we relish its biological effects as being exhilarating, even psychologically rewarding [13]. Recently, more physiological condition were regarded to stress, detrimental effect from stress on meat or carcass quality [4,14,15] were concerned further. The state of stress will lead to increased levels of cortisol and blood sugar reserves overhaul through gluconeogenesis [16]. The physiological activity would effects on several physiological parameters [17] such as blood glucose levels, cholesterol, uric acid and creatinine phosphate. Concentrations of some blood physiological parameters may be indicative of whether cattle are still in a state of stress or have recovered.

Research related to the ability of Bali cattle in restoring physiological condition after transport through the stress was less publicized. Thus this study aims to identify the profile of Bali cattle blood plasma (glucose, triglyceride, cholesterol, and uric acid) after a transport and after a resting phase for 24 hours.

2. Material and method

The research was used repeated measurement design (RMD) with two treatments as variables, without rest (A) and after rest about 24 h (B) with 20 replications. 20 male cattle in 1.5 – 2 years range of age selected and confirmed with the traders before the animal arrived at Tamangapa Slaughterhouse (SH), Makassar South Sulawesi about one or two days before. Healthy and clinical references appropriate with the healthy card follow with the animals. 10 ml jugular blood withdrawn in anticoagulant container, conducted immediately after the animals were gathered in to the receiving yard; and after animals got rest about 24 h. Blood plasma parameters measured at Animal Physiology Laboratory of Animal Husbandry Faculty, Hasanuddin University, Makassar. The blood samples carried to the laboratory in cooling box. Before 30 minutes after blood collections, blood plasmas were separated with cells by centrifuge at 3000 rpm for 15 minutes. After centrifugation, blood plasma was removed into 500µl micro tube and then storage in -30^{o}C before analysis. Plasma blood glucose, cholesterol, triglyceride, and uric acid concentration were determined by Cobas C111 (Roche) Instrument, with standard clinical reagent for Glucose, Tryglyceride, Cholesterol and Uric Acid. Plasma blood parameters data were analyzed by general linier models with univariate procedures of SPSS 19 for Windows.

3. Result

Transport stress caused changes in various blood indices (table 1). Means of glucose level on without resting treatment was 113.679 ± 12.024 mg/dL and after resting for 24 h, the glucose concentration appears went to down ($P<0.01$) to normal concentration at 64.74 mg/dL (table 1). This value was higher than normal physiological range for ruminants. Reports on Onggole cross (PO) cattle was 67-73 mg/dL [18], on Simmentals were raises in feedlot condition with 66,00±5,52 mg/dL and their cross breed with Onggole were 66,85±5,54 mg/dl [19]. Increased of glucose blood level was a normal respond from animal when they were under stress condition. Report on Hereford, Simmental and Holstein show a significant ($p<0.001$) blood glucose raised from 73.08 mg/dL to 107.46 mg/dL when stressor were given, even on hypoglycemic animals, stress significantly raised blood glucose up to 44,1 mg/dL or 25,64% from calm condition [20].

Table 1. Blood plasma profile of Bali Cattle base on rest statutes

Blood plasma profile	Transport stress	Resting	SEM	P_{value}
Glucose (mg/dL)	113.67	64.74	4.194	0.000
Trygliseride (mg/dL)	14.65	19.44	0.891	0.006
Cholesterol (mg/dL)	100.48	75.98	2.493	0.000
Uric Acid (mg/dL)	0.40	0.33	0.017	0.032

Plasma triglyceride concentration on without resting animals was 14.65 ± 2.566 mg/dL and then significantly increased ($p<0.01$) to 19,44 ± 6,816 mg/dL after they got rest about 24 h (table 1). The responds were showed by the Bali cattle were different with Hereford and Brahman [21], in short-duration transportation Hereford and Brahman responded with significantly ($P<0.05$) increasing of triglyceride level, where as the sera triglyceride levels on high production lactating Holstein compare with dry cows (27.5±2.80 vs 25.10±1.20 mg/dL) [22]. In another hand, the levels were found was lower than N'Dama and White Fulani in normal condition with 18,468±0,558 and 22,068±0,09 each [23].

Cholesterol concentration in blood plasma on without resting animals were 100.48 ± 11.173 mg/dL than significantly ($P<0.01$) decrease to 75.98 ± 8.327 mg/dL after animals were rested for 24 h (table 1). The range of cholesterol level before and after resting or in stress and calm condition were normal, depend on 70 – 180 mg/dL. Our result was same with stress respond on dairy cattle, where the stress condition was following in elevation of cholesterol [22], compare with milking pregnant dairy goat had hypercholesterolchemic potencies in dairy goat [24]. Fasting and transporting the beef cattle effected on increase blood cholesterol level from 100.7 mg/dL to 115.3 mg/dL and 120.7 mg/dL after 18^{th} and 32^{th} h transportation times [25]. Cholesterol levels here also showed a different concentration compare with a other tropical cattle, N'Dama had 102.6±3.1 mg/dL and White Fulani 122.0±0.5 mg/dL [23].

The concentration of plasma uric acid in without resting animal were 0.40 ± 0.115 mg/dL and then significantly decrease ($P<0.05$) to 0.33± 0.088 mg/dL after resting for 24 h (table 1). The blood uric acid concentration on both stress and calm condition were lower than Hereford with 0.766 – 0.999 mg/dL (male) and 0.811 – 1.129 mg/dL (female) in normal condition [26], higher value also found in urine were 0.618 – 2.066 [27]. But the values seems relatively same with high yielding dairy cows with 0.420 mg/dL [28].

4. Discussion

Plasma glucose level was able to be an indicator of stress condition. Increasing of glucose level due to increase of cortisol activity where triggers on liver gluconeogenesis of amino acid, glycerol, lactate or propionate [29]. Glucose level was found appeared the stress condition as the effect of transportation. According to [30], glucose level on heat stress animals were 127.74 mg/dL where higher than our result. Glucose elevation respond to stress also reported on feed changes in order to adapting with feed introducing, [31] found the means of blood glucose levels at 0, 3th, 6th and 9th h after feeds changes were 43,86; 68,13; 92,65; and 92,65 mg/dL. Comparing with other breeds, Bali Cattle seems had the highest of glucose under transportation stress condition. This may indicate that Bali Cattle have availability to increase their metabolism respond due to stress condition. Our result also indicates that Bali Cattle show a late in decrease their glucose after recovered from stress. Some report also show this late recovery form stress, [32] reported that peak of blood cortisol level found at 4.5 h after transportation and then linearly decreased during 14.2 h and back in to normal levels at 24 to 48 h after resting. Different respond on triglyceride level also found in this research, Bali cattle show low triglyceride level under stress condition, compare with another reports where triglyceride were increasing during stress [21,33,22]. Possibilities occurred depend on the result, that Bali Cattle had different side in triglyceride metabolism utilization where faster than other breeds. We assumed that during transportation there was a peak of triglyceride level. Reported, the triglyceride levels on fasting beef cattle was increase from 47.3 mg/dL to 53.3 mg/dL at 18^{th} h transportation, then decrease significantly ($p<0.05$) to 33.3 mg/dL at 32th h transportation; and lower level found after resting for 24 h 28.3 mg/dL [25]. Blood cholesterol level rhythms in blood may due to stress condition, high blood cholesterol concentration mostly indication of stress [24]. In this research resting period was followed by turnover of cholesterol, means the Bali Cattle also available to restore metabolism rate in 24 h of resting time. Considering to any respond to chronic stressor on other breeds [22], where the level of cholesterol increased with higher levels as result we found. Uric acid is purin nucleotide metabolic

waste. The xanthine oxidase catalyze uric acid from xanthine and hypoxanthine, produced from purin and significantly release in hypoxia condition [35]. Hypoxia was most likely to occur during the transportation process, high density or overload in truck dump may restrict the oxygen flows. But in this research the levels of uric acid were lower compare with other report [36,27]. However some report suggest that there was no significant relationship between cortisol level and uric acid concentration, so we assumed that hypoxia was the most the causes rather than stress conditions [10,20].

5. Conclusions and recommendation

Base on the results were found we conclude that Bali cattle show the plasma parameters changes responds due to transportation stressor. However, Bali cattle had unique respond compare with other cattle breeds. Changes on glucose level were in wide range, contrary, triglyceride levels were lower under stress condition, normal cholesterol levels were remained whether in stress or normal conditions, and the uric acid levels were lower than normal. Those changes indicated that Bali cattle show the plasma parameters changes well in responded due to transportation stressor. As the recommendation it need to more observation Bali Cattle respond on another transportation stressor treatments, such us long duration transportation (shipping) and engage blood cortisol level observation and or with other physiological parameters.

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