Blood Biochemical Profile of Repeated Breeding Friesian Holstein Grade Cows in The Dairy Processing Unit Faculty of Animal Science Gadjah Mada University

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ABSTRACT

The study was conducted to determine the profile of glucose, cholesterol and blood ureum nitrogen (BUN) of repeated breeding Friesian holstein grade (FHG) cows in Faculty of Animal Science, Gadjah Mada University (UGM). Eighteen heads of FHG cows were equally distribution into repeated breeding and normal cycling groups. The blood samples were collected through caudal vertebrae vein for three times a week. The blood samples were analyzed for plasma glucose, plasma cholesterol and BUN in the Research and Development Integrated Laboratory (LPPT) UGM, then the data were analyzed using T-test. The result showed that there was no significant difference of glucose and cholesterol concentration between the repeat breeding and normal cycling cows. The averages of glucose and cholesterol of repeated breeding cows were 58.53± 3.86 mg/dl and 154.81± 16.64 mg/dl, whereas of normal cycling cows were 61.47± 8.87 mg/dl and 196.06± 82.02 mg/dl. Futhermore, there was a signficant difference of BUN between the repeated and normal cycling. The averages BUN of repeated breeding and normal cycling FHG cows were 31.99±4.80 mg/dl and 28.10±3.97 mg/dl. It could be concluded that repeated breeding FHG cows have similar glucose and cholesterol concentrations in the normal cycling, however the BUN concentration of repeated breeding FHG cows is higher than in normal cycling.

Keywords: Repeated breeding, Friesian holstein grade cows, Glucose, Cholesterols and Blood ureum nitrogen

INTRODUCTION

Friesian holstein grade (FHG) cows are one of dairy cattle in Indonesia, which provide an important source of income for farmers and source of animal protein. Friesian holstein grade cows have low reproductive performance, resulting in relatively low milk productivity (Zainudin *et al.*, 2015).

The problem of reproduction that often occurs in dairy cattle in Indonesia is the low reproduction efficiency. It is closely related to the presence of reproductive disorders, such as repeated breeding. Repeated breeding in cows is generally characterized by high service per conception (more than 3), low conception rate (less than 40%), and long calving interval (18 to 24 months).

Blood biochemical profile indicates nutritional status, and useful for diagnoses and manages infertility in animals. The blood biochemical profiles during estrus are indicated to be

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related to the fertility status of the cow and its reproductive behavior. Blood biochemical components such as protein, albumin, cholesterol, calcium, and phosphorus, have an important effect on the incidence of repeated breeding (Amle *et al.*, 2014). Adequate blood glucose and cholesterol levels in cows can support the synthesis of gonadothropin releasing hormone (GnRH), follicle stimulating hormone (FSH), and luteinizing hormone (LH). Blood ureum nitrogen (BUN) concentrations that are too high cause inefficient use of energy resulting in fertility disruption, reduced available energy, environmental pollution and economic losses.

The blood biochemical profile consisting of glucose, cholesterol and urea in repeated breeding FHG cows is suspected to be different from normal cycling breeding. Therefore, in the present study, we measured serum glucose, cholesterol and urea nitrogen concentrations in repeat breeder FHG cows, and compared them with fertile cows.

MATERIALS AND METHODS

Description of study site and material

Blood samples and reproductive data were obtained from the dairy processing unit Faculty of Animal Science Gadjah Mada University. The blood analysis was carried out in the Integrated Research Laboratory (LPPT) University of Gadjah Mada, and the entire study spanned from February 1 to May 31, 2016. The research subjects were 18 lactation cows with a body condition score of 2.0 to 3.0 (Scale 1-5) and milked twice a day. The cows were fed concentrates, *ad libitum* fresh cut forage and received *ad libitum* access to drinking water. The cows were divided equally into 2 groups: repeat breeding (9 heads) and normal cycling (9 heads). Repeat breeding cow is a cow that fails to conceive from three or more successive insemination, but with normal estrus and absence of detectable clinical abnormalities.

Collection of blood sample and Analysis

Ten milliliters of blood samples were collected from the caudal vertebrae of repeat breeding and normal cycling cows in anticoagulant-coated tubes. The tubes were transferred to an ice container to the laboratory. Cells were removed from plasma by centrifugation at 2000 rpm for 10 min. Plasma was stored at -20°C until further analysis. Blood plasma level measurement was performed on blood glucose, total cholesterol, and blood urea using Microlab 300 spectrophotometer at LPPT UGM.

Determination of blood glucose, blood cholesterol and blood urea level was analyzed according to procedure of Dyasis using commercial kit. The blood glucose was estimated using glucose oxidase method (GOD-POD, liquid kit). Plasma total cholesterol was estimated using cholesterol esterase method (CHOD-POD, Liquid kit). Blood urea was estimated using the urease method (Urease –GLDH, Kinetic UV kit).

Statistics

The data were analyzed using the independent sample T test to compare means between the repeat breeding and normal cycling. Result was expressed as mean ± standard deviation (SD); P-value < 0.05 was considered as significant.

RESULTS AND DISCUSSION

High repeat breeding cases are associated with cholesterol, glucose, albumin and globulin protein (Khan *et al.*, 2010). Measurements of blood biochemical profiles performed in this study included glucose, cholesterol and blood urea (Table 1).

Table 1. Blood biochemical profile of repeated breeding and and normal cycling Friesian holstein grade cows

Blood biochemical profile	Repeat breeding (n=9)	Normal cycling (n=9)
Glucose (mg/dl)	58.53 ± 3.86[a]	61.47 ± 8.87[a]
Cholesterol total (mg/dl)	154.81 ± 6.64[a]	196.06 ± 82.02[a]
Ureum (mg/dl)	31.99 ± 4.80[b]	28.10 ± 3.97[b]

* [a,b] on the same line indicated a significant difference ($p < 0.05$)

Blood glucose levels of repeated breeding tend to be lower than normal cycling cows (Tabel 1). Prihatno *et al.* (2013) reported that glucose levels in blood serum of cows with repeated breeding were lower than normal cycling, respectively around 48.58 ± 6.675 and 68.40 ± 9.60 mg/dl. Khan *et al.* (2010) reported that blood glucose levels in repeated breeding of dairy cows was lower than normal dairy cows, with the highest blood glucose levels of 50.351 ± 3.54 mg/dl in repeated breeding and 63.41 ± 4.87 mg/dl in normal cycling dairy cows.

Cow blood glucose level for normal body function was 60 mg/dl (Utomo, 2003). The content of blood glucose in this study corresponded to the normal range in normal cycling cows, whereas in repeated breeding was less than the normal range. Blood plasma glucose concentration is maintained by the homeostatic mechanism of the insulin hormone so that it was relatively constant (Setiadi *et al.*, 2003). Blood glucose levels was influenced by several factors, such as rations of energy content, carbohydrate type and the role of insulin hormone.

Less glucose levels affected the pituitary hypothalamus to control reproductive function, lead to inhibition of Gonadotropin-releasing hormone (GnRH) secretion (Scaramuzzi *et al.*, 2006). Gonadotropin-releasing hormone regulated growth and follicular development, ovulation and maintaining an appropriate uterine environment for embryonic development (Prihatno and Sri, 2003). Thus, inhibited GnRH secretion caused inhibition of follicular development and ovulation, which might result in anovulation and anestrus (Scaramuzzi *et al.*, 2006), and inhibition of estrogen and progesterone (Prihatno *et al.*, 2013).

The result of this study indicated that average of blood cholesterol levels on repeated breeding dairy cows were lower than normal cycling dairy cows (Table 1). The present research showed that there was no significant different on average of blood cholesterol between repeated breeding and normal cycling. Khan *et al.* (2010) reported that blood cholesterol levels in repeat breeding dairy cows was lower than normal cycling dairy cows in each estrus period. The result of our study was higher than previous finding reported by Prihatno *et al.* (2013). They reported that the blood cholesterol of repeated breeding was 124.59 ± 34.73 mg/dl, while in normal cycling was 166.08 ± 37.06 mg/dl.

In this study, blood cholesterol levels in repeat breeding cows tend to be lower than normal cycling cows. The condition caused by nutrient factor, estrus period and reproductive condition of the livestock. Prihatno *et al.* (2013) reported that lower blood cholesterol levels in dairy cows due to low fat in feed rations and affect the reproductive process. The results reported by Khan *et al.* (2010) presented that normal cycling dairy blood cholesterol levels differed in each estrus period on day zero, fifth, tenth until fifteenth day continued to increase and began to decline on the twentieth day of the estrous period. Savalia *et al.* (2014) reported total blood cholesterol had no effect on some treatment of buffalo group anestrus, repeated and normal breeding.

The high cholesterol levels on the fifteenth day of the estrous cycle were due to increased steroid hormones in the active luteal phase to the mid-luteal of the estrous cycle. Increased demand for cholesterol was used for the biosynthesis of androstenedione, progesterone and estrogen by granulosa cells under the influence of LH pressures (Khan *et al.*, 2010). Murray *et al.* (2003) explained that cholesterol is a fundamental compound for all other

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steroids synthesized in the body such as adrenal cortex hormones and sex hormones, vitamin D, and bile acids. Fat-deficient cattle might prolong the anestrus period, repetitive mating and decrease the number of ovulated eggs (Prihatno *et al.*, 2013).

Blood urea level in repeat breeding FHG cows was 31.99 ± 4.80 mg/dl, whereas in normal cycling was 28.10 ± 3.97 mg/dl. High BUN levels (>19 mg/dl) reduced the pregnancy rates (Butler, 2005). Our research indicated that BUN in both groups was higher than the normal range.

The high concentration of urea was related to fertility disorders, decreased available energy, environmental pollution and economic losses (Setiadi *et al.*, 2003). Increased blood urea nitrogen levels tend to alter the ovarian and uterine physiology, and changes in the uterine environment, such as decreased pH during the luteal phase, may play a role in reducing fertility. In addition, high dietary protein and sulfur intake could decrease the uterine pH during the luteal phase and interfere with embryonic development (Perry *et al*., 2009).

CONCLUSIONS

Repeated breeding Friesian holstein grade cows have similar glucose and cholesterol concentrations in the normal cycling, however the BUN concentration of repeated breeding is higher than in normal cycling**.**

REFERENCES

Amle, M., V. Patodkar, R. Shelar, and Hemant B. 2014. Serum biochemical levels of repeat breeder cross bred cows under rural condition of Satara District of Maharashtra. Int. J. Adv. Vet. Sci. Tech. 3:109-113.

Butler, W. R. 2005. Relationships of dietary protein and fertility. Adv.Dairy Tech. 17:159-168.

Khan, S., A. Thangavel, and S. Selvasubramaniyan. 2010. Blood biochemical profile in repeat breeding cows. Tamilnadu J. Vet. Anim. Sci. 6:75-80.

Murray, R.K., D.K. Granner, P.A. Mayes, and V.W. Rodwell. 2003. Biokimia Harper. 25th Ed. Penerbit Buku Kedokteran EGC. Jakarta.

Perry, G., B.L. Perry, S.D. Fields, J.A. Walker and C.L. Wright, 2009. Influence of blood sulfate concentrations on uterine pH. J. Anim. Sci., 87 (Suppl. 2): 550–551.

Prihatno, S. A., K. Asmarani, N. W. K. Karja, dan B. Sumiarto. 2013. Profil biokimia darah pada sapi perah yang mengalami kawin berulang. Jurnal Kedokteran Hewan. 7: 29-31.

Prihatno, S. A. and S. Gustari. 2003. Pengaruh pemberian prostaglandin F-2α dan gonadotrophin releasing hormon terhadap angka kebuntingan pada sapi perah yang mengalami kasus kawin berulang. Jurnal Sain Veteriner. 21: 14-17.

Savalia, K.K, A. J. Dhami, K.K. Hadiya, K.R. Patel, and N.P. Sarvaiya. 2014. Influence of controlled breeding techniques on fertility and plasma progesterone, protein and cholesterol profile in true anestrus and repeat breeding buffaloes.Veterinary World 7(9): 727-732.

Scaramuzzi, R.J., B.K. Campbell, J.A. Downing, N. R. Kendall, M. Khalid, M. Munoz-Guiterrez, and A. Somchit. 2006. A review of the effects of supplementary nutrition in the ewe on the concentrations of reproductive and metabolic hormones and the

mechanisms that regulate folliculogenesis and ovulation rate. Institut National de Recherche Agronomique. 46: 339-354.

Setiadi, A., B.P. Widyobroto, and B. Rustamaji. 2003. Konsentrasi glukosa plasma darah pada Sapi Peranakan Friesian Holstein yang diberi ransum dengan aras undegraded protein berbeda. Jurnal Indonesia Tropical Animal Agriculture. 28: 211-217.

Utomo, B. 2003. Tampilan Produksi Susu dan Komponen Metabolisme Tubuh Sapi Perah Friesian Holstein (PFH) Akibat Perbedaan Kualitas Ransum. Tesis. Fakultas Peternakan, Universitas Diponegoro. Semarang.

Zainudin, M., M. N. Ihsan and Suyadi. 2015. Efisiensi reproduksi Sapi Perah PPFH pada berbagai umur di CV. Milkindo Berkah Abadi Desa Tegalsari Kecamatan Kepanjen Kabupaten Malang. Jurnal Ilmu-Ilmu Peternakan. 24:32-37.