INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 13, No. 5, p. 301-308, 2018

RESEARCH PAPER OPEN ACCESS

# A comparative study on lipid profile of before and after synchronized dairy cows under bathan rearing system at Sirajgonj district of Bangladesh

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**Key words:** Lipid profile, Synchronization, Artificial insemination, Repeat breeder cows.

http://dx.doi.org/10.12692/ijb/13.5.301-308 Article published on November 18, 2018

## Abstract

Repeat breeder cows (RBC) were identified as cows with normal estrus cyclicity that fails to breed after 3 or more inseminations. The RBC occurrence causes a major financial loss to the dairy herds, including increasing the formulation cost of insemination, treatment, pasturage, fatigue and administration, calving interval, run-on rates and reduced calf and milk production. Studies inquiring alignments between the lipid level of repeat breeder cows before and after synchronization. Twenty eight (28) dairy cows of repeat breeder at the diverse sheds of dairy cultivators at the bathan area at Sirajgonj district in Bangladesh applied for this study. The cows were synchronized in a standard heat period in which GnRH and PGF2α were treated. Subsequently the blood samples were collected and separated serum samples were experimented for the comparative lipid level of synchronized and unsynchronized repeat breeder dairy cows.The level of Cholesterol, Triglycerides were significantly higher in normal repeat breeder cows than synchronized repeat breeder cows. The results also emerged that the level of HDL-Cholesterol was higher in synchronized repeat breeder cows. The mean value of Cholesterol, Triglycerides and HDL - Cholesterol of unsynchronized repeat breeder cows were 21.65 mg/dl, 29.86 mg/dl, 82.67mg/dl and in synchronized cows7.008 mg/dl, 14.12 mg/dl, 124.7 respectively. This quantitative analysis exhibits that the level of Cholesterol, Triglycerides and HDL-Cholesterol were significantly different between normal repeat breeder cows and synchronized repeat breeder cows. These results clearly correlate the lipid profile and repeat breeding problems in dairy cows.

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## Introduction

Lipids are a category of fats and fat-like elements that are significant components of cells and sources of energy. A lipid panel measures the level of specific lipids in the blood. Two significant lipids, cholesterol and triglycerides are transited in the blood by lipoprotein particles. Each fragment comprises a connection of protein, cholesterol, triglyceride, and phospholipid particle. The particles measured with a lipid profile are categorized by their density into high-density lipoproteins (HDL), low-density lipoproteins (LDL), and very low-density lipoproteins (VLDL) (Gordon *et al.*, 1977).Lipid and lipoprotein profile alters in dairy cows and fat metabolism, which may result in metabolic diseases such as ketosis, which is concerned to other disorders together with a reserved placenta, uterine infection, milk fever and mastitis. Many transition period diseases, inclusive fatty liver, also occur in a subclinical conformation attacking the overall health condition, milk production and regenerative performance of dairy cows (Imhasly*et al.*, 2015). Because the lipid metabolism is a prime sight of the physiology and energy metabolism of transition cows (Drackley, 1999; Gross *et al.*, 2013), the objective of this study was to explore the potent changes in serum lipid and lipoprotein profiles in dairy cows.

The estrous cycle (also estrus cycle; elicited from Latin estrus) constitute the recurring physiologic variation that are introduced by reproductive hormones in most mammalian therein females. Estrous cycle begins after sexual maturity in females and obstructed by anestrous phases or pregnancies (Vasconcelos, 1999). Typically, estrous cycles suffice until death. Some animals may show bloody vaginal discharge, often mistaken for menstruation, also called a "period". The approximate estrus cycle of the cow is 21 days, ranging between 18 – 24 days. Heifers outset cycling at the onset of puberty and will suffice to cycle until they are in calf. The beginning of puberty can be influenced by various factors such as nutrition, growth value (poorly grown heifers will bear much longer to attain puberty and outset cycling), breed, and disorders (Henricks, 1970). After calving mature cows usually take up a minimum of 35-42 days to onset cycling freshly, whereas heifers generally take longer – up to 10 days longer. This may be expanded in high yielding cows or those influenced by disorder post calving. The estrus cycle is ruled by the complicated interactions of different hormones that are created in the brain and ovaries; progesterone and estrogen being two of these. The follicle (egg) arises throughout the cycle and ovulation (the discharge of the egg) happens when the progesterone levels fell and the estrogen increase. A feature entitled the corpus luteum then build on the ovary, which then yield progesterone. Any cows that haven't cycled after 35-42 days should be tested by you medicate to cheque for any oddities and to support maximize her chances of early conception (Wolfenson, 1995).

Repeat-breeder cows are general directed to sub fertile animals without any anatomical or infectious oddities that do not become pregnant until the third or subsequent breeding or stay infertile after numerous actions. Repeat breeding is one of the major obstacles affecting the reproductive ability. The reason of repeat breeding is multifaceted; most common motives are genetical, anatomical drawback of the reproductive expanse hormonal asymmetry, infections such as clinical, subclinical, endometritis and poor administration (Koshal, 2014). The main aim of this study was to identify the relationship between lipid profiles with repeat breeding in cows.

## Material and methods

*Study area*

The present study was conducted at the different households of dairy farmers at Sirajgonj district. A total of twenty eight (28) cows were purposively selected under artificial insemination (AI) services for the present study. Selected animals were kept under uniform feeding and management condition and fed with green grass/fodder with free access to water.

*Animals*

A total of twenty eight (n=28) unsynchronized repeat breeder dairy cows and after synchronization of twenty eight (n=28) repeat breeder cows had been analyzed, identified and selected the repeat breeder

cows and collected blood sample following prepared a twenty eight -serum sample for testing.

*Synchronization of dairy cows*

Poor rates of estrous detection combined with poor conception rates (CR) make management of reproduction in lactating dairy cows a challenge in most dairy herds. To help producers manage reproduction more efficiently, protocols for synchronization of estrus had been developed. The dairy cows those were identified as repeat breeder cows had been synchronized with the treatment of GnRH and PGF2α (Parsley, 1995).At day 0, blood samples were collected and GnRH was injected. After 7 days, cows were PGF2α treated and 9 th day GnRH was treated and artificial insemination (AI) was applied to the cows. After 2 hours of AI blood was collected for test. Blood samples were collected in sterilized vacutainer with anticoagulant from the jugular vein of each dairy animal.

*Serum sample preparation*

The serum samples were prepared in the Animal Health Laboratory of Bangladesh Livestock Research Institute, Regional Station, Baghabari, Sahjadpur, and Sirajgonj-6770. The plasma serums were separated from the cells by centrifugation (1500 ×g for 20 min). The separated serum were collected in a sterile vial and preserved at −20°C until analysis.

*Serum samples analysis*

Cholesterol:Collected samples were analyzed by using kits from CHEMELEX, S.A. Polygon Industrial Can Castells, Barcelona, Spain (Catalog 30183). Cholesterol was measured enzymatically in serum in a series of coupled reactionsthathydrolyzedcholesteryl esters and oxidized the 3-OH group of cholesterol. One of the reactions byproducts, $H_2O_2$ was measured quantitatively in a peroxidase catalyzed reaction that producedacolor. Absorbance was measured at 505 nm. The color intensity was proportional to cholesterolconcentration. Analysis was carried out by spectrophotometric measurement method using commercially available PD-303S spectrophotometer, Japan.

Triglycerides:Collected samples were analyzed by using kits from CHEMELEX, S.A. Polygon Industrial Can Castells, Barcelona, Spain (Catalog No. 30364). Triglycerides were measured enzymatically in serum using a series of coupledreactionsin which triglycerides were hydrolyzed to produce glycerol. Glycerol was then oxidizedusingglyceroloxidase, and $H_2O_2$, one of the reaction products wasmeasured.Analysis was carried out by spectrophotometric measurement method using commercially available PD-303S spectrophotometer, Japan.Absorbance was measured at 505 nm.

HDL-Cholesterol:Collected samples were analyzed by using kits from CHEMELEX, S.A. Polygon Industrial Can Castells, Barcelona, Spain (Catalog No. 30188). The very low density (VLDL) and low density (LDL) lipoproteins from serum were precipitated by phosphotungstate in the presence of magnesium ions. After removed by centrifugation the clear supernatant containing high density lipoprotein (HDL) was used for the determination of HDL cholesterol.Analysis was carried out by spectrophotometric measurementmethod using commercially available PD-303S spectrophotometer, Japan.Absorbance was measured at 505 nm.

*Statistical analysis*

Statistical analysis was performed with the two-tailed student's t test. P values <0.05 were considered statistically significant. All statistical analysis was done using Grape Pad Prism 7 (La Jolla, CA).

**Results**

*Cholesterol*

The bars represent the mean conc. of cholesterol in after synchronized repeat breeder cows was about7.008 ± 0.4095 mg/dl and the mean conc. of cholesterol in before synchronized repeat breeder cows was about 21.65 ±1.867mg/dl. From the above figure it was evident that the mean conc. of cholesterol was lower in after synchronized repeat breeder (7.008 ± 0.4095) than before synchronized repeat breeder cows (21.65 ±1.867).

*Triglycerides*

The bars represent the mean conc. of triglycerides in after synchronized repeat breeder cows was about14.12 ± 1.5 mg/dl and the mean conc. of triglycerides in before synchronized repeat breeder cows was about 29.86 ± 2.542 mg/dl. From the above figure it was evident that the mean conc. of triglycerides was lower in after synchronized repeat breeder (14.12 ± 1.5) than before synchronized repeat breeder cows (29.86 ± 2.542).

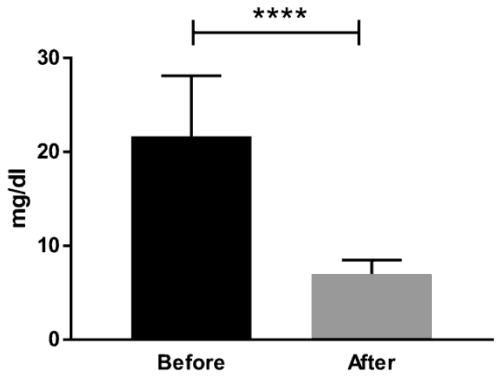


**Fig. 1.** Comparison of mean concentration of Cholesterol between before synchronized and after synchronized repeat breeder cows (p<0.0001).

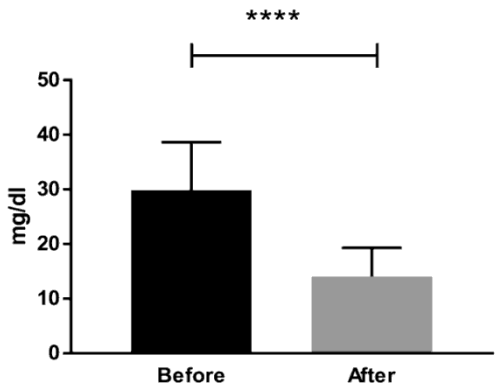


**Fig. 2.** Comparison of mean concentration of Triglycerides between before synchronized and after synchronized repeat breeder cows (p<0.0001).

*HDL-Cholesterol*

The bars represent the mean conc. of HDL-cholesterol in after synchronized repeat breeder cows was about 124.7 ± 7.477 mg/dl and the mean conc. of HDL-cholesterol in before synchronized repeat breeder cows was about 82.67 ± 2.356 mg/dl. From the above figure it was evident that the mean conc. of HDL-cholesterol was higher in after synchronized repeat breeder (124.7 ± 7.477) than before synchronized repeat breeder cows (82.67 ± 2.356).

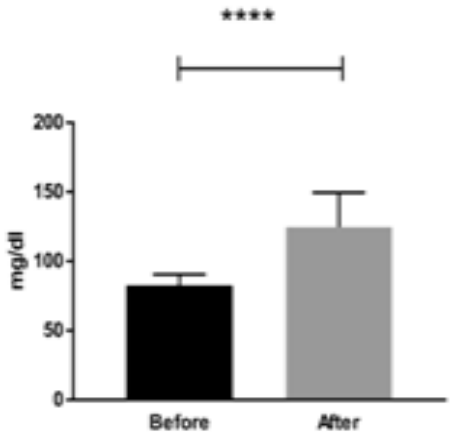


**Fig. 3.** Comparison of mean concentration of HDL-Cholesterol between before synchronized and after synchronized repeat breeder cows (p<0.0001).

## Discussion

*Repeat breeding problem in Bangladesh*

It was observed that repeat breeding (RB) is a serious problem in dairy farmers of Sirajgonj milk pocket venue. It is classically well-defined that a cow isn't conceived after three or more artificial insemination by an inseminator or natural amenities by a breeding bull. Prevalence of repeat breeding complications was found about 29 percent in the Baghabari milk producing areas stated by Islam *et al.*, 2018. Currently, dairy farmers have been suffered a lot due to this difficulty. Strictness of the problem are spreading progressively by increasing reproduction, action, feedstuff, labor and organization charge, increase calving intermission and culling rates and reducing calf and milk manufacture (Islam *et al.*, 2018). The harmful impact of repeat breeding is amplified the number of services per conception ranging from 4 to 24 services in hybridized dairy cows (Islam *et al.*, 2018). It's essential to resolve the RB difficulties for manufacturing more milk to attain the vision 2021 of Bangladesh. Nevertheless, diverse biochemical components in normal levels are indispensable for the normal purpose as well as generative systems of the body. Distinction of the hormonal elements of the animal body has been stated for the propagative disappointment. But none is worked to diminish the specific reasons of repeat

breeding problems in the aforementioned areas. Therefore, this study was commenced with a view to govern the lipid profile of RB cows for minimalizing the RB problems in dairy cows and increasing milk production to full filling the rising demand of milk of the state (Hemme, *et al.*, 2004). The old-style cow rearing system of Bangladesh is increasingly exchanging by the in-put supported profitable systems due to strengthening of agricultural applies among others. Sustainability of commercial farming system depends mainly on production efficacy of current germplasm along with nutritional and other achieve mental practices (Huque, 2011). Repeat breeding is one of the main difficulties affecting the reproductive proficiency. The cause of repeat breeding is multifaceted; most common causes are genitival, anatomical defects of the reproductive tracts hormonal imbalances, infections such as clinical subclinical endometritis and poor management (El-Khadrawy, *et al.*, 2011).

*The reproductive hormones in repeat breeding cattle*

The beneficial application of gonadotropin- releasing hormone (GnRH) to remedy follicular cystic conditions has commanded to its use in reproductive administration of dairy cows. Cooperatively, those studies exhibited that GnRH was about 80% operative in causing follicular cysts to luteinize. Creatures returned to estrus around 18 to 23 days after GnRH treatments. Endogenous luteinizing hormone (LH) unrestricted from the adenohypophysis following GnRH spreads a peak in about 2 h. Sensitivity of the pituitary for LH release after GnRH is restored by 8 to 10 days afterward calving (Warner, *et al.*, 2001). Numerous studies have strained the economic status of reproductive efficacy of dairy cows. Thatcher and Wilcox stated that fertility for dairy cows was improved by amplified number of estrous cycles before first service. The numeral of ovulations before 65 days postpartum was amended after GnRH. Administration of GnRH (100//g) 2 wks. Postpartum donated to a numerical benefit in conception rates at first service. Studies of GnRH in postpartum cows provided indecisive outcomes on fertility rates. Current reports exposed that administration of GnRH at first postpartum breeding give rise to in higher conception rates. This phenomenon also was experiential when GnRH was administered to repeat breeder cows. Embryonic death has been described to be the end outcome of as many as 35% of mating in cows. In beef cattle, most embryonic losses happened before 20 d of gestation. Such fatalities raise the number of services per conception and intermissions between calving, and diminish overall productivity of production. The prevalence of 'repeat breeding' is one of the vital issues causing reproductive disappointments in cows. The diverse stages of reproductive cyclicity are controlled by complex sequential actions and interactions between the 'hypothalamic releasing factors' from the pituitary and the sex steroids. Deficiency of incorporation or synchronization and endocrine imbalances at any stage of the order may result in reproductive disaster. Very little data is existing about the hormonal issues involved in reproductive complaints in cows. Kakar, Razdan and Galhotra (1980) informed that cows do not show a luteinizing hormone (LH) peak in the hottest months of the year (June and July) and determined that this absence of an optimal LH peak might be related with ovarian inactivity and an anestrous state (Arora, *et al.*, 1982). It has been testified systemic levels of progesterone during initial pregnancy in the cow. This information's are about consistently separated on whether pregnant cows have higher levels of progesterone in blood than do non-pregnant cows 6-14 days after insemination (Hasler, J. F., Bowen, 1980).Consequently, the present study was commenced to explore the plasma profile of lipids in dairy cows under bathan rearing system, so as to associate and express the probable biochemical etiological features involved in the infertility problem of the farm managed dairy cow of Sirajgonj milk shed zone.

Consequences so far obtained in the present study exposed that, in dairy cows pregnancy is acknowledged as inducing tremendous physiological and metabolic adaptations necessary to assure the suitable improvement of the fetus and to provide

suitable substrates that are needed in utero and following birth (Van Dorland *et al.*, 2009). In the face of hemostatic mechanisms which function to hold down blood parameters within physiological levels, changes in biochemical indices happen as a result of grown metabolic demands during both pregnancy and lactation. In dairy cows the main changes in metabolic pathways normally commences approximately 3 weeks earlier to calving; it is maximal at parturition and until 3 weeks after calving (Alberghina,*et al.*, 2011). These periods are individualized by the solidarity of body fat, protein and mineral stores to content the fetal need for nutrients and the requirements for milk production and observance (Van Dorland *et al.*, 2009). From this study it was observed that cholesterol and triglyceride levels need to be lower in repeat breeding condition. On the other hand HDL- cholesterol level needs to be higher in repeat breeding cattle.

**Conclusion**

Lipid and lipoprotein profile alters in dairy cows fat metabolism, which may result in metabolic diseases such as ketosis, which is concerned to other disorders together with a reserved placenta, uterine infection, milk fever and mastitis. Many transition period diseases, inclusive fatty liver, also occur in a subclinical conformation attacking the overall health condition, production of milk and regenerative performance of dairy cows. The level of Cholesterol, Triglycerides were significantly higher in normal repeat breeder cows than synchronized repeat breeder cows. The results also emerged that the level of HDL-Cholesterol was higher in synchronized repeat breeder cows. The mean value of Cholesterol, Triglycerides and HDL - Cholesterol of unsynchronized repeat breeder cows were21.65 mg/dl, 29.86mg/dl,82.67mg/dl and in synchronized cows 7.008 mg/dl, 14.12 mg/dl, 124.7 mg/dl respectively.Because the lipid metabolism is a prime sight of the physiology and energy metabolism of transition cows, this study demonstrated the potential changes in serum lipid and lipoprotein profiles in dairy cows. Further investigation is needed to understand the detail mechanism of reproduction and lipid profile.

**Acknowledgements**

The author would like to thank Jahangirnagar University and Bangladesh Livestock Research Institute, Baghabari, Sirajgonj. Prof. Dr. Md. Ibrahim Khalil, Department of Biochemistry and Molecular Biology, Jahangirnagar University also supported this research work.

**Conflict of interest**

The authors declare that they have no conflict of interest.

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