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# Bovine plasma lipid concentrations in machine-milked cows during early lactation period

O. Tekelioglu[1*], M.Cimen[2], T.Bayril[3]

*[1]Department of Mechanical Engineering,& [2]Department of Food Engineering, Faculty of Engineering, Tunceli University, Tunceli, Turkey; [3]DIMES Kazova Animal Farm, Tokat, Turkey*

**Corresponding author e-mail: otekelioglu62@gmail.com*

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## 1 SUMMARY

**In this study ten machine milked cows (MM) and ten suckled +hand milked (HM) Holstein cows were studied for plasma lipid concentrations. Used blood samples were collected from the jugular vein of the cows on the last day of the second (2nd) and fourth (4th) week of the early lactation period.Total lipid levels were lower in MM treatment for second and fourth week (P<0.05) but triglyceride and cholesterol rates of plasma were similar for both groups during study (P>0.05). Further researches are needed to improve the interpretations knowledge of about lactation biology in machine milked cows considering the reasons for lower plasma total lipids.**

## 2 INTRODUCTION

Studies of lipids in plasma of cows have demonstrated significant changes in total lipids during normal lactation (Janovik *et al.,* 2006). Lactation provides an especially fine good opportunity for studying the blood lipids, because a very highly intensive fat metabolism occurs to provide the fat secreted in the milk (Hammon *et al.,* 2009). Plasma triglycerides are the primary source of long-chain fatty acids from dietary or adipose sources for milk fat synthesis. The roles of plasma lipids in body fat deposition and synthesis of milk fat of in lactating animals has received little attention. The regulation of lipid metabolism at secretory activation is a complex activity. The utilization of various sources for triacylglycerides synthesis by the mammary epithelial cells is influenced by both the stage of lactation and the environmental factors such as diet and milking methods (Rudolph *et al.,* 2007). The milk fat rates levels are influenced by plasma lipid concentrations (Mc Namara *et al.,* 1995) but the studies on the plasma lipids for during the early lactation period are limited. This research was aimed to investigate the plasma lipid concentrations in machine milked cows during early lactation period.

## 3 MATERIALS AND METHODS

In this experiment, 10 machine milked (MM) and 10 suckled +hand milked (HM) Holstein cows in first lactation were used during early lactation period in March 2006. Blood samples were collected once from the jugular vein of each cow on the last day of the 2nd and 4th week of the early lactation period. The blood samples were drawn from each animal by a disposable syringe through the vein and the blood was placed in heparinized tubes. The samples were

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then centrifigued at 3500 rpm for 5 min. The plasma (fluid with no blood cells) obtained in each tube was separated and immediately frozen to -40 °C for analysis. Later, an enzymatic colorimetric test was used to determine the total plasma cholesterol (mg $Dl^{-1}$; Boehringer Mennheim CHOD-PAP method) and trygliceride (mg $Dl^{-1}$; Boehringer Mennheim GPO-PAP method) as described (Kerscher & Town, 1985). Plasma total lipids which were determined according to Frings *et al.*(1972).

All of the data on plasma parameters are indicated as mean ± SEM. Comparisons were done by using t-test with help of the SPSS (Norusis, 1993).

## 4 RESULTS AND DISCUSSION

The results (Table 1 and 2) showed significant differences between MM and HM animals with respect to total lipid levels. The total lipid levels were lower in MM group ($P<0.05$) for 2nd and 4th week of early lactation. All plasma parameter levels of MM and HM cows in this study are consistent with normal values for cows reported by Kaneko *et al.* (1997).

The stress associated with separation of dams from their calves might have played a role in inhibiting lipid transfer to the blood in MM group. Dilmac *et al.* (2007) also showed that milk fat levels were lower in MM treatment than in HM treatment. Milk fat production was positively correlated to plasma total lipids by Hartmann & Lascelles (2002), who suggested that the cause was relative underfeeding in early lactation.

Fatty acids of milk lipids (glycerides) arise from two distinct sources, from blood plasma lipids and from direct synthesis in the mammary gland. Raphael *et al.* (1973) found that total lipids at 0 to 4 weeks postpartum averaged 292 mg/dl and increased to 508 mg/dl in weeks 5 to 10 and with a slight decrease to 458 mg/dl during weeks 16 to 33 prepartum. Hartmann & Lascelles (1965) did not observe as marked a change between dry and lactating cows. Mc Namara *et al.* (1995) observed a minimum total lipid at parturition followed by an increase in early lactation.

**Table 1**: Plasma parameters of MM and HM groups in the second week of lactation.

| Plasma Parameters | Treatment | | |
|---|---|---|---|
| | MM | HM | P |
| Trygliceride, mg $dL^{-1}$ | 33.2±15.3 | 23.3±20.3 | N.S. |
| Cholesterol, mg $dL^{-1}$ | 133.9±14.8 | 144.8±18.1 | N.S. |
| Total lipids, mg $dL^{-1}$ | 361.1±10.4 | 386.8±7.2 | * |

*P<0.05, N.S: Not significant

**Table 2**: Plasma parameters of MM and HM groups in the fourth week of lactation.

| Plasma Parameters | Treatment | | |
|---|---|---|---|
| | MM | HM | P |
| Trygliceride, mg $dL^{-1}$ | 14.6±17.1 | 16.3±23.1 | N.S. |
| Cholesterol, mg $dL^{-1}$ | 112.5±16.8 | 131.7±20.8 | N.S. |
| Total lipids, mg $dL^{-1}$ | 351.5±11.7 | 377.4±10.3 | * |

*P<0.05, N.S: Not significant

Trygliceride and cholesterol rates of plasma were not significantly different between the machine milked and hand milked cows ($P>0.05$). Plasma from lactating cows contains about 8 to 32 mg/dL triglyceride (Rindsig & Schuhz, 1974; Mazur *et al.,* 1989).

It is known that plasma cholesterol values are lower in cows with higher losses in body condition scores. Whereas, body condition scores of cows in both group were not different in our study (Data not shown). Therefore, plasma cholesterol levels were not expected to different significantly in between the MM and the HM treatment. It has been suggested that the plasma cholesterol density is related to the energy balance, but this has not yet been completely defined (Ruegg *et al.,* 1992). In general, dairy cows experience a negative energy balance in early lactation, because feed intake can not support the energy required for milk yield and maintenance. Cows in a negative energy balance mobilize more body fat reserves.

A decrease in plasma total lipid percentage levels in MM group can directly lead to financial loss if the milk price depends on milk fat percentage. Because, milk fat production is positively correlated to plasma total lipids (Hammon *et al.,* 2009). In addition, it has been shown that a strong decrease in milk fat percentage is related to a larger and longer lasting negative energy balance.

Further research is needed to improve the interpretations about lactation biology in MM treatment. Finally, a lack of significant differences in plasma cholesterol and trygliceride levels between the macine milked and hand milked cows indicates that machine milking treatment did not negatively affect metabolic pathways in cows that could lead to metabolic disorders.

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