Vol. XVI (1-2), 1979

COMPOSITION OF NORMAL AND RESIDUAL MILK OF BUFFALO AS INFLUENCED BY OXYTOCIN

Sadaqat Hayat Hanjra, M.J. Qureshi, M.D. Ahmed and Bakht B. Khan*

Oxytocin was administered intramuscularly to six lactating buffaloes to determine its effect on milk fat and SNF contents in normal and residual milk. It was used at two levels (10 IU in animals in Group A and 20 IU for those in Group B) throughout the lactation on alternate weeks. The average percentage of fat in normal and residual milk in animals receiving 10 IU was 6.78 ± .069 and 15.10 ± .338, respectively. In animals receiving 20 IU, it was 7.06 ± .097 and 16.24 ± .414 per cent, respectively. The percentage of SNF in buffaloes in Group A was 9.48 ± .055 and 9.24 ± .061 whereas for buffaloes in Group B, the corresponding values were 9.59 ± 0.32 and 8.96 ± .055, respectively.

INTRODUCTION

Oxytocin injections have been successfully used for letdown of milk. The milk obtained with oxytocin injections after a normal milking is referred to as residual milk and its amount is generally considered to be proportional to the level of milk production. This has been observed that as compared to normal cow milk, the residual milk is higher in fat content but lower in solids-not-fat (SNF). In buffalo, however, the composition of residual milk does not seem to have been adequately investigated.

Swanson and Hinton (1951) observed that fat content of normal cow milk increased during last stages of lactation whereas residual milk obtained with oxytocin contained the highest amount of fat at peak lactation followed by a decrease toward the end of lactation. The SNF content on the other hand was low in residual milk as compared to that in normal milk throughout the lactation. A slight increase in the amount of SNF, however, was noticed near the end of lactation. Donker *et al.* (1954) reported that normal and residual milk contained 1.44 and 5.74 per cent fat, respectively, and that small quantities had more fat as compared to larger quantities of residual milk. Koshi and Petersen (1955) found that the amount of fat in residual milk of cow ranged from 6.1 to 22.5 per cent. It was reported that fat content of milk normally

*Faculty of Animal Husbandry, University of Agriculture, Faisalabad.

secreted by buffalo was high during the first month of lactation; it decreased in the second month and then remained more or less constant before it again increased during the last three months of lactation (Aggarwala and Sharma, 1961) Ghosh and Anantakrishnan (1964) found a significant effect of stage of lactation on fat and SNF values of buffalo milk. Khan *et al.* (1971) reported that average fat and SNF content of buffalo milk was 6.47 and 9.97 per cent, respectively.

It was reported that oxytocin could influence the composition of milk (Wheelock *et al.*, 1965). Aliev (1966) and Natzke and Schultz (1967) observed that residual milk of buffalo and cow contained higher percentage of fat than found in normal milk. Morag (1968) found increased amount of fat and total solids after oxytocin administration in cow. Lane *et al.* (1970) reported that percentage of fat in Holstein Fresian and Jersey milk increased from 3.02 and 3.96 to 11.97 and 12.75, respectively. However, oxytocin adversely affected the SNF content.

MATERIALS AND METHODS

The data were obtained from six freshly calved buffaloes. These animals were divided into two groups (A and B). After normal milking, buffaloes in Group A were injected 10 IU and those in Group B were given 20 IU oxytocin intramuscularly on alternate weeks throughout the lactation.

Samples of residual milk obtained during treatment week were saved once each week. During alternate non-treatment weeks, composite samples (morning and evening) of normal milk were also saved. These samples were analysed for fat and SNF contents using conventional methods. The effect of stage of lactation on both of these constituents of normal as well as residual milk was also studied. The data were analysed using standard statistical procedures.

RESULTS AND DISCUSSION

The average percentage of fat in normal milk of buffaloes injected 10 IU oxytocin was $6.78 \pm .069$ while in buffaloes given 20 IU oxytocin it was $7.06 \pm .097$. The week to week comparison revealed that the amount of fat increased steadily from early to late stage of lactation. There was no difference between the percentage of fat in milk of animals treated either with 10 IU or 20 IU

oxytocin (Table 1). However, highly significant difference in fat content between various stages of lactation was observed. The interaction between animals and weeks was also significant.

Average SNF in normal milk obtained from buffaloes given 10 IU or 20 IU oxytocin was 9.48±.055 per cent and 9.59±0.32 per cent, respectively. The SNF was higher at parturition; it dropped down slightly and then increased slowly being the highest toward the end of lactation. The difference between treatments and stage of lactation was non-significant (Table 1).

Table 1. *Analysis of variance for fat and SNF in normal milk.*

Source of variation	D.F.	*Mean square of*	
		Fat (%)	SNF (%)
Between animals			
Treatment	1	2.028N.S.	0.288N.S.
Error (a)	4	0.655	0.576
Within animals			
Weeks	17	0.666**	0.105N.S.
T×W	17	1.022**	0.026N.S.
Error (b)	68	0.135	0.104

**P<0.01, N.S. = Non-significant

The fat and SNF contents in normal milk as found in the present study are in agreement with the values reported by Ghosh and Anantakrishnan (1964) and Khan *et al.* (1971). The slight variation in the results of these studies and those of the present may be attributed to different environmental conditions under which these investigations were conducted. The effect of stage of lactation was similar to that reported by Swanson and Hinton (1951), Aggarwala and Sharma (1961) and Ghosh and Anantakrishnan (1964).

The percentage of fat in residual milk of buffaloes in Group A was 15.10±.338. The corresponding value for animals in Group B was 16.24±.414 per cent. The analysis of variance revealed non-significant difference between treatments while the effect of stage of lactation was highly significant (Table 2).

The average percentage of SNF in residual milk of buffaloes administered 10 IU oxytocin was 9.24±.061 while it was 8.96±.055 in those injected 20 IU.

The effect of treatment was not significantly different whereas the effect due to stage of lactation differed significantly (Table 2). It was observed that more the amount of residual milk, the higher was the percentage of fat in it. The SNF content on the other hand did not exhibit the same trend and was the highest at the start of lactation; later dropped slightly showing again an upward trend towards the end of lactation. These findings agree with those of Swanson and Hinton (1951) and Natzke and Schultz (1967) who reported that the percentage of fat in residual milk was more when its amount was larger.

Table 2. *Analysis of variance for fat and SNF in residual milk.*

Source of variation	D.F.	*Mean square of*	
		Fat (%)	SNF (%)
Between animals			
Treatment	1	35.478N.S.	2.089N.S.
Error (a)	4	27.599	4.027
Within animals			
Weeks	17	16.033**	0.166**
T x W	17	4.676N.S.	0.003N.S.
Error (b)	68	5.225	0.004

**P<0.01 N.S. = Non-significant

The higher percentage of fat in residual milk is probably due to the reason that the last drawn milk would remove adhered or retained fat. If the quantity of fat secreted per day in normal milk is larger, then a higher amount tends to be retained in udder. Therefore, when the animals are at peak production, a higher amount of residual milk with high fat test is produced. Lower amount of SNF in residual milk may be attributed to the fact that synthesis and secretion of these constituents is independent of that of fat (Swanson and Hinton, 1951).

The residual milk as compared to normal milk was found to contain significantly higher amount of fat throughout the experimental period but had low SNF content (Table 3). These findings are in line with those of Swanson and Hinton (1951) and Lano *et al.* (1970) who reported that the percentage of fat was higher and that of SNF was lower in residual milk.

Table 3. *Comparison of percentage of fat and SNF in normal and residual milk.*

Dose	Animal No.	Fat (t value)	SNF (t value)
10 IU	443	10.33**	5.34**
	335	19.97**	15.86**
	384	20.10**	8.53**
20 IU	269	20.59**	7.34**
	143	9.67**	29.08**
	123	15.87**	12.57**

**$P<0.01$

LITERATURE CITED

Aggarwala, A.C. and R.M. Sharma. 1961. A Laboratory Manual of Milk Inspection. Asia Publishing House, New Delhi.

Aliev, M.H. 1966. Residual milk and its role in the milk secretion of buffaloes. Proc. 17th Int. Dairy Cong. (Abst. 137).

Donker, J.D., J.H. Koshi and W.E. Petersen. 1954. The influence of oxytocin induced udder evacuation on milk and butter fat production in a complete lactation. J. Dairy Sci. 37, 299.

Ghosh, S.N. and C.P. Anantakrishnan. 1964. Composition of milk. Part V. Effect of stage of lactation. Indian J. Dairy Sci. 17, 17.

Khan, Bakht, B., A.O. Shaw, M.J. Qureshi and M.D. Ahmad. 1971. A comparison of hydrometric (plastic bead) and gravimetric methods for the determination of solids-not-fat in buffalo milk. Pak. J. Agri. Sci. 8, 90.

Koshi, J.H. and W.E. Petersen. 1955. Complementary milk and its relationship to lactation. J. Dairy Sci. 38, 788.

Lane, G.T., C.W. Dill, B.C. Armstrong and L.A. Switzer. 1970. Influence of repeated oxytocin injections on composition of dairy cows milk. J. Dairy Sci. 53, 427.

Morag, M. 1968. A galactopoietic affect from oxytocin administered between milkings in the cow. Annals Biol. Anim. Biochim. Biophys. 8, 27 (Anim Breed. Abst. 36, 573, 1968).

Natzke, R.P. and L.H. Schultz, 1967. Effect of oxytocin injections on mastitis screening tests and milk composition. J. Dairy Sci. 50, 43.

Swanson, E.W. and S.A. Hinton. 1951. Residual milk from oxytocin injections throughout the lactation. J. Dairy Sci. 34, 419.

Wheelock, J.V., J.A.F. Rook and F.H. Dodd. 1965. The effect of intravenous injections of oxytocin during milking and the removal of residual milk on the composition of cows milk. J. Dairy Res. 32, 255.