

## Oxytocin release response in hand and machine milking Murrah buffaloes

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Dairy cows store more than 80% milk in the cistern compartment of udder in contrast to 50% in sheep and goats (Bruckmaier and Blum 1998) and 5% in Murrah buffaloes (Thomas *et al.* 2004, Michelle and Singh 2008). Due to this reason teat message before milking play an important role in let-down of the alveolar milk into the cisterns in buffaloes (Michelle and Singh 2009). Dairy farmers are now adopting machine milking practices due to cost effectiveness, lesser time on milking operations and hygiene milk production (Filipovic and Kokaj 2009). Milking machine is a remarkably effective stimulation device to release the oxytocin and the tactile stimulation provided by the machine is comparable to calf suckling or hand stimulation in cows (Tancin *et al.* 2001, 2001<sup>a</sup>). Milking machine also applies physiological stress to the teat skin and tissues. It appears that 10 to 20 sec of tactile stimulation is sufficient to elicit oxytocin secretion in high-producing cows but buffaloes take more time to let-down of the milk (Ruegg *et al.* 2000, Ramasamy and Singh 2004). Oxytocin is released by the presence of food in the mouth, oesophagus or stomach (Yayou *et al.* 2011). The duration of feeding might effect oxytocin release by stimulation of peripheral nerves originating in the gastrointestinal tract (Stock and Uvnas-Moberg 1988, Johansson 2000)). The information on this aspect and whether hand and machine milking buffaloes behave similarly in terms of release of oxytocin hormones is lacking in buffaloes. The present study was carried out to investigate the effect of teat message, concentrate intake and the release of oxytocin hormone during hand and machine milking in Murrah buffaloes.

Apparently healthy lactating Murrah buffaloes (12) in mid lactation (av.105 days) and producing average milk yield of 6.0 kg/day were selected from the institute herd. The animals were managed as per the management practices followed in the institute herd and were divided into hand milking group (n=6) or machine milking group (n=6). The animals were

offered *ad lib.* green fodder (maize) while concentrate mixture (2– 3.5 kg/milking) was offered based on milk yield (1.5 kg/ kg milk). Buffaloes were milked twice a day in morning (6:30 AM) and evening (6:30 PM) either by expert hand milker or by machine milking. A polyvinyl catheter was placed into a jugular vein of each animal 5 h before blood collection. The catheters were filled with heparinized saline (200 IU/mL) solution. Blood samples (15) were collected in heparinized vacutainer tubes 20 min before milking, after concentrate intake, after teat message, during milking and 20 min post-milking. Plasma oxytocin was measured by enzyme immunoassay kit. The intra-assay and inter-assay coefficient of variations were 7.5 and 11.2%, respectively. Analysis of data was carried out using *sigma-3* statistical package and mean values were compared with “t” test (Snedecor and Cochran 1980).

**Release of oxytocin during milking operations:** Feeding of concentrate mixture resulted in a significant increase ( $P<0.01$ ) in oxytocin levels which increased ( $P<0.01$ ) further after the teat message to let-down the milk. The ingestion of food triggers oxytocin release by activation of vagal afferent nerves and stimulation of senses such as olfaction (Stock and Uvnas-Moberg 1988, Yayou *et al.* 2011). Further, feeding plus pre-stimulation leads to a 3.6-fold increase in oxytocin

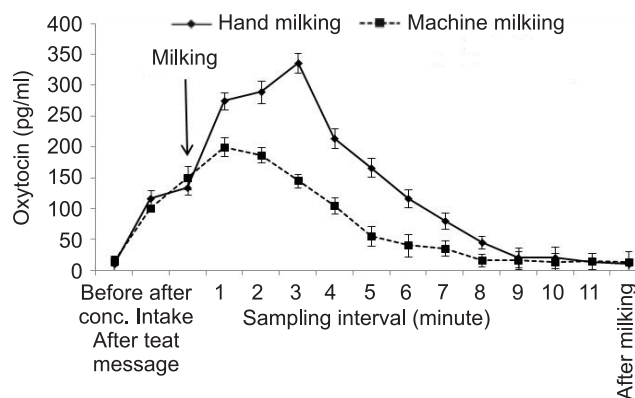


Fig. 1. Effect of hand and machine milking on plasma oxytocin release in Murrah buffaloes.

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level in comparison to direct application of milking cluster or 1 min prestimulation in buffaloes (Thomas *et al.* 2005). The milking operation either by hand or machine stimulated significant ( $P<0.01$ ) release of oxytocin in both hand and machine milking group of buffaloes, however increase was more ( $P<0.01$ ) in hand milking group (Fig. 1). Gorewit *et al.* (1992) reported that hand-milking results in a pronounced and prolonged release of oxytocin and prolactin in comparison to machine milking as observed in this study also. Negrao (2007) reported significantly greater oxytocin concentration during suckling than the hand and machine milking. Plasma oxytocin concentration was significantly higher between group ( $P<0.01$ ) and between interval of sampling ( $P<0.05$ ). In the hand milking group, plasma oxytocin levels increased significantly ( $P<0.01$ ) to peak oxytocin level ( $336.62\pm15.6$  pg/ml) during third minute of milking, and declined gradually to minimum level (44.65 to 45.98 pg/ml) after 20 min of milking. In machine milking group, oxytocin peak was observed after 1 min of milking and thereafter oxytocin levels declined steadily. The teat message caused significant rise in plasma oxytocin in all the buffaloes and corroborates the earlier findings that oxytocin release during udder stimulation is necessary for milk ejection from mammary alveoli and for the maintenance of lactation (Bruckmaier and Blum 1996, Marnet and Negrão 2000). Other investigators have also demonstrated that udder stimulation induces oxytocin release in Shami cows (Kaskous *et al.* 2006) and Murrah buffaloes (Thomas *et al.* 2005).

Negrao *et al.* (2007) reported that oxytocin release was not a restrictive factor in submitting Gir, Gir  $\times$  Holstein cows to machine milking. Contrary to this in this study hand milking stimulus was more effective to elicit oxytocin release during hand milking in comparison to machine milking. However the extents of hand milking stimulus effects are variable, possibly arising from inter-breed variation in the response to stimuli (Walsh 1974). Though hand milking results in more release of oxytocin but introducing the machine milking instead of hand milking help the dairy farmers to improve their milk production with higher work efficiency and hygienic quality of milk (Filipovic *et al.* 2009). Oxytocin hormone has half-life of approximately 1.5 to 2 min (Nickerson 1992). The release pattern of oxytocin in both hand and machine milking suggest that milking of buffaloes should be completed within 5 min as oxytocin level attain peak and decline significantly during this period of time.

### SUMMARY

Experiment was carried out to elucidate the effect of teat message, concentrate intake and milking operation on the release pattern of plasma oxytocin in hand and machine milking Murrah buffaloes. Blood samples were collected from both the groups before milking, after concentrate intake, after teat message, during milking and 20-min post

milking. Plasma oxytocin concentration was measured by enzyme immunoassay kit. Hand milking of buffaloes resulted in more release of oxytocin in comparison to the machine milking; however the pattern of release of oxytocin was similar in both the groups. The peak of oxytocin was attained earlier in machine milking buffaloes than the hand milking buffaloes. The oxytocin levels were restored to normal within 5 to 10 min of milking. It was concluded that factors like concentrate intake, teat message stimulus and milking operation significantly release oxytocin hormone to let down the milk. Hand milking stimulus was more effective in eliciting the oxytocin release in Murrah buffaloes.

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