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EFFECT OF BIRTH WEANING ON FUTURE BEHAVIOUR OF CALVES AND THEIR PRODUCTIVITY: AN OVERVIEW

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Abstract: Weaning practiced in dairy industry may negatively affect the behaviour and production performance of dams along with their calves. The stress caused due to weaning result in alteration of normal behavioural pattern performed by calves. Play behaviour and vocalisation pattern could be employed to assess the weaning stress and in-turn the welfare of calves. Development of abnormal behaviours was more observed in early weaned calves. The effect of weaning stress may last longer in calves and it is negatively associated with the production performance.

Keywords: Birth weaning, Calf behaviour, Performance, Weaning stress.

Introduction

Weaning of calves considered necessary for improving the efficiency of farm and reproduction activity of the dams. Weaning acts as one of the major stress factor after birth and it may affect both dams and calves. The loss of nutrition through milk, lack of social bonding with mother, novel environment and increased social stress among calves as they try to establish dominance in a population lacking adults are the probable sources of stress affecting calves following weaning. The duration and intensity of the response of calves to weaning depend on several factors such as method of weaning, age at weaning, housing and feeding program (Neamt *et al*., 2019). The calves' body weight dynamics and behavioural patterns following weaning suggest a negative emotional state associated with weaning (Sweeney *et al*., 2010) and it could be essential in assessing the welfare of calves. Early separation of calf and dam may negatively affect the health of the cow and calf, increase the stress, and instability of social behaviours. Calf welfare may be enhanced through longer period of maternal suckling, both during suckling period and in future (Kisac *et al*., 2011). Weaning of calves abruptly may affect both body weight and behavioural pattern of the calves. In addition, weaning may cause the calves to develop and preform stereotypic behaviours (Neamt *et al*., 2019). Occurrence of non-nutritive oral behaviours such as cross

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suckling is more in calves that are deprived of suckling their mothers (Ninomiya, 2014). Rearing of dam and calf together is thought to delay the onset of postpartum puberty in dairy animals. Weaning hastens the resumption of postpartum ovarian cyclicity and improves conception rate (Rijasnaz *et al*., 2012). Better growth performance, immune status, health, oxidative stress and fewer incidences of abnormal behaviour observed in buffalo calves under natural suckling system as compared to weaned buffalo calves (Singh *et al*., 2019).

Weaning is practiced to enhance the economic viability of the farm considering quantity of milk yield in one hand and the cost of production of calf rearing on the other hand. Prolonged suckling increases the live bodyweight of calves. However, it may negatively affect the productivity of the dam as the highest milk production was observed in cows that were suckled by their calf for shortest time (Kisac *et al*., 2011). Thus it is the task of the farmer to decide either on higher production of dam or on higher increases in body weights of calves. Following weaning, attachment of dam to their young one is more short-lived as compared to calves to theirs mothers as the cows' reaction to weaning peaks within first day only (Stehulova *et al*., 2017). Hence, efficient weaning is required to reduce the impact of weaning stress on calves and to enhance the farm productivity in intensive rearing systems. The effect of weaning on behaviour of calves and their productivity is reviewed in the following section.

Effect of birth weaning on behaviour of calves

Weaning acts as stress for the calves which result in alteration of their behavioural pattern. Dam is the calf's first social partner immediately after birth and later in life the calf gradually starts spending more time in associating with other calves and cows. However, immediate separation of calves after birth may negatively affect the expression of several behaviours. Among various behaviours performed by calf, play behaviour could be a better indicator of its welfare (Held and Spinka, 2011) as decrease in frequency of play behaviour is observed during stressful conditions in young animals (Rushen and de Passille, 2012). Valnickova *et al*. (2015) has experimented the effect of age at weaning on the play behaviour in calves. They have observed a significantly higher amount of play behaviour in calves separated from mothers at 4^{th} day of calving as compared to calves separated immediately after birth. The effect of weaning on play behaviour is depicted in the Fig.1. Similarly, Wagner *et al*. (2013) also reported higher social play behaviour in calves reared with mothers as compared to calves separated immediately after birth. However, more locomotor play behaviour was observed in calves separated from their mothers at birth (Wagner *et al*., 2013).

The increase in locomotor play might be either due to build-up of inner motivation during deprivation in the weaned calves or in response to the novelty.

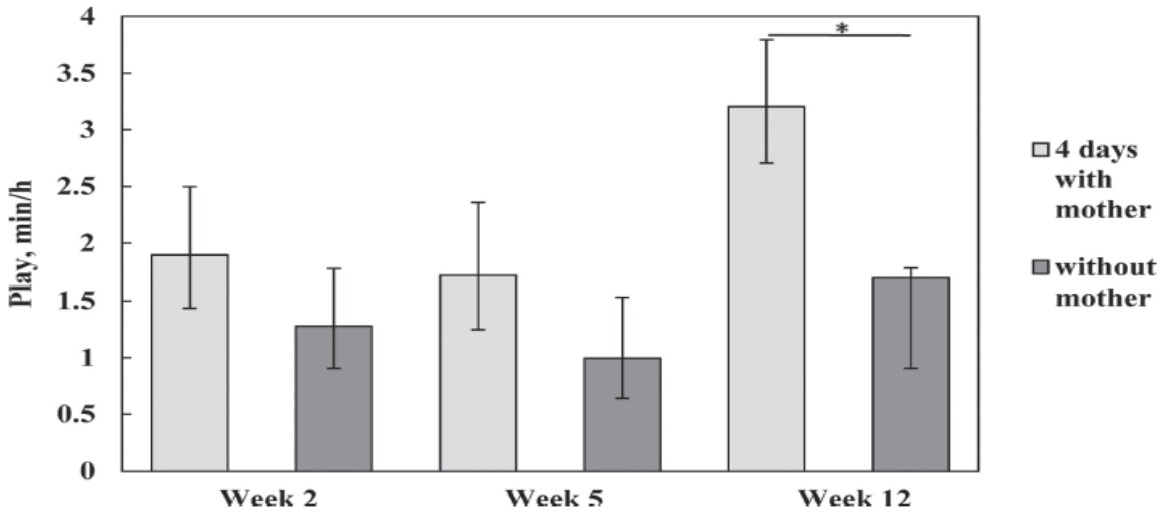
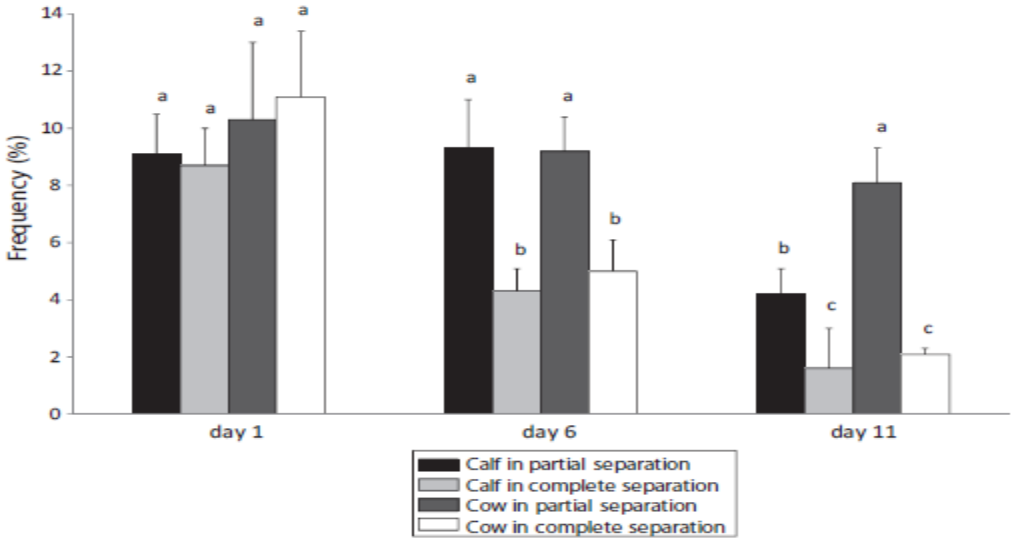


Fig.1. The effect of separation from mother on d 1 or 4 on play levels in the home pen on week 2, 5, and 12 (* represents P < 0.05, adapted from Valnickova *et al.*, 2015)

Acoustic communication could be a better indicator of weaning stress in calves as they vocalize with the motivation to contact their separated mothers. Vocalization frequency is significantly higher immediately after weaning and increased even more at 6 – 8 hours and again at 24 – 26 hours after weaning (Stehulova *et al*., 2017). Vocalization rates were significantly higher in calves weaned at younger age (Lambertz *et al.*, 2015), and in contrary Stehulova *et al*. (2017) reported that age of weaning did not affect the vocalisation behaviour in calves. Female calves vocalize more in comparison to male calves, and hence female calves are thought to be more affected by weaning as compared to male calves (Lambertz *et al.*, 2015; Stehulova *et al*., 2017). Type of weaning may also affect the vocalization rates in cows and calves. The rate of vocalization was higher only on the first day of calving both in partial and complete separation of calf from cows which is an indication short-lived attachment of cows on their calves. However, higher vocalization rates were observed in calves till 11th day postpartum, indicative of stronger attachment of calves to their mothers. Vocalization rates were similar between partial and complete separation on 1st day, however, vocalization rates decreased in partially weaned calves in subsequent observations on 6th and 11th day as compared to complete deprivation from their mothers (Rhim, 2013). The vocalisation rates of cows and calves in partial and complete separation are presented in the fig. 2.



Frequency of vocalizations of cows and calves in partial and complete separation (Different letters indicate significant differences between the mean values on a given day, P<0.05, adapted from Rhim, 2013)

In partial separation, duration of standing is higher and the calves tended to orient their head towards wall separating them from their mothers. This behaviour is suggestive of calves' willingness to reunite with their dams (Rhim, 2013). Expression of different behaviours such as lying, standing, licking, and sniffing by calves during partial and complete separation are presented in the table-1. The method of weaning significantly affects the feeding behaviour of calves, and the data regarding feeding behaviour in abruptly weaned calves and gradually weaned calves is presented in the table-2 (Neamt *et al*., 2019). Increased meal frequency is observed in calves weaned gradually as compared to abruptly weaned calves (Bach, 2012; Neamt *et al*., 2019).

Table 1: Behaviour of calves following partial and complete separation

Behaviour	Day 1		Day 6		Day 11	
	Partial	Complete	Partial	Complete	Partial	Complete
Total duration of standing (min/h)	32.1±6.3	30.7±4.2	30.8^{a}±3.4	21.3^{b}±2.9	25.2±3.5	15.4±1.7
Total duration of lying (min/h)	3.4^{b}±1.1	5.7^{a}±1.4	6.2±2.7	8.5±2.1	6.0^{b}±1.3	15.2^{a}±2.6
Frequency of licking (No./h)	47.2±5.9	49.3±3.6	39.3^{a}±3.9	26.9^{b}±5.1	30.2^{a}±6.1	15.1^{b}±3.3
Frequency of sniffing (No./h)	31.2±2.6	34.6±2.9	29.8^{a}±3.1	20.3^{b}±2.1	34.2^{a}±3.9	18.3^{b}±2.7

(Adapted from Rhim, 2013)

Table. 2: Feeding behaviour of calves under different methods of weaning

Weaning method	Behaviour patterns	Feeding behaviour
Abrupt weaning	No. of events	6.3±0.17[a]
	Average event length	14.9±0.3[a]
	Total daily length	93.87±6.11[a]
Gradual weaning	No. of events	8.1±0.31[b]
	Average event length	18.7±0.84[b]
	Total daily length	151.47±4.28[b]

([a,b] Columns mean with different superscripts differ significantly at P≤0.05, adapted from Neamt *et al*., 2019)

Early rearing conditions during first 12 weeks of life have long-term effect on the behavioural pattern of calves. Self-grooming was more in heifer reared with their mothers during first 12 weeks of life as compared to artificially reared heifers (reared with other calves under deprivation from their dams), and also mother reared animals showed more submissive behaviour as compared to artificially reared animals (Wagner *et al*., 2012). Reduction in aggressive interactions through submissive behaviour may aid the animals to effectively communicate in unfamiliar conditions. Abnormal behaviours such as cross-suckling, self-suckling and licking of inanimate objects were significantly higher in weaned buffalo calves in comparison to suckled calves (Singh *et al*., 2019). Similarly, Kumar (2014) also reported higher incidences of self-suckling in weaned buffalo calves.

Presence of social support (i.e., other calves) may suppress the negative impact of weaning and also enhance the welfare of weaned calves. More researches have to be undertaken to examine the possible benefits of dam rearing on social behaviours and other behaviours such as reproductive behaviour of the growing heifer.

Effect of birth weaning on productive performance of calves

Stress due to weaning may negatively affect the health and productive performance of calves. The weight gain in calves separated at day 4 was significantly higher as compared to calves separated immediately after birth (Valnickova *et al*., 2015). Higher milk consumption might be the reason for faster growth rate in calves reared along with their mothers. Individual housing of calves after weaning may acts as an additional stressor to the calves. If the calves are housed in group, it may significantly increase the growth rate (Jensen *et al*., 2015) which might be due to increase in solid food intake by social facilitation or social learning from the

peer members (Vieira *et al*., 2012; Gaillard *et al*., 2014). The effect of maternal deprivation may last longer in calves evidenced by a significantly higher growth rate at the age of 12 weeks in calves reared with their dams up to 4 days post-calving (Valnickova *et al*., 2015). The daily body weight gain was significantly higher in suckled calves as compared to weaned calves (Singh *et al*., 2019). The daily body weight gain of calves is shown in the fig. 3.

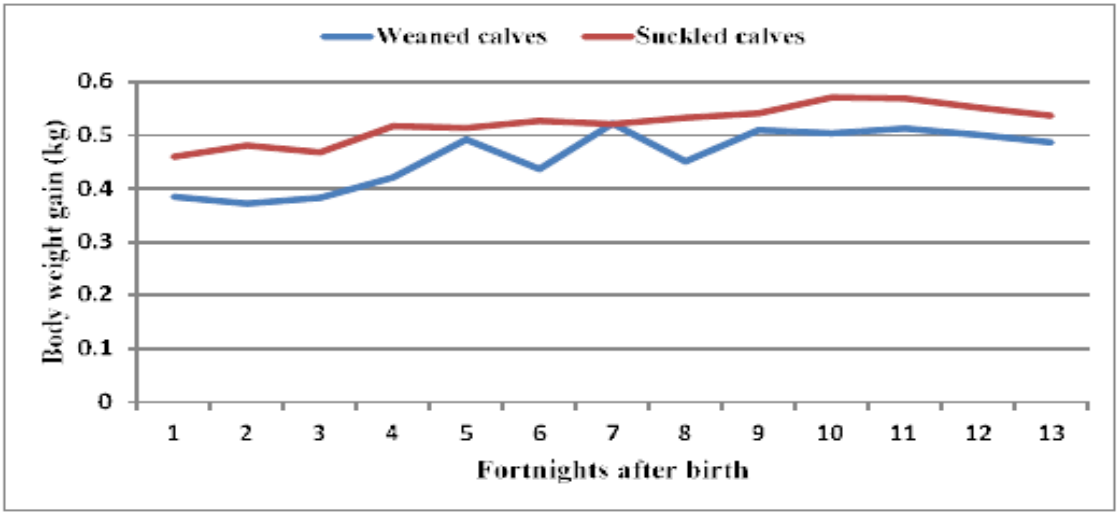


Fig.3. Daily body weight gain (kg/day) of weaned and suckled buffalo calves (Adapted from Singh *et al*., 2019)

Calves weaned at younger age had lower body weights compared to calves weaned at 21st day of calving (Kisac *et al*., 2011). This might be attributed to better nutrition as the calves stayed with their mother till later part of their life had higher intake of milk. Type of weaning may also significantly affect the body weight dynamics in calves. Degree of reduction in weight following weaning was higher in abruptly weaned calves (6.6%) as compared to gradually weaned calves (3.73%), indicating that gradual weaning should be practiced while separating calves from their mothers (Neamt *et al*., 2019). However, concurrent decrease in milk yield was observed in cows under prolonged nursing. Significant differences in body condition scoring (BCS), age at first calving, udder health and milk yield in first lactation was not observed between conventionally reared calves (reared with their mothers) and artificially nursed calves (Wagenaar *et al*., 2011).

Conclusion

Although weaning is necessary for improving the farm efficiency and productivity of cows, it imposes stress to the calves. Weaning of calves from their mothers at birth significantly affect their performance, behavioural pattern and immune status. Rearing of calves with their dams is having many advantages, not only in early stages of life but also in later part of the calves' life. Alteration in behaviours such as play behaviour, vocalisation,

ingestive behaviour etc. is observed in weaned animals. Weaning of animals at very younger age may lead to more incidences of abnormal behaviours. Deprivation of maternal environment negatively affects the growth performance of calves. Thus, it is necessary to adopt improved weaning managemental practices to enhance the productivity, and also to ensure welfare of dairy calves.

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