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Relationship between body condition score, sub-clinical endometritis and milk yield of dairy cows after parturition

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ABSTRACT

The objective of this study was to diagnose sub-clinical endometritis (SCE) via endometrial cytology on day 42 after parturition and its impact on milk yield (305 days) of dairy cows (parity 2–4). Endometrial cytology was performed in 20 dairy cows, out of which 6 cows were found positive for sub-clinical endometritis. Mean number of polymorphonuclear cells was significantly higher in sub-clinical endometritis positive cows (22.00±4.77%) when compared to cows found negative for sub-clinical endometritis (2.58±0.76%). Sub–clinical endometritis positive cows had a significantly lower (P<0.01) 60 days milk yield as compared to sub–clinical endometritis negative cows. Similarly, cows found positive for sub-clinical endometritis (n=6) also had an average milk yield of 1772.38±111.22 litres which was significantly lower to those diagnosed negative for SCE (2392.34±65.16 litres).

Key words: Body condition score, Endometrial cytology, Milk yield, Postpartum cows, Sub–clinical endometritis

One of the most imperative factors determining the profitability of cattle herds is reproductive and productive performance (Pascottini *et al.* 2015; Sharma *et al.* 2018a). In the past decades, the knowledge of the patho-physiology of clinical disorders, e.g. metritis, endometritis and sub-clinical endometritis (SCE) has increased significantly. SCE has been described as a condition with no systemic signs of illness or clinical infection but can be characterised by an elevated population of polymorphonuclear leukocytes (PMN) present in the uterus postpartum (Gilbert *et al.* 2005; Pascottini *et al.* 2015). The cytobrush technique has been used to diagnose sub-clinical endometritis and thus, evaluating the relationship between polymorphonuclear cells (PMNs) and conception (Pascottini and Opsomer 2016). Negative energy balance (NEB) condition arises due to drastic increase in energy requirements for milk yield which can be evaluated by energy intake and output and expressed by the body condition score (BCS). Maintaining optimal BCS during the early lactation period led to higher leptin and lower NEFA concentrations and subsequently low incidence of sub-clinical endometritis (Colakoglu *et al*. 2017). Negative effect on fertility, drop in milk production and early depreciation of potentially useful cows has also been associated with sub-clinical endometritis (Erb and Martin 1980). Therefore, the main objective of the study was to evaluate the relationship between sub-clinical endometritis, body condition score and average milk yield of dairy cows.

The study was conducted on 20 Jersey crossbred cows (parity 2–4) at Livestock Instructional Farm Complex of College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur (32.6ºN, 76.3ºE, altitude 1290.8 m), India. Cows were reared in a loose housing system under standard management conditions, fed a total mixed ration, once daily, *ad lib.,* and had unrestricted access to water. Cows were milked twice daily (04:00 and 15:00 h). BCS of all the animals was recorded immediately after calving using five point scale of scoring (Edmonson *et al.* 1989). Endometrial cytology was performed (on day 42 post-partum) and a differential count, minimum of 100 cells (endometrial, PMNs and epithelial cells), was performed to provide a quantitative assessment of endometrial inflammation in sub-clinical endometritis positive (SCEP) and sub-clinical endometritis negative (SCEN) cows. Milk yield upto 60 days in milk (DIM) and average milk yield (305 days) was also recorded to know the effect of sub-clinical endometritis on milk production. The data was statistically analyzed using student t-test with SPSS® 20 level version for windows.

Body condition score (BCS) of the cows was recorded at the time of parturition and found to be numerically higher (P>0.05) in SCEN cows as compared to SCEP cows (Table 1). BCS at calving is often correlated with Negative Energy Balance (NEB) which can lead to sub-clinical endometritis after parturition (Dubuc *et al.* 2010, Pascottini *et al.* 2017).

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Cows with a BCS ≤2.50 are reported to have higher incidence of sub-clinical endometritis as decreased dry matter intake, increased serum non-esterified fatty acid (NEFA) and β-hydroxybutyrate concentrations impair neutrophil function, thus, enabling the development of sub-clinical endometritis which is in agreement to our study (Gunduz *et al.* 2010, Sharma *et al.* 2018a).

Endometrial cytology has been used as a diagnostic technique for diagnosis of sub-clinical endometritis (Kasimanickam *et al.* 2004, Sharma *et al.* 2018b). In our study, significantly higher (P<0.01) percentage of PMNs were found in SCEP cows as compared to SCEN cows (Table 1). SCE was diagnosed in 6 dairy cows which is based on the presence of >10% PMNs (neutrophils) on day 42 postpartum. Our finding is in agreement to Kasimanickam *et al.* (2004) who diagnosed SCE on the presence of >10% PMNs between day 34–47 postpartum in dairy cows. As neutrophils form the first line of defense against the invading pathogenic organisms, so, any

Table 1. Relationship between BCS, endometrial cytology, milk yield upto 60 days in milk (DIM) and average milk yield (Mean±SE)

Group	BCS (1–5 point scale)	PMNs (Neutrophils)	Milk yield upto 60 DIM (litres)	Average milk yield (litres)
Sub– clinical endometritis positive (n=6)	2.47± 0.18^{ab}	22± 4.77^{a}	302.34± 17.58^{a}	1772.38± 111.22^{a}
Sub–clinical endometritis negative (n=14)	2.63± 0.21^{ab}	2.58± 0.76^{b}	452.78± 23.48^{b}	2392.34± 65.16^{b}

^{a,b}Values with different superscripts within the same column are significantly different (P<0.01).

significant increase in neutrophil population within the uterine lumen due to infectious or metabolic causes can be suggestive of endometrial inflammation (Sharma *et al.* 2018b). In order to halt the propagation and establishment of bacterial infection in the postpartum uterus, phagocytic activity of neutrophils is necessary (Barlund *et al.* 2008). However, uterine inflammation following parturition is a normal process but in some of the postpartum cows, the inflammation exceeds the normal threshold and leads to SCE (LeBlanc 2014).

In sub-clinical endometritis positive (SCEP) cows, milk yield upto 60 days in milk was significantly lower (P<0.01), i.e. 302.34±17.58 litres (Table 1), as compared to SCEN cows (452.78±23.48 litres). Similarly, average milk yield (305 days) of SCEP cows was also significantly lower (P<0.01), i.e. 1772.38±111.22 litres, in comparison to sub-clinical endometritis negative cows (2392.34±65.16 litres). Similarly, Bell and Roberts (2007) found that sub-clinical endometritis may negatively affect milk production. In our study, loss of approximately 2 kg milk/day/cow was found in SCEP cows. In agreement to our findings, McDougall *et al.* (2011) reported a decrease in milk production of 0.6–1.03 kg/cow/day and reduction of milk fat and protein in cows diagnosed with sub-clinical endometritis. Milk production in dairy cows can be reduced due to prolonged period of inflammation which also delays postpartum ovarian activity (Sharma *et al.* 2018b).

Sub–clinical endometritis results in reduced milk yield of dairy cows. As per present scenario, milk production in India should reach 191.3 million tonnes by 2020 so that per capita requirements can be met. In order to utilize the full potential of dairy cows, provision of adequate nutrition, timely diagnosis and therapeutic measures should be provided to ameliorate the milk production and reduction of economic losses associated with it.

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