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Diagnostic and Therapeutic Management of Subclinical Endometritis in Dairy Bovine: A Review

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ABSTRACT

Subclinical endometritis (SCE) is one of the major causes of repeat breeding syndrome in dairy bovines, characterized by the presence of polymorpho nuclear (PMN) cells within uterine cytology sample during early postpartum period. In dairy bovines, on an average 20-53% animals suffer from SCE between 20- and 60-days post-calving due to variable risk factors. Among various diagnostic techniques, cytotape method of sample collection is comparatively superior to cytobrush and other techniques for early diagnosis of SCE in dairy bovine. A variable result of conventional therapy for successful management of uterine infections justifies the interest in stimulation of uterine defence mechanism to combat uterine infections. Natural resources, particularly Phyto-medicines can help to overcome the losses due to SCE in dairy bovines. Proper understanding of risk factors for SCE and its early identification followed by timely therapeutic interventions can minimize the losses incurred by the farmers in dairy bovines owing to SCE.

Introduction

Subclinical endometritis (SCE) in dairy bovines is characterised by an elevated polymorphonuclear cells (PMN) proportion in endometrial cytology. That is why SCE is also called as cytological endometritis (Shivhare et al., 2018). The PMN threshold for identification of SCE varies from 4 to 18%, depending on the time of postpartum. Presence of more than 18 percent PMN cells in a uterine cytology sample collected between 21 and 33 days in milk (DIM)

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or more than 4 percent PMN cells between 48 and 62 DIM (Sheldon et al., 2006) indicates SCE. It has been reported that about 20-53% dairy bovine suffer from SCE during 20-60 days postpartum (Kasimanickam et al., 2004; Gilbert et al., 2005). The prevalence of postpartum endometritis varies with occurrence of early postpartum diseases, time of examination and the diagnostic technique employed (Falkenberg and Heuwieser, 2005). The incidence of subclinical and clinical endometritis was reported as 26.0 and 24.67% in postpartum buffaloes, respectively (Bajaj, 2015). Many authors suggested that SCE extends the calving interval due to delays in uterine involution and ovarian rebound which indirectly causes major economic impact on dairy production (Bajaj et al., 2016; Chaudhari et al., 2020). An annual loss incurred as a result of endometriosis ranges between Rs. 2,902.32 - 3,101.70 per animal under Indian conditions (Jeyakumari et al., 2003). So, an early diagnosis followed by timely interventions is prerequisite to curtail economic losses in dairy bovine.

Diagnostic methods

There are several methods such as rectal examination/ external appearance of cervico-vaginal discharge (LeBlanc et al., 2002), vaginoscopic examination (Barlund et al., 2008), endometritis clinical score (Williams et al., 2005), white side test (Sarkar et al., 2006; Parikh, 2021), ultrasonography (Barlund et al., 2008; Parikh, 2021), endometrial cytology (Shivhare et al., 2018; Parikh, 2021) and uterine biopsy (Ahmadi and Nazifi, 2006) have been used for efficient detection of SCE in dairy bovine. The accuracy of diagnosis of SCE using these methods varies from one to another. Further, the diagnosis of endometritis at field level has been challenging task owing to lack of universally accepted definition of disease as well as the reliability and accuracy of diagnostic tests.

Recto-genital palpation: The accumulation of uterine fluid/ inflammation can only be appreciated in severe degree of infection particularly in metritis condition. However, this method is not accurate enough to find out animals suffering from subclinical endometritis (Pleticha and Heuwieser, 2009).

Vaginal examination: There are several techniques such as a speculum, metrichek and gloved hands by which vaginal examination in dairy cows and buffaloes is carried out for endometriosis diagnosis. However, the accuracy varies among different methods. In Holstein cows, using metricheck device Pleticha et al. (2009) reported comparatively higher incidence of endometritis than the speculum or a gloved hand (47.5 vs. 36.9 and 36.8%, respectively). However, the discharges may arise due to vaginitis/ cervicitis that lead to wrong interpretation of uterine health. Although visual assessment of vaginal discharge using vaginoscopy is not perfect, but veterinarians most commonly use under field condition owing to its ease of use to differentiate endometritic cows from non-endometritic cows (Leutert et al., 2011).

Oviductal patency test: The incidence of Fallopian tube lesions in cows is observed 6.85% (2.6-9.0%) with ovario-bursal adhesions is the most common lesion for repeat breeding condition (Kessy and Noakes, 1985). This condition either causes lower fertility in unilateral and sterility in bilateral lesions or adhesion (Purohit et al., 2008). Different tests such as phenol sulphonaphthaline (PSP) and indocaramine test, CO_2 insufflation test and starch granulation test are commonly used for diagnosis of Fallopian tube obstruction in dairy cows and buffaloes.

pH of genital mucus: Cows and buffaloes with metritis show a pH from 8.23 to 8.80 (Pateria and Rawal, 1990). In SCE cows, the pH of cervical mucus was observed to be higher as compared to unaffected cows (7.27 ± 0.03 vs. 7.80 ± 0.05; Bedewy and Rahaway, 2019). Samples of uterine secretions can serve as a partial indicator of the uterine health status. High pH value (≥ 8.0) is indicative of uterine infection/ endometritis (Prasad et al., 2009). The pH values of uterine flushes in healthy and SCE affected Gir cows at 40-60 days postpartum were recorded 7.28±0.01 and 7.95±0.03, respectively (Parikh, 2021).

Hormonal function tests: Progesterone assay is an objective and accurate test to evaluate the ovarian function and used to diagnose the functional forms of infertility *viz.* delayed ovulation, anovulation, cystic ovarian degeneration, luteal insufficiency that results into repeat breeding condition (Waldmann et al., 2000). Radioimmunoassay (RIA) and enzyme immunoassay (ELISA) can be used as analytical techniques for determining steroids in the biological fluids.

Whiteside test: Whiteside test is used to assess the changes in cervical-vaginal mucus color after boiling with 5% sodium hydroxide solution (Fig. 1). The genital discharge (2 mL) is collected aseptically from suspected animals using blue AI sheath and heated with equal volume of 5% sodium hydroxide in a test tube till its boiling point followed by cooling in running tap water. The appearance of the yellow color is considered as the positive indicator of the presence of infection. Depending upon the change in the color of cervico-vaginal mucus, the uterine infection can be classified into mild infection or subclinical endometritis (mild yellow color), severe infection or clinical endometritis (intense yellow color) or absence of infection (no color) as reported by Kumar et al. (2015). Whiteside is principally based on presence of leukocytes in mucus

(Mandhwani et al., 2017). Neelam et al. (2019) and Parikh (2021) reported that 55.0 and 18.45% positive cases of SCE using Whiteside test. Parikh (2021) also reported sensitivity, specificity, positive predictive value, negative predictive value, kappa, positive likelihood ratio and negative likelihood ratio for Whiteside test as 77.50%, 100%, 100%, 93.43%, 0.84, ∞ and 0.23, respectively, in postpartum subclinical endometritic cows when cytobrush technique was considered as a gold standard. The relative efficacies of Whiteside test and cytobrush technique were 77.5 and 100.0%, respectively (Parikh, 2021).

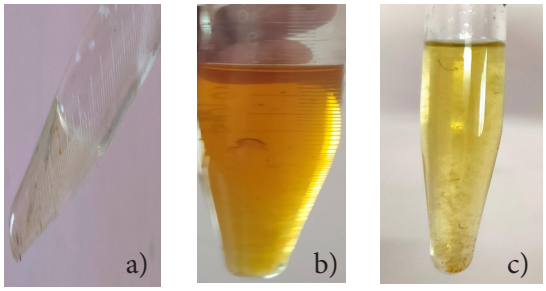

Fig. 1. a. Animal suffering with clinical endometritis
b. Animal suffering with subclinical endometritis
c. Animal without uterine infection (Healthy)

Leukocyte esterase colorimetric strip method: This method is termed as the cow side diagnostic method for detection of SCE (Shivhare et al., 2018). Previous study cited positive association of neutrophil percentage determined by leukocyte esterase test and endometrial cytology in dairy cows (Couto et al., 2013; Pascottini et al., 2017). However, compared to endometrial cytology test, the leukocyte esterase test is less accurate to predict the pregnancy outcomes of dairy cows (Couto et al., 2013).

Endometrial biopsy: Carefully performed uterine biopsies can often reveal the changes in the endometrium and the extent of cellular infiltration and/or cellular morphology changes. Histo-pathological investigation of uterine biopsies would be a useful diagnostic tool for detection of subclinical endometritis in repeat breeding cows. However, it does not help in formulating therapeutic measures on the spot at field level. This method is also considered as time consuming, expensive and has detrimental effect on subsequent fertility in dairy cows (Sheldon et al., 2006). It may cause the disruption of surface epithelium, leukocytic infiltration, peri-glandular fibrosis and varying degree of glandular degeneration (Bajaj, 2002).

Ultrasonography: Trans-rectal ultrasonography is a useful diagnostic tool used to diagnose SCE by ultrasonographic appearance of uterine luminal fluid and/or increased endometrial thickness (Fig.2; Honparkhe et al., 2007; Purohit et al., 2013). The overall mean of uterine horn diameter in healthy and SCE affected Gir cows at day 40-60 postpartum was 1.36±0.09 and 1.55±0.05 cm, whereas the corresponding overall mean uterine wall thickness was 0.28±0.03 and 0.34±0.01 cm, respectively (Fig. 4; Parikh, 2021). It has been reported that uterine lumen diameter above 0.2 cm and presence of echogenic content in the uterus of dairy cows may be used as indicator of SCE, this is because they negatively affect conception rate as well as the proportion of cows become pregnant (Kasimanickam et al., 2004; Lenz et al., 2007). Further, alteration of endometrial echotexture particularly homogeneity and contrast change depending on the cellular density and inflammation status. Thus, in dairy cows it may be used as potential diagnostic markers for SCE (Polat et al., 2015). The presence of a small amount of intra-uterine fluid and thickened uterine walls can be considered as the sign of SCE (Fig. 5; Kasimanickam et al., 2004). The prevalence of SCE (10.00, 19.44, 25.26, 53.33, 75.00 and 78.57%) on the basis of presence of fluid within uterine lumen was reported by earlier researchers (Purohit et al., 2013; Senosy and Hussein, 2013; Behera, 2017; Sahadev, 2017; Ribeiro et al., 2019; Parikh, 2021). The overall mean cervical diameter in healthy and SCE affected Gir cows at 40-60 days postpartum was 2.00±0.10 and 2.16±0.05 cm, whereas, the respective overall mean cervical wall thickness in these cows was 0.30±0.03 and 0.34±0.01 cm, respectively (Fig. 3; Parikh, 2021).

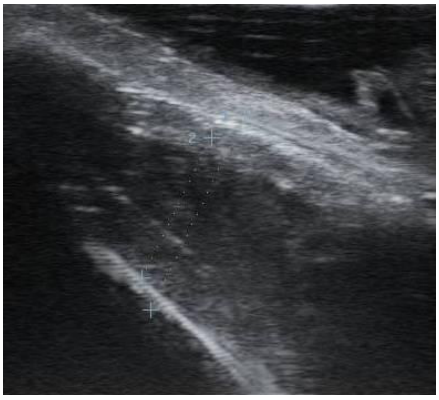

Fig. 2. Ultrasonogram showing increase endometrial thickness

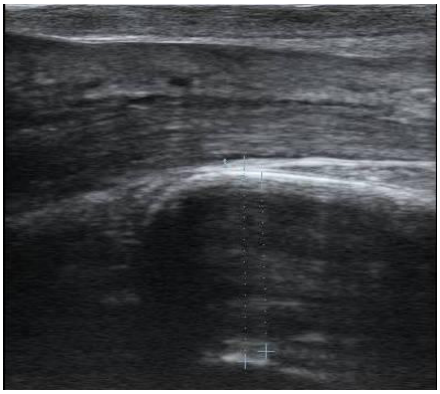

Fig. 3. Ultrasonogram showing measurement of cervical diameter and wall thickness

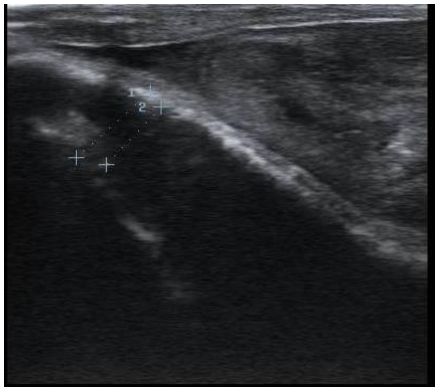

Fig. 4. Ultrasonogram showing measurement of uterine diameter and wall thickness

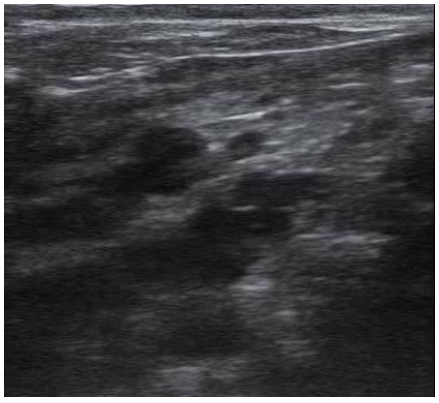

Fig. 5. Ultrasonogram showing presence of fluid within uterine lumen

Uterine cytology: There are several methods used for evaluation of endometrial cytology. These are cytobrush method, cytotape method, aspiration, lavage technique, low volume lavage technique and guarded swabs (Shivhare et al., 2018). Cytobrush technique is a more consistent and reliable method as compared to lavage method to evaluate the true picture of endometrial cytology (Fig. 6). This technique also accurately evaluates the relationship between PMNs and fertility in dairy cows during the postpartum period (Kasimanickam et al., 2005; Shivhare et al., 2018). Vallejo et al. (2018) recommended that endometrial cytology could be used for routine diagnosis of SCE in postparturient dairy cows and buffaloes to improve their reproductive efficiency.

Ghasemi et al. (2012) observed that the cytobrush technique provided sufficient uterine cells to perform both cytology and gene expression analysis with a single sample and the samples obtained using a cytobrush were representative of endometrial cells and leukocytes which are directly involved in the uterine immune defense system. Thus, under field condition cytobrush technique can be used as cow side test for diagnosis of SCE (Singh et al., 2016).

Raval et al. (2018) cited that both the cytobrush technique (PMN %) and Whiteside test of cervico-vaginal mucus are better diagnostic methods of ruling out the subclinical genital infections in repeat breeding cows. Uterine flushing can be effectively used to resolve the SCE by reducing the number of PMNs in the uterus (Alagar et al., 2017). However, Neelam et al. (2019) obtained a better conception rate with endometrial cytology as compared to the bacteriological culture and Whiteside method to diagnose the SCE in dairy cows.

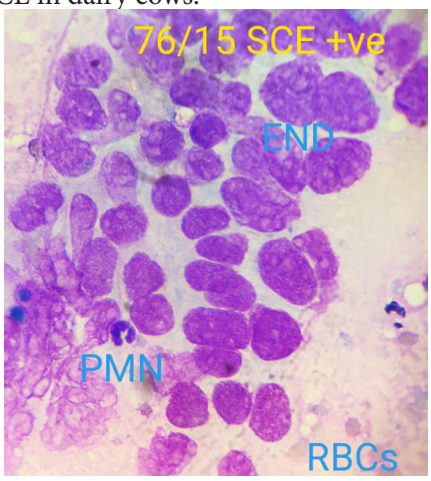

Fig. 6. Cytosmear showing PMNs, endometrial cells and RBCs

Earlier researchers indicated the threshold value of 4-18% PMNs as an indicative of SCE during 21-62 DIM in dairy bovine (Kasimanickam et al., 2004; Gilbert et al., 2005; Barlund et al., 2008; Oral et al., 2009; Singh et al., 2016). The incidence of SCE (PMN >5 %) in Gir cows at 40-60 days postpartum by cytobrush technique was 23.81% (Parikh, 2021), whereas, other found a 12.50% incidence of SCE in Holstein cows at 10% PMN cell threshold. The PMN cell score in SCE positive and healthy Gir cows at 40-60 days postpartum recorded was 13.78±0.58 and 2.63±0.42%, respectively (Parikh, 2021).

Microbiological examination: Study on bacterial profile of repeat breeding cows affected with SCE mostly shows presence of aerobic bacteria (84.72%, Behera et al., 2015). Thus, aerobic bacteria are the primary inhabitant of the uterus in dairy cows with SCE infection. Among the different species of anaerobic bacteria, *Staphylococcus aureus* isolates has been recorded to be the highest percentage of total isolates followed by the *E. coli*., *Streptococcus* spp., *Enterobacter* spp., *Proteus* spp. and *Pseudomonas* spp. Dutt et al. (2017) reported more prevalence of *Bacillus* species followed by *E. coli*, *Staphylococci* and *Proteus* species in Murrah buffaloes affected with SCE. SCE in Gir cows is mainly caused by *E. coli* (45.0%) followed by *Staphylococcus* spp. (20.0%), *Streptococcus* spp. (12.50%), *Corynebacterium* spp. (7.50%), *Bacillus* spp. (7.50%) and *Pseudomonas* spp. (2.50%). Similarly, in healthy Gir cows also, the predominant isolated bacteria were *E. coli* (25.0%) followed by *Staphylococcus* and *Streptococcus* spp. (12.50%, each; Parikh, 2021). In vitro antibiotic sensitivity

varied with isolates, highest sensitivity was recorded for levofloxacin (80.95%), followed by cefoperazon (66.67%) and gentamicin (61.90%) indicating that these antibiotics may be effective in vivo to treat the SCE in Gir cows (Parikh, 2021).

Acute phase proteins: Haptoglobin (Hp) and serum amyloid-A (SAA) are the two major acute phase proteins which play a vital role in diagnosis of inflammatory reaction. So, assessment of both SAA and Hp concentrations during postpartum period could be used as diagnostic marker to monitor endometritis in cows and buffaloes (Eckersall, 2000; Biswal et al., 2014). The mean serum Hp concentrations in healthy and SCE affected Gir cows at 40-60 days postpartum were recorded as 24.83±1.48 and 37.97±0.59 µg/mL, respectively (Parikh, 2021). Serum Hp concentration in healthy cattle is <20 mg/L which increases beyond 2g/L following 2 days of infection (Shivhare et al., 2018). Elevated circulating Hp level in dairy cows during early postpartum period increases risk of uterine infection. Huzzey et al. (2009) reported that dairy cows with elevated serum HP (>1 g/L) on day 3 following calving were 6.7 times more likely to develop mild to severe metritis than the cows with serum level <1 g/L. However, this cut off value could identify 50% positive cases (50% sensitivity) and 87% negative cases (87% specificity), which indicates that HP is less accurate to identify metritic cows as diagnostic markers. It has been reported that SAA can also be used to screen and identify inflammatory diseases in dairy bovines under herd health monitoring programmes (Karreman et al., 2000). The mean SAA concentrations in healthy and SCE affected Gir cows at 40-60 days postpartum were recorded as 18.61±0.53 and 29.37±0.63 µg/mL, respectively and reported that Hp and SAA were found to a reliable biomarker for the diagnosis of SCE in Gir cows (Parikh, 2021).

Cytokine based techniques: The pattern of pro-inflammatory cytokines and other bio-molecules *viz.* IL6, IL8, TNF alpha, CD14, TLR4, IL1 can be used to diagnose SCE in dairy bovine (Sarkar et al., 2016). Higher mRNA expression (20, 30 and more than 50-fold) of TNF alpha, IL6 and IL8 has been observed in SCE cows than healthy cows (Ghasemi et al., 2012). The pro-inflammatory cytokines expressions are differentially altered during the postpartum uterine infections (Manimaran et al., 2016). The expression pattern of pro-inflammatory cytokines of IL8 and TNF alpha can be used as diagnostic marker for subclinical endometritis in cattle (Kalyaan et al., 2015). Elevated IL1 beta and TNF alpha level in cervico-vaginal mucus of repeat breeder buffaloes show their potential use as cow-side test for diagnostic of cytological endometritis (Boby et al., 2017). The mean interleukin-8 concentrations for healthy and SCE affected Gir cows at 40-60 days postpartum recorded were 30.99±2.62 and 58.64±0.27 pg/mL, respectively (Parikh, 2021). Hence, the cytokine-based diagnosis of subclinical endometritis can be useful for accurate and early diagnosis of subclinical endometritis in dairy bovine.

Comparison of different diagnostic methods

Oral et al. (2009) compared the cytobrush technique with the vaginoscopy and a transrectal ultrasonography method to evaluate postpartum endometritis in cows and they suggested that endometrial cytology can be used in cows safely and effectively for the diagnosis of SCE. Ultrasonography though a practical cow-side test, but when used in combination with endometrial cytology is more useful for accurate diagnosis of SCE in Gir cows (Parikh, 2021). Dutt et al. (2017) diagnosed SCE in Murrah buffaloes through cytobrush technique and correlated the findings with microbiological study. They concluded that cytobrush technique could be practically used to detect SCE under field condition. Raval et al. (2018) investigated endometrial cytology and cervical mucus characteristics of repeat breeding crossbred cows in relation to post-treatment fertility. They found that cytobrush technique and Whiteside test of cervico-vaginal mucus were good tools for ruling out the subclinical genital infections in repeat breeding cows.

Cytotape method for sample collection is better than cytobrush and lavage technique for diagnosis of subclinical endometritis in dairy bovine (Pascottini et al., 2017; Shivhare et al., 2018; Rana et al., 2020). Samples taken by cytotape method have less distorted cells and significantly lower contaminated with RBCs. Bedewy and Rahawy (2019) diagnosed SCE using different methods *viz.* Cytobrush technique, measurement of pH, white side test and cervical mucus penetration test in local repeat breeder (n=42) cows. They suggested that all the methods provided a considerable value in field conditions. Parikh (2021) compared Whiteside test, endometrial cytology, trans-rectal ultrasonography and microbiology for diagnosis of SCE at 40-60 days postpartum in Gir cows and reported that endometrial cytology by cytobrush technique (with >5 % PMN threshold) is more consistent, reliable and efficient method, however, this technique requires more skilled persons and specialized instruments.

Therapeutic management

In dairy bovines, SCE is the key risk factor for the repeat breeding syndrome and 0. 5-1% Lugol's iodine solu-

tion through intrauterine route can be used for its effective treatment (Ahmed and Elsheikh, 2014). It has been reported that intrauterine infusion of Lugol's iodine in repeat breeder crossbred cows resulted up to 60 % recovery rate with 40 % conception rate (Bhardwaz *et al.,* 2018). They found significant ($p<0.05$) reduction in bacterial load in uterine flushing and non-significant reduction mean values of PMNs % in Lugol's iodine group than in the control group. Lugol's iodine is not only economical but also it has several health benefits, so it can be used as an alternate therapy for treatment of SCE through intrauterine route (Asfar et al., 2020).

Parikh et al. (2014) observed significantly higher conception rate with gentamicin followed by the ceftiofur in repeat breeder Gir cows. Parikh (2021) also reported better first service (25.0%) and overall conception rates (50.0%) using levofloxacin as a most sensitive antibiotic in SCE affected Gir cows during 40-60 days postpartum. Anbhule et al. (2019) reported a better conception rate with hCG treatment on day 5 post-AI in non-infectious repeat breeder cows. In repeat breeder Gir cows, Parikh et al. (2018) found a better conception rate with GnRH followed by hCG and progesterone treatment. However, the cows should be screened for SCE and biochemical aberrations before initiation of hormonal regimen during early postpartum period for better reproductive performance in crossbred cattle (Chaudhari et al., 2020). Therapeutics involved antibiotics which causes antimicrobial drug resistance. Hence, the alternative therapeutic approach needs to explore. Probiotics are showing a promising alternative and it has shown that the use of the probiotic strains able to prevent uterine infection and inflammation (Suthar et al., 2022).

Immuno-modulators

An ideal immuno-modulator should stimulate immune response, non-toxic even at the high doses, have a shorter withdrawal period and low tissue residues, be compatible with other drugs, repeatedly can be administered, have a defined biological activity and not to be teratogenic or not have any side effects. There are several immuno-modulators used for treatment of endometritis in dairy animals with varying rates of recovery. The common immunomodulators are Lipo-polysaccharides (LPS) of *E. coli*, serum, plasma or hyper immune serum, colostral whey, PMN extracts and its components, bacteria free filtrate, oyster glycogen, leukotriene B4, granulocyte macrophase colony stimulating factor and levamisole (Sarkar et al., 2016).

Singh et al. (2000) studied the effectiveness of immunomodulator in curing bacterial endometritis in repeat breeding crossbred cows by using a single intrauterine infusion of 100 µg of *E. coli* LPS in 30 mL sterile PBS. They observed 100-fold increases in total leukocyte count in the uterine lumen within 6 hrs of infusion with the better conception rate in subsequent estrus. Deori et al. (2004) demonstrated therapeutic efficacy of laboratory preparations of LPS of *E. coli* and bovine free filtrate of *Staphylococcus aureus* for treatment of endometritis. They observed significant increase in the influx of PMN cells as well as immunoglobulin levels in uterine fluid following treatment. *E. coli* LPS had superior therapeutic efficacy (75.0%) with effective immunomodulation followed by oyster glycogen (62.50%), levofloxacin and garlic extract (50.0, each) at 40-60 days postpartum in SCE affected Gir cows (Parikh, 2021).

Sarkar et al. (2015) reported the overall pregnancy rate at subsequent estrus was 70% in cows treated with leukocytes enriched autologous plasma (50-100 mL for 3 days) but pregnancy rate was nil in control group. This might be due to the presence of complement, antibodies and opinions in the serum. The Leukotriene B4 is a potent chemo-attractant which stimulates the migration of PMNs into the uterine lumen. Administration of leukotriene B4 (50 mL of 30 nmol/L) and oyster glycogen (10mg/mL) resolves the SCE in repeat breeding crossbred cows by reducing the oxidative stress (Krishnan et al., 2015).

Levamisole is a common anti-parasitic drug acts as a non-specific immunomodulators in the treatment of subclinical endometritis in dairy bovine. It stimulates cell mediated immune response by potentiating the rate of T-lymphocyte differentiation. Treatment with levamisole @ 2.5 mg/ kg body weight subcutaneously on day 0 (estrus) and subsequently on day 2 and 4 of the cycle, 25% of the endometritic repeat breeder cows conceived at 1st post-treatment estrus with an overall conception of 50 % (Singh et al., 2017b). The intrauterine proteolytic enzymes *viz.* trypsin, chymotrypsin and papain are considered as biological scalpels and have fibrinolytic and proteolytic activity in the inflamed tissue resulting in breakdown of products of infection, damaged cells and tissues (Singh et al., 2017a).

Ozone therapy

Ozone therapy can be used as an alternate method for treatment of subclinical endometritis in dairy animals with the advantage of no milk and meat withdrawal (Zobel, 2013). It acts as a disinfectant especially for anaerobic bacteria (Zimran et al., 1999), bactericidal (Silva et al., 2009), immune stimulator (Zimran et al., 1999) and having anti-inflammatory properties (Gretchkanev et al., 2001).

The bacteria, spores and viruses are inactivated effected by ozone within few minutes of exposure (Bocci, 1996). The antibacterial activity of ozone is more effective than iodine and chlorine (Silva et al., 2009).

Herbal therapy

Various herbal remedies *viz.* garlic, neem, turmeric and ashwagandha have antibacterial, antifungal, antiprotozoal, antitumor, cytotoxic, anti-inflammatory and immuno-modulatory effect and used for treatment of different ailments in dairy bovines (Sarkar et al., 2016). Kumar et al. (2018) treated SCE cows with mixture of garlic, Ashwagandha and turmeric extract and they found better recovery and conception rate. Kadam et al. (2019) stated that the combination of herbal therapy (methanolic neem seed extract plus Ashwagandha) yielded a higher recovery rate (75%) as against with bare neem seed extract (66.7% recovery) in repeat breeder buffaloes. Lawange et al. (2019) studied intrauterine efficacy of garlic extract versus garlic extract plus Ashwagandha powder oral for the treatment of infectious repeat breeding condition in cattle and they found highest recovery rate (83.3%) in garlic extract group, but highest conception rate (66.7%) and pregnancy rate (55.6%) was observed in garlic extract plus Ashwagandha group. Parikh (2021) also observed better first service (25.0%) and overall conception rate (50.0%) with a methanolic extract of garlic in subclinical endometritic Gir cows during 40-60 days postpartum.

Homeopathic treatment

Fertisule- a homeopathic complex when given orally for 21 days, it restores normal reproductive rhythm in repeat breeder cows and buffaloes. It stimulates gonadotropin secretions and stimulates the ovarian activities (Chandel et al., 2009). Jahangirbasha et al. (2014) also emphasized that a homeopathic medication used for treatment of underdeveloped genitalia can be an alternative treatment for initiating non functional ovaries to functional.

Acupuncture therapy

Scientific advancement reports successful use of some alternative medicines, such as acupuncture or moxibustion to mitigate the prevalence of the repeat breeding syndrome in bovines (Hosaha and Nakama, 2002). Moxibustion is defined as the application of a burning herb over accounts by using needles. The energy (*Qi*) flows through the body along 14 pathways referred as Meridians. Along theses pathways, multiple special sites known as acupuncture points where there is a combination of both energy and blood flow occurs. This leads to unique biophysical reactions. Hence, stimulation of such points by touching or needling triggers blood circulation, muscle reaction and Neuro-regulation. Thus, acupuncture can be used to improve reproductive performance in large animals (Zuo et al., 2016). Activation of acupuncture points associated with the reproductive sphere considerably changes the concentrations of LH, FSH, estradiol and progesterone in blood plasma and enhances the pituitary response to GnRH (Taradainik et al., 2016). Lin et al. (2002) suggested that acupuncture is a simple and effective method to treat repeat breeders in dairy herds.

Conclusions

Subclinical endometritis (SCE) is one of the most frustrating gynecological maladies of dairy animals. Diagnosis of the basic cause is the first and most important step in the treatment of SCE, which in turn help in ameliorating the fertility in dairy bovine. Evaluation of endometrial cytology (PMNs) using cytotape method is more accurate for diagnosis of SCE in bovine. Immunomodulation therapy plays a significant role for mitigation of SCE in dairy bovine and it can be used as an alternative therapy. There is the need of the hour to find an alternate therapy using natural resources to augment natural defense mechanism in the uterus of dairy bovines.

Conflict of Interest

None

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