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Bovine endometritis: A review article

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Abstract
Endometritis is considered as one of the most important factor affecting both longevity and profitability of a dairy herd. It is the most frequent and complex pathology in bovines. It often occurs in post parturient dairy cows and is associated with reproductive losses. Endometritis involves several immunological changes as well as molecular mechanisms responsible for inflammation in the female uterus. Various risk factors are associated with the occurrence of Endometrial. The proper diagnosis helps at early treatment, prevention and control of endometritis. The treatment of endometritis should aim at exclusion of bacterial infection from the uterus. The present paper highlights the etiology, clinical signs, diagnosis, treatment, prevention and control measures for endometritis.

Keywords: Endometritis, dairy herd, bovines, risk factors, reproductive losses

Introduction
Endometritis is the common reproductive disease which causes huge economic losses. It is the inflammation of the endometrium which commonly occurs following coitus, artificial insemination or parturition and usually catagerised as clinical and sub clinical endometritis. The bacterial infection in uterus develops in many cows soon after calving [1]. The affected cow does not show any external symptoms [2, 3]. Normal exposure of the cow's uterus to a wide variety of bacterial contaminations during the early post-partum period (first two weeks after calving) [4] may result in endometritis which is usually transient and resolves spontaneously [5, 6]. Various risk factors are associated with clinical endometritis such as retained foetal membranes, assisted calving, stillbirth, Vulval angle, primiparity and male offspring [7]. Most relevant pathogen bacteria involved are *Arcanobacterium pyogenes*, *Escherichia coli*, *Fusobacterium necrophorum* and *Prevotella melaninogenicus*. In recent times, bovine herpes virus 4 (BoHV-4) has been confirmed to play a role in the aetiology of endometritis [8]. Prevalence of clinical endometritis reported to vary from 17% under intensive production conditions [9] to 21–29% in extensive dairy farming [10, 11].
Endometritis negatively affect the performance of the world's dairy industry; economic losses are related to delay in the resumption of ovarian activity, increased number of services per conception, decreased milk yield and costs of treatment of the disease [3]. It reduces the fertility and is coupled with many reproductive losses [12, 13]. The main clinical symptom of endometritis is purulent vaginal discharge, an enlarged uterus [14] in combination with an enlarged cervical diameter [15]. The incidence of chronic endometritis also depends on the sensitivity of the diagnostic method and the time of postpartum when the examination was performed. In veterinary practice, palpation per rectum and vaginoscopic examinations is routinely used for examination. It has been reported that endometritis is often self-limiting with recovery occurring after subsequent estrous cycles [16]. Early treatment of endometritis is recommended as there is a risk that it may lead to the development of pyometra or have other adverse effects on future fertility of the animal. The aim of this paper is to briefly summarize the etiology, clinical findings, diagnosis, treatment, prevention and control of endometritis.

Etiology
Many factors have been reported to be responsible for the occurrence of endometritis. These are dystocia, twins, induction of parturition, retention of the fetal membranes and restoration of the ovarian cyclical activity, milk yield, metabolic diseases and bacterial contamination of the uterus [16]. Retained placental membranes represent the important risk factor for endometritis [7]. Dystocia in cows is often associated with multiple postpartum complications, such as retained fetal membranes and delayed uterine involution, both of which no doubt favor the development of endometritis [17].

A negative energy balance (NEB) is most commonly linked with severe and prolonged uterine inflammation and delayed uterine involution [18]. NEB favors the development of many metabolic disorders, particularly ketosis, which can increase the risk factors for endometritis, specifically retained placenta and metritis by 6.1 to 9.5 times [19].

Environmental contamination with bacteria may contaminate the uterus during parturition. Mastitis represents a source of bacterial contamination within the environment that may favor the development of endometritis [20]. A failure of adequate calcium mobilization around the time of calving results in hypocalcemia. Since calcium is an important element in the process of uterine involution, any deficiency delays this process and is considered as a risk factor for retained fetal membranes and it may affect the incidence and the severity of endometritis [21]. A large number of bacteria and virus are responsible for clinical and subclinical endometritis [22, 23] they are classified according to their pathogenicity and their frequency of isolation. *A. pyogenes* is the most frequently isolated bacteria from the uteri of cows affected with endometritis [24]. Other bacteria such as streptococci, staphylococci and *E. coli* are also thought to cause different degrees of endometritis [5, 25] followed by anaerobic bacteria such as Provetella *spp., Fusobacterium necrophorum* and *Fusobacterium nucleatum* [26, 23]. The bovine herpes virus 4 (BoHV-4) is also responsible for endometritis.

Clinical Signs

There is general, but not unanimous, agreement that endometritis (however defined and diagnosed) does have a detrimental effect on subsequent fertility of affected cows [27]. Endometritis has two effects on fertility. Firstly it is associated with absence of heat behavior, delaying the onset of ovulation after calving and extending the interval between ovulations once cows have been in heat. Secondly, even when they cycle, cows with endometritis are much less likely to get pregnant because the infected uterus is a poor environment for the developing embryo [9, 28]. Endometritis in particular, reduce the reproductive efficiency of cows by extending the calving to conception interval, increasing the number of inseminations per conception and increasing culling rates [29]. It has been shown that there is a strong association between endometritis, both clinical and cytological with a reduction in reproductive performance [18]. Histologically the endometrial endothelium is disrupted with infiltration of leukocytes and vascular congestion and oedema [30]. Studies have shown that cows with endometritis have an increase of 15 days open on the mean. It has also been shown to decrease the risk of pregnancy by 150days in milk by 31% and reduces pregnancy rate by 16% [30]. In the case of cytological endometritis it was interestingly shown that cows with no neutrophils on uterine cytology were just as likely as those with high (>15%) neutrophils of not being pregnant when compared to cows with 1-15% neutrophils indicating the importance of a well-managed immune system [18].

Diagnosis

The global incidence of endometritis in cattle is highly variable, ranging from 3.4% to 40%, depending on the diagnostic method [31]. Diagnosis of endometritis is based on the clinical signs (purulent uterine discharge within 21 days after calving, fetid watery red-brown uterine discharge, fever >39.5 °C, dullness and decreased milk yield, additional signs of toxaemia such as cold extremities, depression and/or collapse and abnormally enlarged uterus detected by rectal palpation mainly during the first week (10 days) after calving and rare during the second week [32]. There are several methods (transrectal palpation transrectal ultrasonography, histological examination of endometrial biopsies, manual vaginal examination, vaginoscopy available in the field to diagnose endometritis [9, 33]. The diagnosis of endometritis can be done by gross pathology and histology. The histopathologic diagnosis is characterized by endometrial inflammation rich in plasma cells with or without accompanying acute inflammation and lymphocytes [34, 35]. Examination of vaginal discharge (VD) is one of the most useful diagnostic procedures, as the presence of pus in the vagina is correlated with the presence of pathogenic bacteria in the uterus [22]. Examination of the vagina and the evaluation of vaginal mucus is the most reliable method for the diagnosis of endometritis [36, 9]. Vaginal examination can be performed manually with drawing vaginal mucus with a gloved hand, using the metricheck device (a siliconhemisphere screwed on a rod) [28] or by vaginoscopy, inspecting the vaginal lumen [9] vaginoscopy was a practical tool to distinguish healthy from diseased cows with clinical endometritis [9, 33]. Recent research has shown that modern diagnostic tools, such as uterine cytology and ultrasound are more sensitive to detect endometritis [2]. Subclinical (cytologic) endometritis can also be diagnosed by using urinary test strips [20].

Treatment

The most important risk factors must be identified and treatment should be adapted specially to each cow according to the clinical examination of the intrinsic and extrinsic risk factors identified. This may result in better management of endometritis and thus will reduce the associated economic losses [37]. The chronic endometritis has a tendency to recover without intervention with no negative impact on reproductive performance [38, 9] ideal treatment of endometritis should eliminate bacteria in the uterine cavity and in the sub endometrial layers and should not inhibit the normal uterine defense mechanisms. It should not cause milk or meat to be unfit for human consumption [39]. A wide variety of therapy has been reported for clinical endometritis, including systemically or locally administered antibiotics, locally administered antiseptic solution and/or systemically injected PGF 2α. [40]. Subclinical endometritis can be treated with a prostaglandin i.m. injection (Cloprostenol 500mg) and intra uterine antibiotic therapy (cephapirin) at 20–33 DIM to improve the reproductive performance [41]. Intrauterine lavage with 500-600 ml of sterile physiological saline (35 °C-40 °C) at Day 30 after calving may significantly decrease the number of PMNs in the uterus and improve the pregnancy rate [42]. One or 2 treatments with PGF 2α before initiation of the timed AI program with subclinical endometritis were unable to improve uterine health, pregnancy rate per AI and maintenance of pregnancy in lactating dairy cows [43].

Prevention and Control

Prevention of endometritis is based around the promotion and support of the innate immune system. Cows having hypocalcaemia, dystocia, stillbirth, twins or retained placenta in the per parturient period are more likely to contract uterine infections than those cows that calve normally. Thus, management of sanitation, nutrition, population density, stress to prevent or reduce the incidence of these predisposing

factors (especially dystocia) should be impeccable. The following management activities such as careful surveillance and assistance at calving, prevention of post parturient metabolic diseases, early diagnosis and treatment of post parturient uterine diseases are the important approaches to reduce the endometritis [44]. Routine systemic or intra-uterine administration of ceftiofur may be beneficial for the prevention of clinical endometritis [45]. Provision of suitable; clean rest area so that fresh in milk cows can live without excessive contamination of the reproductive tract.

The prevalence and severity of endometritis are related to the condition of the livestock as extrinsic factors but also to intrinsic factors specific to each cow, which means that even in the same herd some cows may be more susceptible to developing and sustaining endometritis than other cows. For these reasons, for prevention and before treating affected cows, the most important risk factors must be identified and treatment should be adapted specifically to each cow according to the clinical examination of the intrinsic and extrinsic risk factors identified this may result in better management of endometritis and thus will reduce the associated economic losses [31].

Conclusion

Endometritis plays a critical role in the modern dairy industry. It is highly prevalent, asymptomatic and has a profound detrimental effect on the reproductive performance and atmost importance should be given for the treatment and prevention of endometritis.

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