

IMPACT OF UTERINE INFECTIONS ON FERTILITY AND REPRODUCTIVE EFFICIENCY IN FARM ANIMALS:

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Abstract

This paper reviews to describe the etiological agents (bacterial, viral, fungal) and risk factors contributing to uterine infections. To analyze the impact of uterine infections on reproductive parameters such as conception rate, calving interval, embryonic loss, and milk production. To highlight preventive and management practices that can reduce the incidence and economic losses associated with uterine infections. To identify knowledge gaps and suggest future research directions related to uterine health and reproductive performance.

INTRODUCTION

Reproductive performance of cows and heifers is one of the key parameters reflecting the economic success of dairy farming. Several fertility parameters can be used to describe negative effects of uterine diseases on reproductive performance, e.g. days to first service, estrus detection rate, and probability of pregnancy per insemination. Days to first service and estrus detection rate are mainly affected by management (time for estrus detection, accuracy of estrus detection, claw trimming, and

several other aspects related to management) and to lesser extent by cows' diseases, e.g. cysts, conception risk is strongly related to uterine health. Thus, the prevention of uterine diseases, sufficient detection of affected cows and efficacious treatment strategies are important aspects of the fertility management of dairy cows. Inflammation of the uterus, defined as metritis or end metritis is one of the most common disorders in the postpartum period of dairy cattle. Puerperal

metritis is characterized by abnormal discharge, enlarged uterus, dullness, and a rectal temperature $>39.5^{\circ}\text{C}$ (Sheldon et al., 2006).

Persistent bacterial infection of the uterus may cause metritis and endometritis. *Escherichia coli*, *T. pyogenes*, *Fusobacterium necrophorum* and *Prevotella spp.* are common intrauterine pathogens (Földi et al., 2006; Sheldon et al., 2006).

This review aims to provide detailed literature information on the incidence, pathogenesis, classification and diagnosis of uterine infections, their effects on fertility, economic impact and available treatment options and preventing the occurs of disease. (Sheldon, I. Martin, et al. 2020).

2. POSTPARTUM DISEASES DISRUPT SUBSEQUENT REPRODUCTION IN AFFECTED COWS

Common diseases of dairy cows include retained fetal membranes, metritis, and endometritis (as well as cervicitis), mastitis, lameness and abomasal displacement, clinical hypocalcemia, and ketosis. All of these diseases occur most frequently in the early part of lactation and thus in the period preceding and immediately following insemination (Foditsch et al., 2016; Gilbert and Santos, 2016; Neves et al., 2018). Interestingly, all of these conditions detrimentally affect reproductive performance, whether they are infectious (metritis, endometritis, mastitis, and some cases of lameness) or noninfectious (lameness and abomasal displacement, hypocalcemia, and ketosis). Importantly, diseases of the reproductive tract and those affecting more remote body systems all contribute to reproductive failure.

Santos and Ribeiro (2014) reported that virtually all clinical and subclinical disorders of the postpartum cow, not only those of the reproductive tract, delayed onset of cyclicity, reduced pregnancy per insemination, and increased pregnancy wastage. They also showed that postpartum disease was associated with reduced quality of recovered embryos. An interesting observation is that these diseases and disorders may affect reproductive success, whether

they occur before, close to, or after insemination. For example, it has long been known that mastitis, and especially mastitis attributed to *Escherichia coli* or other gram-negative organisms, occurring shortly after insemination is associated with reduced pregnancy risk (Wilson et al., 2008), and this has been attributed to a luteolytic effect of endotoxemia (Gilbert et al., 1990).

However, cows developing mastitis within the first 45 d postpartum (i.e., before insemination) are almost 3 times more likely to lose a subsequent pregnancy than unaffected cows (Risco et al., 1999). Hertl et al. (2010) examined the effect of clinical mastitis by week of diagnosis and etiology in almost 24,000 cows in 7 herds (including ~55,000 inseminations) from 6th week before to 6th week after insemination. They found no effect of mastitis occurring more than 2nd week before or 5th week after insemination. For clinical mastitis occurring closer to insemination, the effect varied with both time and etiology. The most severe effects were associated with gram-negative mastitis close to insemination but mastitis of all etiologies significantly reduced pregnancy risk.

Although it is not surprising that diseases of the reproductive tract interfere with reproductive outcomes, it is less intuitive to expect that the effect on reproduction extends beyond the resolution of the disease or that diseases of systems other than the reproductive tract could influence reproduction, even after their resolution, yet this is indeed what is observed. Diseases of the reproductive tract and other body systems of both infectious and noninfectious etiology and occurring before, near, or after insemination all affect reproduction. Furthermore, reproduction may be impaired for a considerable time after resolution of the specific disease. Successful reproduction requires birth of a single, live, and viable calf within 12 to 14 month of the previous calving, depending on production system. This, in turn, requires prompt reconception (within a limited and defined period after the previous parturition, often about 100 d), with few inseminations (ideally only one), successful maternal recognition of pregnancy, and nor-mal

growth and development of embryo and fetus (and placenta).

Evidence now suggests that consequences of infectious disease of the reproductive tract can interrupt normal processes in every step of this sequence. Consequences of these infections may include aberrant follicular development and function or failure of ovulation. Oocyte development and maturation may be impaired, leading to fertilization failure or early cessation of development. Damage to the oocyte may result in impaired embryo development and failure of maternal recognition of pregnancy, with loss of the conceptus. Even later embryonic death and fetal death may have their roots in damage inflicted on the oocyte by inflammatory processes.

Uterine infection, uterine microbiota

The postpartum uterus is inevitably contaminated by diverse bacteria, and the processes of contamination, elimination, and re-colonization are complex and not yet fully understood (Földi et al., 2006; Wagener et al., 2015). Recent findings suggest that the uterus is not sterile during pregnancy and may already harbor pathogens such as *Trueperella pyogenes* (Karstrup et al., 2017; Moore et al., 2017). Bacteria may invade not only from the reproductive tract but also via the bloodstream, e.g., from the gut (Jeon et al., 2017). Whether these bacteria cause clinical disease depends on their load, virulence, and the immune status of the cow (Sheldon et al., 2002; LeBlanc et al., 2011).

The main pathogens involved in uterine infections are *Escherichia coli*, *T. pyogenes*, *Fusobacterium necrophorum*, and *Prevotella spp.* (Földi et al., 2006; Sheldon et al., 2006). *E. coli* and its endotoxin LPS disrupt uterine and ovarian functions by binding to Toll-like receptors on endometrial cells, triggering immune responses (Williams et al., 2008; Herath et al., 2009). While *E. coli* is mainly linked with early postpartum metritis, *T. pyogenes* is more frequently associated with endometritis, with pyolysin (PLO) identified as its key virulence factor (Amos et al., 2014).

Beyond these, a broad variety of bacteria, including *Streptococcus uberis*, *Staphylococcus*, *Bacillus*, and *Enterococcus* species, have been detected in the postpartum uterus (Prunner et al., 2014; Wagener et al., 2015). High-resolution metagenomic and FTIR-based studies revealed a highly diverse and dynamic uterine microbiota, comprising over 200 species from 76 genera (Wagener et al., 2015). Interestingly, some pathogens are present even in clinically healthy cows, highlighting the importance of host-pathogen interactions and the potential role of opportunistic bacteria.

Further research is needed to clarify how microbial dynamics influence uterine health and disease outcomes. To gain a deeper insight into mechanism of intrauterine infections it is essential to elucidate the role of bacteria that may act as a mediator of inflammatory host response. Recent studies indicate that *S. uberis* and *B. pumilus* (Wagener et al., 2014b, 2015) might represent such bacterial candidates with a hitherto unknown role in uterine pathology. Both bacteria are prevalent in postpartum dairy cows. *S. uberis* is known as an emerging pathogen for mastitis, but has not been described as uterine pathogen. The rarely described *B. pumilus* was found to be associated with endometritis, but it is still unclear if this species is a causing agent for endometritis or is only an opportunistic contaminant in the inflamed endometrium. Results from in vitro cell culture studies pointed towards a pro-inflammatory potential of *B. pumilus* on endometrial cells (Gärtner et al., 2016).

As shown in some of the above mentioned studies (Santos et al., 2011; Santos and Bicalho, 2012; Wagener et al., 2015), it has to be underlined that in several cows with clinical signs of metritis and endometritis, neither *E. coli* nor *T. pyogenes* can be detected. In this context, the role of anaerobic bacteria, e.g. *Porphyromonas spp.*, as a causing factor as well as a factor for cure rates after antibiotic treatment of metritis needs to be elucidated more in detail (Jeon et al., 2017, 2018). Additionally, further research is required to understand the association between uterine diseases and hitherto

unknown species (Santos et al., 2011; Wagener et al., 2014a).

3.1 Infectious Bovine Rhinotracheitis

Infectious bovine rhinotracheitis (IBR) is a viral disease caused by *bovine herpesvirus 1* (BoHV-1). BoHV-1 causes significant economic losses for dairy cattle. Infections and outbreaks originated by BoHV-1 cause impact on animal health in field conditions with reduced milk production, increased respiratory diseases, increased calf mortality, and reproductive problems (Jones, 2010; Rissi et al., 2008). The rates of infection described vary widely.

In Britain, the percentage of seropositive herds ranges from 40% to 50%; in Belgium, this figure is 62% (Ackermann and Engels, 2006). In Brazil, studies showed a prevalence rate of 29.2%–58.2% (Rocha et al., 2001). Transmission occurs in the absence of visible lesions by artificial insemination (AI) with semen of infected bulls. Genital infections are the most common in cattle. The incubation period for respiratory and genital forms of BoHV-1 is from 2 to 6 days (Jones, 2010). Inoculation of BoHV-1 in the uterus by AI can cause infertility due to endometritis (Graham, 2013). Infection by BoHV-1 exists in three stages: a preliminary infection, lasting about two weeks; a long latent infection; and an occasional viral recrudescence, reactivating viral spread to other animals. Endogenous release of glucocorticoids hormones stressful conditions or exogenous administration of high doses of glucocorticoids can reactivate the productive infection. Thus, control of the disease becomes difficult because animals that do not show clinical signs are able to release virus to the environment when the productive phase is reactivated, conveying it effectively to other susceptible animals (Field et al., 2006).

In respiratory disease cases, the animal shows excessive salivation, nasal discharge, conjunctivitis, and nasal lesions. In the absence of bacterial pneumonia, the animal recovers from 4 to 5 days after the onset of signs (Jones, 2010). In genital infections, the animal shows frequent

urination, swollen vulva. In bulls, lesions on penis and prepuce are seen. Secondary bacterial infections can cause temporary infertility (Jones, 2010). The most common complication caused by BoHV-1 in immunocompromised adult animals is abortion. If the pregnant cow is carrying the BoHV-1, is able to pass it on to the fetus, which can come in term so weak and continue as a carrier and disseminator of the virus when in stressful situations. However, there may also be abortion, mainly from the second month of pregnancy, due to degeneration of the placentomes. Abortion may coincide with respiratory signs or occur without other clinical manifestations in pregnant female. The fetus usually presents autolysate; however, neither the fetus nor the placenta typically presents macroscopic changes (Pituco, 2009).

In countries where control for sanitary sacrifice is not applied, commercially available vaccines are used. However, its effectiveness has not reached large proportion, as the clinical signs of the disease only decrease relatively, but they are not eliminated. Furthermore, it does not prevent the development of the latent stage. Serological testing and elimination of infected animals have been used to eliminate BoHV-1 in Austria, Denmark, and Switzerland (Ackermann and Engels, 2006). It is an expensive procedure (Raaperi et al., 2015), impairing its eradication. More studies are needed to better understand the dynamics of infection and the impact and losses associated with the herd when it is affected by BoHV-1 (Graham, 2013).

3.2 Bovine Viral Diarrhea

Bovine viral diarrhea (BVD) virus (BVDV) is an important pathogen in cattle, which causes abortion, birth of weak and infected calves. BVD has worldwide distribution with significant economic losses to bovine livestock (Dezen et al., 2013). BVD has two genotypes, BVDV-1 and BVDV-2, and two biotypes, cytopathogenic (CP) and non-CP (NCP). BVDV-1 strain can be separated into two subgroups, 1a and 1b. Epidemiological researches suggest 1b and 1a strains predominate in respiratory cases and fetal infections in late gestation, respectively (Chaves et

al., 2010). The transmission rate of BVDV within the herds depends on the prevalence of persistently infected (PI) animals of the existence of areas with high density of animals and of virulence of viral strains (Thurmond, 2005). Studies show that the prevalence of IP cattle is between 0.5% and 2% of the general bovine population (OIE, 2008).

BVDV has been reported in several countries, including Norway, Denmark, Sweden, Germany, Austria, France, Brazil, Uruguay, and Chile. In Brazil, serological studies are being carried out in several regions to verify the prevalence in PI cattle (Del Fava, Pituco and D'Angelino, 2002). In North America, the prevalence of BVDV-1 is high. In the United States, respiratory and reproductive forms are frequent, combating the use of vaccines with attenuated or inactivated virus in the herds (Fulton et al., 2002).

Most viruses found in nature are NCP, but CP viruses are isolated from animals with mucosal diseases or post vaccinated animals. NCP crosses placenta and fetus, causing persistent infection in the fetus. NCP is responsible for various congenital, enteric, and reproductive diseases (Andrews et al., 2004). Persistently infected animals (PI) are the primary reservoir of BVDV, and the largest source of infection. These viruses are immunotolerant to the virus. Their immune system does not respond to BVDV, so the virus continues to multiply, infects tissues, and is excreted throughout the animal's life. PI cattle are more likely to develop mucosal disease and frequently die before 2 years of age. PI calves may be born below normal size and present slower growth rate, reproductive changes, and early death (Flores et al., 2005)

Pathogenesis of immunosuppression involves the immune system. The virus has affinity for immune cells and the destruction of some of these cells is the consequence of infection. Lymphocytes and macrophages are an important target for BVDV replication. A reduction of CD 4⁺ and CD 8⁺ T lymphocytes, B-lymphocytes, and neutrophils occurs with the infection (Graham, 2013).

Methods for serological diagnosis are impaired by interference of maternal antibodies, which happens because PI animals are not identified until colostral immunity has decreased. Virus identification can also be performed by serological techniques such as virus neutralization, immunofluorescence, immunoperoxidase, and ELISA (Pilz et al., 2005). There is no specific treatment for the animals. In cattle suspected of having acute infection, treatment is supportive and preventive against secondary bacterial infection. Animals with chronic BVD should be eliminated from the herd (Chi et al., 2002).

4. Predisposing factors

Factors evaluated for each cow were: parity, genetic line, diet, live weight post-calving, condition score at calving, abortion, calving assistance and presentation, number of calves born alive and dead, calf sex, total birth weight of calves, post-calving cow to calf weight ratio, live weight and condition score at drying off, length of drying off period, lactation length, calving interval and gestation length. Live weights and conditions scores were measured within 48 h after calving and when cows were dried off. Body condition scores were recorded by the same operator before 2002 and by three operators after 2002, using a 0–5 scale with 0.25 intervals, where 0 is very thin and 5 is very fat (Lowman, B. G., Scott, N. A., & Somerville, S. et al., 1973). Calf presentation was recorded as normal (i.e. both front feet and head coming together) or non-normal (i.e. malpresented).

5. Effects of uterine infection on milk production

The average daily feed intake, average daily milk yield, average milk fat and protein content and body condition score were used to study the effects of uterine infection on the reproductive and productive performance of the cow. Milk yields, milk compositions, feed intakes and body condition scores were split into four periods: 1–21 days in milk (DIM), 1–100 DIM, 101–200 DIM and 201–300 DIM. Milk yield was recorded daily

and milk composition for fat and protein was recorded on a weekly basis. Cows were fed ad libitum and feed intakes were recorded through Calan Broadbent gates (before 2001) or HOKO automatic feed measurement gates (after 2001). Body condition scores were recorded on a weekly basis. The fertility parameters evaluated were: days from calving to first service and calving to conception, days from calving to first heat observed, average number of services per conception and conception success or failure. Due to cows being culled, days from calving to conception, the number of services per conception and calving interval were only evaluated from cows that calved again.

6. TREATMENT OPTIONS FOR UTERINE INFECTIONS

Postpartum uterine infections are treated with antibiotics, hormones or their combinations (Palmer, C. et al., 2003) the use of these therapeutic agents is aimed at the elimination of pathogens from the uterus, the induction of the uterine immune system, and the elimination of the adverse effects of inflammation products on fertility. (Williams, Erin J., et al 2005 and Azawi, O. I. et al., 2008)

Antibiotics and PGF2 alpha analogues are used for the parenteral treatment of uterine infections (Williams, Erin J., et al 2005). The most commonly used antibiotic is ceftiofur hydrochloride, which is a member of the family of third-generation broad spectrum cephalosporins (Risco, C. A., & Hernandez, J. et al 2003) In severe cases of uterine infection, the antibiotic treatment is combined with intravenous fluid treatment and the administration of anti-inflammatory agents (Palmer, C. et al., 2003).

Prostaglandin F2 alpha has been shown to be effective in the treatment of uterine infections (Sheldon, I. M., & Noakes, D. E. et al., 1998).. The administration of exogenous PGF2 alpha both induces the secretion of endogenous PGF2 alpha from the uterus and enables the development of the immune functions (Lewis, G. S. et al., 2003). It has been reported that the use of PGF2 alpha

and its analogues during dioestrus resulted in approximately 90% of the cows showing oestrus (Zobel, R., Tkalcic, S., & Cole, W. et al.,2013). Each oestrus enables the self-cleansing of the uterus by means of physiological leukocytosis and increased uterine motility (Folman, Y., Kaim, M., Herz, Z., & Rosenberg, M. et al 1990). Oestrogen increases uterine contractions, mucus production and leukocyte infiltration to the uterus (Arthur, G. H. et al., 1975 and Squires, E. J. et al., 2024). Another systemic method used for the treatment of uterine infections is homeopathy. Homeopathic substances enable the organism to stimulate itself and trigger the onset of the treatment process (Aslan, S., et al.,2000) The administration of Tarantula cubensis extract, a homeopathic substance, to animals in the early postpartum period, has been demonstrated to both decrease the incidence of retentio secundinarum and accelerate uterine involution (Kaçar, Cihan, et al.,2007) Similarly, the last period of pregnancy levamisole treatment (2.5 mg/kg) has been reported to accelerate uterine involution (Pancarci, S. Metin, et al.,2009) .Some reports indicate that trace elements have effect on the immune functions (Yildirim, E., et al 2023 & Macun, H. C. et al., 2013 & Spears, J. W., et al., 2008 & Weiss, W. P. et al., 2008). On the other hand, (Machado et al., 2014) reported that some trace elements (zinc, copper, manganese and selenium) did not alter leukocyte activity.

7. Defense against pathogens in the uterus

Uterine disease provides an opportunity to study animal resilience because, despite exposure of the uterus to similar bacteria, the incidence of disease varies amongst groups of animals, levels of milk production, breeds, and farms. We suggest that preventing uterine disease depends on the complimentary defensive strategies of **avoidance, tolerance and resistance**. These are evolutionary ancient strategies used by plants and animals to counter infection or damage (Rauscher, M. D. et al., 2001). Avoidance, tolerance and resistance are integrated and complementary strategies, but they have different implications for the interaction

between pathogen burden and health. This interaction between pathogen burden and health can be visualized using a reaction norm plot. Reaction norms for a population of animals also allow comparisons between different genotypes, breeds or environments (Read, A. F., et al 2008 and Graham, A. L., et al 2008 & Råberg, L et al., 2008). For example, dairy cows in straw yards are more able to avoid fecal pathogens than cows in cubicles Whistance, (L. K., Arney, D. R., Sinclair, L. A., & Phillips, C. J. C. et al., 2007) dairy cows with lower milk yields are more able to tolerate uterine pathogens (Sheldon, I. M., Cronin, J. G., & Bromfield, J. J. et al., 2019 and, cows with higher cell mediated immune response are more able to resist uterine pathogens causing metritis (Thompson-Crispi, K. A., Hine, B., Quinton, M., Miglior, F., & Mallard, B. A. et al., 2012).

8. Managing cows to prevent uterine disease

Whilst resilience to uterine infection depends on an animals' avoidance, tolerance and resistance strategies, good management can also help support animal resilience. Uterine disease is not inevitable; many well-managed dairy farms have high milk yields but a low incidence of postpartum uterine disease. Conversely, and perhaps more important for animal welfare, sub optimal management of dairy cows can make cows more susceptible to postpartum uterine disease.

An obvious way to avoid postpartum uterine disease is to avoid parturition. Farmers already use extended lactations as a management tool to reduce the frequency of parturition in *Bos taurus* dairy cows, which reduces the annual incidence of postpartum problems. Whilst extended lactations are often thought to reduce herd reproductive performance, in some cases extended lactations improve performance (Niozas, Georgios, et al., 2019). Unfortunately, extended lactations are impractical in seasonally calved herds, and for *Bos indicus* and crossbred dairy cows that have less persistent lactation than *Bos taurus* cows. Pharmaceutical induction of lactation with estrogens and progesterone also avoids parturition, but the protocols need further

development to reduce the number of injections administered to each cow, and many countries prohibit the use of estrogens in food producing animals.

Farmers can also try to control the risk factors for uterine disease. The predominant risk factors for postpartum uterine disease are trauma to the genital tract followed by colonization with pathogenic bacteria. Trauma to the genital tract is more likely in the first parity, after induction of parturition, or following dystocia, stillbirths, twins, male calves, or retained placenta (Markusfeld, O. et al., 1984 and Potter, Timothy J., et al., 2010). Selection of easy-calving breeds and easy-calving sires within a breed could reduce the risk of parturient trauma to the genital tract, but may produce only short-term benefits if the smaller offspring are then used as replacement dairy cows. Using sexed semen to produce female calves, which are smaller than male calves, is a practical way of reducing the risk of uterine disease; mathematical modelling of the replacement of male calves by female calves estimates that this strategy would prevent more cases of clinical endometritis in a herd than eliminating an infrequent risk factor, such as retained fetal membranes (Potter, Timothy J., et al., 2010). Cows should have a clean, comfortable, quiet, and spacious environment to calve without stress. If there is need for intervention during parturition, farmers and veterinarians should ensure that they use clean techniques, they are gentle, and they maintain the cleanliness of the environment.

Prevention of uterine disease also requires appropriate nutritional management during the transition period (LeBlanc, S. J. et al., 2012 and Drackley, J. K. et al., 1999). Cows should be dried off at the target body condition score, fed a pre-partum cow diet that provides the appropriate fiber, vitamins and minerals, and then feed a postpartum diet with sufficient energy and protein to satisfy the metabolic requirements for lactation (Mulligan, F. J., et al., 2006). Farmers should also minimize stress, for example by avoiding transport or multiple changes in animal groups, which lead

to social stress (Dobson, H., & Smith, R. F. A et al., 2000). After parturition, it is important to monitor animal health carefully, particularly those cows that experience risks factors for uterine disease. Veterinary examination of the reproductive tract is important to identify animals with disease and decide on their treatment (Sheldon, I. M. et al., 2018).. However, the routine use of antimicrobials in cows after parturition to try to prevent uterine disease is no longer acceptable because this metaphylaxis increases the risk of antimicrobial resistance, and reducing antimicrobial resistance is a priority for most human health agencies (Rochford, Connor, et al., 2018)

Encouraging a return to ovarian cyclic activity by appropriate nutrition and reproductive management during the transition period also helps counter uterine disease. Estrus and estradiol increase protection against uterine disease in cattle, and the induction of estrus is often used to treat endometritis (Lewis, G. S .et al., 2004). Conversely, progesterone is used to suppress immunity when generating animal models of endometritis(Piersanti, R. L., Zimpel, R., Molinari, P. C., Dickson, M. J., Ma, Z., Jeong, K. C., ... & Bromfield, J. J. et al., 2019).Interestingly, estrus and estradiol increase the expression of components of the complement system (Saut, Joao PE, et al., 2014) but estrus and estradiol do not alter the innate immune response by endometrial tissues or cells in ex vivo studies(Saut, Joao PE, et al.,2014). It remains an open question as to how steroids influence the susceptibility of animals to uterine disease.

10. RECOMMENDATIONS

The peripartum period is of critical importance for uterine health and fertility. The increased growth rate of the fetus in the advanced stages of gestation and the start of milk production after parturition increase the energy requirements of the animal. This requires the feeding of animals with good quality roughage and high-energy feed. The ideal body condition score for bovine animals in this period is indicated as 3.00-3.75. A negative energy

balance triggered by poor nutrition after parturition affects the restart of the estrus cycle, the normalization of the sexual cycle, and the success achieved with artificial insemination. The cleanliness of the calving paddocks, and compliance with disinfection and hygiene rules during interventions to aid birth and dystocia, have an important role in reducing the risk of uterine infections. Regular controls during the postpartum period enable the monitoring of the uterine involution process, the differentiation of physiological and pathological changes and the treatment of infected animals without delay. Furthermore, the access of the veterinary practitioner to the records kept on the farm and to information on the previous parturition of the cow, the diseases the animal has undergone, whether the animal has given birth to twins, the estrus intervals, findings of the last gestational examination and previous inseminations of the animal, as well as the estrus and ovulation synchronization protocols and treatments the animal has been subjected to, all shed light on the reproductive problems of the animal and aid in diagnosis and treatment.

Conclusion :

Infections of the uterus are a major factor in dairy cows' decreased reproductive performance and financial losses. Metritis and endometritis can be caused by bacterial infections, especially those caused by *E. coli*, *Trueperella pyogenes*, *Fusobacterium necrophorum*, and *Prevotella* spp. Infertility, abortion, embryonic loss, and weak calves are all caused by viral diseases like IBR and BVD. These infections may have a negative impact on milk production, increase the number of necessary services, delay the calving period, and reduce the conception rate. Proper management during calving and the postpartum period, good nutrition, early detection, appropriate diagnosis, and effective treatment can help reduce uterine infections. As a result, improving reproductive efficiency, milk production, animal health, and dairy farming's overall profitability all depend on maintaining good uterine health.

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