

DIAGNOSIS AND TREATMENT OF POST PARTUM UTERINE ABNORMALITIES IN THE COW

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Abstract

The successful genetic selection for higher milk production caused a dramatic decline in the reproductive performance of dairy cows all over the world during the last decades. Achievement of optimum herd reproductive performance (calving interval of 12 or 13 months with the first calf born at 24 months of age) requires concentrated management activities especially during the first 100 days following calving. The following management activities are needed to pursue during the early postpartum period to reach or approach the optimal reproductive performance such as careful surveillance and assistance at calving, prevention of post parturient diseases, early diagnosis and treatment of postpartum uterine abnormalities, accurate detection of oestrus, correct timing of insemination, reducing the effect of heat stress and early pregnancy diagnosis. Among these main activities only early diagnosis and treatment of post partum uterine abnormalities and their effects on milk production and reproductive performance are discussed.

Key words: dairy cow, puerperal metritis, clinical endometritis, subclinical endometritis

The successful genetic selection for higher milk production in Holstein cows has nearly doubled the average milk production in the United States since 1960, to over 11,000 kg/year. Over the same time period, there has been a dramatic decline in the reproductive performance of dairy cows. The average number of days open (interval from calving to conception) and the number of services per conception have increased substantially. In order to decrease the longer lactations and the number of cows culled for reproductive reasons it is very important to improve our reproductive management practices [31]. Achievement of optimum herd reproductive performance (calving interval of 12 or 13 months with the first calf born at 24 months of age) requires concentrated management activities especially during the first 100 days following calving. Early postpartum breeding of dairy cows results in more calves, and higher milk production per lactation [3]. Poor reproductive performance can reduce the number of calves born and milk production and may increase the cost of therapy and semen.

The following management activities such as careful surveillance and assistance at

calving, prevention of post parturient diseases, early diagnosis and treatment of post partum uterine abnormalities, accurate detection of oestrus, correct timing of insemination, reducing the effect of summer heat stress and early pregnancy diagnosis are needed to pursue during the early postpartum period to reach or approach the optimal calving interval [33].

Among these main activities only early diagnosis and treatment of post partum uterine abnormalities and their effects on milk production and reproductive performance are discussed in the present work.

1. Clinical definitions of uterine diseases

Sheldon et al. [30] provided clear clinical definitions of uterine diseases which can be readily adopted by researchers and veterinarians and therefore it is strongly recommended to use in the field as well.

1.1. Puerperal metritis

Puerperal metritis is an acute systemic illness due to infection of the uterus with bacteria, usually within 10 days after parturition. Puerperal metritis is characterized by the following clinical signs:

a fetid red-brown watery uterine discharge and, usually, pyrexia [5, 10]; in severe cases, reduced milk yield, dullness, inappetence or anorexia, elevated heart rate, and apparent dehydration may also be present. The term metritis should be used for cows that have delayed involution and a fetid discharge, in the absence of detected fever. Puerperal metritis is often associated with retained placenta, dystocia, stillbirth or twins, and usually occurs toward the end of the first week post partum, being rare after the second week post partum [5, 10, 22]. In summary puerperal metritis should be defined as an animal with an abnormally enlarged uterus and a fetid watery red-brown uterine discharge, associated with signs of systemic illness (decreased milk yield, dullness or other signs of toxæmia) and fever $>39.5^{\circ}\text{C}$, within 21 days post partum [30].

1.1.1. Retained placenta

Retained placenta or retained foetal membranes may occur if the placenta has not been shed by 12 (24 or 48) hours after calving. Majority of the placenta used to be expelled within 6-9 hours after calving (88,7%) [34]. The average incidence of retained placenta after normal calving used to be 7% between 3 (4) to 11 (12) % [9, 14]. After abnormal delivery (e.g. twin pregnancy, caesarean section, foetotomy, forced extraction of the foetus, abortion, premature calving) and in herds infected with brucellosis its incidence rate can range between 20 and 50 % or even more. Several factors like genetic, nutritional, immunological and pathological ones may influence the separation of bovine placenta, however its aetiology is not fully understood. As retained placenta predisposes the development of uterine infections (puerperal metritis, as well as clinical and subclinical endometritis [4], decrease in milk production (decreased milk yield, milk from treated cows withheld) [29] and reproductive performance (increases in days open, services per conception, calving to first heat interval, days from calving to first service and culling rate) [20] therefore the aim of its therapy is to prevent its adverse side effects.

1.2. Clinical endometritis

Clinical endometritis is characterized by the presence of purulent ($>50\%$ pus) uterine discharge detectable in the vagina 21 days or more post partum, or mucopurulent discharge (approximately 50% pus, 50% mucus) detectable in the vagina after 26 days post partum and is not accompanied by systemic signs [22, 28].

1.2.1. Pyometra

Pyometra is characterized by the accumulation of purulent or mucopurulent material within the uterine lumen and distension of the uterus, in the presence of an active corpus luteum. There are often an increased number of pathogenic bacteria within the uterine lumen when the corpus luteum forms and pyometra occurs [23]. Although there is functional closure of the cervix, the lumen is not always completely occluded and some pus may discharge through the cervix into the vaginal lumen. Pyometra is sonographically characterized by a corpus luteum in an ovary, accumulation of mixed echodensity fluid in the uterine lumen and distension of the uterus. According to Sheldon et al. [30] pyometra is defined by the accumulation of purulent material within the uterine lumen, in the presence of a persistent corpus luteum and a closed cervix.

1.3. Subclinical endometritis

Subclinical endometritis can be defined as endometrial inflammation of the uterus usually determined by cytology, in the absence of purulent material in the vagina [12]. In animals without signs of clinical endometritis, subclinical disease may be diagnosed by measuring the proportion of neutrophils present in a sample collected by flushing the uterine lumen, or using a cytobrush [18, 19]. Subclinical endometritis was determined in one study by the presence of $>18\%$ neutrophils in uterine cytology samples collected 20–33 days post partum or $>10\%$ neutrophils at 34–47 days post partum [19]. The assessment of inflammation at 40–60 days post partum corresponded approximately to $>5\%$ neutrophils [13]. It is proposed by Sheldon et al. [30] that a cow with subclinical endometritis is defined by $>18\%$ neutrophils in uterine cytology

samples collected 21–33 days post partum, or >10% neutrophils at 34–47 days, in the absence of clinical endometritis.

2. Diagnosis of uterine diseases

2.1. Puerperal metritis

Diagnosis of puerperal metritis is based on the clinical signs (fetid watery red-brown uterine discharge, fever >39,5°C, dullness, anorexia, elevated heart and respiratory rate) and abnormally enlarged uterus detected by rectal palpation mainly during the first week (ten days) after calving and rare during the second week [5, 22]. It is recommended by Sheldon et al. [30], if the aforementioned clinical signs occur during the first 21 days post partum should be defined as puerperal metritis.

2.1.1. Retained placenta

If the placenta has not been shed by 12 (24 or 48) hours after calving the animal has to be handled accordingly [9, 14].

2.2. Clinical endometritis

There are several methods (transrectal palpation [20], transrectal ultrasonography [16], histological examination of endometrial biopsies [2], manual vaginal examination [30], vaginoscopy [20] available in the fields to diagnose clinical endometritis in the cow however each of the methods has some limitations. In contrast, Metricheck^R (Simcro, New Zealand) consisting of a stainless steel rod with a rubber hemisphere can be used to retrieve vaginal contents more easily and precisely. On the other hand cytobrush cytology is a reliable method of diagnosing clinical endometritis in cattle [1].

The character and the odour of the vaginal mucus [29] can be scored according to the followings:

Mucus character

Score 0 = clear or translucent mucus;

Score 1 = mucus containing flecks of white or off-white pus;

Score 2 = discharge containing ≤ 50% white or off-white mucopurulent material;

Score 3 = discharge containing ≥ 50% purulent material, usually white or yellow, but occasionally sanguineous.

Mucus odour

Score 0: no unpleasant odour

Score 3: Fetid odour

2.2.1. Pyometra

The diagnosis of pyometra can be based on transrectal palpation of a distended uterus and/or transrectal ultrasonography of mixed echogenesity fluid, and the presence of a persistent corpus luteum, with a history of anoestrus [30].

2.3. Subclinical endometritis

Subclinical endometritis can be diagnosed by uterine cytology in the absence of purulent discharge in the vagina. Endometrial and inflammatory cells may be collected by uterine lavage [17, 25], or cytobrush techniques [17] to evaluate the presence of neutrophils in the uterine sample. If >5% neutrophils in uterine cytology samples collected by uterine lavage between days 42-72 after calving was found, subclinical endometritis was defined [25]. The cytobrush technique is a consistent and reliable method for obtaining endometrial samples for cytological examination from postpartum dairy cows. If >18% neutrophils in uterine cytology samples collected 21–33 days post partum, or >10% neutrophils at 34–47 days can be found, in the absence of clinical endometritis, subclinical endometritis can be defined [18].

3. Treatment of uterine diseases

3.1. Puerperal metritis

A great variety of intrauterine antimicrobial agents (oxytetracycline: 4 to 6 g/day) and antiseptic chemicals (iodine solutions: 500 ml of 2% Lugol's iodine immediately after calving and again 6 hours later as a preventive measure), systemic antibiotics (penicillin or one of its synthetic analogues: 20,000 to 30,000 U/kg/cow), ceftiofur /third generation cephalosporin/: 2,2 mg/kg daily for 5 days) and supportive therapy (nonsteroidal anti-inflammatory drugs such as flunixin meglumine, fluid therapy in case of dehydration, therapy with calcium and energy supplements in case of depressed appetite), and hormone therapy (oxytocin: 20 to 40 U repeated every 3 to 6

hours within 48 to 72 hours after calving; prostaglandin $F_{2\alpha}$ or its synthetic analogues) have been introduced in the field [27]. The prognosis for recovery from puerperal metritis varies with severity of the condition. According to our present knowledge intrauterine antimicrobial and antiseptic treatments are not recommended because of irritating the endometrium. Routine use of hormone therapies is also controversial and needs further confirmations. It seems that presently systemic antibiotic and supportive therapy can be recommended for the field [5, 11].

3.1.1. Retained placenta

The aim of the treatment for retained placenta is to reduce the occurrence of puerperal metritis and subsequently clinical and subclinical endometritis, decrease milk losses, reduce reproductive inefficiency, and decrease veterinary expenses. There are a great variety of treatment protocols (manual removal of retained membranes, intrauterine treatments with antibiotics or antiseptics, hormones (oxytocin, prostaglandin), ergot derivatives, calcium, injection of collagenase into the umbilical arteries, versus no treatment recommended for the field. However, all of these methods have some limited values in the treatment of retained placenta [9]. Recent findings confirm that systemic antibiotics without intrauterine manipulation and treatment can be as effective as conventional treatment [5]. This was also confirmed in a later study in febrile cows [6, 7]. It seems that systemic antibiotic is effective if the selection of treatment based on fever which may reduce the use of antibiotics compared with intra-uterine antibiotics [7]. At the same time treatment of acute puerperal metritis with a single dose of flunixin meglumine in addition to antibiotic treatment had no beneficial effect on clinical cure, milk yield within 6 d after the first treatment, or reproductive performance [8].

3.2. Clinical endometritis

If an active corpus luteum is present together with clinical endometritis the treatment of choice may be intrauterine antibiotics (cephapirin having minimal drug

residues in milk and meat) and/or prostaglandin ($PGF_{2\alpha}$ or its synthetic analogues) injection(s). In the absence of an active corpus luteum, the treatment efficacy of clinical endometritis with only prostaglandin injection is limited however such a treatment according to Lewis [21] may bring certain advantages as well. It is very important to diagnose and treat clinical endometritis 21 days after calving because there is a danger which may lead to pyometra.

3.2.1. Pyometra

The best treatment protocol is to use prostaglandin ($PGF_{2\alpha}$ or its synthetic analogues) injection(s) because of the presence of a persistent corpus luteum. Due to common relapse it is recommended to repeat the prostaglandin treatment 12 to 14 days later. Intra-uterine antibiotic therapy (cephapirin) may be used as well. Complete restoration of the endometrium may need 4 to 8 weeks therefore it is very important to diagnose and treat pyometra as soon as possible after calving to decrease the destructive nature of pyometra on the endometrium [24].

3.3. Subclinical endometritis

Subclinical endometritis can be treated with a prostaglandin im injection (cloprostenol 500 mg) or an intrauterine antibiotic therapy (cephapirin) at 20–33 DIM to improve the reproductive performance [19].

1. Prevention of uterine diseases

Cows having hypocalcaemia, dystocia, stillbirth, twins or retained placenta in the periparturient period are more likely to contract uterine infections than are 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. Therefore prevention remains limited to general guidance on hygiene at calving [15], adequate nutrition (Ca, Se, Vit. E, etc.) and the control of infectious diseases. One of the pharmacological approaches to the prevention and treatment of retained placenta can be the administration of prostaglandin immediately after calving [32] however due

to controversy results further studies are needed to confirm its efficacy. Routine systemic administration of ceftiofur hydrochloride may be beneficial for the prevention of metritis, but its effect on reproductive performance is not significantly different to that of no treatment [26].

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