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Postpartum uterine diseases and their impacts on conception and days open in dairy herds in Italy

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ABSTRACT

The objective of this study was to describe the incidence and the impact of postpartum uterine diseases in postpartum cows on future uterine status and reproductive performance in large Italian dairy herds. This study provides an important quantitative estimate of uterine and postpartum diseases incidence that afflict high-producing Italian dairy cows. The total number of cows included in the study was 1498 on three farms; all cows were followed from the dry period until 300 days postpartum. All farms used high-quality data collection systems and standard operating procedures: weekly herd health visits, monthly Dairy Herd Improvement Association visits, and, due to cheese-making milk quality requirements, a supplementary milk sample collected at 7 ± 3 days postpartum evaluated for milk components. Clinical metritis in primiparous cows did not change the time to the first artificial insemination (AI) or days open; conversely, clinical metritis in multiparous cows had impact on the time to first AI (hazard ratio: 0.66, $P < 0.01$) and resulted in a lower conception rate at first insemination and an increase in days open (odds ratio: 0.64, $P < 0.05$). Clinical endometritis had a strong deleterious effect on first AI conception rate (odds ratio: 0.34, $P < 0.05$) and days open across all lactations (hazard ratio: 0.68, $P < 0.05$). Persistent metritis, defined as the presence of both clinical metritis and clinical endometritis in the same animal in the same lactation, caused low conception rate both in the first-lactation and in older cows and had a strong negative effect on the proportion of pregnant cows at 300 days ($P < 0.05$). In conclusion, the impact of endometritis on fertility was true across lactation groups. A good management and precocious diagnosis of the pathologies is not resolutive to restore good fertility parameters, and understanding the immune response in first-lactation cows may be of value for developing alternative intervention protocols for older-lactation cows.

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1. Introduction

As a result of genetic improvement from years of selection, dairy cows have become more efficient in producing milk, but modern cows seem to be more sensitive to

environmental changes and less tolerant to stress and disease. Uterine inflammatory diseases (metritis, clinical endometritis, and subclinical endometritis) are some of the most important diseases occurring in the postpartum period. Uterine health is often compromised due to postpartum contamination of the uterine lumen by ubiquitous and pathogenic bacteria. Most cows do not develop severe uterine infections, but these infections are frequently persistent clinical diseases that reduce the reproductive

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efficiency of cows and the profit of dairy farms. Until 2006, the literature showed a disparate classification of uterine pathology. Therefore, some authors [1–3] proposed to categorize postpartum inflammation of the uterus according to the time of onset of the disorder and the characteristics of the uterine discharge. An examination of vaginal discharge to detect the presence of pus is the most convenient method for endometritis diagnosis. Characteristics and odor of the vaginal discharge can be scored, and this endometritis score is correlated with the growth density of pathogenic bacteria in the uterus. Improvements in the quality of clinical diagnosis may be obtained by the application of an ultrasound examination. Ultrasonography can also help in early detection of silent estrus, anestrous, and cystic ovarian conditions and has proven to be useful in reducing days to first service, days open, and calving interval [4–6]. Moreover, precise diagnostic techniques based on routine ultrasound examination in all cows in the herd, along with accurate data on subsequent fertility, would provide accurate information on the impact of uterine disorders on reproductive parameters.

Clinical forms of metritis and endometritis have been reported with an incidence ranging from 14% to greater than 40% in cows [2,7–12]. Metritis within a week of parturition was present in 40% of dairy cows [2], with a range from 35% to 50% reported in large surveys [13,14]. When the status of the reproductive apparatus was assessed at 35 days postpartum, 43% of the cows had subclinical endometritis, and the days open increased by 27 days; still, quantitative estimates on the incidence of uterine disorders and the impact of these disorders are limited, particularly since more accurate definitions of uterine disorders have been introduced [1].

Uterine disorders were defined as follows: puerperal metritis (PM), clinical metritis (CM), endometritis, and subclinical endometritis. PM (abnormally enlarged uterus; fetid, watery, red–brown uterine discharge; signs of toxemia; and fever of >39.5 °C) or CM (enlarged uterus, purulent discharge in vagina, and no systemic signs) should be diagnosed within 21 days postpartum. Clinical endometritis is characterized by the presence in the vagina of purulent ($>50\%$ pus) uterine discharge detectable 21 or more days after parturition, or a mucopurulent discharge after 26 days postpartum. Subclinical endometritis (no detectable clinical changes in the uterus) is diagnosed by the percentage of neutrophils in the postpartum uterine cytology samples.

The objective of this study was therefore to describe the incidence of uterine and postpartum diseases and to evaluate the impact of early uterine diseases in postpartum cows on time to first artificial insemination (AI), conception risk, and time to conception (days open) in large commercial Italian dairy herds.

2. Materials and methods

2.1. Herd descriptions

The data were collected on three large Italian Holstein dairy herds. Two farms (A and C) were using a rotary parlor (40 milking stands), and one farm (B) was milking in a

double 12 herringbone. All cows were milked twice a day, and dried manure was used as bedding for the lactating cows. Groups of lactating cows were housed in a paddock with cubicles with straw, and dry cows and cows in the calving pen were bedded on a bedded pack with straw. The produced milk was used exclusively for Parmesan cheese production. All farms used standard operating procedures for the most important management processes. High-quality data collection systems were present on the farms and included weekly herd health visit reports. All eligible animals were checked weekly using clinical inspection and ultrasound evaluation. Monthly Dairy Herd Improvement Association (DHIA) visits for recording milk and components and for recording all disease and reproductive events were entered into a computerized database. Daily milk production was collected using DeLaval milk meters, and daily milk weight data were transferred from Alpro to the AfiFarm data management system. All DHIA and milk production data were imported into the AfiFarm management system, and reproduction and health data were recorded and managed with the AffFarm system. The 305-day milk production was obtained from the records and is defined as the standardized milk production in 305 days of lactation, standardized for the herd, age, and season of calving.

2.2. Nutrition

Because the milk was used exclusively for Parmesan cheese production, the use of corn silage was precluded from the diet. A total mixed ration (TMR) was fed to the cows twice a day. The diet consisted of 50% concentrates (8 kg of steamed crushed corn, 2 kg of barley, and 3 kg of high protein mix that consisted of soybean and sunflower seeds mixed with a mineral mix) and 50% forages (1/2 grass hay and 1/2 alfalfa, in accordance with the guidelines for the production of Parmesan cheese), with 17 kg of water added to the TMR. For dry cows, a dry diet was fed that consisted of *ad libitum* forages (50% hay and 50% alfalfa) with 2 kg of a purchased dry cow concentrate. During the final 14 to 21 days of the dry period, the diet consisted of 40% of the TMR diet for the lactating cows (mentioned previously) and 60% of the diet for early dry cow; during this period, anionic salts were added to the diet.

2.3. Cow measurements

Disease definition and diagnostic criteria were consistent across farms. Most veterinary work was performed by the first author (Toni F.), and written disease definitions were given to the participating dairy producers. All cows were examined during the routine or during heat detection by manual mucus examination, to assess the healthy or pathologic status of the reproductive tract; briefly, the vulva was cleaned using a dry paper towel and a clean, lubricated, gloved hand was inserted through the vulva into the vagina and the mucus contents were examined: cows were considered as healthy if they show a clear mucus or pathologic if mucus was turbid or contains pus. All the abnormal scored cows were checked by ultrasound, to assess the presence of abnormal fluid in the uterus and confirm

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