

Unilateral twin pregnancy: A non-infectious factor required for the etiological diagnosis of abortion in dairy herds

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Abstract. Twin pregnancies are classified into bilateral (one fetus in each uterine horn: 44%) and unilateral (both fetuses in the same uterine horn, right or left: 56%). The incidence of abortion during mid- to late gestation is approximately 1% in cows carrying bilateral twins and more than 40% in cows carrying unilateral twins. In this period, abortion seems most commonly associated with infectious agents. However, although this imbalanced abortion rate may imply that unilateral twin pregnancy is a non-infectious abortion factor, few available data can describe the cause of abortions in twin pregnancies. The current findings suggest that unilateral twin pregnancy is a non-infectious factor required for the etiological diagnosis of abortion in dairy herds.

Key words: Double ovulation, Infectious abortion, Non-infectious abortion, Timing of abortion

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Introduction

A high incidence of abortion may have devastating consequences on dairy herd profitability [1]. Significant pregnancy losses due to non-infectious causes occur during the first 60 days of gestation [2–5], whereas infections are more common causes of abortion during mid- to late gestation [6–9]. Twin pregnancy, a main non-infectious factor associated with pregnancy loss during the first trimester of gestation [4], is classified into bilateral (one fetus in each uterine horn: 44%) and unilateral (both fetuses in the same uterine horn, right or left: 56%) [10]. It was recently reported that more than 40% of cows carrying unilateral twins on Day 60 may suffer abortion during the second or third trimester of gestation [10, 11]. This article focuses on the poor control of twin pregnancies within clinical reproductive control programs and places particular emphasis on their effects against the maintenance of pregnancy at the mid-gestation. The authors propose unilateral twin pregnancy as an additional non-infectious factor required for the etiological diagnosis of abortion in dairy herds.

Problem of twin pregnancies in dairy herds

The first problem with twin pregnancy is diagnostic accuracy. Although the embryo can be detected by ultrasound between Days 25 and 30 of gestation [12], the period in which pregnancy diagnosis is usually performed in herds, the accuracy of a twin pregnancy diagnosis is lower until Day 30 [4]. The embryo is close to the endometrium from Day 25 to 30 and often difficult to find, particularly in cases of a single pregnancy in older cows [13] or twin pregnancies [4]. In contrast, from Day 30 onwards, making a pregnancy diagnosis is easier because the embryos are surrounded by fluid [13]. Further efforts should be made to identify twins in cows with two or more corpora lutea at the time of pregnancy diagnosis, particularly when two corpora lutea are present in the same ovary. Assessment of the presence of twins or singletons on Day 60 of gestation would be appropriate since placentation is fully established [12, 14] and the chances of fetal loss are much lower [2].

Spontaneous embryo reduction has been described in twin pregnancies in cows

that remain pregnant, with an incidence of 6.2% [15], 11.2% [16], and 28.4% [17]. Interestingly, most cases of single-embryo mortality in twins occur before Days 36–42 of gestation and rarely occur after Day 60 [15]. This means that the fate of pregnancies involving live twins on Day 60 is twin birth or abortion.

The incidence and timing of abortion in dairy cows carrying twins was reported for a study population of 1194 cows [10]. The presence of live twins was determined by transrectal ultrasonography between 55 and 61 days of gestation, and the pregnancy was confirmed 60 days later. Abortion was recorded in 23.3% (278/1194) of cows before Day 260 of pregnancy: 1.3% (7/522) in bilateral and 40.3% (271/672) in unilateral twin pregnancies. The mean date of abortions was Day 174 of gestation (range, 135–249). Pregnancy was also monitored in a further study of 615 unilateral multiple pregnancies until abortion or parturition with similar results [11]. The abortion rate before 260 days of gestation in cows maintaining live twins at 58–64 days after insemination was 42.6% and the average time to abortion was 176 days (range, 122–251 days) [11]. Only cows testing seronegative for *Neospora caninum* were included in both studies [10, 11]. In previous clinical trials of the same herds, the abortion rate for *Neospora*-seropositive cattle during the second and third trimesters of gestation was 30% [18, 19], whereas only 1.9% (heifers plus parous cows [18]) and 4.2% (parous cows [19]) of their seronegative partners aborted. In

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these herds, cows were brucellosis-free, vaccination programs were undertaken to prevent bovine viral diarrhoea, and infectious bovine rhinotracheitis, brucellosis, and neosporosis were tested for annually [18, 19].

Preventing infections and confirming non-infectious abortions in dairy herds is not easy. However, the latter studies were performed in well-managed herds subjected to efficient vaccination programs against infectious agents. In this context, abortions of unilateral twin pregnancies should not be considered of infectious cause [10, 11]. The fact that only 1.3% of cows carrying bilateral twins aborted [10] reinforces this assumption. Conversely, a cow factor may provide a good explanation. Mechanical stress due to a lack of space in the case of unilateral twins could add to the metabolic stress of high milk production and perhaps explain why the risk of abortion was higher in the middle than at the end of the lactation period. In fact, using cows that aborted from 215 to 249 days of gestation as reference, the odds ratio for abortion during the period of 135 to 154 days of gestation was 3 (43% of aborting cows; $P < 0.0001$) [10].

Hence, the negative economic impact of twin pregnancy is not only attributable to losses incurred during the first trimester of gestation; this impact may be larger because of the incidence of cows suffering abortion during the second or third trimester of gestation.

Significance and impact of twinning

Twinning is not desirable in dairy herds, as it compromises a cow's subsequent health and productive lifespan. In essence, twin births increase the risk of reproductive disorders such as dystocia, perinatal mortality, retained fetal membranes, metritis, and longer calving to conception interval [20–23]. Both a higher culling rate and reduced mean production lifespan (by 200 days) have been reported for cows delivering twins versus singletons [21, 22]. The twinning rate can reach 12% in some herds [24], and the economic impact of twinning is likely to rise. Genetics appears to be a major regulatory factor for twinning rates. An analysis of data involving 37,174 sires showed that those born after 1990 had a higher incidence of twins (5.6%) than those born before 1981 (4.6%) [25]. In an epidemiological study of 52,362 lactations, the rate of twinning increased from 1.4% in 1983 to 2.4% in 1993, with a concurrent increase in milk production as the single most important reason for this increase [26]. Genetic progress and improvements in nutrition and management

practices linked to a continuous increase in milk yield suggest that the twinning rate is set to increase further over the years to come.

Concluding remarks

In the setting of dairy herds under ever-increasing pressure to improve efficiency, twin pregnancies clearly reduce profitability. A substantial peak in losses, normally exceeding 30% of pregnancies, occurs before Day 60 of gestation, when placentation is completed in the cow [12, 14]. Such losses are likely the result of the high sensitivity of placentation to any type of stress [2–5]. Following this peak, the first abortion of unilateral twin pregnancies may be registered at the start of the fifth month, the period when abortion is extensively associated with infectious agents. Interest in twin pregnancies during the first trimester of gestation is growing [4, 27]. However, data describing the proportion of twin pregnancies that ultimately result in twins are scarce [10, 11]. A high incidence of abortions in the middle of gestation is probably the single most important factor affecting herd profitability. The risk assessment of abortion is a component of the dairy industry policy. Since the fate of twin pregnancies in which both embryos are alive on Day 60 is either twin birth or abortion, the assessment of live unilateral twins on Day 60 of gestation has considerable clinical implications for the risk assessment of subsequent abortion. Overall, we may reasonably conclude that unilateral twin pregnancies should be considered a non-infectious factor required for the etiological diagnosis of abortion during mid- to late gestation in dairy herds.

Conflicts of interest: The authors declare no conflicts of interest.

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