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Vulvovaginal laceration as a risk factor for uterine disease in postpartum dairy cows

A. Vieira-Neto,* F. S. Lima,† J. E. P. Santos,* R. D. Mingoti,‡ G. S. Vasconcellos,‡ C. A. Risco,§ and K. N. Galvão§#¹

*Department of Animal Sciences, University of Florida, Gainesville 32610

†Department of Veterinary Clinical Medicine, University of Illinois, Champaign 61802

‡Department of Veterinary Medicine, Universidade de São Paulo, Pirassununga, SP, Brazil 13635

§Department of Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville 32610

#D. H. Barron Reproductive and Perinatal Biology Research Program, University of Florida, Gainesville 32610

ABSTRACT

The main objective was to evaluate the association between vulvovaginal laceration and uterine diseases in dairy cows. The secondary objectives were to evaluate the association between vulvovaginal laceration and cyclicity, and reproductive performance. The vulvovaginal region of 660 Holstein cows from a 5,000 lactating-cows herd was inspected at 4 d in milk (DIM) for the presence of lacerations, and scored (VLS) as follows: 0 = no laceration; 1 = laceration <2 cm at the dorsal commissure of the vulva or lateral walls of the vulva/vagina; 2 = laceration ≥2 cm at the dorsal commissure of the vulva or at the lateral walls of the vulva/vagina, or both. Vaginal discharge was scored at 4, 6, and 8 DIM for diagnosis of metritis, and then at 32 DIM for diagnosis of purulent vaginal discharge (PVD). Data were analyzed using LOGISTIC and PHREG procedures of SAS. Cows with VLS 2 had greater incidence of metritis than cows with VLS 0 (69.1 vs. 42.4%), and cows with VLS 1 tended to have greater incidence of metritis than cows with VLS 0 (52.0 vs. 42.4%). Cows with VLS 2 had greater incidence of PVD than cows with VLS 0 (56.5 vs. 43.1%). A lower proportion of cows with VLS 2 than VLS 0 were cyclic by 64 DIM (70.0 vs. 86.8%). A lower proportion of cows with VLS 2 than VLS 0 were pregnant at 60 d after first AI (28.7 vs. 33.6%). Proportion of pregnant cows at 60 d after AI tended to be lower for VLS 1 than VLS 0 (28.4 vs. 33.6%). Hazard of pregnancy by 300 DIM was not affected by VLS. Hazard of pregnancy was decreased for cows with metritis, PVD, and anovular cows. In summary, vulvovaginal laceration was associated with uterine disease and cyclicity, which were negatively as-

sociated with reproductive performance. Vulvovaginal laceration was recognized as a risk factor for postpartum uterine disease.

Key words: vulvovaginal laceration, vaginal discharge, reproductive performance, dairy cow

INTRODUCTION

Uterine diseases, such as metritis and clinical endometritis/purulent vaginal discharge (PVD), are highly prevalent in high-producing dairy cows. Metritis and PVD affect ~20% of lactating dairy cows, with the incidence ranging from 8% to more than 40% (Goshen and Shpigel, 2006; LeBlanc, 2008; Mendonça et al., 2014). Metritis is characterized by the presence of fetid red-brownish uterine discharge in the first 21 DIM (Sheldon et al., 2006), whereas PVD is characterized by purulent vaginal discharge after 21 DIM or mucopurulent vaginal discharge after 26 DIM (Sheldon et al., 2006). Numerous studies have demonstrated both direct and indirect negative effects of uterine disease on overall dairy herd performance and profitability (LeBlanc et al., 2002; Goshen and Shpigel, 2006; Overton and Fetrow, 2008).

Several risk factors are recognized for both metritis and PVD such as dystocia, male offspring, twins, stillbirth, abortion, prolapsed uterus, retained placenta (RP), ketosis, and hypocalcemia (Dubuc et al., 2010; Galvão, 2013); however, information is lacking about the association between vulvovaginal laceration and uterine disease. It is intuitive to think that dystocia may lead to vulvovaginal lacerations, which may affect DMI, and hence worsen the state of negative energy balance postpartum (Proudfoot et al., 2009), and disrupt physical barriers, which may predispose to uterine infections through decreased immune function and increased access of bacteria to the reproductive tract, respectively (Sheldon et al., 2009; Galvão, 2013). Therefore, we hypothesized that cows having vulvovaginal laceration at calving would be associated with greater incidence

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¹Corresponding author: galvaok@ufl.edu

of uterine diseases and impairment of reproductive performance. The objective was to evaluate the association between vulvovaginal laceration and the incidence of metritis and PVD. The secondary objectives were to evaluate the association between vulvovaginal laceration and cyclicity, and reproductive performance.

MATERIALS AND METHODS

Animals, Housing, and Feeding

This study was conducted in a 5,000 lactating cow herd located in north central Florida. A total of 660 (280 primiparous and 380 multiparous) Holstein cows were enrolled from October 2012 to January 2013. Cows were housed in freestall barns, and were milked 3 times daily. The rolling herd average milk production was 11,000 kg of milk/cow per year. Cows were fed the same TMR, formulated to meet or exceed the NRC (2001) nutrient requirements for lactating Holstein cows weighing 680 kg and producing 45 kg of 3.5% FCM.

Sample Size and Exclusion Criteria

This was a convenience sample collected during screening of cows for enrollment in a previous study (Lima et al., 2014). The sample size provided sufficient power (80%) to detect statistical differences (α of 5%) of approximately 10 percentage units in a dependent variable with 2 levels such as metritis (yes or no) and an independent variable with 3 levels such as vulvovaginal laceration score (VLS; 0, 1, 2). Power was calculated using the Power and Sample Size Calculator of Minitab (ver. 16.2.4, Minitab Inc., State College, PA). Correction for unequal group sizes was performed using the online tool StatsToDo (https://www.statstodo.com/SSizUnequal_Pgm.php). Differences of 7 percentage units could be detected with independent variables with 2 levels such as parity (primiparous or multiparous).

All cows that calved from October 2012 and January of 2013 were eligible for enrollment in the study with the exception of cows that had a delivery by cesarean section or fetotomy.

Evaluation of Calving-Related Disorders and Body Condition Score

Information on BCS at calving, calving ease, twins, sex of the calf, and stillbirth were recorded. The presence of RP was evaluated 24 h after calving. Calving ease was scored using a scale from 1 to 5: 1 = no assistance; 2 = assistance by one person without the use

of mechanical traction; 3 = assistance by 2 or more people; 4 = assistance with mechanical traction; 5 = fetotomy or cesarean section. A calving ease of 2 to 5 was considered dystocia; however, cows with score of 5 were excluded from the study. Stillbirth was defined as the birth of a dead calf or a calf that died within 24 h of birth. Retained placenta was characterized by failure to release the placenta within 24 h of parturition. Body condition was scored using a scale from 1 to 5 (Ferguson et al., 1994). Vulvovaginal laceration was scored (VLS) at 4 DIM: 0 = no laceration; 1 = laceration less than 2 cm at dorsal commissure of the vulva or at the lateral walls of the vulva/vagina, or both; 2 = laceration greater than 2 cm at dorsal commissure of the vulva or at the lateral walls of the vulva/vagina, or both (Figure 1).

Evaluation of Uterine Disorders and Cyclicity

Vaginal discharge was scored at 4, 6, and 8 DIM for diagnosis of metritis as previously described (McLaughlin et al., 2013): 1 = no discharge observed; 2 = discharge not fetid, normal lochia, viscous, red, brown, or clear; 3 = discharge not fetid, thick mucus, and cloudy, clearing, or clear; 4 = discharge not fetid, might have been purulent or mucopurulent, and chocolate brown color; 5 = discharge fetid, thin, serous, or watery, might have been red/pink to chocolate brown color with or without pieces of necrotic tissue present. Vaginal discharge was retrieved by palpation per rectum, and cows with at least one vaginal discharge score 5 were diagnosed with metritis.

Vaginal discharge was scored at 32 ± 3 DIM for diagnosis of PVD as previously described (LeBlanc et al., 2002): 1 = clear mucus or translucent mucus; 2 = cloudy mucus with flecks of pus; 3 = mucopurulent (approximately 50% mucus and 50% pus present); 4 = purulent (>50% pus present); 5 = purulent or red-brown and foul smelling. Vaginal discharge was retrieved using the Metricheck device (Metricheck, Simcro, Hamilton, New Zealand), and cows with a vaginal discharge score ≥ 3 were diagnosed with PVD.

Cyclicity was evaluated at 50 ± 3 and 64 ± 3 DIM by ultrasonographic examination of the ovaries using a portable ultrasound scanner equipped with a 7.5-MHz transrectal probe (Easi-Scan, BCF Technology, Rochester, MN) as previously reported (Lima et al., 2014). Cows with a corpus luteum with diameter >15 mm recorded on 1 of the 2 examination days were considered to be estrous cyclic, whereas those without a visible corpus luteum >15 mm in both examinations were considered anovular. A diagram with a summary of the activities is shown in Figure 2.

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