aSPRA Asociación Peruana de Reproducción Animal

www.spermova.pe

SPERMOVA

Spermova 2019; 9(2): 92-94

Artículo corto - Short Report

DOI. 10.18548/aspe/0007.12

UTERINE HEALTH AND ITS RELATIONSHIP WITH MINERAL PROFILE, HEMATOLOGY VALUES AND LEUCOCITARY FORM IN DAIRY COWS IN GRAZING SYSTEMS

Salud uterina y su relación con perfil mineral, valores de hematología y forma leucocitaria en vacas lecheras en sistemas a pastoreo

Emanuel Frana[1,3], Sandra Bernardi[2,3,4], Maira Vega[1,2], Pablo Roberto Marini[1,3,4]

1 Chairs of Production of Milk Cattle,
2 Chairs of Obstetrics and Pathophysiology of Reproduction.
3 Latin American Center for Dairy Problems Studies (CLEPL). Faculty of Veterinary Sciences, UNR -Argentina.
4 CIC-UNR.

* Corresponding author
P.R. Marini
E-mail: pmarini@unr.edu.ar

Recibido: 03/12/19
Aceptado: 27/12/2019
Publicado: 31/12/2019

ABSTRACT

The objective of this work was to evaluate the relationship of uterine health with mineral profile, hematological values and leukocyte form in dairy cows in grazing systems. During the months of March 2017 to July 2019, a total of 249 primiparous and multiparous Holstein cows belonging to dairy establishments in the southern basin of the province of Santa Fe - Argentina were reviewed in the postpartum period. The results showed that of the 249 (100%) cows at the first review, 111 (44.6%) were healthy and 138 (55.4%) had some degree of clinical endometritis. Of which 63 (45.6%) presented G1, 60 (43.5%) presented G2 and 15 (10.9%) cows presented G3. The Ca2+ and Mg2+ values did not show significant differences ($p \geq 0.05$) between both groups of cows. Significant differences ($p < 0.05$) were found between the two groups, for the White Blood Cell values, being smaller in the group of animals with clinical endometritis. The red series values found not showing significant differences ($p \geq 0.05$) between both groups of cows. It is concluded that for this group of cows analyzed no relationship of uterine health with the mineral profile and values of the red series has been found. However, in the leukocyte form, cows with clinical endometritis had lower white blood cell values than healthy cows.

Keywords: *dairy cows, clinical endometritis, leukocyte formula, blood count*

RESUMEN

El objetivo de este trabajo fue evaluar la relación de la salud uterina con el perfil mineral, valores hematológicos y forma leucocitaria en vacas lecheras en sistemas a pastoreo. Durante los meses de marzo de 2017 a Julio de 2019 se revisaron en el posparto un total de 249 vacas Holando argentino primíparas y multíparas pertenecientes a establecimientos lecheros de la cuenca sur de la provincia de Santa Fe – Argentina. Los resultados mostraron que de las 249 (100%) vacas a la primera revisación, 111 (44,6%) estuvieron sanas y 138 (55,4%) presentaron algún grado de endometritis clínica. De las cuales 63 (45,6%) presentaron G1, 60 (43,5%) presentaron G2 y 15 (10,9%) vacas presentaron G3. Los valores de Ca2+ y Mg2+ no presentaron diferencias significativas ($p \geq 0,05$) entre ambos grupos de vacas. Se hallaron diferencias significativas ($p < 0,05$) entre los dos grupos, para los valores de Glóbulos Blancos, siendo menor en el grupo de animales con endometritis clínica. Los valores de la serie roja encontrados no mostrando diferencias significativas ($p \geq 0,05$) entre ambos grupos de vacas. Se concluye que para este grupo de vacas analizadas no se ha encontrado relación de la salud uterina con el perfil mineral y valores de la serie roja. Sin embargo, en la forma leucocitaria las vacas con endometritis clínica presentaron menores valores de glóbulos blancos que las vacas sanas.

Palabras clave: *vacas lecheras, endometritis clínica, fórmula leucocitaria, hemograma*

INTRODUCCION

Uterine inflammation has a negative effect on reproduction and it is one of the most important causes of infertility and subfertility in dairy herds (Sheldon et al., 2009). This inflammatory process can cause pregnancy rate reduction, an increase in the number of days between birth and conception, the number of services per conception (Kasimanickam et al., 2004; Sheldon et al., 2009), and the incidence of repeat breeder (Salasel et al., 2010). The endometrium regulates the inflammatory response by producing and releasing cytokines and chemokines (Galvão et al., 2011) that attract and activate hematopoietic immune cells to fight local infection (Turner et al., 2012).

Endometrial bacterial infection causes uterine diseases. These are common after birth in current dairy cattle and lead to a decrease in productivity and fertility. The incidence of postpartum metritis and endometritis has increased in the last 50 years. This has given rise to a generalized interest in understanding better its characteristics and their impact on animal health. In a meta-analysis of more than 10 000 animal records, there was evidence that postpartum metritis caused subfertility increasing the time up until the first insemination in seven days. Thus, reducing the conception rate for the first insemination by 20%, and increasing the interval birth-conception by 19 days.

In different situations such as nutritional deficiencies and diseases, hematological parameters constitute a paraclinical exam that helps diagnosis. These hematological profiles are subject to normal variations from different factors such as physiological state, age, breed and health. The most appropriate range for reference is that which can be generated from a group of healthy animals with physiological characteristics as closely related to the animal as possible (Roland et al., 2014).

In different situations such as nutritional deficiencies and/or diseases, hematological parameters and mineral profiles constitute a paraclinical exam that helps diagnosis. These hematological and mineral profiles are subject to normal variations from different factors such as physiological status, age, breed and health (Roland et al., 2014).

The objective of this study is to evaluate the relationship between uterine health, mineral and hematological profiles, and leukocyte form in dairy cows in grazing systems.

MATERIALS AND METHODS

From March 2017 to July 2019, a total of 249 primiparous and multiparous Holstein cows from dairy establishments in the southern basin in the province of Santa Fe, Argentina were examined at postpartum. These establishments are representative of dairy systems in the studied area: a total of 250 cows, with an average annual production of 24 liters per cow per day, under a continuous delivery system and artificial insemination. During these months, the feeding consisted on 20 kg of dry matter offered among grazing crops and preserved and concentrated forages. A gynecological control was carried out on all cows in between 18 and 21 days after giving birth. According to the appearance of the cervicovaginal fluid samples obtained by vaginal touch, cows were divided into two groups: Healthy Cows (VS, by its initials in Spanish), crystalline mucus. And cows with Clinical Endometritis (VEC, by its initials in Spanish), which were classified according to the following categorization: transparent mucus showing small floccules of pus Grade 1 (G1), purulent mucus in more than 50% of the total volume Grade 2 (G2), and entirely purulent mucus and/or purulent blood, brownish and odorous Grade 3 (G3).

A total of 10 ml of blood was collected from the coccygeal vein and divided into two tubes: one with EDTA anticoagulant solution at a concentration of 3.7 to 5.4 µM, and the other without any solution for serum extraction. The tube without solution was centrifuged at 2500 rpm for 10 minutes and the serum obtained was transferred to microvials for storage at 2-4° C until analysis. Magnesium (Mg^{2+}) and Calcium (Ca^{2+}) concentrations were determined by semiautomatic spectrophotometry (Metrolab 1600 DR spectrophotometer; commercial kit Ca-Color AA and Mg-Color AA). Blood samples with EDTA solution were homogenized before carrying out a smear that was tinted with May-Grünwald-Giemsa for the erythrocyte morphology observation and the making of the leukocyte formula. A manual white blood cell count was carried out using a Thoma pipette, a Turk's solution and a Neubauer cell count chamber. Capillaries (75 x 1.5 mm), Rolco CH 24 Duron microcentrifuge and commercial standardized scale were used to determine the hematocrit. Hemoglobin was determined by colorimetry (Metrolab 330, UV visible at 540 nm) and the results were compared with a known normal pattern.

The variables analyzed were: Healthy Cows (VS) or Cows with clinical endometritis (VEC), Ca^{2+} and Mg^{2+} level in blood mg/dl, white blood cells in thousands, Lymphocytes in %, Monocytes in %, Granulocytes in %, Neutrophils in %, Eosinophils in %, Basophils in %, red blood cell count in (x106/mm3), Hemoglobin in g/dl and Hematocrit in %. The variables were described according to their average and standard error. It was tested if there were significant differences between the groups (VS and VEC) by applying analysis of variance to a classification criterion. Single factor averages for ANOVA.

RESULTS AND DISCUSSION

Results showed that out of the 249 (100%) cows at first review, 111 (44.6%) were healthy and 138 (55.4%) had some degree of clinical endometritis. From those 138 cows: 63 (45.6%) presented G1, 60 (43.5%) presented G2 and 15 (10.9%) presented G3. These results are similar to those reported by Biga and Marini (2017), they showed that out of the 100% of cows reviewed, 45.6% were healthy at first review and 54.4% presented some degree of clinical endometritis.

Mineral metabolism varies significantly during the transition period (Corbellini, 2000), specially Calcium (Ca), Phosphorus (P) and Magnesium (Mg) given the changes imposed by the beginning of lactation. Ca^{2+} values were between 6 - 12.6 mg/dl proving that some cows were below the values 8.4 to 11.0 mg/dl cited by (Kaneko, 2008) and 9.7 - 12.4 mg/dl cited by (Radostits, 1999). None of the two groups of cows show significant differences ($p \geq 0.05$). VS group showed Ca^{2+} levels of (8.9 ± 1.4 mg/dl) and VEC group of (8.6 ± 1.1 mg/dl).

Mg2+ values were 1.4 - 4.5 mg/dl. They were in the upper range if compared with 1.7 to 3.0 mg/dl cited by (Kaneco, 2008) and 1.8 - 2.3 mg/dl cited by (Radostits, 1999). Mg2+ values in both groups were similar. There were no significant differences ($p \geq 0.05$).VS group showed Mg2+ levels of (2.4 ± 0.1 mg/dl) and VEC group of (2.2 ± 0.1 mg/dl).

Leukocyte formula values found are within the normal range for GB/mm3 cattle (4000-12000), lymphocytes (45-75%), monocyte (2-7%), and granulocyte (15-45%) (Schalm et al., 1981; Meyer and Harvey, 1999).

However, white blood cell values showed significant differences ($p < 0.05$), being smaller in the group of animals with clinical endometritis. Red series values found are within the normal range for cows Red Blood Cells mill/mm3 (5-10), Hemoglobin gr/dl (8-15), Hematocrit % (24-46), and granulocyte % (15-45) (Schalm et al., 1981; Meyer and Harvey, 1999). They show no significant differences ($p \geq 0.05$) between healthy cows and cows with different degrees of clinical endometritis.

CONCLUSION

It is concluded that no relationship between uterine health and mineral profile and red series values has been found for the group of cows analyzed. However, in the leukocyte form, cows with clinical endometritis had lower white blood cell values than healthy cows.

CODE OF ETHICS

The authors declare that the study presented has been carried out in accordance with the Code of Ethics for animal experiments, as reflected in the regulations: http://ec.europa.eu/environment/chemicals / lab_animals / legisl ation_en.htm.

CONFLICT OF INTEREST

The signatory authors of this research paper declare that they have no potential conflict of personal or economic interest with other persons or organizations that may unduly influence this manuscript.

AUTHORS CONTRIBUTIONS

Preparation and execution: SB, PRM Development of the methodology: EF, VM Conception and design: EF, VM, SB, PRM Article edition: EF, SB, PRM Study supervision: SB, PRM

REFERENCES

- Biga P, Marini PR. La endometritis clínica en vacas lecheras y su respuesta a diferentes tratamientos. XXV Jornadas de Jóvenes investigadores. Grupo Montevideo. Encarnación – Paraguay. 2017; pp7.
- Corbellini CN. Etiopatogenia e controle da hipocalcemia e hipomagnesemia em vacas leiteiras. En: González FHD, Ospina HP, Barcellos JOJ (Eds.). Anais do Seminario Internacional sobre deficiencias minerais em Rumiantes. Porto Alegre, Brasil. Ed. UFRGS. 1998; pp. 1-17.
- Galvão KN, Santos NR, Galvão JS, Gilbert RO. Association between endometritis and endometrial cytokine expression in postpartum Holstein cows. Theriogenology 2011; 76:290–299. Doi. 10 .1016/ j .theriogenology .2011 .02 .006.
- Kaneko JJ. Clinical Biochemistry of Domestic Animals. 6th. Ed. San Diego, USA Academic Press. 2008; 904pp.
- Kasimanickam R, Duffield TF, Foster RA, Gartley CJ, Leslie KE, Walton JS, Johnson WH. Endometrial cytology and ultrasonography for the detection of subclinical endometritis in postpartum dairy cows. Theriogenology 2004; 62:9–23. Doi. 10 .1016/ j .theriogenology .2003 .03 .001
- Meyer D, Harvey J. El Laboratorio en Medicina Veterinaria. 2da Edición. Editorial. Inter-Médica. 1999
- Radostits O, Gay CC, Blood DC, Hinchcliff KF. Medicina Veterinaria (Vol. II). 9a Ed. McGraw-Hill – Interamericana España. Madrid, España 1999; pp. 2159-2161.
- Roland L, Drillich M., Iwersen M. Hematology as a diagnostic tool in bovine medicine. J. Vet. Diagn. Invest. 2014; 26:592–598.
- Salasel B, Mokhtari A, Taktaz T. Prevalence, risk factors for and impact of subclinical endometritis in repeat breeder dairy cows. Theriogenology 2010; 74:1271–1278. Doi. 10 .1016/ j.theriogenology .2010 .05 .033.
- Schalm OW, Jain N, Carroll E. Hematología Veterinaria. Buenos Aires. Editorial Hemisferio Sur 1981; p: 856
- Sheldon IM, Price SB, Cronin J., Gilbert RO, Gadsby JE. Mechanisms of infertility associated with clinical and subclinical endometritis in high producing dairy cattle. Reprod. Domest. Anim. 2009; 44:1–9. Doi. 10 .1111/ j .1439 -0531 .2009.01465 .x.
- Turner ML, Healey GD, Sheldon IM. Immunity and inflammation in the uterus. Reprod. Domest. Anim. 2012; 47:402–409. Doi. 10 .1111/ j .1439 -0531 .2012 .02104 .x.