

PERIPARTURIENT HEMATOLOGICAL FINDING IN DAIRY COWS WITH UTERUS AND UDDER INFLAMMATION*

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SUMMARY: The aim of this study was to investigate blood pictures and NEFA concentration in healthy cows and cows with mastitis and metritis in week before and week after calving. Calving showed significant influence on the blood parameters in the healthy and the sick cow. So after calving leads to decrease in erythrocyte count, decrease in hemoglobin, decrease in white blood cell count with a relative increase of neutrophils to lymphocytes (stress leukogram). NEFA concentration increases after parturition in both groups of cows. Cows suffering from metritis showed a significantly lower number of erythrocytes in the period before calving, and week after calving, while the hemoglobin concentration was significantly lower in the week after calving compared to control healthy cows. Metritic cows had higher leukocyte number in week before and week after calving. Leukocyte profile of these cows was characterized by increased neutrophile percent in week after calving and decreased monocyte percent in week after and week before calving compared to control group. Cows with mastitis showed higher neutrophile percent in week before and week after calving and lower percent of eosinophils in same period compared to healthy cows. NEFA concentration was significantly higher in diseased cows in week after calving. Prediction of metritis is possible in function of monocyte percent and level of anemia. Percent of eosinophil may indicate the mastitis in dairy cows.

Key words: dairy cows, periparturient period, hematological findings, metritis, mastitis.

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INTRODUCTION

The transition period of dairy cows is the period of 21 days before and 21 days after calving. In this period begins a state of lactation, which increases the energy needs of the organism in dairy cows. Because of negative energy balance in this period appear many periparturient diseases and disorders such as ketosis, fatty liver syndrome, milk fever, retentia secundina, mastitis, metritis, abomasum displacement and lameness. Uterus and udder inflammation (metritis and mastitis) are very important problem in intensive production. Metritis is inflammation of the uterus, which is most often diagnosed in the first thirty days after birth, and its prevalence varies from 5 to 40% (LeBlanc et al., 2002). Results have shown out that incidence rate of clinical mastitis vary from 3.12 to 8.33%. Comparing to clinical, substantially greater the incidence rate of subclinical mastitis was found, which ranged from 17.19 to 30.00% (Hristov et al., 2005).

Biochemical signs of metabolic peripartal stress are: hyperketonemia, hypoglycemia, hypocalcemia, reduced reactivity of leukocytes and changes in the activity of antioxidants (Goff i Horst, 1997). Cows in the transition period showed certain changes in hematological findings which including: reduced number of erythrocyte, decreased hemoglobin concentration and reducing the number of leukocytes (Gavan et al., 2010). Peripartal negative balance with hyperketonemia damaging immune cell function and has negative effect to uterus health (Hammon et al., 2006). Also, negative influence of hyperketonemia to udder disease were showed (Suriyasathaporn et al., 2000).

The aim of our research is to investigate difference in periparturient hematological finding in healthy cows and cows with metritis and mastitis.

MATERIAL AND METHODS

Experiment involved 60 cows: 20 with clinical mastitis in first 100 day of lactation, 20 with metritis and 20 healthy cows (control group).

Blood samples were taken in the 7-10 days before and 7-10 days after parturient. Blood was taken by venipuncture of jugularis vein. The samples were analyzed immediately after the taking by automatically hematology analyzer. It was examined the number of erythrocytes and leukocytes with differential blood count, and measured the concentration of hemoglobin using hematology analyzer Hemavet 950. NEFA concentration was measured by photometric methodology using a commercial kit (Rayto photometer).

As parameters for the presence of metritis take are: vaginal discharge present for more than three weeks postpartum, open cervix, slow uterus involution and elevated rectal temperatures. Rating the presence of mastitis was based on examination of clinical signs of mastitis and monitoring changes in the milk using the CMT test.

Statistical procedures included t-test for difference between healthy and diseased group for each examined parameters in blood. For proof of connection between specific change in blood and udder and uterus inflammation was used chi-square test.

RESULTS

All result are presented in Table 1. Calving showed significant influence on the blood parameters in the healthy and the sick cow. So after calving leads to decrease in erythrocyte count, decrease in hemoglobin, decrease in white blood cell count with a relative increase of neutrophils to lymphocytes (stress leukogram).

NEFA concentration increases after parturition in both groups of cows. Cows suffering from metritis showed a significantly lower number of erythrocytes in the period before calving, and week after calving, while the hemoglobin concentration was significantly lower in the week after calving compared to control healthy cows. Metritic cows had higher leukocyte number in week before and week after calving. Leukocyte profile of these cows was characterized by increased neutrophile number in week after calving and decreased monocyte percent in week after and week before calving compared to control group. Cows with mastitis showed higher neutrophile percent in week before and week after calving and lower percent os eosinophils in same period compared to healthy cows. NEFA concentration was significantly higher in diseased cows in week after calving.

Chi-sq test (Table 2) presents significant connection between metritis and decreased monocyte percent and mastitis and decreased eosinophils percent. Cows with decreased monocyte percent had 27 time higher chance to develop metritis. Also, cows with decreased eosinophils percent had 5 time higher chance to develop mastitis.

Table 1: Prepartum and postpartum hematology finding in healthy and diseased cow

Parameters	Healthy		Metritis		Mastitis		SEM	Calving	Disease
	Prepart.	Postpart.	Prepart.	Postpart.	Prepart.	Postpart.			
Erythrocytes x 10 ¹² /ml	6,85	5,87	6.22*	5.23*	7.01	6.38	0.42	0.01	0.01
Hemoglobin g/l	110	86	100	74*	105	91	1.55	0.05	0.05
Leukocytes x10 ⁹ /ml	8.9	8.1	9.2*	8.7*	8.7	8.4	0.12	0.01	0.05
Lymphocytes %	52	43	51	47	51	44	2.35	0.05	NS
Monocytes %	3.84	5.78	1.94*	0.93*	2.1	3.2	0.55	0.05	0.01
Neutrophils %	40	48.55	42	53*	49*	52*	0.87	0.01	NS
Basophils %	1	0.89	1	0	0	0	0.11	NS	NS
Eosinophils %	3.05	1.56	3.3	2.1	1.3*	1*	0.25	0.05	0.05
NEFA	0.45	0.55	0.48	0.71*	0.5	0.64*	0.07	0.01	0.01

Table 2: Chi sq test - 80 samples (20 healthy and 20 diseased cows in week before and week after partum)

Chi-sq. test Metritis: monocyte	Metritis yes Mono.<2%	Metritis yes Mono.>2%	Metritis no Mono.<2%	Metritis no Mono.>2%	χ^2	p<	Odds ratio
	30	10	4	36	17.29	0.001	27
Chi-sq. test Mastitis: eosinophils	Mastitis yes Eos.<1.5%	Mastitis yes Eos. >1.5%	Mastitis no Eos. <1.5%	Mastitis no Eos. >1.5%	χ^2	p<	Odds ratio
	25	15	10	30	11.43	0.001	5

DISCUSSION

Peripartal hematological findings have general characteristics that are typical for that period: reducing the number of red blood cells in postpartal period, decreased hemoglobin concentration and reducing the number of leukocytes and increased number of NEFA (Belić et al., 2011; Cincović et al., 2011). This finding observed both in health and diseased cows because calving was enough stress to start metabolic and hematological changes.

In diseased cows was found higher NEFA concentration. Elevated NEFA concentrations in cows may be associated with reduced capacity to adapt and increased stress sensitivity (Hachenberg et al., 2007). Disease is sign of decompensation and higher stress sensitivity. Cows that have excessive lipid mobilization and ketogenesis as well as reduced concentration of glucose have a significantly higher ratio of neutrophils and lymphocytes (Belić et al., 2011a). This previous results are in relation to results in this paper.

Increase the number of neutrophils, reducing the number of lymphocytes with signs of monocytosis and eosinopenia indicate birth stress because glucocorticoids alters the differential white blood cell lineage (Weiss and Wardrop, 2010). In cows with metritis increase the number of leukocytes was occurred on account of increase in neutrophils, but the number of monocytes was decreased. Reducing the number of monocytes was observed by other authors (Chassagne et al, 1998) and characterized as a risk factor for the development of metritis. Galvão et al. (2012) concluded that altered levels of expression and production of pro-inflammatory cytokines by postpartum monocytes could contribute to impaired inflammatory response and predispose cows to development of metritis. Whereas neutrophils are the main phagocytic leukocytes, monocytes and macrophages are actively involved in immunomodulation after infection. Increased number of neutrophils can be explained by the development of inflammation, but it comes as a response to increased concentrations of cortisol during calving. Monocytes migrate from the blood into peripheral tissues, and they are forming macrophages

which are very important in the protection from infection (Weiss and Wardrop, 2010). It is important to note that the functionality of neutrophils decreases during peripartal metabolic stress, which predisposes cows to metritis (Hammon et al, 2006). Reduced transcription of genes for prostaglandin E2 that is essential in the protection of metritis is linked with an increase in the number of leukocytes and neutrophils, although this

finding the authors was characterized as a random (Silva et al., 2008). Reduced number of red blood cells and reduced the concentration of hemoglobin, which is dominated by cows prone to metritis ($p < 0.05$) may be explanations to bleeding from uterine inflammatory injury. Placenta retention is an important cause of metritis. Blood finding of this disease is characterized by anemia and leucocytosis (Ahmed et al., 2009), which is consistent with our findings. Blood samples obtained from cows suffering from endometritis show characteristics similar to peripartum hematological findings but with monocytosis (Hanafi et al., 2008). Peripartum hematological findings may be useful in assessing the occurrence of metritis. Peripartum increase the number of leukocytes in dairy cows, suffering from mastitis, was in line with previously obtained results (Barnouin and Chassagne, 2000). Cows that showed signs of mastitis in the first third of lactation have shown a tendency to eosinopenia. Previously was determined that the reduced number of eosinophils found on farms with a higher prevalence of mastitis (Holtenius et al., 2004). The relationship between eosinophils and udder infection is demonstrated by prostaglandin E (Atroshi et al., 1996), and the pathogenesis is similar to that described by metritis.

CONCLUSION

Increase the number of leukocytes in samples of peripheral blood, during the peripartum period and tendency to anemia may be an indicator of future udder and uterus inflammation. Decreased monocyte percent exposed cows to higher risk for uterus infection, while decreased eosinophils percent increases the risk for udder inflammation. This finding could help veterinarian to predict periparturient udder and uterus infection.

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PERIPARTALNI HEMATOLOŠKI NALAZ KOD MLEČNIH KRAVA SA UPALOM MLEČNE ŽLEZDE I UTERUSA

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Izvod

Cilj ovog istraživanja bio je da se ispita krvna slika i koncentracija NEFA kod zdravih krava i krava sa mastitisom i metritisom u nedelji pre i posle partusa. Teljenje je pokazalo signifikantan uticaj na vrednosti ispitivanih parametara, tako da posle teljenja postoji sledeći nalaz: smanjen broj eritrocita, snižena koncentracija hemoglobina, smanjen broj leukocita sa relativnim porastom procenta neutrofila i sniženim procentom limfocita (stresni leukogram) i povećanje koncentracije NEFA. Ovakav nalaz je postojao i kod zdravih i kod bolesnih krava. Krave sa upalom materice (u odnosu na kontrolu) pokazuju značajno niži broj eritrocita kako u periodu pre teljenja tako i posle, dok je značajno niža koncentracija hemoglobina postojala samo u nedelji posle teljenja. Leukocitni profil ovih krava se karakterisao povišenim procentom neutrofila u nedelji posle teljenja i snižen procenat monocita u nedelji pre i posle teljenja poredeći sa zdravom kontrolom. Krave sa upalom mlečne žlezde pokazuju takođe povišen procenat neutrofila u nedelji pre i posle teljenja i snižen procenat eozinofila u poređenju sa zdravom kontrolom. Koncentracija NEFA je značajno viša kod obolelih krava u nedelji posle partusa. Predviđanje nastanka metritisa je moguća i u vezi je sa procentom monocita u diferencijalnoj beloј lozi i stepenom anemije, dok je nastanak mastitisa moguće predvideti u vezi sa procentom eozinofila u diferencijalnoj beloј lozi u periodu oko teljenja.

Ključne reči: mlečne krave, peripartalni period, krvna slika, mastitis, metritis.

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