SHORT COMMUNICATION

INTRAUTERINE TABLET TREATMENT ACCOMPANIED WITH PARENTERAL APPLICATION OF CEFTIOFUR IN ENHANCING OF REPRODUCTIVE EFFECTIVENESS OF DAIRY COWS IN THE MUNICIPALITY OF SANSKI MOST

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ABSTRACT

Manual assistance during parturition will often contribute to uterine contamination, which may lead to development of uterine infections. About 76% of cows with assistance during parturition, placental retention, or both will develop metritis. Uterine function is often compromised by bacterial contamination during and after parturition, where pathogens persist in the uterine lumen for a long time causing chronical disorders, which decrease fertility. The study have been conducted in the area of municipality Sanski Most, and, in total, 30 cows were included. Reasons for clinical interventions and treatment during the puerperium were mostly dystocia, placental retention and uterine prolapse. According to a type of antibiotic therapy, animals were divided in two groups, the first to receive antibiotics in the form of intrauterine tablets and the second to receive intrauterine tablets together with parenteral administration of ceftiofur. The most common pathological process in both groups was retention of the placenta. Group of animals that had received intrauterine tablets and parenteral ceftiofur had better reproductive parameters and achieved ideal intercalving intervals of 12 months.

Keywords: Dystocia, fertility, metritis, placental retention, therapy

INTRODUCTION

Manual assistance by a farm's personnel or veterinarians during parturition will often contribute to uterine contamination, which may lead to development of uterine infections. Average incidence of dystocia is 2 to 10%, but manual assistance during parturition is common in ≥50% of cases (Kaya et al., 2012). About 76% of cows with assistance during parturition, placental retention, or both will develop metritis (Lewis, 1997), while endometritis is more common in malnourished cows (Heuer et al., 1999).

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Uterine infections are generally classified according to clinical signs and a degree of severity. Metritis indicates that all layers of the uterine wall are inflamed, while endometritis indicates that the endometrium is inflamed, which is considered to be the least severe uterine infection (Lewis, 1997; Sheldon and Owens, 2017). Metritis as inflammation of the uterus caused in most cases by bacteria is characterized by enlargement of the organ and accumulation of the watery red-brown or viscous off-white purulent uterine discharge (Sheldon et al., 2018). The severity of metritis is categorized by the signs of the animal's health, from mild disease to toxaemia. Clinical endometritis is defined as the presence of a purulent discharge from the vagina, while subclinical endometritis, since it is harder to be observed, represents more serious and an emerging issue. Results by Domecq et al. (Domecq et al., 1997) represent the most common health disorders in multiparous cows: metritis (19.9%), placental retention (8.7%) and dystocia (6.5%).

Uterine function is often compromised by bacterial contamination during and after parturition, and pathogens continue to persist in the uterine lumen for a long time causing chronic disorders, which often decrease fertility (Savio et al., 1990). Uterine infections postpartum are results of contamination with G^+ i G^- aerobic and anaerobic bacteria during parturition. Inflammatory processes in the uterus are expected after parturition and usually resolve 14 to 28 days postpartum (Brick, 2011). Cows with a great risk to develop uterine disorders are those with dystocia, parturition assistance, placental retention, stillbirth, twins and milk fever (Lima et al., 2009; Oliviera et al., 2020). Uterine infections like metritis itself may lead to > 150 days of the service period (Britt, 1975). In the first 10 days postpartum, in the uterus lumen *Streptococcus spp*, *Staphylococcus spp* and *Bacillus spp* are isolated without clinically apparent signs of disease, while *Trueperella pyogenes*, *Escherichia coli*, *Fusobacterium necrophorum*, and *Bacteroides spp*. are dominant in clinically affected animals (Földi et al, 2006).

The main goal of chemoprophylactic treatment is to enhance uterine defence and tissue regeneration as well as to remove the inflammatory component (Sheldon et al., 2006). Ideally, such treatment should eliminate pathogens and shorten a withdrawal period for meat and milk (Lewis, 1997), like ceftiofur (Kaya et al., 2012). Intrauterine administration of medications ensures high concentrations of an active substance in the uterine lumen and endometrium, while systemic administration may not result in sufficient and effective concentration of an active substance in the uterine lumen and layers (Földi et al., 2006). In recent years, cephalosporines have proven a good therapeutical effect against G^+ and G^- bacteria recognized as uterine pathogens (Chester et al., 2004), with benefits in the later reproductive performances (Brick, 2011). Ceftiofur from the third generation of cephalosporines has a broad spectrum of effectivness, and, after parenteral administration, minimal inhibitory concentrations in all uterine layers and lochias are quickly achieved ,and metritis incidence in cows with placental retention is reduced (Drillich et al., 2007).

The current study aims to determine the beneficial effects of additional ceftiofur administration in the prevention of early puerperal infections and enhancement of later reproductive performances, compared to traditional/conventional therapy with intrauterine tablets only.

MATERIALS AND METHODS

The study has been conducted in the area of municipality of Sanski Most in 2021. This area has a long tradition in cattle breeding.

Animals

Initially, 40 cows were chosen, but some were excluded due to the additional diagnostics and therapeutic procedures. Hence, 30 cows of different breeds were included in the study (Simmental, Holstein, Oberintal and Montafon). All cows had satisfactory or good zoohygienic conditions, were kept in tie-stalls during the night, while the rest of the day at free-stall system. Machine milking have been performed twice daily. The voluntary

waiting period for the next reproductive protocol was at least 40 days. Cows in the study were 1-6 lactations old. According to clinical signs during examination like difficult birth, increased body temperature, abnormal vaginal discharge, visible placental tissue, etc., the diagnose was formed, while the day of the first therapy, type of therapy and later reproductive performances were taken during the study period.

Groups and therapy

Cows have been divided into two groups considering as much as possible equal representation of different postpartum disorders, severity of clinical signs, age and breed. The control group (n=12) had cows of several breeds like Simmental (n=7), Red Holstein (n=3) and Montafon (n=2), while the experimental group (n=18) had Simmental (n=12), Black Holstein (n=2), Red Holstein (n=2), Montafon (n=1) and Oberinntal/Tyrol Grey (n=1) breed.

The experimental group, after definitive diagnosis, had parenteral administration (intramuscular) of antibiotic ceftiofur hydrochloride (Neoceftiofur HCL 5%, "FM Pharm" d.o.o. Subotica, Serbia, 1ml = 50 mg) in a dose of 1ml/50 kg of body weight in the duration of 5 days. Beside administration of Neoceftiofur HCL, 5% intrauterine tablets were used additionally as the traditional way of treating puerperal uterine disorders. Applied intrauterine tablets consisted of rifaximin (Fatroximin, tablets, 1 tablet = 300 mg of rifaximin) used in a dose of 4 tablets or oxytetracycline chloride (Geomicin F, Genera DD, Rakov Potok, Croatia, 1 tablet = 1g of oxytetracycline chloride) used in a dose of 1-2 tablets. In total, among cows in the experimental group, 8 cows received rifaximin and 10 cows received oxytetracycline tablets besides ceftiofur injections.

The control group was treated traditionally with intrauterine tablets only (Fatroximin in 8 cows and Geomicin F tablets in 4 cows). Intrauterine tablets were used according to instructions of the manufacturer after clinical findings.

In the cases of placental retention, remnants of the placenta were expelled manually prior to the therapy. The same applied to the cases of uterine prolapse/ reposition. In both groups the data about lactation number, body condition score (visually determined), diagnosis and applied therapy had been recorded.

Artificial insemination and pregnancy check

Artificial insemination has been performed after the clinical examination (vulva appearance, presence and characteristics of estral mucus) and with the assistance tool for estrus detection and determination of optimal insemination time - Draminski estrus detector (measure of electric resistance of estral mucus). Diagnosis of pregnancy was established with ultrasonography using a mobile device with a linear endorectal probe (Mindray DP-20, probe 75L50EAV 5-10 MHz) in a period of 35 to 40 days after artificial insemination.

Reproductive parameters and statistical analysis

After the treatment, data for all animals were noted (reproductive results): a period to detection of first estrus postpartum, a period to first postpartum artificial insemination, success of the first and eventually repeated artificial insemination and the length of the service period. Analysis of associated variables (breed, lactation, diagnosis and the beginning of therapy) was done by stratification within groups according to the variable categories and calculation of the average values (median values) and a range of noted values for every group, separately. Results have been presented in the tables to point at the differences between groups according to associated variables (control confounding).

To present initial variables (reproductive results), descriptive statistical analyses were conducted for continued variables presented as calculated median value and standard error of median regarding calculated proportions for nominal initial variables. Comparation of median and proportions between two groups were conducted

using two-way T-test, assuming different variances and Chi-square test for comparation of proportions interpreted for a level of statistical signifficance of 5% (α=0.05).

RESULTS

Determined parameters of general health as well as pathological conditions during parturition and puerperium, separately for the control and the experiment group, were shown in Table 1.

Table 1 Presentation of certain pathological conditions in experimental and control group

Experimental group		Control group	
Diagnosis	Ratio of animals	**Diagnosis**	Ratio of animals
Dystocia	(33.3%)	**Dystocia**	(8.3%)
Retention of placenta (with 1 case of ketosis and milk fever)	(55.5%)	**Retention of placenta**	(75%)
Uterine prolapse	(11.1%)	**Uterine prolapse**	(16.6%)

According to Table 1, the most common pathological process in both groups was retention of the placenta, mainly alone and sometimes accompanied with ketosis or milk fever.

Table 2 Breed, average lactation, postpartum beginning of therapy and body condition status in experimental and control groups

		Control group (n)	Experimental group (n)
Number of animals		12	18
Breed	Simmental	7	12
	Holstein Friesian	3	4
	Other breeds	2	2
Average lactation number		3 (1-6)*	4 (1-5)*
Diagnosis	Dystocia	1	6
	Retention of placenta	9	10
	Uterine prolapse	2	2
Average days of postpartum beginning of therapy		2 (1-2)*	2 (1-5)*
Body condition status		3.3	3.2

* median and range

Table 3 Incidence of placental retention among breeds

Breed	Experimental group	Control group
Simmental	38.8% (n=7)	50% (n=6)
Holstein Friesian	16.6% (n=3)	5.5% (n=1)
Montafon		11% (n=2)

Table 4 Reproductive results achieved after therapy in control and experimental group (median and standard error of the mean) as well as values of statistical testing and statistical differences (p<0,05). In control group, where only intrauterine tablets were used as a routine way of treatment, many reproductive parameters are lower comparing to experimental group, where ceftiofur was applied together with intrauterine tablets

	Days PP* until observed estrus	Days PP* until AI**	Pregnancy after first AI** (%)	Pregnancy after second AI** (%)	Total pregnancies (%)	Service period
Control group (n=12)	91.42 (7.51)	96.92 (8.83)	41.7%	85.7%	91.6%	114.17 (9.67)
Experimental group (n=18)	**66.5 (6.57) *****	76.61 (7.19)	61.1%	85.7%	94.4%	**85.67 (7.55) *****

Bolded numbers represent comparisons found to be significantly different.
* Postpartum
** Artificial insemination
***Level of significance 5%

According to comparisons of averages by t- test, statistically significant difference between the experimental and control group is confirmed for difference in days PP until observed estrus (p = 0.019) and difference in duration of the service period (p=0.029). Other comparisons by t-test (difference in days PP until AI) and by chi-square test (proportion of pregnancy after AI) were not found significantly different at set level of statistical significance (p<0.05).

DISCUSSION AND CONCLUSIONS

Numerous professional literature reports about the negative effects of uterine infections to reproductive performances (Schultz-Rajala and Gröhn, 2000) and delay of estrus and ovulation (Benmrad and Stevenson, 1986) exist. This delay of first observed estrus and artificial insemination is very visible in the control group, which had a lot of retained placentas. This condition is related to developing of metritis, which is identified as a main reason for decreased fertility in cows (Drillich et al., 2007) visible in the control group, which had negative statistical significance in a time interval to observed estrus and the service period.

Cows with a high risk of uterine disorders are those with dystocia, parturition assistance, retention of the placenta (Dubuc et al., 2011; Lewis, 1997) as well as stressful conditions and poor body condition which decrease immunity (Brick 2011). According to Sheldon (Sheldon et al., 2006), metritis and endometritis are common in dairy cows and, in order to prevent them, active control of the puerperium has to be undertaken. Application of intrauterine tablets gives high concentrations of an active substance in the uterine lumen and endometrium, and little is absorbed in the systemic blood stream, while parenteral administration often does not give enough of inhibitory concentrations in the uterus (Földi et al., 2006). Meanwhile, in Europe, it is still a common practice to deal with retention of the placenta manually and use intrauterine tablets. However, in recent years, many reports suggest that this way of treatment decreases uterine defense mechanisms, disturbs later fertility and decreases milk production (Drillich et al., 2007). Because of the above mentioned, recommended treatment is parenteral administration of therapeutics like the third generation of caphalosporines, ampicillin, penicillin, oxytetracycline, cloxacillin and sulphonamids (Espadamala et al., 2018). Our

experimental group was administered intrauterine tablets and ceftiofur parenterally. Ceftiofur was used for 5 days, and tablets are effective only one day, which can explain more positive effect against microorganisms and better reproductive parameters.

Puerperal metritis usually occurs within the first two weeks postpartum (Brick, 2011; Földi et al., 2006) as a result of extensive bacterial contamination (usually 5-10 days), caused by microbes like *Escherichia coli*, *Fusobacterium necrophorum*, *Bacteroides spp*. and *Trueperella pyogenes*. Because of mixed infection, this disorder is treated with medicaments effective against G^- and G^+ bacteria. Frequency of metritis in dairy cows is in the range 10 to 36% (average 23%), mostly in the first 10 days postpartum (McLaughlin et al., 2012). However, most of our therapies began on the first (dystocia) or second day (retention of placenta, uterine prolapse) postpartum, which probably helped for contaminants in the uterine lumen to be eliminated earlier, while the obtained reproductive parameters were desirable.

Metritis is common after dystocia and retained placenta, when it often spreads into endometritis, causing protracted consequences to fertility (Feu et al., 2009; Reist et al., 2003) due to chronic inflammation of the endometrium. Cows with retained placenta or metritis have double chances to get subclinical endometritis after 30 days postpartum (Galvão et al., 2009). Usually, clinical endometritis is present in 14 - 40%, while *Escherichia coli* and *Trueperella pyogenes* are common isolates. Used antibiotic protocol has to be effective against these bacteria in order to reduce clinical endometritis and enhance reproductive performances (Kasimanickam et al., 2016).

Timely diagnostics and therapy of cows with retention of the placenta and metritis are very important, because later pregnancy rates are similar to healthy cows (Risco et al., 2007). Based on a short time period to observed first estrus postpartum, high pregnancy rates and the short service period in the experimental group suggested that the combination of parenteral administration of ceftiofur and intrauterine tablets gave the same results as in animals without disturbed function of genital organs during puerperium. Many intrauterine tablets as an active substance have oxytetracyclines, but several studies report about increased resistance of uterine-isolated *T. pyogenes* to oxytetracyclines (Ziv et al., 1995), and there is also an irritating effect to the endometrium. Parenteral administration of oxytetracyclines usually doesn't achieve minimal inhibitory concentrations in the uterine layers and lumen. Because of mentioned facts, more and more often in therapy of uterine infections parenteral administration of antibiotics is used. Time required for achieving minimal inhibitory concentrations of ceftiofur in serum, endometrium and lochia is 1.2 - 1.5 hours (Wang et al., 2018). Intrauterine tablets as a traditional way of treatment probably still have positive effects against most microorganisms responsible for metritis or endometritis, but their negative effect inside the uterine lumen lasts longer, while estrus detection, pregnancies after first AI and the service period are lower in comparison to the experimental group that used ceftiofur as additional help.

During the last several years, in many countries ceftiofur has been used in the treatment of retained placenta, and many studies report about clinical recovery, but not improvement in reproductive performances (Haimerl and Heuwieser, 2014). This was not the case in our experimental group, where almost all animals (94.4%) become pregnant during ideal three months of the service period. Piccardi et al., (2016) reported that after ceftiofur administration in cases of retained placenta, metritis incidence was reduced and clinical cure rate improved, probably because of decreased number of microorganisms in the uterus. However, Oliviera (Oliviera et al., 2020) also reported about later detrimental effects to fertility, milk production and culling despite the therapy. Our results do not agree with Oliviera et al. (2020) in a part of a detrimental effect to fertility and culling, especially in the experimental group. One of the explanations could be the breed of the cows, where Oliviera et al. had in their study Holstein

cows, while in our study, most of the cows were Simmental breed.

Giuliodori et al. (2013) had also treated a group of Holstein-Friesian cows affected by puerperal and clinical metritis with ceftiofur, which have resulted in the service period of 129 and 111 days, while their control group of healthy cows had 109 days. Their control group have similar results to our control group, but cows treated with ceftiofur had a significantly shorter service period, which could be also related to breed, as previously mentioned by Oliviera et al. (2020).

Many authors report that systemic administration of ceftiofur during 3 consecutive days in cows with placental retention is successful at achieving minimal inhibitory concentrations against pathogens like *E. coli* and *T. pyogenes* (Drillich et al., 2006; Krueger et al., 2013), and this effect could be extended with additional administration for one or two days, like it was in our experimental group. Other authors (Lima et al., 2019; Piccardi et al., 2016) report that the clinical rate of recovery from metritis should be 75-80% after administration of ceftiofur for 3-5 days, which was probably the case in the experimental group having statistically significant shorter period to first observed estrus and service period.

Mellado et al. (2017) report that the treatment with ceftiofur in duration of three days did not give desirable results in prevention of infection, and they suggest treatment for 5 or 6 days. Something similar is reported by Kaya et al. (2012), where treated animals had a significantly shorter service period and the good pregnancy rate. Results of those authors coincide with our results as well.

Our study indicates that the most common cause for veterinary interventions in early puerperium was placental retention. Treatment of cows by utilization of intrauterine tablets alone or in combinations with ceftiofur has given a very high rate of pregnant cows in both groups. However, additional administration of ceftiofur had better success of first insemination postpartum and had statistically significant better results in shortening days to first observed estrus and duration of the service period. This additional utilization of ceftiofur has enabled ideal intercalving interval of 12 months to be achieved in the experimental group.

Additional application of ceftiofur had a good effect in dealing with prevention of uterine infections during the early postpartum period, especially in Simmental breed, and could probably be used as the only medicament.

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CONFLICT OF INTEREST

The authors declared that there is no conflict of interest.

AUTHOR'S CONTRIBUTIONS

BČ and SB conceived and designed the study, carried out the experimental work, made substantial contributions to acquisition, analysis and interpretation of data and participated in manuscript writing.SŠH performed the statistical analysis and made a substantial contribution to interpretation of data and manuscript writing. AĆ, LV, AM, PB, AHP AŠR made substantial contributions to writing the manuscript, critically revised the manuscript and approved its submission.

REFERENCES

Benmrad JM, Stevenson JS. 1986. Gonadotropin-releasing hormone and prostaglandin F2α to postpartum dairy cows: estrus, ovulation and fertility traits. J Dairy Sci, 69, 3.

Brick AT, Schuenemann GM, Bas S, Daniels JB, Pinto CR, Rings DM, et al. 2012. Effect of intrauterine dextrose or antibiotic therapy on reproductive performance of lactating dairy cows diagnosed with clinical endometritis. J Dairy Sci, 95(4), 1894-905.

Brick TA, et al. 2012. Effect of intrauterine dextrose or antibiotic therapy on reproductive performance of lactating dairy cows diagnosed with clinical endometritis. J Dairy Sci, 95(4), 1894-905. doi: 10.3168/jds.2011-4892.

Britt JH. 1975. Early postpartum breeding in dairy cows. A review. J Dairy Sci 58, 2.

Chester ST, Chenault JR, McAlister JF. 2004. Efficiacy of ceftiofur hydrochloride sterile suspension administred parenterally for the treatment of postpartum metritis. J Am Vet Med Assoc, 224, 10.

Domecq JJ, Skidmore AL, Lloyd JW, Kaneene JB. 1997. Relationship between body condition scores and conception at first artificial insemination in a large dairy herd of high yielding Holstein cows. J Dairy Sci, 80, 1.

Drillich M, Arlt S, Kersting S, Bergwerff AA, Scherpenisse P, Heuwieser W. 2006. Ceftiofur Derivatives in Serum, Uterine Tissues, Cotyledons and Lochia after Fetal Membrane Retention. J Dairy Sci, 89, 3431-8.

Drillich M, Klever N, Heuwieser W. 2007. Comparison of two management strategies for retained fetal membranes on small dairy farms in Germany. J Dairy Sci, 90.

Dubuc J, Duffield TF, Leslie KE, Walton JS, LeBlanc SJ. 2011. Randomized clinical trial of antibiotic and prostaglandin treatments for uterine health and reproductive performances in dairy cows. J Dairy Sci, 94, 1325-38.

Espadamala A, Pereira R, Pallarés P, Lago A, Silva-del-Río N. 2018. Metritis diagnosis and treatment practices in 45 dairy farms in California. J Dairy Sci, 101, 9608-16.

Feu MA, Evans ACO, Lonergan P, Butler ST. 2009. The effect of dry period duration and dietary energy density on milk production, bioenergetic status and postpartum ovarian function in Holstein-Friesian dairy cows. J Dairy Sci, 92, 6011-22.

Földi J, Kulcsar M, Pecsi A, Huyghe B, De Sa C, Lohuis JACM, et al. 2006. Bacterial complications of postpartum uterine involution in cattle. Anim Reprod Sci, 96, 265-81.

Galvão KN, Greco LF, Vilela JM, Sá Filho MF, Santos JEP. 2009. Effect of intrauterine infusion of ceftiofur on uterine health and fertility in dairy cows. J Dairy Sci, 92, 1532-42.

Giuliodori MJ, Magnasco RP, Becu-Villalobos D, Lacau-Mengido IM, Risco CA, Sota RL. 2013. Metritis in dairy cows: Risk factors and reproductive performance. J Dairy Sci, 96, 3621-31.

Haimerl P, Heuwieser W. 2014. Antibiotic treatment of metritis in dairy cows: A systematic approach. J Dairy Sci, 97, 6649-61.

Heuer C, Shukken YH, Dobbellar P. 1999. Postpartum body condition score and results from the first test day milk as predictors of disease, fertility, yield and culling in commercial dairy herds. J Dairy Sci, 82, 2.

Kasimanickam VR, Owen K, Kasimanickam RK. 2016. Detection of genes encoding multidrug resistance and biofilm virulence factor in uterine pathogenic bacteria in postpartum dairy cows. Theriogenology, 85(2), 173-9.

Kaya D, Ay SS, Küçükaslan I, Beceriklisoy HB, Ağaoğlu AR, Findik M, et al. 2012. The effectiveness of combined preventive treatment with Ceftiofur, Oxytocin and PGF2α on fertility parameters in cows. Revue de Méd Vét, 6(6), 302-8.

Krueger X, Scherpenisse P, Roiger S, Heuwieser W. 2013. Determination of ceftiofur derivatives in serum, endometrial tissue and lochia in puerperal dairy cows with fever or acute puerperal metritis after subcutaneous administration of ceftiofur crystalline free acid. J Dairy Sci, 96, 1054-62.

Lewis GS. 1997. Symposium: Health problems of postpartum cow. Uterine health and disorders. J Dairy Sci, 80, 5.

Lima FS, Risco CA, Thatcher MJ, Benzaquen ME, Archbald LF, Santos JEP. 2009. Comparison of reproductive performance in lactating dairy cows bred by natural service or timed artificial insemination. J Dairy Sci, 92, 5456-66.

Lima FS, Vieira-Neto A, Snodgrass JA, De Vries A, Santos JEP. 2019. Economic comparison of systemic antimicrobial therapies for metritis in dairy cows. J Dairy Sci, 102, 7345-58.

McLaughlin CL, Stanisiewski E, Lucas MJ, Cornell CP, Watkins J, Bryson JL, et al. 2012. Evaluation of two doses of ceftiofur crystalline free acid sterile suspension for treatment of metritis in lactating dairy cows. J Dairy Sci, 95, 4363-71.

Mellado M, Solano R, Veliz F, De Santiago A, Gaytan L, Garcia J. 2017. The effects of four protocols for the treatment of retained placenta on reproduction performance and milk yield in Holstein cows. J Hell Vet, 68.

Oliveira EB, Cunha F, Daetz R, Figueiredo CC, Chebel RC, Santos JE, et al. 2020. Using chitosan microparticles to treat metritis in lactating dairy cows. J Dairy Sci, 103.

Piccardi M, et al. 2016. Effect of puerperal metritis on reproductive and productive performance in dairy cows in Argentina. Theriogenology, 85, 887-93.

Reist M, Erdin DK, Von Euv D, Tschümperlin KM, Leuenberger H, Hammon HM, et al. 2003. Postpartum reproductive function: association with energy, metabolic and endocrine status in high yielding dairy cows. Theriogenology, 59, 1707-23.

Risco CA, Benzaquen ME, Archbald LF. 2007. Rectal temperature, calving related factors and the incidence of puerperal metritis in postpartum dairy cows. J Dairy Sci, 90.

Savio JD, Boland MP, Hynes N, Roche JF. 1990. Resumption of follicular activity in the early postpartum period of dairy cows. J Reprod Fert, 88, 569-79.

Schultz-Rajala PJ, GrÖhn YT. 2000. Epidemiology of reproductive performance in dairy cows. Reprod Sci, 60-1.

Sheldon IM, Lewis GS, LeBlanc S, Gilbert RO. 2006. Defining postpartum uterine disease in cattle. Theriogenology, 65.

Sheldon IM, Owens ES. 2017. Postpartum uterine infection and endometritis in cattle. Anim Reprod, 14, 3.

Wang J, Peng H, Kong J, Zhao T, Zhang S, Cao X. 2018. Pharmacokinetic profile of Ceftiofur Hydrochloride Injection in lactating Holstein dairy cows. J Vet Pharmacol Therap, 41, 301-6.

Ziv G, Cohen RO, Bernstein M. 1995. Isolation and antimicrobial susceptibility of Actinomices pyogenes from the uterus of dairy cows with retained fetal membranes and postpartum endometritis. Theriogenology, 43.

INTRAUTERINO LIJEČENJE UZ PARENTERALNU APLIKACIJU CEFTIOFURA U POBOLJŠANJU REPRODUKTIVNE EFIKASNOSTI MLIJEČNIH KRAVA U OPĆINI SANSKI MOST

SAŽETAK

Manuelna pomoć tokom poroda doprinosi kontaminaciji uterusa i postaje važan faktor u razvoju infekcija uterusa. Otprilike 76% krava koje su imale asistencije prilikom poroda, zaostajanju posteljice ili oboje će razviti metritis. Funkcija uterusa je često narušena bakterijskom kontaminacijom u toku i nakon poroda, gde ti patogeni perzistiraju u lumenu uterusa duži vremenski period, uzrokujući hronične poremećaje koji smanjuju plodnost. Istraživanje je sprovedeno u općini Sanski Most i uključivalo je 30 krava. Razlozi za kliničke intervencije i terapiju su uglavnom bili distocia, zaostajanje posteljice i prolaps uterusa. Prema vrsti antibiotske terapije životinje su se podijelile u dvije grupe, prvu koja je dobivala samo intrauterine tablete i drugu koja je primala intrauterine tablete i parenteralno ceftiofur. Najčešći patološki proces u obje grupe je bila zaostala posteljica. Grupa životinja koja je dobivala ceftiofur je imala bolje reproduktivne parametre i dostigla je idealan međutelidbeni period od 12 meseci.

Ključne reči: Distocia, mjeseci, plodnost, terapija, zaostala posteljica