

# BÖLÜM 6



## POSTPARTUM UTERUS ENFEKSİYONLARI: TERAPÖTİK VE YÖNETİM SEÇENEKLERİ

*İbrahim KÜÇÜKASLAN<sup>1</sup>*

### GİRİŞ

Süt sığırcılığı işletmeleri için her ne kadar temel amaç süt üretimi ve karlılık olarak görünse de bu amaca ulaşmanın en önemli faktörü buzağı ve damızlık hayvan üretimin devamlılığıdır. Bu amaç doğrultusunda fertilitenin ideal sınırlar içerisinde tutulması gerekmektedir. Yetiştiriciler hayvanlarının doğum sonrası en kısa zamanda kızgınlık gösterip gebe kalmasını arzu etmektedirler. Postpartum kızgınlıkların gözlenmesi ve yeniden gebe kalma aralığını etkileyen en önemli faktörlerden biri de doğum sonrası uterus sağlığıdır. Doğumdan sonra süt ineklerinin endokrin sistemi, oosit ve folikül gelişimi, embriyo kalitesi, konseptus gelişimi ve gebeliğin anne tarafından tanınmasında sorunlara neden olan uterus problemleri ile karşılaşılır, bu da fertilitayı azaltmakta, sürüden ayrılan sayısını arttırarak süt üreticileri için önemli ekonomik kayıplara neden olmaktadır (1-3). Bu problemlerden en sık karşılaşılanları postpartum uterus enfeksiyonlarıdır. Bu bölümde, uterus enfeksiyonlarının tanımı, insidansı, önemi, oluşumunda etkili risk faktörleri ve tedavi seçenekleri ele alınırken, aynı zamanda süt ineklerinde uterus enfeksiyonlarının olumsuz etkilerini azaltmak için izlenebilecek yönetim seçeneklerinden bahsedilecektir.

<sup>1</sup> Doç. Dr., Dicle Üniversitesi Veteriner Fakültesi, Doğum ve Jinekoloji AD., i.kucukaslan@gmail.com

- Uzak kuru dönemde (Buzağılama öncesi 8-3 hafta) gereksinimin üzerinde enerji alınımı önlenmelidir.
- Kısıtlanmamış her an taze yeme ulaşılabilecek bir yem tüketimi sağlanmalıdır.
- İnek başına 75 cm durak alanı sağlanmalı, 10 kilitli sistemde en fazla 8 hayvan bağlanmalıdır.
- Hayvanların günün 11 ila 12 saati boyunca yatabileceği alanlar sağlanmalıdır.
- İnek başına  $\geq 1$  serbest durak ve  $\approx 10\text{m}^2$  yataklık alanı sağlanmalıdır.
- Ahır ve grup değişiklikleri en aza indirilmelidir.
- Kuru dönem ve freş grupları için ayrılan bölmeleri beklenen aylık ortalama doğum sayısının %130 ile %140 arasında daha büyük olarak tasarlanmalıdır.
- Bağıl nem indeksi 68 olduğunda fan ve duşlarla ısının düşürülmesi sağlanmalıdır.
- Beslenme düzenlenerek ineklerin doğuma 3,0 veya 3,25 VKS ile girmeleri ve minimum 2,5 VKS ile doğum sonrası süreci geçirmeleri sağlanmalıdır.
- NEFA seviyesi; beklenen doğum haftası boyunca  $< 0.4$  mmol/L olmalıdır.
- BHBA seviyesi; doğum sonrası 1. haftada  $< 1.1$  mmol/L, 2. haftada  $< 1.4$  mmol/L olmalıdır.
- Haptoglobulin seviyesi; doğum sonrası ilk haftada  $< 0.8$  g/L olmalıdır.

## KAYNAKLAR

1. Bromfield JJ, Santos JE, Block J, et al. Uterine infection: linking infection and innate immunity with infertility in the high-producing dairy cow. *Journal of Animal Science*. 2015;93(5):2021-2033.
2. LeBlanc SJ. Postpartum uterine disease and dairy herd reproductive performance: a review. *The Veterinary Journal*. 2008;176(1):102-14.
3. Sheldon IM, Dobson H. Postpartum uterine health in cattle. *Animal Reproduction Science*. 2004;(82-83):295-306.
4. Sheldon IM, Lewis GS, LeBlanc S, et al. Defining postpartum uterine disease in cattle. *The rriogenology*. 2006;65(8):1516-30.
5. Alaçam E. Evcil Hayvanlarda Doğum ve İnfertilite 7. baskı. Ankara: Medisan Yayınevi; 2010.
6. Sheldon IM, Williams EJ, Miller AN, et al. Uterine diseases in cattle after parturition. *The Veterinary Journal*. 2008;176(1):115-21.
7. Williams EJ. Drivers of Post-partum Uterine Disease in Dairy Cattle. *Reproduction in Domestic Animals*. 2013;48:53-8
8. Sheldon IM, Dobson H. Postpartum uterine health in cattle. *Animal Reproduction Science*. 2004;82(3):295-306

9. Bonnett BN, Martin SW, Meek AH. Associations of clinical findings, bacteriological and histological results of endometrial biopsy with reproductive-performance of postpartum dairy-cows. *Preventive Veterinary Medicine*. 1993;15(2-3):205-220.
10. Bondurant RH. Inflammation in the bovine female reproductive tract. *Journal of Animal Science*. 1999;77:101-110.
11. Gilbert RO. Management of reproductive disease in dairy cows. *Veterinary Clinics of North America: Food Animal Practice*. 2016;32(2):387-410.
12. Lima FS, Vieira-Neto A, Vasconcellos GSFM, et al. Efficacy of ampicillin trihydrate or ceftiofur hydrochloride for treatment of metritis and subsequent fertility in dairy cows. *Journal of Dairy Science*. 2014;97(9):5401-5414.
13. LeBlanc SJ, Duffield TF, Leslie KE, et al. Defining and diagnosing postpartum clinical endometritis and its impact on reproductive performance in dairy cows *Journal of Dairy Science*. 2002;85(9):2223-2236.
14. Dubuc J, Duffield TF, Leslie KE, et al. Risk factors for postpartum uterine diseases in dairy cows. *Journal of Dairy Science*. 2010;93(12):5764-5771.
15. Gilbert RO, Shin ST, Guard CL, et al. Prevalence of endometritis and its effects on reproductive performance of dairy cows. *Theriogenology*. 2005;64(9):1879-1888.
16. Bicalho ML, Lima FS, Ganda EK, et al. Effect of trace mineral supplementation on selected minerals, energy metabolites, oxidative stress, and immune parameters and its association with uterine diseases in dairy cattle. *Journal of Dairy Science*. 2014;97(7):4281-4295.
17. Curtis CR, Erb HN, Sniffen CJ, et al. Association of parturient hypocalcemia with eight periparturient disorders in Holstein cows. *Journal of the American Veterinary Medical Association*. 1983;183(5):559-561.
18. Gröhn Y, Erb HN, McCulloch CE, et al. Epidemiology of reproductive disorders in dairy cattle: associations among host characteristics, disease and production. *Preventive Veterinary Medicine*. 1990;8(1):25-39.
19. Ruiz-García LF, Arévalo IKC, Carcelén F, et al. Association between serum calcium levels and the presentation of postpartum endometritis in housed dairy cows. *Research in Veterinary Science*. 2022;144:92-97.
20. Mani V, Weber TE, Baumgard LH, et al. Growth and Development Symposium: Endotoxin, inflammation, and intestinal function in livestock. *Journal of Animal Science*. 2012;90(5):1452-1465.
21. LeBlanc SJ. Reproductive tract inflammatory disease in postpartum dairy cows. *Animal*. 2014;8(s1):54-63.
22. Hotamisligil GS, Erbay E. Nutrient sensing and inflammation in metabolic diseases. *Nature Reviews Immunology*. 2008;8(12):923-934.
23. Ingvarsen KL, Moyes K. Nutrition, immune function and health of dairy cattle. *Animal*. 2013;7:112-22
24. Yazlık MO, Çolakoğlu HE, Kaya U, et al. Does increased immune response at early postpartum period have a relationship with metabolic markers and subsequent fertility? *Polish Journal of Veterinary Sciences*. 2020;23(1):27-35
25. Kurt S, Salar S, Özdal Salar M. Antibiogram and pathogen isolation from vaginal discharge in dairy cows with metritis. *Veteriner Hekimler Derneği Dergisi*. 2019;90(2):66-70.
26. Molina-Coto R, Lucy MC. Uterine inflammation affects the reproductive performance of dairy cows: A review. *Agronomía Mesoamericana*. 2018;29(2):449-468
27. Carneiro LC, Cronin JG, Sheldon IM. Mechanisms linking bacterial infections of the bovine endometrium to disease and infertility. *Reproductive Biology*. 2016;16(1):1-7
28. Bicalho MLS, Machado VS, Oikonomou G, et al. Association between virulence factors of *Escherichia coli*, *Fusobacterium necrophorum*, and *Arcanobacterium pyogenes* and uterine diseases of dairy cows. *Veterinary Microbiology*. 2012;157(1-2):125-131.

29. Sheldon IM, Rycroft AN, Dogan B, et al. Specific strains of *Escherichia coli* are pathogenic for the endometrium of cattle and cause pelvic inflammatory disease in cattle and mice. *Plos One*. 2010;5(2).
30. Moges N, Regassa F, Yilma T, et al. Isolation and antimicrobial susceptibility of bacteria from dairy cows with clinical endometritis. *Journal of Reproduction and Infertility*. 2013;4(1):04-08.
31. Duvel A, Maass J, Heppelmann M, et al. Peripheral blood leukocytes of cows with subclinical endometritis show an altered cellular composition and gene expression. *Theriogenology*. 2014;81(7):906-917.
32. Prunner I, Wagener K, Pothmann H, et al. Risk factors for uterine diseases on small- and medium-sized dairy farms determined by clinical, bacteriological, and cytological examinations. *Theriogenology*. 2014;82(6):857-865.
33. Gün C, Kaya D, Ağaoglu A, et al. Monitoring postpartum period as part of a herd management program and its effects on fertility in cows. *Erciyes Üniversitesi Veteriner Fakültesi Dergisi*. 2013;10(1):21-31.
34. Vieira-Neto A, Lima FS, Santos JEP, et al. Vulvovaginal laceration as a risk factor for uterine disease in postpartum dairy cows. *Journal of Dairy Science*. 2016;99(6):4629-4637.
35. Healy LL, Cronin JG, Sheldon IM. Endometrial cells sense and react to tissue damage during infection of the bovine endometrium via interleukin 1. *Scientific Reports*. 2014;4:7060.
36. Ricci A, Gallo S, Molinaro F, et al. Evaluation of subclinical endometritis and consequences on fertility in piedmontese beef cows. *Reproduction in Domestic Animals*. 2015;50(1):142-148.
37. Bretzlaff K. Rationale for treatment of endometritis in the dairy-cow. *Veterinary Clinics of North America: Food Animal Practice*. 1987;3(3):593-607.
38. Sheldon IM, Noakes DE, Rycroft AN, et al. Effect of postpartum manual examination of the vagina on uterine bacterial contamination in cows. *Veterinary Record*. 2002;151(18):531-534.
39. Williams EJ, Fischer DP, Pfeiffer DU, et al. Clinical evaluation of postpartum vaginal mucus reflects uterine bacterial infection and the immune response in cattle. *Theriogenology*. 2005;63(1):102-117.
40. Sheldon IM, Noakes DE. Comparison of three treatments for bovine endometritis. *Veterinary Record*. 1998;142(21):575-579.
41. Ferry JW. Dairy reproduction beyond palpation. *The Bovine Practitioner*. 2019;1993(27):58-60.
42. Gilbert RO. Bovine endometritis - the burden of proof. *Cornell Veterinarian*. 1992;82(1):11-14.
43. Oltenacu PA, Britt JH, Braun RK, et al. Relationships among type of parturition, type of discharge from genital-tract, involution of cervix, and subsequent reproductive-performance in holstein cows. *Journal of Dairy Science*. 1983;66(3):612-619.
44. Gilbert RO, Shin ST, Guard CL, et al. Incidence of endometritis and effects on reproductive performance of dairy cows. *Theriogenology*. 1998;49(1):251.
45. Kucukaslan I, Kaya D, Emre B, et al. Evaluation of endometrial echotexture and cervical cytology in cows during and after treatment of endometritis. *Tierarztl Prax Ausg G Grosstiere Nutztiere*. 2014;42(6):343-350.
46. Kasimanickam R, Duffield TF, Foster RA, et al. Endometrial cytology and ultrasonography for the detection of subclinical endometritis in postpartum dairy cows. *Theriogenology*. 2004;62(1-2):9-23.
47. Yavari M, Haghkhah M, Ahmadi MR, et al. Comparison of cervical and uterine cytology between different classification of postpartum endometritis and bacterial isolates in holstein dairy cows. *International Journal of Dairy Science*. 2009;4:19-26.

48. Fricke PM. Scanning the future—ultrasonography as a reproductive management tool for dairy cattle. *Journal of Dairy Science*. 2002;85(8):1918-1926.
49. Pierson RA, Ginther OJ. Ultrasonography for detection of pregnancy and study of embryonic-development in heifers. *Theriogenology*. 1984;22(2):225-233.
50. Kähn W, Volkmann D. Ultrasonography in the cow. In: Kähn W, (ed.) *Veterinary reproductive ultrasonography*. Hannover, Germany: Schlütersche; 2004. p. 83-185.
51. Polat B, Cengiz M, Cannazik O, et al. Endometrial echotexture variables in postpartum cows with subclinical endometritis. *Animal Reproduction Science*. 2015;155:50-55.
52. Sheldon IM, Bushnell M, Montgomery J, et al. Minimum inhibitory concentrations of some antimicrobial drugs against bacteria causing uterine infections in cattle. *Veterinary Record*. 2004;155(13):383-+. doi: DOI 10.1136/vr.155.13.383-387.
53. Bretzlaff KN, Ott RS, Koritz GD, et al. Distribution of oxytetracycline in genital-tract tissues of postpartum cows given the drug by intravenous and intrauterine routes. *American Journal Of Veterinary Research*. 1983;44(5):764-769.
54. Drillich M, Beetz O, Pfutzner A, et al. Evaluation of a systemic antibiotic treatment of toxic puerperal metritis in dairy cows. *Journal of Dairy Science*. 2001;84(9):2010-2017.
55. Drillich M, Wittke M, Tenhagen BA, et al. Treatment of chronic endometritis in dairy cows with cephapirin, tiaprost or a combination of both. *Tierarztl Prax Ausg G Grosstiere Nutztiere*. 2005;33(6):404-410.
56. Kasimanickam R, Duffield TF, Foster RA, et al. The effect of a single administration of cephapirin or cloprostenol on the reproductive performance of dairy cows with subclinical endometritis. *Theriogenology*. 2005;63(3):818-830.
57. Risco CA, Hernandez J. Comparison of ceftiofur hydrochloride and estradiol cypionate for metritis prevention and reproductive performance in dairy cows affected with retained fetal membranes. *Theriogenology*. 2003;60(1):47-58.
58. Sheldon IM, Rycroft AN, Zhou C. Association between postpartum pyrexia and uterine bacterial infection in dairy cattle. *Veterinary Record*. 2004;154(10):289-293.
59. Roberts SJ. *Veterinary obstetrics and genital diseases*. 3rd ed. Newyork: S.J. Roberts-Woodstock; 1986.
60. Melia J, Sadri B, Siregar TN, Riady G, Asmilia N, Hanafiah M, et al., editors. The effectiveness of lugol for endometritis therapy in Aceh cow. *E3S Web of Conferences*; 2020: EDP Sciences. <https://doi.org/10.1051/e3sconf/202015101008>
61. Handler J, Aslan S, Findik M, et al. Efficacy of intrauterine administration of Eucacomp® and Lotagen® in cases of puerperal and postpuerperal endometritis in dairy cattle. *Praktische Tierarzt*. 2005;86(3):188-196.
62. Grüssel T, Busch W. Experimental studies of the effect of peracetic acid on the endometrium of cattle. *Tierärztliche Praxis*. 1997;25(1):28-34.
63. Schnyder D, Küpfer U, Zwahlen R. Endometrial histology after infusion of various drugs into the uterus of cows. *Schweizer Archiv für Tierheilkunde*. 1990;132(7):353-364.
64. Grunert E. *Fertilitätsstörungen beim weiblichen Rind*: Georg Thieme Verlag; 1999.
65. Friedman M. Chemistry and Multibeneficial Bioactivities of Carvacrol (4-Isopropyl-2-methylphenol), a Component of Essential Oils Produced by Aromatic Plants and Spices. *Journal of Agricultural and Food Chemistry*. 2014;62(31):7652-7670.
66. Baser KHC. Biological and pharmacological activities of carvacrol and carvacrol bearing essential oils. *current Pharmaceutical Design*. 2008;14(29):3106-3119.
67. Kaya S, Kaçar C, Merhan O, et al. Klinik endometritisli ineklerde intrauterin kekik esansiyel yağı ile birlikte dimetil sülfoksit uygulamasının klinik iyileşme üzerine ve serum haptoglobin, tümör nekrozis faktör ve nitrik oksit düzeylerine etkisi. *Kocatepe Veterinary Journal* , 2021;14(1): 45-50.

68. Ahmadi MR, Makki M, Mirzaei A, et al. Effects of hypertonic dextrose and paraffin solution as non-antibiotic treatments of clinical endometritis on reproductive performance of high producing dairy cows. *Reproduction in Domestic Animals*. 2019;54(5):762-771.
69. Brick TA, Schuenemann GM, Bas S, et al. Effect of intrauterine dextrose or antibiotic therapy on reproductive performance of lactating dairy cows diagnosed with clinical endometritis. *Journal of Dairy Science*. 2012;95(4):1894-1905.
70. Machado VS, Oikonomou G, Ganda EK, et al. The effect of intrauterine infusion of dextrose on clinical endometritis cure rate and reproductive performance of dairy cows. *Journal of Dairy Science*. 2015;98(6):3849-3858.
71. Maquivar MG, Barragan AA, Velez JS, et al. Effect of intrauterine dextrose on reproductive performance of lactating dairy cows diagnosed with purulent vaginal discharge under certified organic management. *Journal of Dairy Science*. 2015;98(6):3876-3886.
72. Sagai M, Bocci V. Mechanisms of action involved in ozone therapy: Is healing induced via a mild oxidative stress? *Medical Gas Research*. 2011;1:29.
73. Escandon BM, Espinoza JS, Perea FP, et al. Intrauterine therapy with ozone reduces subclinical endometritis and improves reproductive performance in postpartum dairy cows managed in pasture-based systems. *Tropical Animal Health and Production*. 2020;52(5):2523-2528.
74. Polat B, Cengiz M, Colak A, et al. Comparison of intrauterine ozone and rifaximine treatment in cows with subclinical endometritis. *Kafkas Üniversitesi Veteriner Fakültesi Dergisi*. 2015;21(5):773-776.
75. LeBlanc SJ. Interactions of metabolism, inflammation, and reproductive tract health in the postpartum period in dairy cattle. *Reproduction in Domestic Animals*. 2012;47:18-30.
76. Galvao KN, Flaminio MJBF, Brittin SB, et al. Association between uterine disease and indicators of neutrophil and systemic energy status in lactating Holstein cows. *Journal of Dairy Science*. 2010;93(7):2926-2937.
77. Bjerre-Harpoth V, Friggens NC, Thorup VM, et al. Metabolic and production profiles of dairy cows in response to decreased nutrient density to increase physiological imbalance at different stages of lactation. *Journal of Dairy Science*. 2012;95(5):2362-2380.
78. Whitaker DD, Goodger WJ, Garcia M, et al. Use of metabolic profiles in dairy cattle in tropical and subtropical countries on small holder dairy farms. *Preventive Veterinary Medicine*. 1999;38: 119-131.
79. Thatcher WW, Santos JE, Silvestre FT, et al. Perspective on physiological/endocrine and nutritional factors influencing fertility in post-partum dairy cows. *Reproduction in Domestic Animals*. 2010;45(Suppl 3):2-14.
80. Santos JEP, Bilby TR, Thatcher WW, et al. Long chain fatty acids of diet as factors influencing reproduction in cattle. *Reproduction in Domestic Animals*. 2008;43:23-30.
81. Garnsworthy PC, Fouladi-Nashta AA, Mann GE, et al. Effect of dietary-induced changes in plasma insulin concentrations during the early post partum period on pregnancy rate in dairy cows. *Reproduction*. 2009;137(4):759-68.
82. Ruiz-Garcia LF, Arevalo IKC, Carcelen F, et al. Association between serum calcium levels and the presentation of postpartum endometritis in housed dairy cows. *Research in Veterinary Science*. 2022;144:92-7.
83. Schmitt R, Pieper L, Borchardt S, et al. Effects of a single transdermal administration of flunixin meglumine in early postpartum Holstein Friesian dairy cows: Part 1. Inflammatory and metabolic markers, uterine health, and indicators of pain. *Journal of Dairy Science*. 2022. Epub 20220112. doi: 10.3168/jds.2021-20555.
84. Kaya D, Ay S, Kucukaslan I, et al. The effectiveness of combined preventive treatment with Ceftiofur, Oxytocin and PGF2 on fertility parameters in cows. *Revue de Medecine Veterinaire*. 2012;163(6):302-308.

85. Ametaj BN, Iqbal S, Selami F, et al. Intravaginal administration of lactic acid bacteria modulated the incidence of purulent vaginal discharges, plasma haptoglobin concentrations, and milk production in dairy cows. *Research in Veterinary Science*. 2014;96(2):365-70.
86. Deng QL, Odhiambo JF, Farooq U, Lam T, Dunn SM, Ametaj BN. Intravaginal lactic acid bacteria modulated local and systemic immune responses and lowered the incidence of uterine infections in periparturient dairy cows. *Plos One*. 2015;10(4).
87. Freick M, Kunze A, Passarge O, et al. Metritis vaccination in Holstein dairy heifers using a herd-specific multivalent vaccine Effects on uterine health and fertility in first lactation. *Animal Reproduction Science*. 2017;184:160-71.
88. Machado VS, Bicalho MLD, Junior EBDM, Rossi R, Ribeiro BL, Lima S, et al. subcutaneous immunization with inactivated bacterial components and purified protein of *Escherichia coli*, *Fusobacterium necrophorum* and *Trueperella pyogenes* prevents puerperal metritis in holstein dairy cows. *Plos One*. 2014;9(3).
89. Meira EBS, Ellington-Lawrence RD, Silva JCC, et al. Recombinant protein subunit vaccine reduces puerperal metritis incidence and modulates the genital tract microbiome. *Journal of Dairy Science*. 2020;103(8):7364-7376.
90. Baldrick P. The safety of chitosan as a pharmaceutical excipient. *Regulatory Toxicology and Pharmacology*. 2010;56(3):290-299.
91. Jeon SJ, Cunha F, Ma XJ, et al. Uterine microbiota and immune parameters associated with fever in dairy cows with metritis. *Plos One*. 2016;11(11).
92. Daetz R, Cunha F, Bittar JH, et al. Clinical response after chitosan microparticle administration and preliminary assessment of efficacy in preventing metritis in lactating dairy cows. *Journal of Dairy Science*. 2016;99(11):8946-8955.
93. de Oliveira EB, Cunha F, Daetz R, et al. Using chitosan microparticles to treat metritis in lactating dairy cows. *Journal of Dairy Science*. 2020;103(8):7377-7391.
94. Risco CA, Management of the postpartum dairy cow to maximize pregnancy rate. XXI World Buiatrics Congress - XXVIII Uruguayan Buiatrics Journey. 4-8 December 2000, Punta del Este, Uruguay (pp. 741-752).
95. König S, May K. Invited review: Phenotyping strategies and quantitative-genetic background of resistance, tolerance and resilience associated traits in dairy cattle. *Animal*. 2019;13(5):897-908.
96. LeBlanc SJ. Strategic interventions for reproductive management. *WCDS Advances in Dairy Technology*. 2014;26:275-289.