



## Postpartum uterine infection and impacts on herd fertility *Infecção uterina pós-parto e seu impacto na fertilidade do rebanho*

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Postpartum uterine disease is extremely important in dairy cattle. It is both common and detrimental to reproductive performance. The major diseases of the postpartum period are acute puerperal metritis, purulent vaginal exudate, and endometritis. All of these diseases are associated with the same spectrum of bacteria. These bacteria occur in the uterus in a specific sequence and seem to be synergistic in their pathogenic effects.

The most important organisms of the postpartum bovine uterus include *Escherichia coli*, gram-negative anaerobes such as *Fusobacterium necrophorum* and *Prevotella melaninogenica*, and *Trueperella pyogenes*. *E. coli* is typically the earliest pathogenic invader of the uterus. Usually however, it has largely disappeared before the important diseases occur. Nevertheless the early appearance of *E. coli* seems to pave the way for later invasion by other pathogens.

Each of the major pathogenic species is associated with specific virulence factors. In the case of *E. coli*, the most important virulence factor appears to be *fimH*. This is an adhesion factor. For *Fusobacterium necrophorum* the major virulence factor appears to be its leukotoxin which, as the name suggests, disables leukocytes. *Trueperella pyogenes* has as its major virulence factors *fimA*, an adhesion factor, and pyolysin.

Acute puerperal metritis typically occurs between 3 and 10 days postpartum. It is characterized by systemic disease, usually with fever, a fetid, watery, reddish-colored uterine discharge, and uterine flaccidity. Early *E. coli* infection is followed by predominantly gram-negative anaerobic infection at the time of the diagnosis. The usual treatment is administration of systemic antibiotics, sometimes in combination with anti-inflammatory agents.

The condition referred to as purulent vaginal exudate was formally called clinical endometritis. However, it is now known that the condition is independent of endometrial inflammation and is most likely associated with cervicitis. It is predisposed to by acute metritis and obstetrical complications. Diagnosis is by vaginoscopy, or by detection of conspicuous exudate at the vulvar lips. Early treatment of the predisposing conditions may reduce the incidence of purulent vaginal exudate.

Endometritis is characterized by an increased proportion of neutrophilic leukocytes in the endometrium after four weeks postpartum. The major predisposing factor appears to be severe negative energy balance in the periparturient period. Although it was previously believed that endometritis was characterized by inflammation in the absence of infection, it is now clear that concomitant bacterial infection is a feature of the disease. The most common pathogens isolated at this stage are *T. pyogenes* and the gram-negative anaerobes. The only treatment that has convincingly been demonstrated to be effective for endometritis is intrauterine administration of a special formula of cephapirin (Metricure®, Merck Animal Health). Treatment with prostaglandin does not decrease incidence of endometritis, or improve reproductive performance of affected cows.

Acute puerperal metritis, purulent vaginal exudate and endometritis all contribute to impaired reproductive performance. The effect of purulent vaginal exudate and endometritis appear to be independent and additive.

There is a relationship between ovarian activity and uterine infection. In general, cows with severe uterine contamination are slow to ovulate in the postpartum period. An exception occurs in the case of pyometra. Affected cows have bacterial contamination of a low grade but would remain healthy if ovulation were postponed for a period. However, some of these cows ovulate in the face of infection resulting in an active corpus luteum, a closed cervix and potentially impaired defense mechanisms. This combination allows a purulent exudate to develop and accumulate in the uterine lumen. In general, cows with pyometra are effectively treated with a luteolytic agent.

Although it is true that cows ovulating early in the postpartum period have superior reproductive performance, and it is also true that cows with uterine contamination have delayed postpartum ovulation, the detrimental effects of endometritis and of failure to ovulate appear to be independent and additive.

**Keywords:** cow, fertility, uterine infection.

**Palavras-chave:** fertilidade, infecção uterine, vaca.

### Recommended references

Bicalho ML, Machado VS, Oikonomou G, Gilbert RO, Bicalho RC. Association between virulence factors of *Escherichia coli*, *Fusobacterium necrophorum*, and *Arcanobacterium pyogenes* and uterine diseases of dairy cows. *Vet Microbiol*, v.157, p.125-131, 2012.



- Bicalho RC, Machado VS, Bicalho ML, Gilbert RO, Teixeira AG, Caixeta LS, Pereira RV.** Molecular and epidemiological characterization of bovine intrauterine *Escherichia coli*. *J Dairy Sci*, v.93, p.5818-5830, 2010.
- Cheong SH, Nydam DV, Galvão KN, Crosier BM, Gilbert RO.** Cow-level and herd-level risk factors for subclinical endometritis in lactating Holstein cows. *J Dairy Sci*, v.94, p.762-770, 2011.
- Cheong SH, Nydam DV, Galvão KN, Crosier BM, Gilbert RO.** Effects of diagnostic low-volume uterine lavage shortly before first service on reproductive performance, culling and milk production. *Theriogenology*, v.77, p.1217-1222, 2012a.
- Cheong SH, Nydam DV, Galvão KN, Crosier BM, Ricci A, Caixeta LS, Sper RB, Fraga M, Gilbert RO.** Use of reagent test strips for diagnosis of endometritis in dairy cows. *Theriogenology*, v.77, p.858-864, 2012b.
- Dubuc J, Duffield TF, Leslie KE, Walton JS, LeBlanc SJ.** Definitions and diagnosis of postpartum endometritis in dairy cows. *J Dairy Sci*, v.93, p.5225-5233, 2010a.
- Dubuc J, Duffield TF, Leslie KE, Walton JS, LeBlanc SJ.** Effects of postpartum uterine diseases on milk production and culling in dairy cows. *J Dairy Sci*, v.94, p.1339-1346, 2011a.
- Dubuc J, Duffield TF, Leslie KE, Walton JS, LeBlanc SJ.** Randomized clinical trial of antibiotic and prostaglandin treatments for uterine health and reproductive performance in dairy cows. *J Dairy Sci*, v.94, p.1325-1338, 2011b.
- Dubuc J, Duffield TF, Leslie KE, Walton JS, LeBlanc SJ.** Risk factors for postpartum uterine diseases in dairy cows. *J Dairy Sci*, v.93, p.5764-5771, 2010b.
- Galvão KN, Flaminio MJ, Brittin SB, Sper R, Fraga M, Caixeta L, Ricci A, Guard CL, Butler WR, Gilbert RO.** Association between uterine disease and indicators of neutrophil and systemic energy status in lactating Holstein cows. *J Dairy Sci*, v.93, p.2926-2937, 2010a.
- Galvão KN, Frajblat M, Brittin SB, Butler WR, Guard CL, Gilbert RO.** Effect of prostaglandin F-2 alpha on subclinical endometritis and fertility in dairy cows. *J Dairy Sci*, v.92, p.4906-4913, 2009.
- Galvão K, Frajblat M, Butler W, Brittin S, Guard C, Gilbert R.** Effect of early postpartum ovulation on fertility in dairy cows. *Reprod Domest Anim*, v.45, p.e207-e211, 2010b.
- Machado VS, Oikonomou G, Bicalho ML, Knauer WA, Gilbert R, Bicalho RC.** Investigation of postpartum dairy cows' uterine microbial diversity using metagenomic pyrosequencing of the 16S rRNA gene. *Vet Microbiol*, v.159, p.460-469, 2012.
- Santos TM, Caixeta LS, Machado VS, Rauf AK, Gilbert RO, Bicalho RC.** Antimicrobial resistance and presence of virulence factor genes in *Arcanobacterium pyogenes* isolated from the uterus of postpartum dairy cows. *Vet Microbiol*, v.145, p.84-89, 2010.
- Santos, TM, Gilbert, RO, Bicalho RC.** Metagenomic analysis of the uterine bacterial microbiota in healthy and metritic postpartum dairy cows. *J Dairy Sci*, v.94, p.291-302, 2011.
- Sheldon IM, Rycroft AN, Dogan B, Craven M, Bromfield JJ, Chandler A, Roberts MH, Price SB, Gilbert RO, Simpson KW.** Specific strains of *Escherichia coli* are pathogenic for the endometrium of cattle and cause pelvic inflammatory disease in cattle and mice. *PLoS One*, v.5, p.e9192, 2010.
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