

DISTRIBUTION OF DOMINANT FOLLICLES IN POSTPARTUM DAIRY COWS

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Abstract: Clinical and subclinical disorders and diseases cause reproductive failures and decline in milk production. Etiology of disorders is mainly because of pathological effect of microorganisms, lapses in nutrition and lodging, as well as in management. After parturition, body is under stress and milk yield is highest, which favors appearance of metabolic and infective diseases. Status of puerperium, number of lactation, body condition score and season of parturition, have highest effect to cyclic ovarian activity. Regular development of dominant follicles, ovulation, formation of *corpus luteum* and luteolysis is necessary for establishment of regular cyclic ovarian activity, which leads to better fertility. Experiment had included 50 cows during first 52 days of lactation. Cows were separated in two main groups, those with normal puerperium - NP (n=32) and abnormal puerperium - AP (n=18). Examinations have been performed during period of 6 to 52 days postpartum. Ovarian dominant follicles have been observed using diagnostic ultrasound linear scanner. The highest number of dominant follicles are present during first two examinations, then their number declines and later in last two examinations rise again. Decrease in number of dominant follicles in both groups is most expressed in period of 14-30 days. During first examination, left ovaries have more dominant follicles, compared with right ovaries, while during later examinations, it is changed in favor of right ovaries. Increased number of vital dominant follicles from period 38-45 days postpartum and absence of abnormal uterine content in lumen in same period postpartum is sign of upcoming fertile estrus.

Keywords: cattle, ovaries, dominant follicles, puerperium

Introduction

Cattle industry and especially dairy cattle breeding is important and often primary goal in many farms. This industry is directed for increase in fertility, milk yield, meat quantity and many other products. Clinical and subclinical manifested disorders and diseases cause reproductive failures and decline in milk production. Etiology of disorders is mainly because of pathological effect of microorganisms, lapses in nutrition and lodging, as well as in management. After partrition, body is under stress and milk yield is highest, which favors appearance of metabolic and infective diseases. Management lapses in period of puerperium, may have long lasting negative effects for uterine involution and cyclic ovarian activity, silent estrus is more expressed and open days period becomes longer.

Absence of conception, leads to decreased milk yield, because successful conception is required for development of mammary parenchym and better milk production (*Senger, 2005*). Metabolical excretion of estradiol and progesterone is higher in lactating then in non-lactating cows and is related with blood flow through liver. This process enable that more steroide hormones become metabolised and excreted from body, while low circulated levels of estradiole and progesterone have effect to decreased intensity and lenght of estrus. Follicular activity postpartum should appear 5-10 days postpartum with development of antral follicles (*Leslie, 1983; Sheldon et al., 2002*), which is proof of new follicular phase.

Follicles continue to grow, while one becomes pronouncedly dominant and ready to ovulate after LH wave, while some cows are not observed in estrus before 40 days postpartum (*Mutevelić et al., 2003*). Following number of dominant follicles, it is observed that estral cycle is characterised with growth of 2 or 3 dominant follicle, which is called follicular waves (*Savio et al., 1988*) and this dominant follicles, supress growth of other follicles. During puerperium, before normal cyclic ovarian activity is restored, dominant follicles regress and becomes atretic (*Mutevelić et al., 2003*). Status of puerperium, number of lactation, body condition score and season of parturition, have highest effect to cyclic ovarian activity (*Williams et al., 1995*). Cows with normal puerperium, have earlier ovulation than cows with puerperal disorders (*Williams et al., 1995*). Teatfeeding of calf, levels of IGF-I and insulin, also have important role in development of dominant follicles (*Kawashima et al., 2007; Montiel et al., 2005*).

Follicular activity is suppressed in period 14-28 days postpartum, but later it becomes less and less expressed (*Sheldon et al., 2000*). Size of dominant follicle is different among younger and older cows, but also in lactating and non-lactating cows. Regular development of dominant follicles, ovulation, formation of corpus luteum and luteolysis is necessary for establishment of regular cyclic ovarian activity, which leads to better fertility (*Kasimanickam et al., 2004*).

The purpose of this research was to use ultrasonography, observe appearance and distribution of dominant follicles in left and right ovaries, among cows with normal and abnormal puerperium status.

Material and methods

Research has been conducted at dairy farm of Holstein-Friesian cows during autumn and winter season in 2009/2010. Experiment had included 50 black Holstein cows during first 52 days of lactation. All cows were kept in same nutritive and lodging conditions, in tie-stall, without ability to move around. All anamnestic data, have been taken from farm protocols. Cows were separated in two main groups, those with normal puerperium - NP (n=32) and abnormal puerperium - AP (n=18). Cows with disorders of any kind like retained placenta, metritis, purulent vaginal discharge and similar, were placed in group of abnormal puerperium.

Examinations of ovaries, have been performed in period of 6 to 52 days postpartum, during next time phases: 6-13 days, 14-21 days, 22-29 days, 30-37 days, 38-45 days and 46-52 days, when experiment had ended. Ovarian dominant follicles have been observed using diagnostic ultrasound linear scanner SHIMADZU SHIMASONIC SDL-32 with 3,5 MHz linear probe.

Obtained data are graphically represented using software package Microsoft Office Excell 2010.

Results

In cows with normal and abnormal puerperium, all dominant follicles were calculated and graphically represented in next 5 charts.

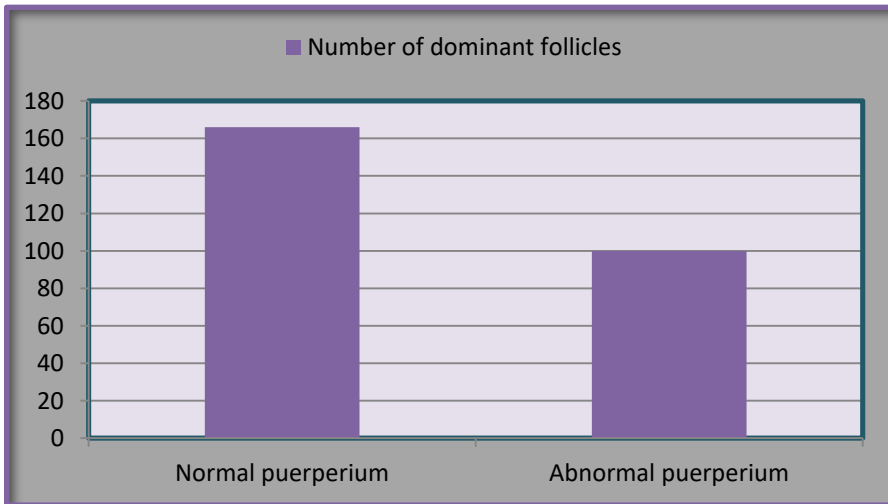


Chart 1. In total 266 dominant follicles were counted, 166 in NP and 100 in AP group.

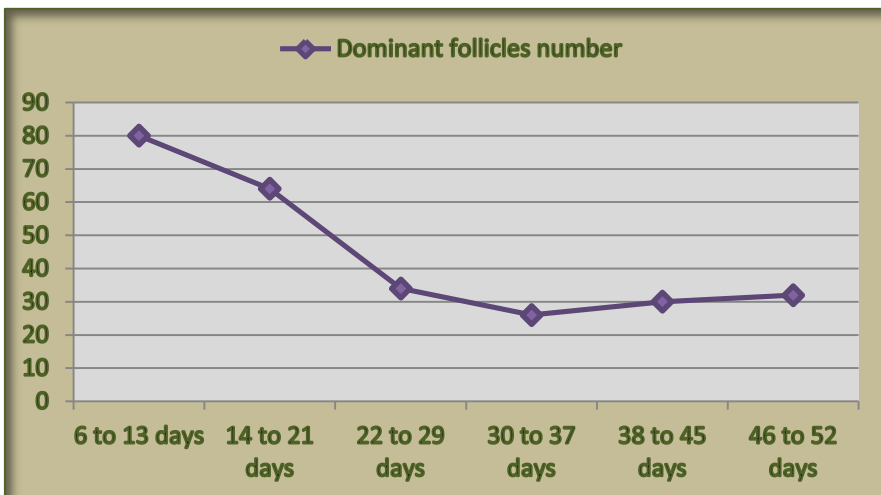


Chart 2. Total number of dominant follicles in left and right ovary in NP and AP group during observation 6-52 days of postpartum period.

In chart 2. can be seen that highest number of dominant follicles are present during first two examinations, then their number declines and later in last two examinations rise again, which may be seen in charts 3 and 4 also.

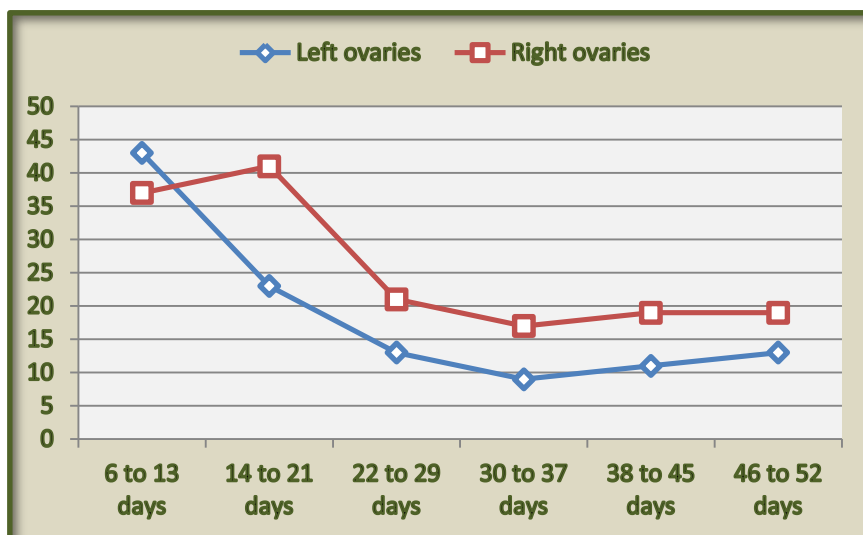


Chart 3. Distribution of dominant follicles in left and right ovaries in NP and AP group observed during 6-52 days of postpartum period.

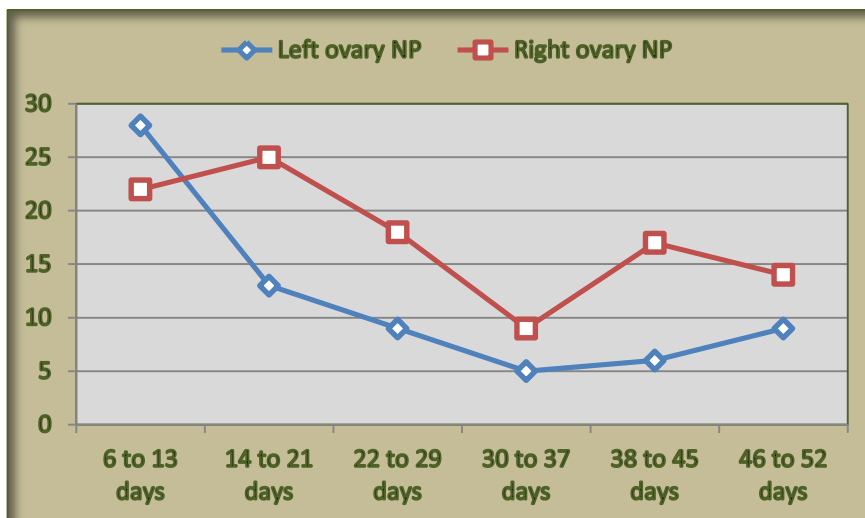


Chart 4. Distribution of dominant follicles in left and right ovaries in NP group during 6-52 days of postpartum period.

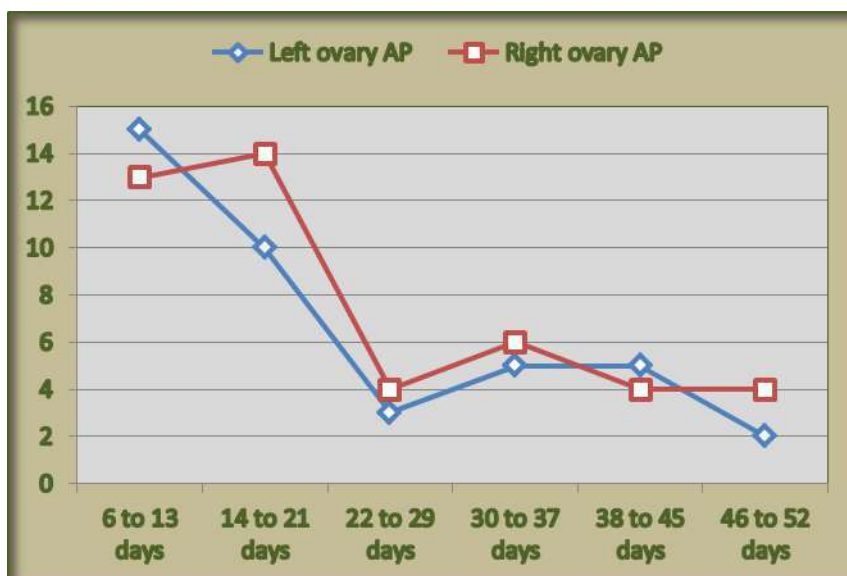


Chart 5. Distribution of dominant follicles in left and right ovaries in AP group during 6-52 days of postpartum period.

In charts 4 and 5, it can be seen that during first examination, left ovaries have more dominant follicles, compared with right ovaries, while during later examinations, it is changed .

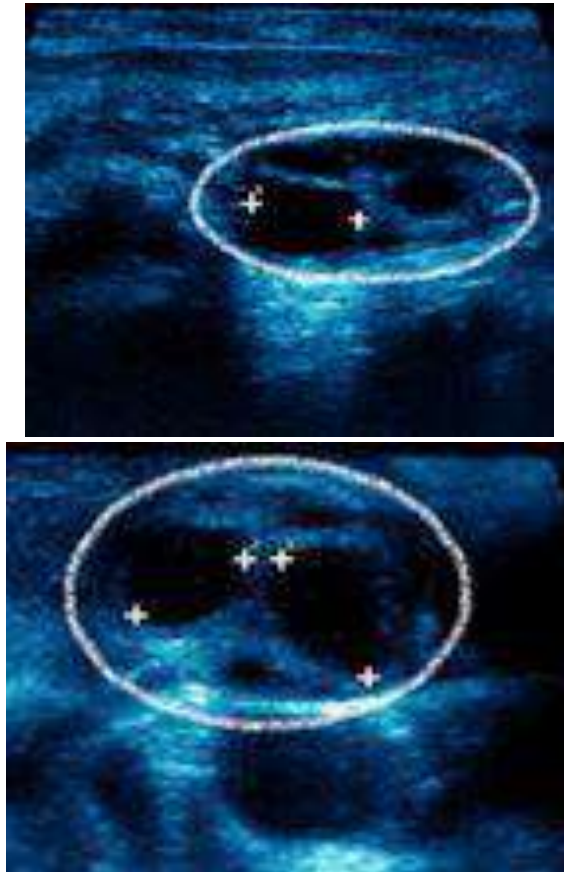


Figure 1 and 2. Appearance of one (left) and two (right) dominant follicle in ovary.

Discussion

Lapses in dairy cows management followed with intensive exploitation during puerperium, may lead to irregularities in uterine involution and ovarian cyclicity, which decrease reproductive performances during lactation (Földi *et al.*, 2006). About 50% of all cows have irregular ovarian function after parturition (Bisinotto *et al.*, 2010). When uterine problems are absent or resolved quickly, pattern of dominant follicle development is changed and becomes more dominant in ovary contralateral of previously pregnant uterine horn (LeBlanc *et al.*, 2002). Irregular ovary function is in most cases caused by retention of placenta, metritis, delayed uterine involution, low body condition, lameness and long luteal phase.

Ovarian examinations gave us insight in pattern of dominant follicles development and distribution during first 52 open days for cows in NP and AP group.

Levels of FSH are very important for follicular development, but also presence of corpus luteum and levels of progesterone. Dominant follicles in first two weeks, often do not react to gonadotropin stimulation, ovulation is absent, those follicles goes through atresion and their number is reduced (*Montiel et al., 2005*), which can be seen in our results too, where in same time their number is significantly lower. Both groups begin to develop DF in the first 10 days postpartum (*Leslie et al., 1983; Sheldon et al., 2002*) and had more dominant follicles in first examination in left ovary. Reason of this is probably because most pregnancies are in right uterine horn. Follicular activity in the begining is decreased in ovary ipsilateral to previously pregnant uterine horn, which can be seen also in NP and AP groups, but higher activity in same horn later is related with better conception (*Sheldon et al., 2000*).

During puerperium, through relationship hypothalamus-pituitary-ovaries, cyclic secretion of gonadotrophin hormones is restored and in NP cows, this process is finished by the end of six weeks (*Peter et al., 2009*), which prety much, may be seen in our results too, where foliculogenesis begins to stabilise and number of dominant follicles to increase in observed period of 38 – 52 days postpartum. This begins in most cows in period of 14-28 days postpartum and it is mentioned by many authors (*Sheldon et al., 2002; Sheldon et al., 2004; Williams et al., 2007*).

In our research, decrease in number of dominant follicles in both groups is most expressed in period of 14-30 days. About 2/3 of cows have restored ovarian cyclicity after 45 days postpartum (*Shretsha et al., 2004*), which coincide with our increase in number of dominant follicles and their stabilisation until the end of experimental period.

Presence of microorganisms in uterus and resorption of their products, cause disturbance in relation hipotalamus-pituitary-ovaries, which have effects to secretion of GnRH and LH hormones, decrease in number of dominant follicles and lesser secretion of estradiol (*Sheldon et al., 2004*). Cows with retention of placenta, are under higher effect from endotoxins from G- microorganisms, which changes physiological function between hipotalamus, pituitary and ovaries. In period 22-29 days the highest incidence of *endometritis*, developed after placental retention have been found (*Gilbert et al., 2005*), which is probably related with lowest number of dominant follicles found in that period in AP group. This kind of changes, delay foliculogenesis and decrease follicular grow rate during puerperium (*Peter et al., 1988*), which is not so obvious in the begining as it is during later *puerperium*, which coincide with same author.

Conclusions

1. In comparison between number of dominant follicles in NP and AP group and considering difference in number of animals, total number of dominant follicles is not significantly different among groups.
2. Great number of dominant follicles is found in first 14 days postpartum in NP and AP groups, which then goes into atresia.
3. Total number of dominant follicles is larger in left ovaries in the beginning of puerperium in NP and AP group.
4. Total number of dominant follicles after decline, stabilises in period 30-37 days postpartum and begin to increase.
5. Right ovaries had more dominant follicles in all observed periods, except in the beginning of puerperium.
6. Cows with diagnosed endometritis had lowest number of dominant follicles.
7. Increased number of vital dominant follicles from period 38-45 days postpartum and absence of abnormal uterine content in lumen in same period postpartum is sign of upcoming fertile estrus.

Distribucija dominantnih folikula kod mlečnih krava postpartum

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Rezime

Klinički i subklinički poremećaji i obolenja, dovode do reproduktivnih neuspeha i pada mlečnosti. Etiologija poremećaja je najčešće u patološkom delovanju mikroorganizama, propusta u ishrani i smeštaju, te u menadžmentu. Nakon teljenja, telo je pod stresom i mlečnost je najviša, a što pogoduje pojavi metaboličkih i infektivnih obolenja. Status puerperija, broj laktacija, telesna kondicija i godišnje doba teljenja, imaju najveći uticaj na ciklične procese na jajnicima.

Pravilan razvoj dominantnih folikula, ovulacija, formiranje žutog tela i luteoliza su neophodni za uspostavljanje pravilne ovarijalne cikličnosti, koja vodi boljoj plodnosti. Eksperiment je uključio 50 crnih Holštajn krava tokom prvih 52 dana laktacije. Krave su podeljene na dve glavne grupe, one s normalnim

puerperijem - NP (n=32) i abnormalnim puerperijem - AP (n=18). Pregledi su se radili tokom perioda 6 do 52 dana postpartum. Dominantni folikuli na jajniku su uočavani dijagnostičkim ultrazvukom.

Najveći broj dominantnih folikula je uočen tokom prva dva pregleda, zatim njihov broj opada i tokom zadnja dva pregleda je ponovo u rastu. Pad broja dominantnih folikula u obe grupe je najizraženiji u periodu 14-30 dana. Prilikom prvog pregleda, levi jajnici imaju više dominantnih folikula, dok pri kasnijim pregledima, to se menja u korist desnih jajnika. Rast broja vitalnih dominantnih folikula u periodu 38-45 dana postpartum i odsustvo abnormalnog sadržaja u lumenu uterusa u istom periodu, najavljuje dolazak fertilnog estrusa.

Ključne reči: goveda, jajnici, dominantni folikuli, puerperium

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