

PLASMA PROGESTERONE LEVELS AND CLINICAL FINDINGS IN DAIRY COWS WITH POST-PARTUM ANOESTRUS

**SŁAWOMIR ZDUŃCZYK, EDWELL SIATAMBI MWAANGA,
JACEK MAŁECKI-TEPICHT, WOJCIECH BARAŃSKI
AND TOMASZ JANOWSKI**

Department of Obstetrics and Pathology of Reproduction,
Faculty of Veterinary Medicine, Warmia and Masuria University in Olsztyn,
10-957 Olsztyn, Poland,

In the study, 1118 Polish Black and White cows from a dairy herd were examined during a three-year period. Three hundred and eighty-eight (34.7%) animals showed no visible oestrus signs until day 60 post-partum. In those cows clinical examinations were performed twice, with a 10 day interval, and blood samples for progesterone analysis were collected simultaneously. Progesterone was measured by the radioimmunoassay (RIA). Based on progesterone values and clinical examination silent heat was diagnosed in 189 (48.7%), ovarian afuction in 178 (45.9%), follicular ovarian cysts in 19 (4.9%) and *corpus luteum pseudogaviditatis* in 2 (0.5%) anoestrous cows. Progesterone analysis showed that only 270 (69.6%) anoestrous cows were correctly diagnosed by rectal palpation. The results show that post-partum anoestrus is still of great importance in Polish dairy cows. The two main clinical causes of anoestrus are silent heat and ovarian afuction. Progesterone determination in milk or blood is necessary if incidences of misdiagnosis are to be avoided.

Key words: dairy cows, anoestrus, rectal palpation, progesterone determination.

The early resumption of normal ovarian activity accompanied by visible oestrus symptoms is essential for the optimal calving interval of 365 days (2, 19, 29). Post-partum anoestrus, defined as the lack of oestrus until 60 days post-partum, is the major factor causing elongation of this interval and, in consequence, substantial economic losses (14, 21, 25, 30, 31). Incidences of postpartum anoestrus may vary among herds from 10 to 40% (4, 6, 17, 18).

There are four clinical forms of anoestrus: (1) silent heat; (2) cystic ovarian disease; (3) ovarian afuction; (4) *corpus luteum pseudogaviditatis* (8, 21, 25, 32). Rectal palpation is a main method used for clinical evaluation of ovarian activity in dairy herds, but it may cause high proportion of misdiagnosed and incorrectly treated animals (7, 19). False diagnoses can be avoided by ultrasound scanning or progesterone determination in milk or blood (9, 12, 26).

There is only a limited number of field studies on anoestrus in Polish dairy cows (28, 32). Therefore, the aim of this study was to investigate incidence of clinical forms of post-partum anoestrus in Polish dairy cows based on progesterone values in plasma and rectal palpation.

Material and Methods

Animals. The study was carried out on 1118 Polish Black and White cows from a dairy herd in the north-east of Poland, which were examined during a three-year period. Cows were housed in tie-stall barns and fed grass and corn silage, hay and concentrate during winter, and pastured during the summer months. The average milk yield was about 4000 kg per year. During winter oestrus detection was carried out twice daily at the time of milking, in summer 3 times.

Clinical examination. Three hundred and eighty-eight cows showed no visible oestrus signs until day 60 postpartum (Fig. 1). Those animals were clinically examined twice, in a 10-day interval. Blood samples were collected simultaneously from the tail vein into heparinised evacuated tubes. The blood samples were immediately centrifuged and plasma was stored at -20° until assayed for progesterone.

Progesterone assay. Progesterone concentration in blood plasma was determined using RIA as described by Hoffmann (10). A progesterone level of 3,18 nmol/l plasma has been assumed as the threshold value indicating luteal function. The obtained progesterone values and clinical findings were interpreted as follows:

1. Low progesterone levels found on both examinations and small ovaries without palpable structures (follicles or *corpora lutea*) were an indication of ovarian afuction.
2. High progesterone level on the first, but low on the second examination or low on the first and high on the second examination and presence of palpable structures on ovaries were interpreted as a silent heat.
3. Low progesterone levels on both examinations and presence of follicles, at least 2 cm in diameter, were interpreted as follicular ovarian cysts.
4. High progesterone levels on both examinations were interpreted as *corpus luteum pseudograviditatis* or luteal cysts, depend on clinical findings.

Results

Of the 1118 cows investigated, 388 (34.7%) failed to show visible signs of oestrus (Fig. 1). Based on progesterone values and clinical examination silent heat was diagnosed in 189 (48.7%), ovarian afuction in 178 (45.9%), follicular ovarian cysts in 19 (4.9%) and *corpus luteum pseudograviditatis* in 2 (0.5%) anoestrous cows (Fig. 2). Progesterone analysis showed that 270 (69.6%) anoestrous cows were correctly diagnosed by rectal palpation (Fig. 3).

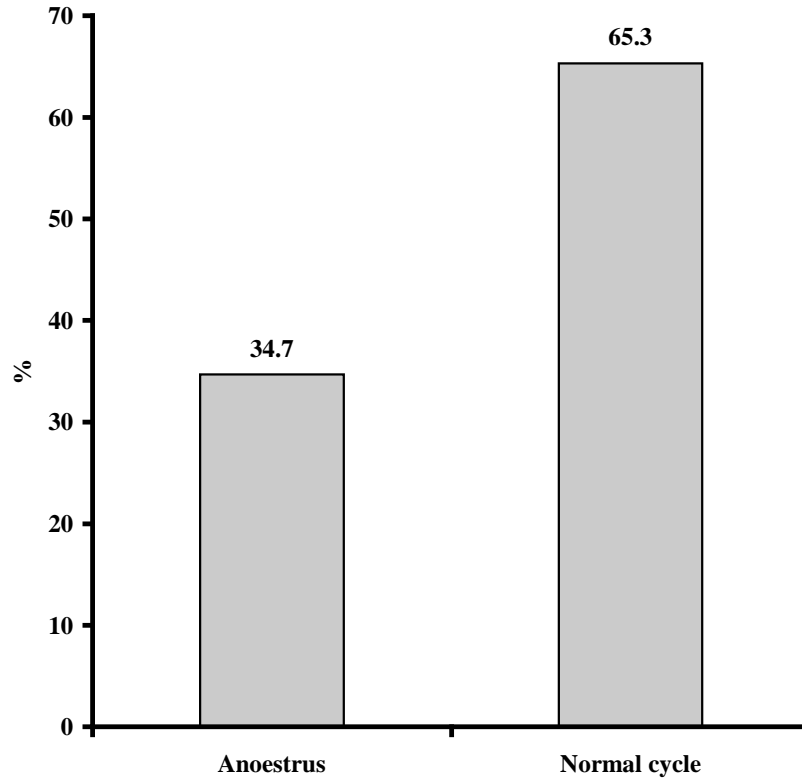


Fig. 1. Incidence of post-partum anoestrus in the herd.

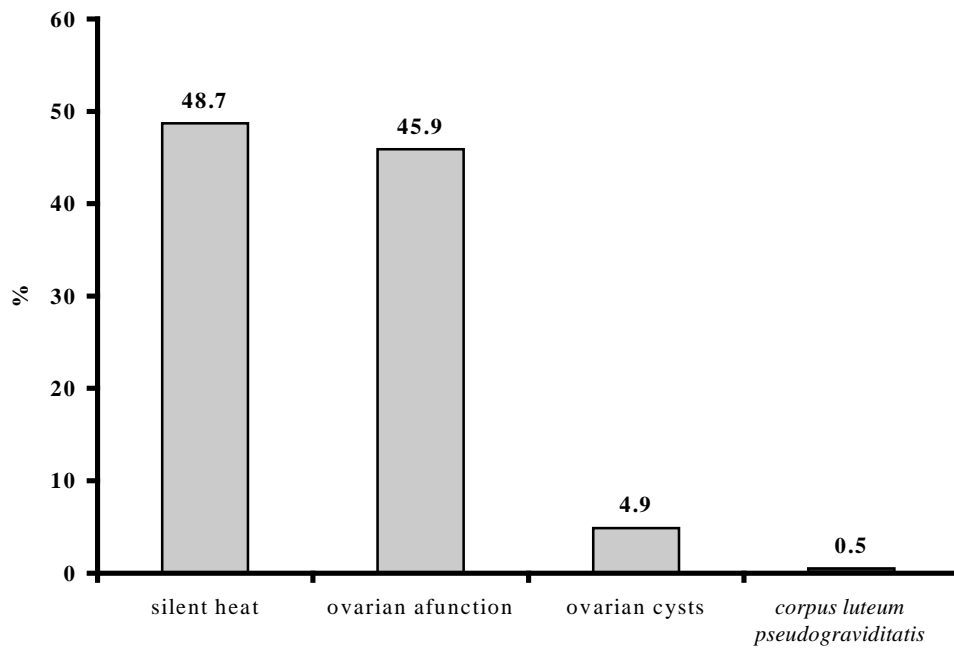


Fig. 2. Incidence of different clinical forms of post-partum anoestrus in the investigated herd.

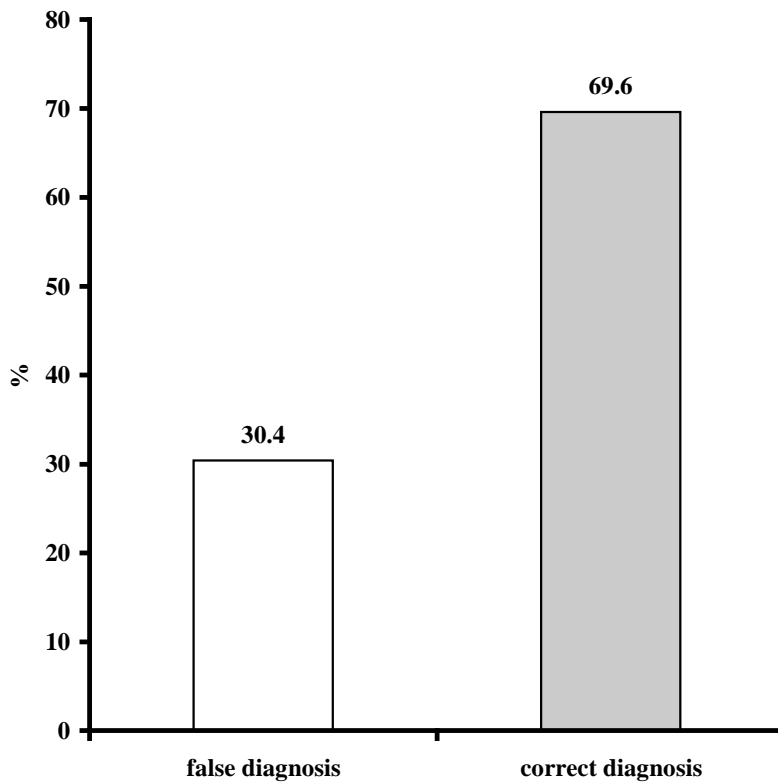


Fig. 3. Verification of rectal palpation diagnosis of clinical forms of anoestrus by progesterone analysis.

Discussion

In dairy cows the anoestrous period after calving should not exceed 60 days. Animals, which did not exhibit oestrus signs during this period are regarded as pathologically anoestrous (14, 21, 25). In this study 388 (34.7%) of the 1118 cows

investigated showed no heat during 60 days after calving. Our results correspond with other earlier studies, in which also about 40% of cows were diagnosed as having anoestrus (1, 16, 24). Fischer *et al.* (6) found a higher incidence of post-partum anoestrus of 49%. Other authors reported lower prevalence rates, ranging from 16 to 20% (4, 18). The variability in occurrence of anoestrus may result from different managerial, environmental and nutritional conditions existing in various herds (2, 21, 25).

As proved by progesterone determination and rectal palpation silent heat was the main clinical form of anoestrus in this herd, representing 48.7% of all anoestrus cases. Silent heat is regarded as one of the most prominent infertility problems in dairy farms, affecting about 40-60% of post-partum periods (3, 12, 30). The high rate of silent heat is mainly a result of bad oestrus detection (21, 25). Some authors suggest that negative energy balance in high yielding cows is related to the elevation of progesterone during oestrus and inhibition of oestrus behaviour (27, 30).

Another important clinical form of anoestrus observed in this study was ovarian afuction. Out of 388 anoestrous declared cows, 178 (45.9%) were diagnosed with ovarian afuction. Thus, total incidence rate of this disorder in the herd amounted to 10.5%. This result is in accordance with other studies. De Kruif (4), Mayer *et al.* (18) and Zduńczyk *et al.* (32) found prevalence rate of 10-20%. In problematic herds, as high as 30-60% of ovarian afuction cases can be observed (5, 20). This variability could be due to managerial, individual cow status or as a result of different diagnostic methods (2, 21, 25, 32).

Other clinical causes of anoestrus in the herd were follicular ovarian cysts (4.9%) and *corpus luteum pseudogaviditatis* (0.5%). According to Kesler *et al.* (13) and Lopez-Diaz and Bosu (15), ovarian cysts occur in 15% of dairy cows during the early post partum period. In the most cases these cysts disappear spontaneously, while in the remainder, initiation of the cycle is inhibited. De Kruif (4) reported that 7% of the anoestrous cows were affected by ovarian cysts.

Corpus luteum pseudogaviditatis is a failure of the normal *corpus luteum* to regress despite the absence of pregnancy. Prolonged luteal activity is generally associated with the presence of mummified foetus or uterine infection (11, 12, 22). This ovarian disorder affect usually only a small proportion (1%) of animals (12, 21). However, Opsomer *et al.* (23) found prolonged luteal phase in 20% of the examined progesterone profiles in high yielding cows.

Verification of rectal palpation diagnosis of clinical forms of anoestrus by progesterone analysis showed that only 270 (69.6%) of the 388 cases were correctly diagnosed. This finding is consistent with earlier studies where misdiagnoses of ovarian function ranged from 20 to 50% (7, 19, 26).

Our results demonstrate the high occurrence of post-partum anoestrus in Polish dairy cows. Almost 35% of cows showed no oestrus signs during 60 days post-partum. The two most important clinical causes of anoestrus were silent heat and ovarian afuction. Other ovarian disorders such as ovarian cysts and *corpus luteum pseudogaviditatis* were much less important. Furthermore, the results showed that rectal examination of the ovaries is an inaccurate method for diagnosing clinical forms of anoestrus in dairy cows and should therefore be accompanied by progesterone determination in blood or milk.

References

1. Bartlett P.C., Kirk J., Coe P., Marteniuk S., Mather E.C.: Descriptive epidemiology of anestrus in Michigan Holstein-Friesian cattle. *Theriogenology*, 1987, **27**, 459-476.
2. Bostedt H., Kozicki L.E., Finger K.H., Karg H.: Untersuchungen über den Einfluss verschiedener Haltungsbedingungen auf postpartale Regenerationsvorgänge am Genitaltrakt von Milchkühen unter besonderer Berücksichtigung der Progesteronprofile. *Zuchthyg.*, 1985, **20**, 17-33.
3. Claus R., Karg H., Zwiauer D., von Butler I., Pirchner F., Rattenberger E.: Analysis of factors influencing reproductive performance of the dairy cow by progesterone assay in milk-fat. *Br. Vet. J.*, 1983, **139**, 29-37.
4. De Kruif A.: En onderzoek van runderen in anoestrus. *Tijdschr. Diergeneeskd.*, 1977, **102**, 247-253.
5. Elsaesser F., Ellendorf F., Schmidt D.: Die Milchprogesteronbestimmung als Mittel zur Objektivierung des Fruchtbarkeitsstatus von Milchkuhherden in der Post-partum-Phase. *Dtsch. Tierärztl. Wschr.*, 1979, **86**, 53-54.
6. Fischer K., Hoffmann B., Bockisch F.-J., Failing K., Baljer G.: Erhebungen zum Fruchtbarkeitsstatus von Milchkühen. Teil 1: Univariate Befunderhebung und Zuordnung in Beobachtungsklassen. *Tierärztl. Umschau*, 1998, **53**, 372-379.
7. Grunert E.: Zur Problematik der rektalen Ovarkontrolle beim Rind. *Der Prakt. Tierarzt*, 1979, **60**, *Colleg. Vet.*, 9, 13-18.
8. Grunert E.: Zur Ovardystrophie beim Rind. *Der Prakt. Tierarzt*, 1982, **63**, *Colleg. Vet.*, 12, 73-77.
9. Hoedemaker M., Held T., Grunert E.: Einsatzmöglichkeiten des Progesterontests zur Diagnose ovariell- und uterusbedingter Sterilitätsformen des Rindes. *Der Prakt. Tierarzt*, 1986, **67**, *Colleg. Vet.*, 16, 15-19.
10. Hoffmann B.: Bestimmung von Steroidhormonen beim weiblichen Rind. Entwicklung von Messverfahren und physiologische Daten. *Fortschritte der Veterinärmedizin*. Verlag Paul Parey, Berlin und Hamburg, 1977.
11. Janowski T., Zduńczyk S., Chmielewski A., Mwaanga E.S.: Untersuchungen über Progesteronprofile bei Kühen mit puerperalen Endometritiden. *Tierärztl. Umschau*, 1998, **53**, 399-402.
12. Kalis C.H.J., van de Wiel D.F.M.: Relationship of clinical examinations to milk progesterone profiles. *Proceed. 9th Intern. Congr. Anim. Reprod. and A.I.*, June 16-20, 1980, Madrid, **2**, 125-134.
13. Kesler D.J., Garverick H.A., Bierschwal C.J., Elmore R.G., Youngquist R.S.: Reproductive hormones associated with normal and abnormal changes in ovarian follicles in postpartum dairy cows. *J. Dairy Sci.*, 1979, **62**, 1290-1296.
14. Lamming G.E.: Milk progesterone for assessing response to treatment of subfertile cattle. *Proceed. 9th Intern. Congr. Anim. Reprod. and A.I.*, June 16-20, 1980, Madrid, **2**, 143-151.
15. Lopez-Diaz M.C., Bosu W.T.K.: A review and an update of cystic ovarian degeneration in ruminants. *Theriogenology*, 1992, **37**, 1163-1183.
16. Markusfeld O.: Inactive ovaries in high-yielding dairy cows before service: Aetiology and effect on conception. *Vet. Rec.*, 1987, **121**, 149-153.
17. Martinez J., Thibier M.: Reproductive disorders in dairy cattle. I. Retrospective influence of herds, season, milk yield and parity. *Theriogenology*, 1984, **21**, 569-579.

18. Mayer E., Francos G., Neria A.: Eierstocksbefunde und Fertilitätsparameter bei Kühen mit „unbeobachteter Brunst“. Tierärztl. Umschau, 1987, **42**, 506-509.
19. McLeod B.J., Williams M.E.: Incidence of ovarian dysfunction in postpartum dairy cows and the effectiveness of its clinical diagnosis and treatment. Vet. Rec., 1991, **128**, 121-124.
20. Munro C.D., Boyd H., Watson J.D., McBride B., Martin B., Booth J.M., Holdsworth R.J.: Monitoring pre-service reproductive status in dairy cows. Vet. Rec., 1982, **110**, 77-80.
21. Mwaanga E.S., Janowski T.: Anoestrous in dairy cows: Causes, prevalence and clinical forms. Reprod. Dom. Anim., 2000, **35**, 193-200.
22. Olson J.D., Mortimer R.G., Ball L.: Aspects of bacteriology and endocrinology of cows with pyometra and retained fetal membranes. Am. J. Vet. Res., 1984, **45**, 2251-2255.
23. Opsomer G., Coryn M., Deluyker H., de Kruif A.: An analysis of ovarian dysfunction in high yielding dairy cows after calving based on progesterone profiles. Reprod. Dom. Anim., 1998, **33**, 193-204.
24. Opsomer G.: Anoestrus in dairy high yielding cows. Thesis, Ghent University, 1999.
25. Opsomer G., de Kruif A.: Post-partumer Anöstrus bei Milchkühen – eine Übersicht. Tierärztl. Praxis, 1999, **27(G)**, 30-35.
26. Pieterse M.C., Taverne M.A.M., Kruip Th.A.M., Willemsse A.H.: Detection of corpora lutea and follicles in the cow: A comparison between transvaginal ultrasonography and rectal palpation. Vet. Rec., 1990, **126**, 522-544.
27. Raś A.: Badania wpływu zaburzeń gospodarki energetycznej na procesy rozrodcze krów mlecznych. Rozprawy i monografie, 18, Wyd. ART Olsztyn, 1999.
28. Romaniuk J.: Badania nad leczeniem afunkcji jajników u krów. Medycyna Wet., 1973, **29**, 296-298.
29. Schmidt G.H.: Effects of length of calving intervals on income over feed and variable costs. J. Dairy Sci., 1989, **72**, 1605-11611.
30. Schopper D., Schemer R., Weiler U., Claus R.: Einfluß der Milchleistung auf Fruchtbarkeitskriterien der Milchkuh post partum: Auswertung von Progesteronprofilen. Reprod. Dom. Anim., 1993, **28**, 225-235.
31. Senger P.L.: The estrus detection problem: New concepts, technologies, and possibilities. J. Dairy Sci., 1994, **77**, 2745-2753.
32. Zduńczyk S., Żebracki A., Glazer T., Janowski T., Raś A.: Badania nad występowaniem i leczeniem nieczynności jajników u krów w warunkach chowu wielkostadnego. Acta Acad. Agricult. Techn. Olst., Veterinaria, 1992, **20**, 88-91.