ACCURACY OF ULTRASONOGRAPHY AND RECTAL PALPATION IN THE DIAGNOSIS OF SILENT HEAT IN COWS COMPARED TO PLASMA PROGESTERONE CONCENTRATION

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Abstract

The study was carried out on five dairy herds in the North-East Poland. The cows, which showed no visible oestrus signs until day 60 postpartum, were examined by ultrasonography and rectal palpation twice, at a 10-d interval. A real-time, B-mode scanner with a 5 MHz probe was used. The plasma progesterone concentration was determined using RIA. A high progesterone level on the first examination, but low on the second, or low on the first and high on the second examination were interpreted as a silent heat. Based on the progesterone values, silent heat was diagnosed in 145 anoestrous cows, whereas ultrasonographically, 106 cows were found to have silent heat. The accuracy of the ultrasonography and rectal palpation in the diagnosis of silent heat in cows was 89.0% and 69.7%, respectively (P ≤ 0.05). For the diagnosis of the corpus luteum, the sensitivity and specificity of the ultrasonography was 94.7% and 84.0%, and for rectal palpation 86.2% and 70.3%, respectively (P ≤ 0.05). Our results showed that ultrasonography is a useful tool in the diagnosis of silent heat in cows.

Key words: cows, silent heat, ultrasonography, rectal palpation, progesterone.

Silent heat is defined as the lack of behavioural oestrus symptoms, although the genital organs undergo normal cyclical changes (9, 11). It is the main reason for post-partum anoestrus in dairy cows, causing elongation of service period and, as a consequence, substantial economical losses (9-11).

Rectal palpation is the main method used for the clinical evaluation of ovarian activity in dairy herds, but it may cause a high rate of misdiagnosed and incorrectly treated animals (3, 7, 8, 14). Ultrasonography is considered an important diagnostic aid to rectal palpation (5, 6, 12, 13). There are few data regarding the comparative evaluation of ovarian functional status by use of ultrasonography, rectal palpation, and progesterone concentration.

The aim of this study was to assess the accuracy of ultrasonography for the diagnosis of silent heat compared to plasma progesterone concentration.

Material and Methods

The study was carried out in five dairy herds in the North-East Poland on 583 cows. The average milk yield was about 7,000 kg per year. Oestrus detection was performed three times daily. Cows, which showed no visible oestrus signs until day 60 postpartum, were examined by ultrasonography and rectal palpation twice at a 10-d interval. A real-time, B-mode scanner (Honda 1500) with a 5 MHz linear probe was used. Blood samples were collected simultaneously from the tail vein into heparinised evacuated tubes. The plasma progesterone (P4) concentration was determined using RIA according to the method described by Hoffmann (4).

The presence of physiological ovarian structures (follicles, corpus luteum) was an indication of cyclicity in anoestrous cows. A high progesterone level on the first examination, followed by a low level on the second, or a low level followed by a high level, were interpreted as silent heat (14).

The accuracy of ultrasonography and rectal palpation for the diagnosis of silent heat, and the sensitivity and specificity of these methods for the diagnosis of the presence or the absence of the corpus luteum were calculated. The sensitivity was defined as a correct diagnosis for the presence of the corpus luteum, the specificity as correct diagnosis for the absence of the corpus luteum.

The differences in these parameters between ultrasonography and rectal palpation were analysed by chi-square test and P ≤ 0.05 was accepted as significant.
Results

Based on the progesterone values, silent heat was diagnosed in 145 anoestrous cows. Thus, the average frequency of silent heat in the examined herds was 24.8%. Ultrasonographically, 106 cows were found to have silent heat, whereas, by rectal palpation, silent heat was diagnosed in 101 cows. The accuracy of the ultrasonography in the diagnosis of silent heat in cows was 89.0%, and that of rectal palpation was 69.7% (P≤0.5; Fig. 1).

The sensitivity and specificity of ultrasonography for the diagnosis of the corpus luteum were 94.7% and 84.0%, respectively, and for rectal palpation 86.2% and 70.3%, respectively (P≤0.05; Fig. 2). In Figs 3-5, the correct diagnoses of ovarian status by ultrasonography are given; in Fig. 6, a wrong classification of ovarian stroma as the corpus luteum is presented.

Fig. 1. Accuracy of ultrasonography and rectal palpation in the diagnosis of silent heat in cows;
a, b – difference between both methods significant at P≤0.05.

Fig. 2. Sensitivity and specificity of ultrasonography and rectal palpation for the diagnosis of the presence or the absence of the corpus luteum; a, b – difference between both methods significant at P≤0.05.
Discussion

Based on progesterone determination, silent heat was diagnosed in 24.8% of cows. The size of this difference varies from 10% to 40% between the different studies (8, 10, 11, 14). This variability could be due to differences in the oestrus detection and diagnostic methods.

Rectal palpation is the most widely used technique for the diagnosis of ovarian function in cows. The low accuracy achieved by rectal palpation in our study is consistent with previous studies (8, 12-14). The accuracy of ultrasonography in the diagnosis of silent heat in cows was significantly higher (P ≤ 0.05) than that of rectal palpation. The sensitivity and specificity of ultrasonography were also significantly greater (P ≤ 0.05) than those obtained with rectal palpation. Similar results were reported by Pieterse et al. (12) and Ribadu et al. (13).

The sensitivity of both methods was higher than their specificity. This indicates that it is easier to determine the presence than the absence of the corpus luteum. As proved by progesterone determination, another important cause of anoestrus in our study was ovarian afunction (true anoestrus). In these cows, low progesterone levels were found on both examinations, but in a high proportion of cows, the presence of the corpus luteum was diagnosed by ultrasonography (16.0%) and rectal palpation (29.7%). Cows with true anoestrus are characterised by small ovaries, which have no functional structures, or only low follicular development (11). In similar studies, in which progesterone determination was compared with ultrasonography, the specificity ranged from 70% to 100% (1, 13). The differences may be attributed to the types of transducers (sectorial vs linear, 5.0 vs 7.5 MHz) and the experience of an examiner. Compared with the dissection of the ovaries collected at slaughter, ultrasonography incorrectly diagnosed five, and rectal palpation nine, of 62 cases of the absence of the corpus luteum. These wrong diagnoses were mainly caused by the misinterpretation of ovarian stroma in the ultrasonography, and by the identification of small follicles as corpora lutea by rectal palpation (12). Other authors (2) incorrectly diagnosed 27.6% of acyclic ovaries by rectal palpation. In these animals, corpora lutea were detected, but not confirmed at autopsy, or follicles were identified as corpora lutea.

Earlier studies showed that errors in determining the presence of the corpus luteum were
attributed to undetected *corpora lutea* or *corpora lutea* identified as follicles. With either method, it is difficult to diagnose a growing or regressing *corpus luteum* (2, 5, 12, 13).

Our study has revealed that ultrasonography permits a better estimation of the ovarian status in anoestrous cows than rectal palpation, and it is a useful tool for the diagnosis of silent heat.

**References**