Ultrasound Examination of Cows During the Puerperium in Everyday Veterinary Practice

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Abstract: Regular control of cows during puerperium allows as detecting and treating pathological processes in the early phase, to optimise duration of service and calving period followed with the occurrence of physiological cycles. The application of ultrasound in daily practice enables precise detection of follicles ability for ovulation and identification of functional corpus lutei, early diagnose of pregnancy, determination of foetal sex as well as an early and accurate identification of pathological processes (metritis, endometritis and pyometra). This survey included 54 cows: experimental group consist of 32 animals (26 of Simmental and 6 of Holstein-Friesian breed) that were under continuous control of the veterinarian (routine gynaecological and ultrasound examination), while remaining 22 animals in the barn (12 Simmental and 10 Holstein-Friesian cows) served as a control group – inseminated only at the invitation of the owner. Insemination index (1.69) and duration of service period (82.27 days) in the experimental group of Simmental cows were significantly lower (P<0.001) than in the control group (3.25 and 155.17 days, respectively). Although smaller insemination index was observed in experimental group of Holstein-Friesian cows (2.17) compared to the control (3.10) this difference wasn't significant. Also, service period (100.67 days) in the experimental group was significantly shorter (P<0.05) compared to the control animals (180.30 days). These results showed that application of ultrasound improved certain fertility indicators in cows, i.e. minus insemination index and shortened duration of service period.

Keywords: Ultrasonography, ovulation, insemination index, service period, Simmental, Holstein-Friesian cow.

INTRODUCTION

Prerequisites for successful control and management of reproduction in cows are: detailed insight into physiological processes and changes during sexual cycle, pregnancy, puerperium and postpuerperal period, as well as knowledge about the most common pathological conditions. Also, it is necessary to understand possible effects of many internal and external factors (nutrition, housing, pathogens) that may affect reproduction. The greatest improvement of reproduction and management can be expected with increase of the efficiency of oestrus detection, early identification of specific changes during cycle phases, with training of insemination techniques and proper feeding/breeding of cows during transition period [1]. These measures result with reducing the incidence of reproductive disorders.

Folliculogenesis in cows mostly ends with ovulation of one dominant follicle that reaches diameter of 13-20 mm, followed with development of corpus luteum (CL) [2-4]. Follicular development in cows and heifers occurs in waves whose number within the cycle depends on the ages and luteal function. The most of sexual cycles consist of two or three follicular waves (each of them lasts about 8-10 days), while less of them develop four waves [3-7]. To determine the optimal time of insemination, it is necessary to know the time of ovulation [4, 8]. Morphological and functional status that enables next pregnancy is established at the end of the puerperium (from 42nd till 45th day). In accordance with these findings are results of Dobranić *et al*. [9], which found certain ovarian activity between 20th and 25th day post partum, and completion of puerperium between 40th and 45th day. Return of cyclical ovarian activity and normal oestrus can be expected only in females with a normal/physiological puerperium [10]. All of these are affected by many internal and external factors such as fitness and body weight, age, number and duration of lactation, feeding, season, etc. [11]. One of the goals in milk production is to shorten the service period under 100 days, and thus the calving period to approximately one year. Cows with longer service period are considered to be less productive [4].

According to Gnemmi [12], only 20% clinicians who deal with cattle reproduction use ultrasound in everyday veterinary practice. It is mostly used for early determination of pregnancy, despite diverse and reliable purpose. Capabilities of ultrasound in cattle

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reproduction are numerous: examination of uterus 12th and 20th day post partum for metritis and endometritis diagnosis, examination of uterus after prolonged treatment of chronic endometritis, pyometra or mucometra, than for determination of physiological and pathological changes on the ovaries (observation of the dynamics of follicular cycle, cystic degenerations, CL), early diagnosis of pregnancy, embryonic mortality, twins and determination of foetal sex [12-22]. All these features can improve the fertility of cows and thus minimize cost of production on the farm. Application of ultrasound in everyday veterinary practice could have a major role in reduction of business costs on farms [12, 23]. For example, its continuous application may reduce possible mistakes during rectal palpation of the ovaries. According to the same authors, even excellent clinicians make mistakes in 30-35% of cases of ovarian palpation, and this percentage may increase up to 70% in the cases of identification of pathological conditions. This may lead to a very long period of puerperium at the farm (i.e. more "open days") and to the frequent administration of drugs and hormones. Regular ultrasound on the farm decrease calving period for at least 5%, reduce the number of "open days" and consumption of drugs. Therefore, its use should become a part of farm management and control of health status and productivity of animals. Important advantage of ultrasound lies in the fact that this method is minimally invasive, non traumatic and doesn't last much longer than a normal rectal examination, which depends largely on the experience of the veterinarian [2, 12, 21, 23, 24].

MATERIAL AND METHODS

Animals included in the study: This study was conducted on the family farm with capacity up to seventy animals. During observation 54 cows were located in the facility. Experimental group included 32 cows, of which 26 were of Simmental and 6 of Holstein-Friesian breed. In order to control the puerperium (early detection of possible occurrence of pathological conditions, the precise identification of the oestrus stages and ovulation after calving) and early confirmation of pregnancy, cows were included into continuous monitoring based on the scheme described below. Other cows in the barn served as a control group (12 of Simmental and 10 of Holstein-Friesian breed) which were inseminated only at the invitation of the owner, after observed visible signs of oestrus.

Methodology of monitoring and ultrasound examination in the experimental group: The first examination was performed on the day of calving, followed with appropriate treatment if it was necessary. Another observation was on 7th-9th day post partum, during which dynamics of involution of reproductive organs as well as eventual existence of pathological process (uterine atony, metritis) were determined by gynaecological examination. Third time cows were examined on 20th or 21st day; in addition to routine gynaecological examination, ultrasound were performed with the aim to determine ovarian / follicular activity, to detect the first cycle or possible disturbances (cysts, ovarian atrophy). For ultrasonography we used Tringa Linear Vet scanner (Eurotron, Pia Medical) with a multifreguency linear endorectal probe of 5-8 MHz. Cows were controlled for the fourth time on day 42nd to 45th with routine gynaecological and ultrasound examination to determine the stage of reproductive cycle and expected oestrus. In the case of pathological conditions appropriate therapy was undertaken. Early control of the pregnancy was performed by ultrasound on 28th to 31st day after insemination. In the case of negative findings, cows were inseminated on the appearance of the next oestrus. Health status and condition of animals were monitored during survey.

Data processing was performed using statistical software Statistica v.10 (StatSoft Inc., 2011). The significance of differences between average values established in the experimental and control groups within each breed was determined by Student T-test or Mann-Whitney U-test, depending on data distribution.

Table 1: Average Values of Certain Fertility Indicators in Simmental Cows

Group	indicator	n	mean ± standard deviation	median (min – max)
experimental	insemination index	26	1,69** ± 0,86	1 (1 – 4)
	service period (days)		82,27** ± 39,84	68 (38 – 192)
control	insemination index	12	3,25 ± 1,91	3 (1 – 7)
	service period (days)		155,17 ± 37,67	156,5 (81 – 208)

**Significally lower value (P<0.001) compared to the control group.

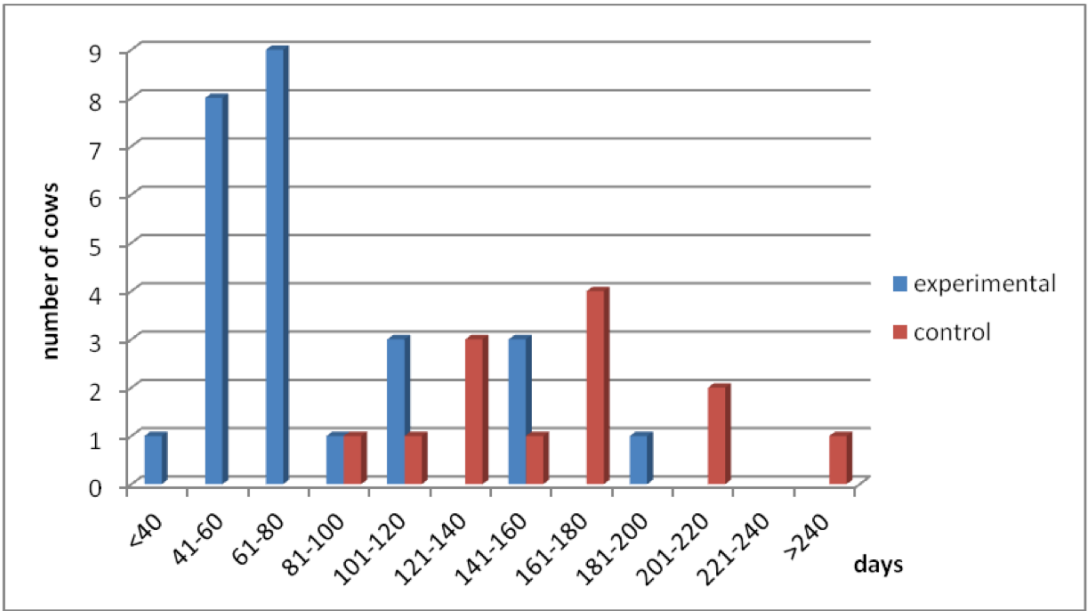

Figure 1: Duration of service period (days) in Simmental cows.

RESULTS AND DISCUSSION

Results for Simmental cows are presented in Table **1** and on Figure **1**.

Table **1** shows mean (± std. dev.) as well as median (minimal – maximal values) of insemination index and service period in Simmental experimental and control groups. As is evident from Table **1**, both insemination index and service period in the experimental group were significally lower (P<0.001). That was expected because control animals were examined (gynaecological) and inseminated on owner's request, after observed signs of oestrus. Furthermore, in the control group greater variability of insemination index was observed, because some of animals needed to be inseminate seven times, while only one cow was inseminated for four times in the experimental group. Greater variability and wide range in duration of service period in experimental cows were caused with a very short period in some of them. Average insemination indexes in study performed by Ivaniš [25] on Simmental cows were 2.4 for females under routine gynaecological control and 2.6 in control group inseminated only at the owner's request. The same author found that average length of service period in the first group was 108.5 days, while in the control it last 121.6 days.

Distribution of animals according to the duration of service period within both groups is shown on Figure **1**.

Regular examination of animals enables precise detection of oestrus and therefore successful insemination which decrease duration of the service period. Thus, the experimental group achieved extraordinary results in field conditions, with service period shorter than 80 days in the most of animals (Figure **1**). On the contrary, in a control group more than 80% of cows had service period longer than 121 days.

Results for Holstein cows are presented in Table **2** and on Figure **2**.

Although the average value of insemination index in the experimental group was lower than in control, this

Table 2: Average Values of Certain Fertility Indicators in Holstein Cows

Group	indicator	n	mean ± standard deviation	median (min – max)
experimental	insemination index	6	2,17 ± 0,75	2 (1 – 3)
	service period (days)		100,67* ± 30,59	92,5 (68 – 151)
control	insemination index	10	3,10 ± 1,91	3 (1 – 6)
	service period (days)		180,30 ± 71,61	202 (57 – 265)

*Significally lower value (P<0.05) compared to the control group.

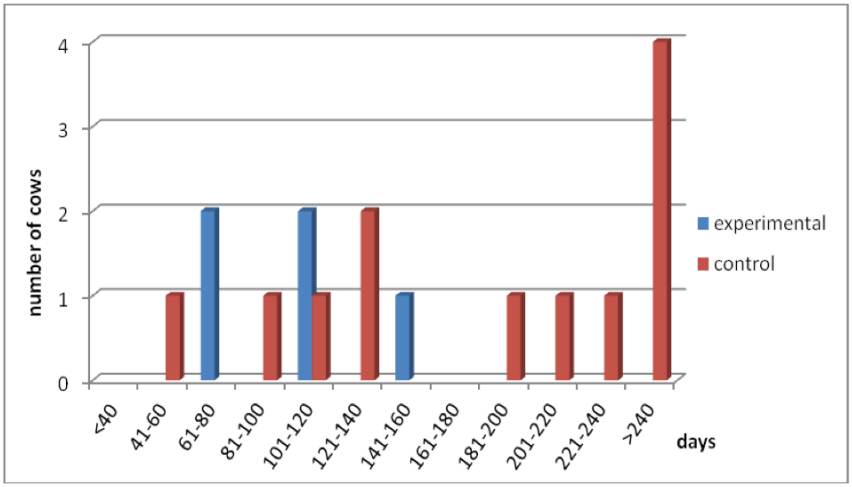

Figure 2: Duration of service period (days) in Holstein cows.

difference wasn't significant. Furthermore, just two cows needed triple insemination for pregnancy in experimental group, while some animals within the control group were inseminated for six or seven times. Duration of service period was significantly shorter ($P<0.05$) in experimental cows. Both indicators of fertility had greater variability and range in the control group of animals.

In the study of Kočila [26] the average insemination index in Holstein-Friesian cows that have established normal cyclical activity during puerperium was 1.8 and duration of service period 119 days, while in the group without cyclic activity they amount 3.6 and 156, respectively. Ivaniš [25] found that average insemination index in the group of Holstein cows under regular control amounts 2.2 and service period 116.1 days, while in animals that were inseminated on the owners request they amount 3.3 and 156.2 days.

In the agreement with findings on the Simmental breed, Holstein-Friesian cows of the experimental group had shorter service period which lasted between 61 and 120 days in majority of animals. On the contrary, it was longer than 121 day in 75% of females within the control group (Figure **2**).

Selection of cows for high milk production decreases their resistance and causes different difficulties in establishing of normal reproductive cycle after calving. High productive cows often show energy deficiency after calving, associated with increased lactation. It contributes to the appearance of pathological conditions or abnormal ovarian activity, to a low percentage of conception and extension of the service period [4, 27-29]. Such animals are usually removed from the herd because of their economic unprofitability caused with reduced reproductive efficiency.

Obtained results indicate that application of ultrasound and regular gynaecological control of cows contribute to better reproductive results i.e. with those methods optimal duration of calving period was achieved (approximately one year in most of Simmental cows and 13 months in Holstein-Friesian breed).

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