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*Original article*

# Comparison of efficacy of Ovsynch protocol to single PGF2α administration in treatment of individual dairy cows with post-service subestrus

**W. Barański, A. Nowicki, S. Zduńczyk**

Department of Animal Reproduction with Clinic,
University of Warmia and Mazury, ul. Oczapowskiego 14, 10-719 Olsztyn, Poland

## Abstract

The aim of this study was to evaluate the efficacy of the Ovsynch protocol in the treatment of post-service subestrus in individual dairy cows compared to a single administration of PGF2α. The study was performed on 517 Polish Friesian Holstein cows with post-service anestrus over four years in 3 dairy herds under a herd health program. Cows (n=240) diagnosed ultrasonographically as non-pregnant and with a mature corpus were treated with a single PGF2α administration and inseminated at detected estrus. Cows without corpus (n=277) were treated with the Ovsynch protocol. The estrus detection rate after $PGF_2$α administration, percentages of cows pregnant after the treatment and at day 260, intervals from parturition to treatment and from treatment to conception and pregnancy loss rates were calculated. The overall percentage of cows pregnant after treatment did not differ between animals treated with the Ovsynch protocol and with PGF2α (38.9% vs. 42.5%; $p>0.05$). In herd A the percentage of cows pregnant after treatment was significantly lower ($p<0.05$) for the Ovsynch group than for the PGF2α group (30.2% vs. 61.2%). In contrast, in herd C the percentage of cows pregnant after treatment was significantly higher ($p<0.05$) in the Ovsych group than in the PGF2α group (39.6% vs. 28.8%). The overall estrus detection rate after administration of PGF2α was 59.6%. However, it was significantly lower ($p<0.05$) in herd C (44.7%) than in herds A (79.6%) and B (76.3%). The overall pregnancy loss rate ranged from 5.1% to 13.3% and did not differ significantly between herds and treatment groups ($p>0.05$). In conclusion, Ovsynch protocol can be a useful alternative for treatment of post-service suboestrus in individual cows in dairy herds with insufficient oestrus detection.

**Key words:** Ovsynch, prostaglandin F2α, post-service, subestrus, cow

Correspondence to: W. Barański, e-mail: wojbar@uwm.edu.pl

## Introduction

Post-service anoestrus is a common problem in dairy cows and is characterized by the lack of typical oestrus expression in non-pregnant cows (Bartlett et al. 1987, Barański et al. 2018). The cows do not return to oestrus after unsuccessful service; they appear pregnant and are late identified as non-pregnant only during pregnancy diagnosis. Post-service anestrus is one of the major factors causing the elongation of the interval from calving to conception. The incidence rate of post-service anoestrus ranges from 20% to 50% (Martinez and Thibier 1984, Nation et al. 2001, Barański et al. 2018). The main reason for post-service anestrus is subestrus, defined as a condition in which the cows are cycling regularly but they are not seen in heat (Bartlett et al. 1987, Barański et al. 2018). The subestrus problem particularly affects high-yielding cows. With increasing milk yield the intensity and duration of heat expression are reduced (Lucy 2001, Lopez et al. 2004, Dobson et al. 2008).

A common treatment for cows with suboestrus is the single administration of prostaglandin F2α (PGF2α) and subsequent artificial insemination (AI) in detected estrus (Stevenson and Pursley 1994, Mwaanga et al. 1999, Mateus et al. 2002, Baryczka et al. 2018). A prerequisite for the efficient treatment with PGF2α is the presence of a sensitive corpus luteum (Plunkett et al. 1984, Seguin et al. 1985, Repasi et al. 2005). A single treatment with PGF2α requires good estrus detection. Most cows with a mature corpus luteum show heat on days 4 to 7 after injection of PGF2α, depending on the stage of follicle development (Plunkett et al. 1984, Seguin et al. 1985).

Alternatively, the Ovsynch protocol can be used to treat subestrous cows without the need for oestrus detection (timed artificial insemination [TAI]). This protocol was developed by Pursley et al. (1995) for synchronization of ovulation and consists of 2 injections of GnRH, 7d before, and 48 h after an injection of PGF2α. The cows are inseminated 16 to 25 h after the second injection of GnRH. In many countries the Ovsynch protocol or a modiefied version has become standard in the dairy industry. In Poland these protocols are predominantly used as a therapy for individual problem cows. The meta-analysis of Rabiee et al. (2005) showed that the conception and pregnancy rates obtained with the Ovsynch program were comparable with the prostaglandin based estrus synchrony programs. However, there are only a few data about the efficacy of the Ovsynch protocol in the treatment of individual suboestrous cows. McDougall (2010) reported that the Ovsynch treatment of cows with post-partum anoestrus under seasonal breeding systems resulted in earlier conception but had no effect on the pregnancy rate. The effectiveness of the Ovsynch protocol in the treatment of post-service anoestrus in individual cows has not yet been studied.

The aim of this study was to compare the efficacy of the Ovsynch protocol to a single administration of $PGF_2\alpha$ in the treatment of post-service suboestrus in individual dairy cows.

## Materials and Methods

The study was performed from January 2012 to December 2015 in 3 dairy herds under a herd health program located in North-East Poland. The herds comprised 660 Polish Holstein Friesian cows (herd A 230 cows, herd B 270 cows and herd C 160 cows) housed in free stall barns bedded with straw. The cows were two- to seven-years old, with an average milk yield of 9000 kg. The cows were fed grass and corn silage, concentrates, and vitamin and mineral supplements. Total mixed ration feeding systems were used. Estrus was observed three times a day. Cows detected in estrus were inseminated by AI technicians. Pregnancy was diagnosed by transrectal ultrasound at days 30-37 after AI using a 5 MHz linear transducer (Honda HS-V 1500). Cows diagnosed as pregnant were re-examined on day 260 after AI using transrectal palpation. Cows (n=240) diagnosed ultrasonographically as non-pregnant and with a mature corpus luteum (> 8 mm in diameter) were treated with $PGF_2\alpha$ (25 mg of dinoprost, Dinolytic, Pfizer, Poland). Cows without the corpus luteum (n=277) were treated with the Ovsynch protocol [day 0, buserelin (0.021 mg, Receptal®, MSD Animal Health, Poland) → day 7, dinoprost (25 mg, Dinolytic®, Zoetis, Poland) → day 9, buserelin (0.021 mg/ml) → day 10, TAI].

The intervals from parturition to treatment, estrus detection rate, percentage of cows pregnant after the treatment and at day 260 and pregnancy loss rate were calculated.

### Statistical analysis

The data were analysed using the chi-squared test and the t-test using GraphPad Prism version 9.00 (GraphPad Software, San Diego, CA, USA). The level of significance was considered as $p<0.05$.

## Results

The average length of the interval from calving to treatment was similar for cows treated with the Ovsynch protocol and $PGF_2\alpha$ ($p>0.05$; Table 1). The overall percentage of cows pregnant after treatment did not differ between animals treated with the Ovsynch

Table 1. Interval from calving to treatment, pregnancy rate and foetal loss rate after treatment of suboestrous cows with Ovsynch protocol or single administration of $PGF_2\alpha$.

| Herd | Treatment | No of cows | Interval from calving to treatment days (mean ±SD) | Oestrus detection rate after single $PGF_2\alpha$ treatment | Pregnant after treatment % (n/n) | Pregnancy loss % (n/n) |
|---|---|---|---|---|---|---|
| Herd A | Ovsynch | 42 | 169.5 ± 67.6 | - | 35.7 (15/42) a | 13.3 (2/15) |
| | PGF2α | 49 | 164.3 ± 51.6 | 79.6 (39/49) a | 61.2 (30/49) b | 6.7 (2/30) |
| Herd B | Ovsynch | 75 | 173.5 ± 44.4 | - | 44.0 (33/75) | 6.1 (2/33) |
| | PGF2α | 59 | 167.7 ± 43.3 | 76.3 (45/59) a | 57.6 (34/59) | 5.1 (3/59) |
| Herd C | Ovsynch | 149 | 166.2 ± 78.1 | - | 39.6 (59/149) | 11.8 (7/59) |
| | PGF2α | 132 | 163.3 ± 72.1 | 44.7 (59/132) b | 29.5 (39/132) | 7.7 (3/39) |
| Overall | Ovsynch | 266 | 169.1 ± 68.1 | - | 40.2 (107/266) | 10.3 (11/107) |
| | PGF2α | 240 | 164.6 ± 61.9 | 59.6 (143/240) | 42.9 (103/240) | 7.8 (8/103) |

protocol and with PGF2α (38.9% vs. 42.5%; $p>0.05$). However, there were large variations among herds. In herd A the percentage of cows pregnant after treatment was significantly lower ($p<0.05$) for the Ovsynch group than for the PGF2α group (30.2% vs. 61.2%). In contrast, in herd C the percentage of cows pregnant after treatment was significantly higher ($p<0.05$) in the Ovsynch group than in the PGF2α group (39.6% vs. 28.8%). The overall estrus detection rate after administration of $PGF_2\alpha$ was 59.6%. However, it was significantly lower ($p<0.05$) in herd C (44.7%) than in herds A (79.6%) and B (76.3%). The overall pregnancy loss rate ranged from 5.1% to 13.3% and did not differ significantly between herds and treatment groups ($p>0.05$).

## Discussion

The Ovsynch protocol may be used to treat subestrous cows (Rhodes et al. 2003, Nowicki et al. 2017). However, the efficacy of the Ovsynch protocol and a single PGF2α administration on reproductive performance in individual cows with post-service anestrus has not yet been compared. Our study showed that the overall percentage of cows pregnant after treatment did not differ between animals treated with the Ovsynch protocol and with a single injection of $PGF_2\alpha$. Similar results are reported when the Ovsynch protocol was compared with single, double or triple $PGF_2\alpha$ injections for oestrus synchronization. Rabiee et al. (2005) evaluated 13 papers containing 17 trials on Ovsynch vs. PGF2α oestrus synchrony programs in the meta-analysis of conception rate and pregnancy rate in lactating dairy cows and showed that the risk of conception and pregnancy rates in the Ovsynch-treated group did not differ from those in the PGF2*α* programs.

However, there was large variation in pregnancy outcomes between herds in our study. In herd A significantly more cows were pregnant after treatment with $PGF_2\alpha$, whereas in herd C more cows were pregnant after treatment with the Ovsynch protocol. This was presumably due to poor estrus detection in herd C, in which the estrus detection rate was significantly lower than in herds A and B. These results indicate that the Ovsynch protocol can be a useful alternative for treatment of post-service subestrus in individual cows in dairy herds with insufficient estrus detection rates, whereas in herds with good estrus detection the use of PGF2α is recommended. It should also be taken into account that the Ovsynch protocol requires three hormonal injections and may be controversial from an animal welfare point of view.

There were no statistically significant differences in the pregnancy loss rates between herds and treatments groups. It seems that estrus induction with PGF2α and synchronization of ovulation with the Ovsynch protocol did not affect pregnancy loss rate, which ranged from 5.1% to 13.3% and was similar to results reported in other studies (Paisley et al. 1978, Forar et al. 1996, Szenci et al. 1998, Barański et al. 2012). Some in vitro studies suggest that hormonal manipulation may cause corpus luteum dysfunction and lead to termination of pregnancy (Pilawski et al. 2008, Skarżyński et al. 2008).

In conclusion, use of the Ovsynch protocol in post-service subestrous cows resulted in similar mean conception rates to first insemination compared with cows treated with a single injection of PGF2α. The treatment with the Ovsynch protocol was more successful in the herd with poor oestrus detection. Thus, the Ovsynch protocol can be a useful alternative for treatment of post-service suboestrus in individual cows in dairy herds with insufficient oestrus detection.

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