Assessment of usefulness of Ovulitral for the improvement of dairy cows fertility effects

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Abstract: Assessment of usefulness of Ovulitral for the improvement of dairy cows fertility effects. Fertility of high producing dairy cows is today a big issue for commercial farm in Europe and all around the world. This study was made on Polish Holstein Friesian cows of Agricultural Experimental Farm Wilanów-Obory (Poland) to evaluate the improvement of fertility permitted by the use of a specific supplementation (Ovulitral) given to the cows just before insemination. This specific dietary supplement is composed of trace elements, vitamins and amino-acids selected to enhance hormonal dialogue and reduce oxidation stress and hence improve fertility of cows. This experimentation has been made from October 2010 to July 2011, the 146 cows of the trial were assigned to a control/test group depending on their characteristics: lactation rank, days from calving, milk yield at peak. These cows were inseminated on natural heat by inseminators and the test group received 100 ml of Ovulitral at the insemination. Pregnancy of cows was validated by scan at 35 days after insemination. Success of insemination is about 48% on the control group versus 65% on Ovulitral group (p < 0.05). That improvement constitutes a significant difference. The improvement of fertility is higher for the cows in 1st and 2nd lactation. It is also interesting to point out that there is no difference of improvement of fertility between the cows inseminated before or after 80 days on the two groups on trial. These results confirm results obtained with Ovulitral on commercial farms in France.

Key words: dairy cows, fertility, dietary supplementation.

INTRODUCTION

New, more and more precious evaluation methods of breeding value and cattle selection together with an improvement of feedstuffs quality, rations composing as well as housing conditions caused a distinct increase of cows’ milk yield in the recent years. In the first place it concerns the farms applying the new feeding and housing technologies and using the achievements of the world’s and national genetics. In many medium and big cow herds the average lactation yield exceeds 10,000 kg demonstrating a growing tendency in subsequent years (Ocena i hodowla bydła mlecznego 2012). Unfortunately, this beneficial tendency of milk yield increase accompany some negative occurrences like cows’ longevity shortening and reproduction effects worsening (Coleman et al. 1985, Bousquet et al. 2004, Krzyżewski et al. 2004). In order to break this tendency, in 2007 a new index “Production-Functionality” was introduced to breeding value evaluation. In the index milk performance traits in 50%, and not in whole as previously, influence its value. In the remaining 50% the index is influenced by functional traits, including the low inherited fertility. This low inherited fertility traits cause a low effec-
tiveness of selection in this range. Therefore farmers are to be inclined to use feeding supplements to the feedstuffs for cows in order to improve the effectiveness of the fertility rate.

In the presented research the influence of the preparation Ovulitral on dairy cows fertility was examined. This special dietary supplementation was created in order to improve the fertility by stimulation of hormonal expression and oxidative stress reduction. An improvement of fertility was proven on comparative experimentation concerning this supplementation made in several farms in France (Chalony and Michel 2009).

To validate the effectiveness of Ovulitral and eliminate the influence of environmental conditions of particular barn, it was decided to conduct the research on a big herd of high yielded cows kept in the equal conditions at the Experimental Station Wilanów-Obory.

Ovulitral is an unique natural feeding addition for dairy cows used just prior the insemination in order to improve the fertility rate and embryo nidation. The superior goal of use of the preparation is oxidative stress reduction by providing the suitable level of vitamin E and methionine. The preparation contains also vitamins A, B1, D3 as well as pro-vitamin β-carotene also influencing the fertility (Girard 1998, LeBlanc et al. 2004, Bulvestre 2007). Moreover it contains amino-acids such as lysine, arginine and tryptophan that are present in GnRH (Gonadotropin Releasing Hormone) (Shaver and Bal 2000, Hugentobler et al. 2007). The optimal distribution of Ovulitral is 100 ml per cow.

MATERIAL AND METHODS
This experimentation was conducted on the dairy farm of Agricultural Experimental Farm Wilanów-Obory (Poland) from October 2010 to July 2011. In this farm, average milk production is about 10,000 kg per cow per year for the 360 cows milked. Cows are kept in 3 free stall barns and divided into 3 groups depending on lactation rank, milk yield and days in lactation. Cows are milked twice daily; milk yield is measured everyday by milking machine. Cows have a total mixed ration distributed daily; composition is described in crude matter for each feed. The ration consisted of the following farm feedstuffs: corn silage (26 kg), lucerne and grass silage (15 kg), siled maize corns (7 kg) and straw (1 kg). These feedstuffs were supplemented (appropriately to the yield) by a concentrate consisting of: soya, rape and wheat meals, fat component, salt and mineral-vitamin compound. The TMR is stable along the period of experimentation, so there is no bias linked to the composition of ration. Results of reproduction are improvable on this herd, the average is about 2.3 straws per pregnancy in 2010, and bulls do the service for cows at more than 4 failed insemination. Average calving-to-calving interval is about 430 days. Inseminations are made by inseminators of the farm after heat detection. Inseminations are usually made after 60 days after calving and average interval between calving and first insemination is about 90 days.

The research was carried out on 146 cows divided into 3 groups created according to the subsequent lactation criterion (the first, second and third). Within
each lactation group 2 subgroups were allocated: cows inseminated until the 80th day after calving and cows inseminated later than on the 80th day after calving. In each group one half constituted the experimental cows receiving Ovulitral, and the second half cows not receiving it.

The repartition was made by the manager of the farm for each cow coming on heat and apt to the reproduction. On test group, the cows were given the quantity of 100 ml of Ovulitral; Ovulitral was distributed in the 4 hours before the insemination. Cows were inseminated randomly with semen of several bulls. There is no bias between semen used on the cows.

Pregnancy diagnosis was performed by ultrasound at 35 days after insemination by the vet of the farm without knowing from which group are the cows (blind test). Data were analyzed using logistic regression with Minitab (MINITAB 2000). Otherwise, Chi-square test was used to evaluate quality of grouping depending on qualitative factors (lactation rank, interval of lactation). T-test was also used to evaluate difference of milk yield at peak and at AI.

The repartition of the 146 cows was well made so that there is no difference between the two groups, as it is established in the Table 1. Cows in trial are primiparous for 35.6%, 37.0% for the 2nd lactation and 27.4% for the 3rd lactation. There is no significant difference between control and experimental groups on this criterion. The average (control and experimental group) milk yield of the cows is about 35 kg at the peak for primiparous and 48 kg for cows in 2nd lactation and 48.4 kg for cows in the 3rd. There is no significant difference of milk production.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Number of cows</th>
<th>Milk yield (kg)</th>
<th>Percentage of cows inseminated before 80 days (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st lactation</td>
<td>Control group</td>
<td>26</td>
<td>35.1 ± 4.7 a</td>
</tr>
<tr>
<td></td>
<td>Experimental group</td>
<td>26</td>
<td>35.1 ± 4.9 a</td>
</tr>
<tr>
<td>2nd lactation</td>
<td>Control group</td>
<td>26</td>
<td>48.5 ± 6.7 b</td>
</tr>
<tr>
<td></td>
<td>Experimental group</td>
<td>26</td>
<td>47.2 ± 7.2 b</td>
</tr>
<tr>
<td>3rd lactation</td>
<td>Control group</td>
<td>28</td>
<td>50.3 ± 8.5 b</td>
</tr>
<tr>
<td></td>
<td>Experimental group</td>
<td>21</td>
<td>46.5 ± 6.7 b</td>
</tr>
</tbody>
</table>

Chi-2 test: 0.91, T-test: NS, × Chi-2 test: 0.01, × Chi-2 test: 0.005, × Chi-2 test: 0.005.

a, b, c – statistical significance at P ≤ 0.05.

TABLE 1. Characteristics of cows in experimentation.
between control and test group. There is no significant difference between control and test group concerning interval between calving and insemination. The figures are proving that the grouping is well balanced between control and test group. Cows in experimentation were inseminated from October 2010 to July 2011; scans for control of gestation were done on the same period. The average date of insemination is similar in the two groups for each lactation rank.

RESULTS AND DISCUSSION

The logistic regression analysis of results is very interesting to class the factor by rank of influence (Table 2). The two preponderant criteria are milk yield at the AI and Ovulitral distribution. These factors have a significant effect with a p-value very closed to 5%. Ovulitral effect is positive for the fertility rate in first AI. In contrary, milk yield has a negative effect on fertility rate. Interval from insemination to calving and lactation rank are not significant in this regression analysis, but these factors are also linked to milk yield.

As the grouping is well balanced, it is possible to analyze the results individually on these criteria. First significant factor is milk yield; fertility rate decreases with milk yield at AI that confirms conclusion of several studies (Mulligan et al. 2007, Balendran et al. 2008). Pregnancy in 1st AI decreases of about 5 percentage points for 5 kg of milk. Hence, the regression indicates a fertility of 70% for cows producing 25 kg per day at the AI, and at 50 kg per day the fertility is about 45%.

The second significant criterion is the Ovulitral distribution (Fig. 1). There are 48% of pregnancies after the 1st insemination on the control group, this result is coherent comparing to results of fertility obtained in fields on Polish Holstein Friesian cows. Results on the Ovulitral group is higher than control group and reach 64.4% of success. This significant improvement of fertility is interesting, with a gap of more than 15 percentage points between the two groups. This evolution is in concordance with results obtained in other trial designed on multiple farms (Piron 2005, Chalony and Michel 2009).

Grouping made for the trial has been proven to be not biased between control and Ovulitral group, so that average can be interpreted directly. But cows on trial have some different characteristics, and results depending on these criteria are also interesting to be studied, even if it is not the major factors.

Lactation rank is a non-significant criterion in the logistic regression, but it is correlated to the milk yield of the cows and usually has a depressive effect on fertility (Balendran et al. 2008). It is interesting to point out that milk yield is also linked to parity of cows, i.e. first lactation cows have a lowest milk yield.

### TABLE 2. Results of logistic regression

<table>
<thead>
<tr>
<th>Factor</th>
<th>Regression coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovulitral</td>
<td>0.65</td>
<td>0.058</td>
</tr>
<tr>
<td>Milk yield at AI</td>
<td>–0.049</td>
<td>0.053</td>
</tr>
<tr>
<td>AI before 80 days after calving</td>
<td>0.278</td>
<td>0.432</td>
</tr>
<tr>
<td>Lactation rank</td>
<td>–0.01</td>
<td>0.979</td>
</tr>
<tr>
<td>Constant</td>
<td>1.658</td>
<td>0.052</td>
</tr>
</tbody>
</table>
Assessment of usefulness of Ovulitral for the improvement of fertility rate

Improvement of fertility rate on 1\textsuperscript{st} and 2\textsuperscript{nd} lactation is very important on Ovulitral group – respectively 31\% and 23\% (Fig. 2). The difference between control and Ovulitral groups is superior to 20 percentage points. Otherwise, on 3\textsuperscript{rd} lactation the result is not interesting.

The interval between calving and insemination is known in bibliography to be important on fertility rate, this criteria is linked to the milk yield (Baldi et al. 2000, Caldwell 2003, Ponsart et al. 2007). On this experimentation, fertility on control group is about 50\% on cows inseminated before 80 days and also on cows after 80 days (Fig. 3). Pregnancy rate after first insemination in control group, amounting to about 50\%, is commonly achieved in majority of herds in Poland (Krzyżewski et al. 2004, Olechnowicz and Jaśkowski 2011). It indicates, that the herd, in which the research was conducted, is a good reference point for Ovulitral effectiveness evaluation. In Ovulitral group, fertility is about 68\% before 80 days after calving, corresponding to an improvement of 18 percentage points of fertility. On cows inseminated

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Results of cows fertility}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Effect of Ovulitral supplementation depending on lactation rank}
\end{figure}
after 80 days, the fertility is at 61% on Ovulitral group, that is a difference of 15 points compared to control group. To resume, there is a huge improvement of fertility on Ovulitral compared to control group.

The date of insemination should have an effect on the fertility, depending on composition of alimentation and luminosity of barns (Roche et al. 2000, Olechnowicz and Jaśkowski 2011). In fact fertility is really stable along the period test within the two groups. Fertility on control group is stable about 40 to 50% of fertility. And on the test group the fertility is about 60 to 70%.

CONCLUSIONS

The results of the experiment indicate on beneficial influence of Ovulitral application at about 4 hours before insemination on cows fertilization effectiveness, especially in the 1st and 2nd lactation. In groups receiving that preparation, comparing to the control group, fertility effectiveness after first insemination significantly increased by 31 percentage points (from 42 to 73) in the 1st lactation and by 23 percentage points (from 54 to 77) in the second lactation. In the 3rd lactation not significant decrease of fertility effectiveness appeared. The obtained results show, that there is real possibility of reproduction effects improvement by use of preparations increasing and intensifying heat symptoms and consequently enhancing fertility effectiveness.

REFERENCES


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Streszczenie: Ocena przydatności Ovulitralu do poprawy efektów rozrodu krów mlecznych. Płodność wysokowydajnych krów mlecznych jest dziś dużym problemem gospodarstw w Europie i na całym świecie. Niniejsze doświadczenie zostało przeprowadzone na krowach o zmniejszonym stresie oksydacyjnym, a w konsekwencji poprawie płodności krów. Doświadczenie przeprowadzono w okresie od października 2010 do lipca 2011 roku. 146 krów doświadczalnych przydzielono do grupy kontrolnej i testowej w zależności od ich charakterystyki,
na którą składały się wydajność laktacyjna, liczba dni po wycieleniu, szczytowa wydajność mleka. Po wykryciu rui, krowy były inseminowane, a grupa doświadczalna otrzymywała dawkę 100 ml preparatu Ovuliral przy inseminacji. Ciąża była oceniana ultrasonograficznie w 35. dniu po inseminacji. Zapłodnialność wynosiła 48% w grupie kontrolnej i 65% w grupie królów otrzymujących preparat Ovuliral (p < 0,05). Poprawa płodności była wyższa u krów w pierwszej i drugiej laktacji. Interesujące jest również to, że nie stwierdzono różnic między krowami inseminowanymi przed i po 80. dniu od wycielenia. Uzyskane wyniki potwierdzają wyniki doświadczenia przeprowadzonego na farmach we Francji.

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