EFFICACY OF OVSYNCH PROTOCOL ON PREGNANCY IN LACTATING DAIRY CATTLE DURING SUMMER SEASON

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SUMMARY

The objective of the present work was to determine the effect of Ovsynch protocol on pregnancy rate in lactating dairy cattle subjected to synchronization of ovulation during summer season.

Induction of ovulation for timed artificial insemination (TAI) with Ovsynch protocol was conducted on forty Holstein Friesian cows from a commercial dairy herd in Alexandria disert road (Dina farm),Egypt during the summer season of 2004.

Animals were assigned to four groups according to lactation number: G I"1st lactation n=13",G II"2nd lactation n=7",G III"3rd lactation n=14" and G IV" 4th lactation n=6" .The mean number of days postpartum (DIM) at the start of treatment was 89.38, 77.28, 90.42and 84.66 for group I, II, III and IV, respectively. The frozen-thawed semen used for AI was of good quality. Pregnancy diagnosis was checked by rectal palpation 45 to 55 d after insemination. The pregnancy rate per AI was defined as the percentage of cows that were confirmed pregnant after one AI.

High pregnancy rate (50%) was recorded for animals in G IV followed by G II and G III (42.85%). Low pregnancy rate (30.7%) was reported in Group I .The overall pregnancy rate was 40% .

From this investigation it could be concluded that synchronization of ovulation with GnRH and PGF2 α provided an effective way to manage reproduction in lactating dairy cattle exposed to heat stress during summer.

INTRODUCTION

Reproductive efficiency is one of the key components of a profitable dairy system. The physiological and environmental stresses of high milk production, inadequate nutrient intake, low body condition and intensive management systems impair reproductive performance in dairy cattle **(Butler, 2000; Thatcher et al., 2000).** Heat stress causes endocrine changes that reduce follicular activity and alter the ovulatory mechanism, leading to a decrease in oocyte and embryo quality. The uterine environment is also modified, reducing the likelihood of embryo implantation. Appetite and dry matter intake are both reduced by heat stress thus prolonging the postpartum period of negative energy balance and increasing days open, particularly in high producing dairy cows **(Rensis and Scaramuzzi ,2003).**

One way to manage the decline in reproductive performance of dairy herds is to apply methods to control follicular dynamics and luteal life span. A flood of new timed insemination protocols has been introduced to the dairy industry since the introduction of Ovsynch in the mid 1990"s. Application of the Ovsynch protocol allows for synchronization of follicular development, luteal regression, and time of ovulation with minimal need for detection of estrus **(Pursley et al., 1995; 1997a ; Pursley et al., 1997b).** It includes a GnRH-prostaglandin F 2 alpha – GnRH treatment. When the females are cycling with a large follicle present at the time of injection, the first Gn-RH injection triggers ovulation and formation of an accessory corpus luteum. At the same time, it reprograms follicle development by initiating the emergence of a new follicular wave. To get full control of ovarian function, the Ovsynch treatment includes a prostaglandin injection 7 days after the first GnRH treatment to time luteal regression(natural and accessory corpora lutea) in all females. Ovulation is timed by the second GnRH administration.

Incorporation of ovulation synchronization in dairy herd reproductive management programs allows producers to minimize labor requirements for estrus detection while improving overall reproductive performance **(Pankowski et al., 1995).**

To achieve maximum precision in ovulation synchrony, it is necessary to have a recently selected dominant follicle present by the completion of the treatment program. New wave emergence needs to be synchronized during treatment, because both the stage of follicular wave and the duration of dominance cause variation in the duration of the follicular phase.

Gonadotropin-releasing hormone has been used to cause predictable new wave emergence in some cattle synchronization protocols, in combination with PGF2 α **(Pursley et al., 1995; 1997a; Pursley et al., 1997b;)**; sheep (**Deligiannis et al., 2005**) and goats (**Holtz et al., 2007**).

Many studies have shown Ovsynch to be a highly effective and economical strategy for improving reproductive performance in high-producing lactating dairy cows **(Burke et al., 1996; Pursley et al. ;1997a , b; Britt and Gaska, 1998).**

The present experiment was conducted to determine the effect of Ovsynch protocol on pregnancy rate and pregnancy loss in lactating dairy cows subjected to synchronization of ovulation during summer season.

MATERIALS AND METHODS

Induction of ovulation for timed artificial insemination (TAI) with Ovsynch protocol was conducted in Egypt on Holstein Friesian cows from a commercial dairy herd in Alexandria disert road (Dina farm) , during the summer season of 2004.

A total of forty Primiparous and pluriparous lactating Holstein dairy cows with good body condition score (≥ 2.5) were housed in free-stall barns and were milked thrice daily. They were fed a total mixed ration (TMR) twice daily throughout the experiment for adlibitum consumption to meet or exceed requirements for a lactating dairy cattle weighing 650 kg and producing an average of 25.24-29.30 kg/d milk with 3.5% **(NRC, 2001).** In addition, animals had free access to salt lick and water.

Animals were assigned to four groups according to lactation number (G I "Ist lactation, n=13",G II "2nd, n=7",G III"3rd, n=14" and G VI" α 4th lactation, n=6")

The mean number of days postpartum (DIM) at the start of treatment was 89.38, 77.28, 90.42 and 84.66 for group I, II, III and IV, respectively.

On day O, all cows were intramuscularly injected (i m) with 125 ug of GnRH (GONA breed, Parnell laboratories "AUST"PTY.Ltd.), followed 7 days later by an i m injection of 25 mg of PGF2 α (Estroplan, Parnell laboratories "AUST"PTY.Ltd.). On day 9, all animals received a second treatment with 125 ug of GnRH. Timed artificial insemination (TAI) was done 16-20 h after the second dose of GnRH treatment **(Fricke et al., 1998).**

The frozen-thawed semen used (10 x 10^6 spermatozoa per straw) for A I was chosen by the herd manager as part of routine management of the herd. Pregnancy diagnosis was checked by rectal palpation 45 to 55 d after insemination. The pregnancy rate per AI was defined as the percentage of cows that were confirmed pregnant (at the single pregnancy diagnosis) after one AI. Statistical analysis of the data was done according **to Snedecor and Cochran (1980)**. Results were expressed as means and their standard errors (SEM).

RESULTS

One category of animals that posed an obstacle in synchronization was cows that had not yet cycled after calving. These cows were termed anestrus because they are not showing estrus yet. The systems currently available that use GnRH appeared to do a reasonable job of inducing a fertile ovulation in these anestrous cows. In the current work, the ovarian cycle was synchronized in all animals and the overall first service pregnancy rate was 40.00% (table 1) after application of Ovsynch protocol. In Group I which had a mean days in (DIM) of 89.38 days and amean milk production of 27.76 kg achieved a low pregnancy rate of 30.7% (table 1 and fig. 1). Meanwhile, G II and G III (cows in the 2nd and 3rd lactation) recorded a higher pregnancy rate (42.85%) than G I (30.70 %), but DIM were 77.28 and 90.42 days for G II and G III, respectively (table, 1).

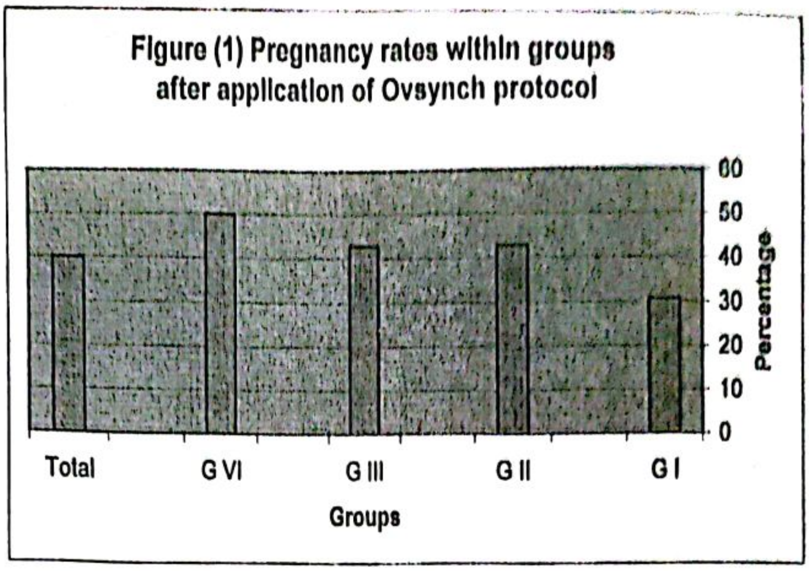
Although G VI "4th lactation" had DIM 84.66 days and milk production, □□ kg , pregnancy after timed artificial insemination (TAI) was the highest (50%) in this group. It recorded 19.3 points higher than G I and 7.15 points higher than G II and G III.

Table (1) Pregnancy rates after synchronization of ovulation and timed artificial insemination (TAI) in different groups of cows under treatment

Groups	No	DIM (Mean ±SE)	MP (Mean ± SE)	Pregnancy rate (%) after TAI
G I 1st lactation	13	89.38 ± 3.62	27.76 ± 1.22	30.70 (4 / 13)
G II 2nd lactation	7	77.28 ± 7.33	26.85 ±2.51	42.85 (3 / 7)
G III 3rd lactation	14	90.42 ± 3.90	25.42 ±1.64	42.85 (6 / 14)
G VI 4th lactation	6	84.66 ± 4.72	26.00 ±2.75	50.00 (3 / 6)
overall	40	85.42 ± 3.6	26.53 ± 1.88	40.00 (16 / 40)

DIM = days in milk

MP = milk production (kg).



DISCUSSION

Efficient reproduction is a cornerstone to profitable dairy production.The Ovsynch / TAI protocol (a non steroidal) is a recent advance in reproductive biology that has been recommended to improve reproduction of lactating dairy cows.

The Ovsynch protocol provided a very predictable time of AI after the start of treatment. Ovsynch could benefit dairy operations because it allows for timed AI of lactating cows without detection of estrus. The stage of estrous cycle at the initiation of an Ovsynch protocol had no significant effect on the size of the ovulatory follicle and conception rate (**Wittke et al.,3003**). From the present work, synchronization of ovulation with GnRH and PGF2α resulted in a pregnancy rate of 40% for the treatment groups.

Results of the current work recorded that groups differed in overall pregnancy rates [Group I = 30.7%. Group II = 42.85%, Group III =42.85% and 50% for Group VI]. However, pregnancy rate was greater for Group VI than for the other three Groups. It may be attributed to the size of the ovulatory follicle, which is related to the stage of the estrous cycle and follicular wave development that may also play a role in fertility. In addition, insemination may occur closer to the time of ovulation **(Pursley et al., 1998).** Moreover, greater concentrations of serum progesterone during the period before PGF2α injection were reported to improve fertility of lactating dairy cows that were subsequently inseminated (Folman et al., 1990 ; Rosenberg et al., 1990).

In the present work, first-lactation cows tended to have lower pregnancy rates than older (n = 6) cows (30.70% vs. 50.00%). In the contrary, other studies (El-Zarkouny et al., 2004 ; Tenhagen et al., 2004) reported that first-lactation cows were to be more fertile at first AI than older cows which may have a greater incidence of metabolic and reproductive problems that may reduce their pregnancy outcomes when inseminated as a part of the Ovsynch protocol. However, **Lamb et al.**, (2001) observed that parity did not have any significant influence on reproductive performance parameters after synchronization of ovulation.

Regarding Group II and III ," 2nd and 3rd lactation " , the pregnancy rates were similer (42.85%) for each (table 1 and Fig. 1). Several and similar reasons may account for this result : 1) cows in both groups were at the most favorable stages of the estrous cycle at initiation of Ovsynch , 2) increased proportion of cows showing estrus near 72 h after PGF2α injection , 3) a positive effect of the second injection of GnRH given at 48 h after PGF2α when animals were near the onset of estrus, and 4) a greater maturity of the ovulatory follicle and oocyte at the time of ovulation .These observations are in good agreement with data previously published in cattle (**Lucy and Stevenson, 1986; Mee et al., 1993 ; Kaim et al., 2003**). Administration of GnRH, near or right at the onset of a spontaneous LH surge, produced an LH surge of greater magnitude or induced a small secondary LH surge (**Lucy and Stevenson, 1986**), thus decreasing the time from estrus to ovulation and generally improving conception rates (**Lucy and Stevenson, 1986; Kaim et al., 2003**),

In the current study neither days in milk nor milk production had a significant impact on pregnancy rates in the different groups of animals. Such a finding fits with other reports (**Tenhagen et al., 2003**) describing that the stage of lactation, but not milk production level, has a major influence on conception rates after TAI.. **Pursley et al., (1997b ; 1998)** reported that cows receiving TAI early postpartum (<75 DIM) had a lower PR/AI than cows receiving TAI later during lactation.

Ovsynch program applied in the present work may be effective in improving pregnancy rates and would be able to provide a very predictable time of AI after the start of treatment (**Stevenson et al., 1996; Alnimer et al., 2002**).

The goal to obtain 40% pregnancy rate (table,1 and fig. 1) within groups of animals under Ovsynch experiment that exposed to elevated ambient temperature during summer were considered good results which coincided with results previously obtained by **Tenhagen et al.,(2003).** The timed insemination program (Ovsynch) did improve group reproductive performance during summer heat stress. Moreover, pregnancy rates were greater after Ovsynch (timed AI) than after detected estrus for dairy cows exposed to elevated ambient temperatures (**Cartmill et al., 2001**)

From this investigation it could be concluded that breeding to a synchronized ovulation would allow more control in AI programs and would remove dependence on estrus detection before AI during summer season. Potentially, the need for detection of estrus could be eliminated from a reproductive management program. Thus, synchronization of ovulation with GnRH and PGF2α provided an effective way to manage reproduction in lactating dairy cattle in Egypt exposed to heat stress during summer.

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كفاءة نظام الأوفسينك على العشر فى الأبقار الحلوب خلال موسم الصيف

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الملخص العربى

كان الهدف من هذه الدراسة هو تحديد تأثير نظام التبويض الموحد على معدل العشر فى الأبقار الحلوبة وذلك خلال موسم الصيف.أجريت تجربة توحيد التبويض مع توحيد ميعاد التلقيح دون النظر الى حدوث علامات شبق وذلك على عدد أربعون بقرة فريزيان هولشتاين لقطيع حلاب بطريق الاسكندرية الصحراوى (مزرعة دينا) مصر وذلك خلال موسم صيف ٢٠٠٤

وزعت الأبقار الى أربعة مجموعات وذلك حسب موسم الحليب وكانت مجموعة رقمI" موسم حليب أول" وعددها ١٣ بقره، مجموعه رقم II "موسم حليب ثانى" وعددها ٧ أبقار،مجموعه رقم III "موسم حليب ثالث" وعدها ١٤ بقره ومجموعه رقم VI "موسم حليب رابع او اكثر" وعددها ٦ أبقار.

بلغ متوسط أيام الحليب لكل مجموعة بعد الولادة وحتى بداية التجربة ٨٩ ، ٧٧,٢٨ ، ٩٠,٤٢ ، ٨٤,٦٦ يوما وذلك للمجموعات I، II، III، VI على الترتيب والتوالي هذا وكان السائل المنوى المجمد المستخدم فى التلقيح الإصطناعى ذو جودة عالية وتم استخدامه حسب نظام وادارة المزرعة المتبع فيها وتم تشخيص العشر بطريقة الجس من خلال المستقيم للأبقار التى مضى على تلقيحها ٤٥ الى ٥٥ يوما .وحدد معدل العشر على انه نسبة الأبقار التى تم تأكيدعشارها بعد تلقيحة واحده.

على الرغم من أن المجموعة الرابعة والتى سجلت متوسط أيام حليب منذ الولادة حتى بداية التجربة بلغ ٨٤,٦٦ كجم ومتوسط انتاج حليب مقداره ٢٦ كجم إلا أن معدل العشر بها قد بلغ نسبة ٥٠% تلى ذلك المجموعتين الثانية والثالثة وبنسبة٤٢,٨٥ % لكل منهما بينما كان أقل معدل عشر (٣٠,٧%) تم تسجيله فى المجموعة الأولى هذا وقد بلغ المتوسط الكلىللعشار لكل المجموعات ٤٠%.

ويستخلص من هذه التجربة أن استخدام نظام توحيد التبويض والتلقيح فى ميعاد ثابت سوف يسمح بمزيد من التحكم فى برامج التلقيح دون الإعتماد على الحيوانات التى يظهرعليها علامات شبق خلال فصل الصيف وعليه فإن توحيد التبويض باستخدام GnRH والبروستاجلاندين يحسن من الكفاءة التناسلية للقطعان الحلابة التى تتعرض للإجهاد الحرارى خلال الصيف.