Effect of Gonadotropin-Releasing Factor (GnRH) and Antioxidants on the Rate of Estrous Repetition Dairy Cows

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Abstract: The aim of this study was to assess the effect of the administration of a gonadotrophin-releasing factor (GnRH) and antioxidants (vitamin E and selenium) on the rate of repetitions of estrous behavior in dairy cows with and without a history of reproductive problems. The work was conducted in an female Production Unit (APU) of dairy cattle in the State of Mexico, 300 females in production were used. The study was divided into six lots of 50 animals each. Lot A with GnRH: A1 without repetitions and A2 with repetitions. Lot B with antioxidants: B1 without repetitions and B2 with repetitions. Lot C with GnRH + antioxidants: C1 without repetitions and C2 with repetitions. The results were as follows: In lot A1 without GnRH, 49 animals were diagnosed as pregnant and remaining as repeater during rectal palpation 21-24 days after insemination. In lot A2 with GnRH, only 1cow was diagnosed pregnant and the remaining 49 repeated estrous. In lot B1 without Antioxidants, 24 animals were diagnosed as pregnant and 26 repeated estrous. In lot B2 with Antioxidants, 26 females were diagnosed pregnant and the remaining 24 repeaters. In lot C1 without GnRH + Antioxidants, 24 females were diagnosed as pregnant and 26 repeated estrous. In lot C2 with Antioxidants + GnRH), 49 were diagnosed as pregnant cows and 1 repeated estrous. At the end of the experiment, the 300 cows represented 100%, 173 were pregnant which is equivalent to 58% and the remaining 127, repeated estrous to 21 days equivalent to 42%. Shows that treatment based on GnRH + Antioxidants, had better results than using the individual treatments. In the following figure shows the % of cows with repetitive 3 treatments, treatment with antioxidants obtained the highest number of repeaters cows. In conclusion, treatment with GnRH in cows with no history of reproductive problems, was the best, with a result of 98% (49 females lot A1), the same value was obtained from treatment with GnRH and antioxidants in cows with a history of reproductive problems (49 females lot C2), which was the best treatment to reduce the rate of cows with estrous repetition.

Key words: Gonadotropin-realising factor, antioxidants, repetition of estrous behavior, dairy cows.

INTRODUCTION

Reproductive problems of repetitions estrous, is considered the second largest breeding after postpartum an estrous in the female Production Unit of dairy cattle, both of which have been identified as major causes that determine a low reproductive efficiency (Palomares-Nevada, 2005).
Characteristics of cows with reproductive problems, are as follows: estrous returned to service after a third unsuccessful (not achieved conception after 3 or more services) between normal display, no evidence of abnormalities in the genital organs, detected by rectal palpation (Cavazos, 2006).

Reproductive efficiency is one of the main factors affecting the dairy cattle production, including the physiological and environmental conditions, inadequate nutrient intake, low body condition, and intensity of management systems (Butler, 2000; Thatcher et al., 2000). One of the main limiting factors for reproductive function in many farms, is detection of estrous. The rates of detection of estrous in dairy herds are usually low, approximately below 50% (Rodastis et al., 1994; Quaife, 1995).

The low fertility is related to metabolic imbalances, as the high-producing dairy cows, is generally maintained in negative energy balance during the first 70-80 days postpartum. This condition affects the pulsatile LH secretion, follicular development, corpus luteum function and possibly the characteristics of the oocyte, which could potentially be related to low fertility in farms (Cavazos, 2006; Morales, 2000).

Fertility in the postpartum period, is negatively influenced by the incidence of anoestrous, absence of estrous behavior, which may be an indication of conditions such as inadequate nutrition peripartal or chronic pathological conditions such as uterine and ovarian disease (Peter and Vos, 2009).

Studies on gonadotropins release factor, open the possibility of using them in the early post-partum to induce ovulation and first estrous, increase the synchrony of ovulation, and reduce the risk of repeating luteolytic mechanism in cows. However, the response has been very variable and different outcomes (Hernández, 2006; Hernández-Cerón et al., 2006).

Selenium (Se) is present in all body tissues. The physiological functions of selenium, in particular, are mediated by selenoproteins, glutathione peroxidase (GSH-Px1-4) are among the most important selenoproteins, whose main function coincides with its antioxidant effect. Deiodinasa supplementation is another important selenoprotein. This enzyme regulates the thyroxine (T4) converting biologically active 3,3',5'-pentabromodiphenyl - triiodothyronine (T3) or reverse triiodothyronine (rT3) (Pavlata and Pechova, 2004).

It plays an important role in the functional integrity of the reproductive tract, thyroid function and normal function of the immune system of cattle. To compensate the nutritional deficiency of Se, using supplementation with this mineral, thereby allowing the variables to optimize production, fertility and give greater protection to females against infectious diseases. It plays an important role in the functional integrity of reproductive tract, thyroid function and normal function of the immune system of females (Leyan et al., 2004).

The best known role of vitamin E is its antioxidant activity, which contributes to the stabilization of the fatty acids susceptible to oxidation in cell metabolism. The lipid peroxidation catalyzed by free radicals in a continuous biological process that causes lesions in the cellular structures. Vitamin E itself, along with selenium can inhibit these processes. Regarding the immune system, cells of the immune system and phagocytic, which proliferate rapidly after stimulation are particularly susceptible to injuries caused by free radicals, peroxides and superoxide (Weber, 1995).

Therefore, the central role of vitamin E in improving the immune response and phagocytosis is the prevention of lipid peroxidation of cell membranes. Vitamin E also appears to participate in the conversion of arachidonic acid into prostaglandins. Such compounds play an important regulatory role in biological processes, including immune response (Weber, 1995).

Vitamin E and Se, are essential to protect the female body from damage caused by the production of harmful or toxic metabolites. These two micronutrients are necessary and responsible for the maintenance and integrity of cell walls and membranes in the tissues (Ricciardino, 1993).

The aim of this study was to assess the effect of administration of gonadotropin-releasing factor (GnRH) and antioxidants (Selenium and vitamin E) on the rate of recurrence of estrous behavior in dairy cows with and without a history of reproductive problems.

**MATERIAL AND METHODS**

300 lactating females with a similar body condition were used. We selected 150 of these females from those that their records showed three or more repetitions of estrous, the remaining 150 did not show this feature in their records.

The study is organized as follows:

Lot A, got treatment with Factor Liberation Gonadotropins (GnRH).
A1 with three or more repetitions of estrous and,
A2 with no history of previous alterations of estrous behavior.
Lot B, treatment with antioxidants (vitamin E and selenium).
B1 with three or more repetitions of estrous and B2 with no history of previous alterations of estrous behavior. Lot C, treatment of gonadotropin release factors (GnRH) and antioxidants (vitamin E and selenium). C1 with three or more repetitions of estrous and C2 with no history of previous alterations of estrous behavior. The study was held approximately two months. A lot of each female was treated with 0.0084 mg GnRH intramuscularly and females in the control group B were treated with 50 mg of Vitamin E and Selenium intramuscularly. Each female of lot C, was treated with 0.0084 mg intramuscular injection of GnRH and 50 mg of Vitamin E and Selenium intramuscularly. All females were inseminated after detection of estrous by direct observation.

Results:
The results were:

In lot A1 without GnRH, 49 females were diagnosed as pregnant and remaining as repeater during the rectal palpation 21-24 days after insemination.

In lot A2 with GnRH, only 1 was diagnosed pregnant female and the remaining four repeated estrous (Figure 1).

In lot B1 without antioxidants, 24 females were diagnosed as pregnant and 26 repeated estrous.

In lot B2 with antioxidants, 26 females were diagnosed pregnant and the remaining 24 repeaters (Figure 2).

In lot C1 without GnRH + Antioxidants, 24 females were diagnosed as pregnant, while 26 females as repeaters.

In lot C2 with Antioxidants + GnRH), 49 were diagnosed as pregnant cows and 1 repeated estrous (Figure 3).

At the end of this work, the 300 cows represent 100%, 173 were pregnant which is equivalent to 58% and the remaining 127, repeated estrous to 21 days equivalent to 42% of the total (Figure 4).

This graph shows that combination treatment based on GnRH + Antioxidants, had better results than using the individual treatments (Figure 5).

In the following figure shows the % of cows with repetitive 3 treatments, with the result that the treatment with antioxidants obtained the highest number of repeaters cows (Figure 6).

![Fig. 1: Number of pregnant cows and repetitive with GnRH treatment.](image1)

![Fig. 2: Number of pregnant cows and repeaters with antioxidants treatment.](image2)
Fig. 3: Number of pregnant cows and repeater with GnRH + antioxidants treatment.

Fig. 4: % of pregnant cows and repeaters.

Fig. 5: % of pregnant cows with the 3 treatments.
Fig. 6: % of estrous repeat of cows with the 3 treatments.

Discussion:
The repeater cow syndrome is a problem that currently affects dairy cattle farms, reducing the reproductive performance of females and causing major economic losses.

According to Hernández (2006), in Mexico for 30 years, over 50% of pregnant cows were served, but now the incidence is less than 40% in this work were 58% of pregnant cows.

We got 42% of repeaters as indicated by Palomares-Naveda (2005), whose information indicates that the optimum percentage of replications should be between 10 and 15%, in contrast to a study by Cavazos (2) who reported a normal level between 15 and 16% of replicates.

Cutaia (2006) used GnRH treatment in cows and won a relay of 40 to 45% of gestation, in contrast to another study by Hernandez who indicated a 31%, using a GnRH treatment in repetitive cows, but in studies by Hernández et al. (2005), did not find any results in the percentage of cows and reduced fertility repeaters, while in the present work, 31% was obtained using the same treatment.

In this work, we obtained 35% of cows using repeaters antioxidants that percentage is lower than the indicated by McClure (McClure, 1994) who obtained a 60 to 70% of repeating cows.

In this work, we found that cows with a repetition rate of conception were similar to cows repeating, 50%, respectively, which reflects a problem of infertility compared with the group traditionally known as infertile cows. Agreement as indicated by Morales (Morales, 2000), is likely to be served when the majority of cows had at least two previous estrous cycles. It looks like that the low fertility during the first service, is related to metabolic imbalances, as the high-producing cows are usually kept in negative energy balance among the first 70 to 80 days postpartum. This condition affects the pulsatile LH secretion, follicular development, corpus luteum function and possibly the characteristics of the oocyte, which could potentially determine the low fertility to first service. In this study, cows were inseminated 12 hours after detection of estrous, it was not determined but the energy balance, of many of them probably was still in negative energy balance, thus the low fertility could be explained by this condition. Fertility in cows in this study was 58%, is in contrast to the first service of cows (50%) repeaters and cows (50%), this is because the cows are not exposed, among other factors, to metabolic changes imposed by high milk production, associated with nutritional factors.

In conclusion, treatment with GnRH in cows with no history of reproductive problems, was the best one, with a result of 98% (49 females from lot A1), the same value was obtained from treatment with GnRH and antioxidants in cows with a history of reproductive problems (49 females from lot C2), which was the best treatment to reduce the rate of cows with estrous behavior repetition.

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