COMPARATIVE TREATMENTS OF ANESTROUS BALADY COWS USING PGF$_2\alpha$ AND/OR PMSG WITH SPECIAL REFERENCE TO SOME BIOCHEMICAL CHANGES AND CONSEQUENT FERTILITY

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ABSTRACT

A total number of 60 anestrous balady cows, divided into two main groups according to the ovarian findings (30 with persistent CL and 30 with smooth inactive ovaries). Each main group was divided into 3 subgroups according to the hormonal treatment used. The first one, injected with 25 mg PGF$_2\alpha$ (Lutalyse) two doses 11 days a part. The second subgroup injected with 0.25 mg PMSG (Folligon) and the third injected with 25 mg PGF$_2\alpha$ (Lutalyse) plus 0.25 mg PMSG (Folligon). Estimation of serum progesterone, concentration, estradiol 17-B, thyroid hormones ($T_3$ and $T_4$) and some serum biochemical constituents as inorganic phosphorus, total cholesterol, glucose and total protein concentrations were performed for all animals before and at the appearance of heat signs. The obtained results revealed that, balady cows with persistent CL showed a highly significant decrease in serum progesterone and glucose level after all hormonal treatment. However, a highly significant increase in of estradiol -17β, $T_3$, $T_4$, inorganic phosphorus and total cholesterol concentrations were observed after treatments with PGF$_2\alpha$ and/or PMSG. On the other hand, there was a significant increase in serum total protein level after treatment with PGF$_2\alpha$, PMSG alone and PGF$_2\alpha$ plus PMSG. Concerning the cow with smooth inactive ovaries, there were highly significant increase in level of serum progesterone and Estradiol -17β after all regimes used. There were highly significant increase in levels of serum $T_3$, $T_4$, were noticed. Whereas, serum total cholesterol and glucose were highly significantly decreased after all regimes. The values of serum inorganic phosphorus showed a highly significant increase after treatment with PGF$_2\alpha$ alone and PGF$_2\alpha$ plus PMSG. Moreover non significant increase in values of serum inorganic phosphorus observed after treatment with PMSG alone. The mean value of serum total protein level showed a significant increase after treatment with PGF$_2\alpha$ alone and PMSG alone. Besides, there was a highly significant increase in the level of total protein after treatment with PGF$_2\alpha$ plus PMSG.
The present study revealed also that, higher percent of conception rate (70% and 60%) after 1.5 ± 0.22 and 1.9 ± 0.21 number of services recorded in animals treated with PGF₂α plus PMSG from both main groups having persistent CL and smooth inactive ovaries respectively. It could be concluded that injection of PGF₂α followed by PMSG 3 days later might give higher conception rate and lower number of services per conception in baldy cows with persistent CL and smooth inactive ovaries.

Key words: PGF₂α, PMSG, Anestrous, Baldy cows, CL Hormonal and Biochemical changes; Conception rate.

INTRODUCTION

The problem of infertility in apparently healthy balady cows did not receive the desired attention. Various hormonal treatments were used to improve fertility such as GnRH (Qayum et al., 1991); PGF₂α (Abdel-Latif, 1993 and Sosa, 1994); and exogenous estrogen (Zaabel et al., 1995a). The efficiency of the reproductive process usually controlled by hereditary and environmental factors (Hafez, 1993) and dynamic activity of thyroid gland (Afify et al., 1970).

Administration of PGF₂α results in the increase of adrenal steroid plasma level and antagonizes some insulin effects (Deaver et al., 1986). Thyroid hormones increase the basal metabolic rate by increasing oxygen consumption (Kachans and Romson, 1989).

So, the present work was designed to study the effect of some medicaments on the level of ovarian and thyroid hormones in addition to some serum biochemical constituents of anestrous balady cow heifers before and after treatments with different hormones which may helpful in improving the reproductive efficiency of animals.

MATERIALS AND METHODS

This study was carried out on 60 anestrous balady cows (3-6 years) on the village system in Kalubia province. All animals showed anestrous from the onset of puberty. Complete gynaecological examination has been carried out two times 10 days in between before the start of experiments. Animals were classified into two main groups according to the rectal finding on the ovaries (30 with persistent CL and 30 with smooth inactive ovaries). Repeated rectal examination were performed to detect the persistence of CL. High values of progesterone were confirmed the rectal examination. Animals in each group were classified into 3 subgroups according to the drug used as follows:

Subgroup I: 10 cows injected l/m with 25 mg PGF₂α (Lutalyse)* and repeated injection after 11 days in animals which not came in estrus.

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Subgroup II: 10 cows injected i.m with 0.25 mg PMSG (Folligon)**
Subgroup III: 10 cows injected i.m with 25 mg PGF₂α (Lutalyse)* and after 5
days, the non responded heifers injected with 0.25 mg PMSG (Folligon)*

Gynaecological examination and close observation have been carried
daily after treatment to follow-up the effect of the drugs on heat response and
conception rate. Pregnancy was diagnosed by rectal palpation 60 days after
service. Blood samples were collected from all animals from the jugular vein
immediately before treatment and at the onset of heat signs. Serum was separated
by centrifugation at 3000 r.p.m for 10 minutes and stored at -20°C until
analyzed for Progesterone, Estriol -17β, T₃, and T₄. In addition some blood
biochemical constituents as serum inorganic phosphorus, total cholesterol,
glucose and total proteins were determined. Serum progesterone and Estradiol-
17β concentration were estimated by radio immuno assay (RIA) using
commercial kits, provided by diagnostic products corporation, Los-angeles,
USA, according to Kubosik (1984) and Xing et al., (1983) respectively. Serum
T₃ (Tri-iodothyronine) and T₄ (Thyroxine) concentrations were determined also
by RIA with a commercially available kits (Diagnostic products corporation,
Los-angales, Cat. No., TKT31 and TKT41) for T₃ and T₄, respectively. Serum
inorganic phosphorus, total cholesterol, glucose and total proteins were
determined colorimetrically according to the methods of Wootton, (1982), Zak
et al., (1954), Trinder, (1969) and Weichselbaum (1946), respectively. Data
were statistically analysed according to Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

The effect of hormonal treatments on ovarian hormones, thyroid
hormones and some serum biochemical constituents in relation to reproductive
efficiency in anestrus balady cows (with persistent CL or smooth inactive
ovaries) were shown in table (1). The present results revealed that, there was a
sharp decrease in serum progesterone level in cows with persistent CL in all
treated groups (Table 1 and Fig. 1). These findings were in agreement with those
reported by Singh et al., (1979) who found a sharp fall in peroxide level
after treatment of subestrus buffaloes with PGF₂α. The decreased peroxide
level after treatment with PGF₂α might be attributed to the luteolytic effect of
PGF₂α on CL. These results confirmed by Fogwell et al., (1978); and Sosa,
(1994). Moreover, decreased progesterone level after PMSG treatment might be
attributed to the effect of FSH on estrus induction (Qayum et al., 1991). On the
other hand the mean values of serum progesterone level were significantly
increased after different treatments in animals with static (smooth inactive)
ovaries. These findings supported by Essawy (1987), who found that, small
elevation in progesterone concentration was noticed in buffaloes before ovulation, these elevations were originated from adrenal gland and/or luteinized follicles.

Regarding serum estradiol-17β level, the obtained data (Table 1 and Fig. 2) revealed a highly significant increase of serum estradiol-17β after treatment with PGF2α and/or PMSG in cows with persistent CL and smooth inactive ovaries. These results agreed well with that of Zaabel et al., (1995a) who reported that, estradiol-17β level showed a highly significant increase after treatment with PGF2α plus Gn-RH and Gn-RH alone in heifers with and without CL, respectively. Moreover, Pandey et al., (1982) stated that, treatment of buffaloes with PGF2α brings about abrupt release of estradiol within one day of injection. The elevation of serum estradiol -17β after treatment with PGF2α and/or PMSG might be due to a direct effect of these drugs on the ovarian estrogen biosynthesis (Qayum et al., 1991).

A significant increase in serum T3 level after treatment with PGF2α and/or PMSG in animals with persistent CL and with smooth inactive ovaries and/or PMSG in animals with persistent CL and with smooth inactive ovaries (Table 1 and Fig. 3). These results were nearly similar to those reported by Zaabel et al., (1995b) who observed a significant increase in serum T3 level after treatment with PGF2α and PGF2α plus oestradiol benzoate therapy in buffalo cows with and without palpable CL. Moreover Ibrahim et al., (1990) reported that, the serum T3 concentration was increased significantly after injection of anestrous buffalo cows with 25mg PGF2α. The higher levels of serum T3 might be attributed to the stimulatory effect of PGF2α on gonadotrophins secretion, steroid production by the adrenals and insulin release (Johnson et al., 1973).

Regarding serum T4 level (Table 1 and Fig. 4), there was a highly significant increase in their level after treatment with PGF2α and/or PMSG in both groups. These results agreed well with that recorded by Zaabel et al., (1995b). The increased level of serum T4 at the onset of estrus might be due to increased estrogen level at this period, as estrogen stimulated thyroid gland activity by direct action without the intervention of pituitary gland (Kumar et al., 1991) and Megahed et al., (1995). On the other hand, Kesler et al., (1981) reported no changes in thyroid hormones concentrations during estrous cycle.

The serum inorganic phosphorus levels showed a highly significant increase after treatment with PGF2α alone and PGF2α plus PMSG in cows with persistent CL and smooth inactive ovaries (Table 1 and Fig. 5). Whereas, a non significant increase in the level of serum inorganic phosphorus was recorded after treatment with PMSG in cows with static ovaries. The increase in serum inorganic phosphorus level after PMSG treatment was closely similar to that reported by Samy (1991) who stated that, the serum inorganic phosphorus showed a non significant increase at 5th and 15th days, followed by a significant increase at 20th and 30th after treatment with Gn-RH. The author attributed the
higher values of serum inorganic phosphorous levels during that time to the metabolic effect of Gn-RH on the anterior pituitary and stimulation of FSH and LH secretion which may also have an indirect role in the activation of some enzymes necessary for phosphorus absorption from the intestine. In contrary, Hussein, et al., (1994) recorded that, injection of buffaloes with Gn-RH significantly decreased serum inorganic phosphorus. Which might be attributed to the time of sampling and/or nutritional status of the animals and potency of drugs. On the other hand, Dhoble and Gupta (1987) and El-Nour (1996) found that, the level of inorganic phosphorus did not have a relationship to the clinical response following administration of Gn-RH and PGF₂α.

The present results revealed that there was a highly significant increase in total cholesterol level after treatment with PGF₂α and/or PMSG in cows with persistent CL and significant decrease in these parameters in animals with smooth ovaries (Table 1 and Fig. 6). A non significant increase in serum total cholesterol level was noticed after treatment with Gn-RH and PGF₂α in buffaloes suffering from ovarian inactivity (Samy, 1991 and Abdel-Latif, 1993). The increase in serum total cholesterol level after treatment with PGF₂α might be attributed to increased endogenous biosynthesis of cholesterol in endocrine gland tissue from acetate (Purohit and Kohli, 1977). Whereas, decrease in serum total cholesterol level in heifers without CL after treatment with PGF₂α alone may be due to increase metabolic activity of animals under the effect of oestrogen hormone and hyperthyroidism (Glomset and Williams, 1968).

The obtained data (Table 1 and Fig. 7) indicated that there was a highly significant decrease in serum glucose concentration of infertile animals with persistent CL and smooth inactive ovaries after different hormonal treatments. There results agreed well with those obtained by Abdel-Latif (1993) who recorded that, the serum glucose levels was significantly decreased in PGF₂α treated heifers with and without palpable CL. Similarly, El-Nour (1996) reported that, serum glucose level was decreased during both follicular and luteal phases of ewes synchronized with PGF₂α. Although the decrease in serum glucose level still within the normal range, this decrease might be due to the effect of PGF₂α which cause stimulation of insulin release and have some insulin like effects on carbohydrate metabolism (Goodman and Gilman, 1980), and the uterine cells became more permeable for glucose during estrus (El-Baghady, 1984). In contrary, El-Shawaf (1984) found that, serum glucose level was significantly higher during follicular phase than in the luteal one in buffaloes.

Concerning serum total protein (Table 1 and Fig. 8) revealed that, there was a highly significant increase in its level after treatment with PGF₂α plus PMSG in cows with persistent CL and smooth inactive ovaries and after treatment with PMSG alone in animals with persistent CL. Whereas, a significant
increase in serum total protein level was noticed after treatment with PGF-
alone in heifers with persistent CL and static ovaries. These results agreed well
with that reported by Abdel-Latif (1983) who observed that, injection of PGF-
caused significant increase in serum total protein level in aurole buffalo cows.
The increase of serum total protein might be due to the anabolic action of
The increase of serum total protein might be due to the anabolic action of
estrogens during estrus that favour the protein synthesis and retention of
heterogeneous substances in the tissues.

Concerning the clinical reproductive efficiency the highest conception rate
(70% and 60%) with lowest number of services per conception (1.6 ± 0.22 and
1.9 ± 0.23) was exhibited after treatment with PGF-2α plus PMSG in both cows
with persistent CL and smooth inactive (static) ovaries (Table 2 and Fig. 9). Our
results were higher than that obtained by Graves et al. (1974) who found the
pregnancy rate of anestrous cows was 28.2% after PGF-2α plus Gn-RH
The conception rate was 60% in animals with persistent CL which
and Eissa et al. (1990). The treatment with PMSG exhibited 50% and 40%
conception rate after 2.3 ± 0.26 and 3.0 ± 0.26 number of services per
cow with static ovaries and persistent CL respectively. These
results disagreed with Lee et al. (1983) who cited that the conception rate of
heifers treated with GnRH at first breeding did not differ greatly than control
one.

From the present study it could be concluded that the best trial for
treatment of anestrous balady cow-heifers with persistent CL and smooth
inactive ovaries is exhibited by the administration of PGF-2α followed by PMSG
injection 5 days latter. So we recommended the physician and farmers in Egypt to
use these hormones for estrous induction and ovulation in subestrous and
anestrous balady cows and improving their reproductive efficiency.
Table (1): Effect of PGF$_2$α and/or PMSG on ovarian, thyroid hormones and some biochemical constituents in balady cows with persistent CL (P.C.L) and smooth inactive ovaries (S.I.O.).

<table>
<thead>
<tr>
<th>Groups Parameters</th>
<th>Persistent Corpus luteum (P.C.L.)</th>
<th>Smooth inactive ovaries (S.I.O.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PGF$_2$α (Lutalyse)</td>
<td>PMSG (Folligon)</td>
</tr>
<tr>
<td>Progesterone ng/ml</td>
<td>2.166 ± 0.013</td>
<td>1.267 ± 0.028</td>
</tr>
<tr>
<td>Estradiol 17-β pg/ml</td>
<td>0.827 ± 0.026**</td>
<td>0.529 ± 0.032**</td>
</tr>
<tr>
<td>T3 (Triiodothyronine) ng / dl</td>
<td>11.46 ± 0.32</td>
<td>15.53 ± 0.20</td>
</tr>
<tr>
<td>T4 (Thyroxine) µg/dl</td>
<td>24.44 ± 0.26 **</td>
<td>28.44 ± 0.14 **</td>
</tr>
<tr>
<td>Inorganic Phosphorus mg/dl</td>
<td>45.96 ± 0.09</td>
<td>37.41 ± 0.44</td>
</tr>
<tr>
<td>Total cholesterol mg/dl</td>
<td>66.25 ± 0.30**</td>
<td>61.19 ± 0.16**</td>
</tr>
<tr>
<td>Glucose mg/dl</td>
<td>2.98 ± 0.22</td>
<td>2.09 ± 0.32</td>
</tr>
<tr>
<td>Total protein gm/dl</td>
<td>6.18 ± 0.10**</td>
<td>5.47 ± 0.32**</td>
</tr>
</tbody>
</table>

** Significant differences (P < 0.05).
* Significant differences (P < 0.01).

B: Before treatment.
S.E: Standard error.

Data are presented as mean ± S.E.
Table (2): Estrus number of services / conception and conception rate in balady cows after treatment with PGF$_2$α and/or PMSG.

<table>
<thead>
<tr>
<th>Hormones used</th>
<th>Time elapsed till 1st heat (days)</th>
<th>No. Of services/conception</th>
<th>Conception rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PCL</td>
<td>S.I.O</td>
<td>PCL</td>
</tr>
<tr>
<td>PGF$_2$α (Lutalyse)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st inj.</td>
<td>4.00 ± 1.00</td>
<td>5.60 ± 0.56</td>
<td>2.0±0.21 (a)</td>
</tr>
<tr>
<td>2nd inj.</td>
<td>14.00 ± 0.53</td>
<td>16.20 ± 0.53</td>
<td></td>
</tr>
<tr>
<td>PMSG (Folligon)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>singl inj.</td>
<td>15.60 ± 0.52</td>
<td>4.80 ± 0.39</td>
<td>3.0±0.26 (aab)</td>
</tr>
<tr>
<td>PGF$_2$α + PMSG (lutalyse Folligon)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st inj.</td>
<td>8.00 ± 0.30</td>
<td>8.30 ± 0.26</td>
<td>1.6±0.22 (babc)</td>
</tr>
<tr>
<td>2nd inj.</td>
<td>18.20 ± 0.29</td>
<td>19.50 ± 0.27</td>
<td></td>
</tr>
</tbody>
</table>

S.I.O.: Smooth inactive ovaries

- PCL - Persistent corpus luteum
- Values with the same single alphabetic were significantly differs (P<0.05)
- Values with the same double alphabetics were highly significant differs (P < 0.01)
Fig. (1): The mean level of progesterone hormone in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).

Fig. (2): The mean level of estradiol 17β hormone in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).

Fig. (3): The mean level of T3 hormone in cows with persistent CL (PCL) and smooth ovaries (SIO).
Fig. (4): The mean level of T4 hormone in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).

Fig. (5): The mean level of inorganic phosphorus in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).

Fig. (6): The mean level of total cholesterol in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).
Fig. (7): The mean level of glucose in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).

Fig. (8): The mean level of total protein in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).

Fig. (9): The percentage of conception rate in cows with persistent CL (PCL) and smooth inactive ovaries (SIO).
REFERENCES


المجموعة الأولى: أعطي كل حيوان 25 مليجرام من البروستاجلاندين F2- ألفا في الفص الضخم ثم حقق 20 ملمالجم من PMSG. وقبل الانتظار 48 ساعة، مسببة العقم ببروتيرين-17 وتوليد البروجستيرون. بعد ذلك، أجريت الفحوصات الدراسية في الإصابع والدم قبل أن يتم احتجازها. بالإضافة إلى ذلك، أجريت الفحوصات الدراسية في الإصابع والدم قبل أن يتم الاحتفاظ بها. 

المجموعة الثانية: أعطي كل حيوان 25 ملمالجم من البروستاجلاندين F2- ألفا. وبعد 12 يوماً، كان هناك نقص في القدرة على الإخصاب، وذلك بسبب تأثير النشاط على مستوى البروجستيرون. وتمايز الفحوصات الدقيقة في الإصابع والدم قبل أن يتم الاحتفاظ بها. 

الكولسترول الكلي، الجلوكوز، والبروتين الكلي. وقد أشترط النتائج على النحو التالي: بالنسبة للأبقار البلدية التي تتيح من وجود الجسم الأصفر كان هناك نقص عالي من الدهون في مستوى البروجستيرون والجلوكوز وذلك بعد كل العلاجات المختلفة. بينما كان هناك زيادة عالية في مستوى البروجستيرون والجلوكوز في مستوى البروجستيرون 17- البتين T4 وT3. من PMSG، والـ and/or F2- ألفا. 

иbrوستاجلاندین F2- ألفا، الـ PMSG، البروستاجلاندین F2- ألفا، الـ PMSG.