Role of Selenium and/or Vitamin E in Preventing Some Pre-and Post-Partum Problems in Dromedary She Camels

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Abstract
A total of 24 pregnant she camels were randomly assigned into four equal experimental groups, control group not supplemented with either selenium (Se) and/or vitamin E, organic selenium group was supplemented in the diet with 3.6 mg Se/animal for 75 days, Vitamin E group was supplemented in the diet with 15 IU/kg DM of Vit. E. for 75 days, and selenium and vitamin E group was supplemented in the diet with (3.6 mg of Se/animal + 15 IU/kg DM of Vit. E for 75 days. The supplementation was done at one month before calving at calving and one month after calving. Blood samples were collected 4 weeks postpartum. Some blood biochemical parameters such as protein profile parameters and thyroid hormones. Oxidative stress parameters as Malondialdehyde (MDA), glutathione peroxidase (GPX), and total antioxidant capacity (TAC) were measured. Results showed increase in protein profile parameters in all treated groups than control one. Reduce activity of MDA in all treated groups. Meanwhile, there was significant increase in both GPX activity and TAC postpartum in all treated groups compared to the control. A significantly increase in the concentrations of triiodothyronine hormone (T3) in all treated groups compared to control ones.

Key words:
Dromedary she camels, Selenium, Vitamin E, protein profile, thyroid hormones, oxidant and antioxidant parameters.

Introduction
Camels (Camelus dromedaries) considered as a vital species of livestock with good source of meat, milk and wool beside they can live in arid and semi-arid harsh environment (Faye et al., 2013). Vitamin E is a fat-soluble vitamin and is not synthesized in the rumen. Therefore, vitamin E requirement must be provided in the animal feed. The
predominant action of vitamin E against oxidation in the biological system via different mechanisms, including suppressing the ROS formation by inhibition of enzymes that contribute to the free radical production (Baraka, 2012), upregulating/protecting antioxidant defense, or directly scavenging reactive oxygen species (Brunetti, et al., 2013). Selenium (Se) is an essential trace element, reducing tissue peroxides and stimulating immune response (Pourjafar et al., 2014). Interaction with vitamin E is sometimes synergistic and sometimes partially substitutive to minimize cellular damage caused by endogenous free radicals (Ali et al., 2018). Additionally, Aghwan et al., (2016) denoted that, vitamin E and Se are considered as essential components of the antioxidant defense mechanisms, and play a critical role in the growth, the function of the immune system, and in the improvement of the animal’s reproduction via their share in the critical enzymatic reactions (Maraba et al., 2018). Selenium supplementation reduces postpartum reproductive disorders like ovarian cysts and metritis (Mehdi and Dufrasne, 2016). Se also plays an important role in udder health, preventing clinical and subclinical mastitis (Machado et al., 2013).

Material and methods
The study was conducted in Animal Production Research Institute (APRI), camel farm at Mattrouh governorate, Egypt. Animals: Twenty-four apparently clinically healthy pregnant she camels, aged 5-12 years, number of parities (1-5), and weighing 400-650 kg were used in the present study. Experimental animals were housed in semi – opened pens. Experimental design: The she camels were divided randomly into 4 equal groups, with each group containing 6 animals in each. Control group: she camels were not supplemented with Se and / or Vit. E.
Se-Organic group: she camels supplemented with organic selenium 3000 mg/kg (alkosel®3000, Lallemand Animal Nutrition, Canada). This product is an inactivated whole cell yeast (Saccharomyces cerevisiae) produced by growing yeast in the presence of measured amounts of selenium salts. Live yeast cells absorb selenium and biochemically transform it into selenoproteins (selenomethionine). Organic selenium supplemented to each camel was 1.2 g of organic compound per day for 75 days. This quantity corresponded to a daily offer of 3.6 mg Se/animal. The selenium organic was in powder form and given daily by putting the powder in a date (Faye et al., 2013).

Vit. E group: she camels were received 15 IU/kg DM of α-tocopherol acetate/camel (Multi-Veta-October, Egypt) for 75 days (one month before calving, at calving, and one month after calving in diet (Faye et al., 2013).

Se organic and Vit E group: she camels were supplemented with 3.6 mg from organic Se+ 15 IU/kg DM α-tocopherol acetate for 75 days (one month before calving, at calving and one month after calving) in a date.

Feeding:
Experimental she camels were fed diet in pregnancy and lactation in summer season, composed of concentrates feed mixture (12% crude protein and 70% TDN) (5kg/ head/day) in addition to a good quality roughage material that were alfalfa hay (2kg/head/day) and rice straw (5kg/head/day). In winter season, concentrates feed mixture (12% crude protein and 70% TDN) (3.5kg/head/day), berseem (20kg/ head/ day) and rice straw (5kg/ head/ day). All animals had a free access to drinking water.

Blood sampling:
Blood samples were collected from all dams at one month postpartum. Ten ml of blood was collected in sterile glass test tubes without anticoagulant through puncture of the jugular vein using a sterile needle. The collected blood samples were let to coagulate, and centrifuged at 3000 rpm for 20 min. The harvested serum was kept at −20°C until evaluation.

Biochemical analysis:
The determination of serum total proteins and albumin were done according to Doumas et al. (1971). Serum globulins were calculated by subtracting the values of [albumin] from that of [total protein]. Determination of MDA activity was conducted by the method developed by Okhawa et al. (1979). GPX activity was determined by the method of Flohe and Gunzler (1984) and Total antioxidant capacity (TAC) was determined...
by the methods of Koracevic and Koracevic (2001). Determination of T3 and T4 were carried out according to Braveman (1996).

Reproductive parameters: Data regarding reproductive performances of all supplemented groups of she camels were recorded during postpartum period (up to 75 days after calving). These parameters include the following: retained placenta, ovarian cyst, repeat breeder, abortion, early embryonic death, metritis and mastitis.

Statistical analysis: All data were subjected to statistical analysis according to Snedecor and Cochran (1982) and results were expressed as Means ± standard error (SE). Differences between means in different groups were tested for significance using student T test as independent t test for all parameters.

Results

Results of biochemical analysis: Result of the present study revealed that, Se supplementation either with / or without Vit. E or organic form had significant (p<0.05) effect on serum total proteins, albumin, and globulins concentrations in all treated groups when compared with the control group. There was significant increase (P<0.05) in both GPX activity and TAC for she camels supplemented with Se + Vit. E, Se group, and Vit E group compared to control ones. On the contrary, significant (p<0.05) decrease in serum activity of MDA in all tread groups (Se, Vit E and Se + Vit. E) compared with control group was recorded. The results showed significant (P<0.05) increases in serum T3 concentrations in she camels supplemented with Se + Vit. E then Se then Vit. E compared to control. While no significant differences were found in serum T4 levels (Table 1).

Results of reproductive parameters: In our study, selenium supplements with or without Vit. E and a combination of Se / Vit. E during pre- and postpartum period improve reproductive health status of she camels which manifested by decreasing in the uterine disorders, retained placenta, repeat breeder, ovarian cyst, embryonic death, and abortion when compare to the control group.
Table (1): Effect of selenium with or without vitamin E supplementation on different biochemical parameters (Mean ± standard error)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Se</th>
<th>Vit. E</th>
<th>Se/Vit E</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.P. (g/dl)</td>
<td>5.39 ±0.25a</td>
<td>7.28 ±1.13b</td>
<td>6.42 ±0.43c</td>
<td>7.66 ±1.42a</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>2.67 ±0.24a</td>
<td>3.24 ±0.07b</td>
<td>3.12 ±0.22c</td>
<td>3.65 ±0.31a</td>
</tr>
<tr>
<td>Globulins (g/dl)</td>
<td>2.72 ±0.01a</td>
<td>4.04 ±0.6b</td>
<td>3.30 ±0.21c</td>
<td>4.01 ±1.11a</td>
</tr>
<tr>
<td>GPX (mU/ml)</td>
<td>196.42±43.02b</td>
<td>251.56±42.21a</td>
<td>258.65±33.23a</td>
<td>256.25±37.66a</td>
</tr>
<tr>
<td>TAC (mM/L)</td>
<td>0.458± 0.04c</td>
<td>0.853± 0.01a</td>
<td>0.765±0.1a</td>
<td>0.831±0.03a</td>
</tr>
<tr>
<td>MDA(nmol/ml)</td>
<td>7.67±4.18a</td>
<td>5.13±1.16b</td>
<td>5.08±1.47b</td>
<td>4.57±2.29b</td>
</tr>
<tr>
<td>T3 (ng/ml)</td>
<td>31.32±6.25d</td>
<td>47.09±7.75b</td>
<td>41.27±6.43c</td>
<td>59.68±5.91a</td>
</tr>
<tr>
<td>T4 (µg/dl)</td>
<td>12.5 ± 2.19b</td>
<td>14.6 ± 3.22a</td>
<td>14.1 ± 3.15a</td>
<td>15.2 ± 2.9a</td>
</tr>
</tbody>
</table>

T. P = total protein, GPX= Glutathione peroxidase, TAC= Total antioxidant capacity, MDA= Malondialdehyde, T3=triiodothyronine AA, T4=thyroxine. Mean ± Standard Error with different superscripts (a, b, c) in the same row, are significantly different at P<0.05.

Table (2): Incidence number of clinical puerperal complications in different treated groups.

<table>
<thead>
<tr>
<th>Disorders</th>
<th>Control</th>
<th>Se</th>
<th>Vit. E</th>
<th>Se/Vit. E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained placenta</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mastitis</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Ovarian cyst</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Repeat breeder</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Metritis</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Embryonic death of neonates</td>
<td>11</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Abortion</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Discussion
Selenium (Se) is known as an essential trace mineral that has several important functions at the level of the cell and organism in animal and human health, and therefore it is relevant to various patho-physiological conditions (Alfihan et al., 2015). The results obtained in the present study showed that serum total proteins (TP), albumin and globulins were significantly increased (P<0.05) for she camels supplemented with Se + Vit. E group then Se group then Vit. E group compared with the control group. The results were in agreement with previous findings in she camels Elkhair and Ahmed (2017) and Ahmed and Elkhair (2019). The higher concentration of serum total proteins in the supplemented group could be due to the role of Se in protein synthesis (Abou-Zeina et al., 2014). Moreover, Se is known as an essential
component of range of selenoproteins (Sherief et al., 2019). Selenoproteins in which selenium is present as selenocysteine, represent an important role in many body functions, such as the production and reproductive properties, the antioxidant defense, and the formation of thyroid hormones (Mehdi et al., 2013).

In the current study, it has shown that supplementation of selenium, vitamin E and combination of Vit E/Se has improved oxidant/antioxidant status through increasing of GPx activity, TAC, and decreasing circulating MDA significantly. The result may be concise with results of Hassan and Abd-Allah (2021) and El-Sayed et al. (2020). GPX activity is a powerful indicator of selenium status and reflects the long-term selenium status. Our observations of TAC were in line with the results of Sherief et al. (2019) and Kassab et al. (2020). In the former study, the authors observed a significant elevation in the values of TAC compared with the control ones during the postpartum period which established that, the maternal supplementation of Vit. E/Se during the late stage of gestation and early lactation can ameliorate the antioxidant status. In contrast, the findings of MDA levels were in line with that Sherief et al. (2019) and being away from that reported by Shakirullah et al. (2017) who stated that, supplementation of Vit E/Se at a dose of 50 mg and 0.3 mg/kg of diet for 4 weeks provoked no significant effect on MDA levels.

When evaluating the effect of antioxidants (Se and / or Vit. E) on the blood activities of thyroid hormones. The present study showed significant (P<0.05) increases in serum triiodothyronine (T3) concentrations in she camels supplemented with Se + Vit. E then Se group then Vit. E group compared to control. While no significant differences were found in serum thyroxin (T4) levels. Similar changes in thyroid hormone activity were in agreed with Abo-Zeina et al. (2014). On the contrary of our result, they found significant increase in plasma T4 levels in neonate's camels like Ahmed and Elkhair (2018) and in lambs Dhari and Kassim (2019). High concentration of thyroxin (T4) may be due to the direct action of selenium and its ability to increase glucose metabolism (Mao and Teng, 2013).

The use of Se, vitamin E, or their combination during the transition period was lower the incidence of some reproductive problems compared to the control group. Similar to our study results, supplementation with Se, Vit E and Se/Vit E has
reduced retained placenta (Yosathai, 2014) and mastitis (Mehdi and Dufrasne, 2016). Selenium and vitamin E as natural antioxidants have an important role in preventing the occurrence of retained placenta, these nutrients increase the activity of neutrophils; enhance their chemotactic effect and phagocytosis of opsonized pathogenic microorganisms (Joksimović-Todorović and Davidović, 2013). Adequate Se intake prevents various disorders like early embryonic mortality in neonates (Zarczy ‘nska et al., 2013). Se increases proliferation of corpus luteal cells by degrading lipid peroxides resulting in increased progesterone concentration (Kamada and Ikumol, 1997). This improved luteal function will help in preventing early embryonic death (Bajaj and Sharma, 2011). So, Se supplementation improves fertility by reducing embryonic death during the first month of gestation (Mehdi and Dufrasne, 2016). Selenium also has an effect on the decrease in the incidence of metritis and ovarian cysts (Wilde, 2006). The significant increase in the expression of the glutathione peroxidase 1 gene (GPx1) in granulosa cells of healthy follicles points to antioxidant role of GPx1 during the ovarian follicular development (Ceko et al., 2015).

Conclusion
The present study concluded that supplementation of vitamin E and/or Se to she camels during the transition period has a vital role, through the changes observed in different oxidative parameters and the enhancement of the metabolic status, which optimizing the reproductive efficiency of she camels.

References


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دور السيلنيوم مع/ أو فيتامين هـ في الوقاية من بعض مشاكل ما قبل الولادة وبعدها في إناث النوق

هوندا السيد محمود - حسن السيد عبده المتولي - احمد موسى علي حسن عامر

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اجريت دراسة على عدد 24 من النوق في الفترة الأخيرة من الحمل وقد قسمت هذه النوق بطريقة عشوائية إلى أربع مجموعات متساوية، المجموعة الضابطة لم يتم إضافه السيلنيوم/أو فيتامين هـ لل العليقة، مجموعة السيلنيوم العضوي تم إضافة 3.6 جرام من السيلنيوم/نافة لمدة 75 يوماً، مجموعة فيتامين هـ تم إضافة فيتامين هـ 15 وحدة دولية/كيلوغرام من المادة الجافة من فيتامين هـ إلى العليقة لمدة 75 يوماً ومجموعة السيلنيوم مع فيتامين هـ تم إضافة 3.6 جرام من السيلنيوم العضوي بالإضافة الى 15 وحدة دولية/كيلوغرام من المادة الجافة من فيتامين هـ في العليقة. تم إضافة نتائج قبل الولادة عند الولادة وشهر بعد الولادة.

تم تجميع عينات الدم للحصول على السيرم من النوق بعد 4 أسابيع من الولادة لقياس بعض التغيرات البيوكيميائية مثل قياس البروتين الكلى والألبومين وحساب الجلوبيلين. وكذلك تم قياس مؤشرات التاكسد/ مضادات الاكسدة ومنها GPX - TAC - MDA وكذلك XGP - TAC. كما تم قياس هورمونات الغدة الدرقية ومنها ثلاثي السيروكسين وأيضا السيروكسين.

وقد اوضحت النتائج ارتفاع في مستوى البروتين الكلى والألبومين في كل المجموعات التي تم إضافة السيلنيوم مع/أو فيتامين هـ وكذلك نقص في مستوى مؤشرات التاكسد المتمثلة في MDA في كل المجموعات التي تم إضافة السيلنيوم مع/أو فيتامين هـ وعلى العكس وقد زيادة كبيرة في مستوى مؤشرات الاكسدة المتمثلة في GPX TAC في مجموعات السيلنيوم مع/أو فيتامين هـ، أما بالنسبة لهرمون الغدة الدرقية فقد وجد زيادة ملحوظة في ثلاثي السيروكسين في كل مجموعات النوق التي تم إضافة السيلنيوم مع/أو فيتامين هـ إلى العليقة.
