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Ameliorating Effect of Selenium Nanoparticles and L-Carnitine on Some Haemato-Biochemical Parameters and Oxidative Stress Status During Pregnancy Periods in Ossimi Ewes.

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Abstract

A total number of 27 mature Ossimi ewes divided into three groups (9 ewes/each). The 1st group, which served as control (C), was treated with distilled water (10 mL/kg B.W. /day), the 2nd group treated with selenium nanoparticles (SeNPs 1 mg/kg B.W. /day), and the 3rd group treated with L-Carnitine (L-Car 350 mg/Kg/day). Data revealed that the hematological parameters hematocrit (HCt) had significant differences (**at 90 days of pregnancy, P = 0.0299**) and mean cell volume (MCV) showed significant differences (at days 45 and 90, P = 0.0014 and P = 0.0580, respectively). Triglyceride (TG) levels changed significantly at 45, 90, and 150 days of pregnancy; total cholesterol levels changed significantly at 150 days; low-density lipoprotein (LDL) levels changed at 45 and 90 days of pregnancy; and high-density lipoprotein (HDL) levels changed at 45 and 90 days of pregnancy. AST and ALT decreased due to the treatment with SeNPs and L-Carnitine (L-Car) during 45, 90, and 150 days of pregnancy, while ALT decreased during 90 and 150 days of pregnancy due to the treatment with SeNPs and L-Car compared with the control group. The urea concentration showed a significant decrease due to the treatments during 90, and 150 days of pregnancy, and the creatinine concentration significantly decreased at 90 days of pregnancy. Furthermore, data showed significant decreases in oxidized glutathione (at days 90 and 150, P = 0.0001) and nitric oxide (at days 45 and 150) due to the treatment with SeNPs and L-Car. It was found that there was a significant improvement in blood serum ATP and an increase in reduced glutathione and superoxide dismutase due to LC and SeNPs treatment during different pregnancy periods. Hence, SeNPs and L-Car administration improved different biochemical and hematological parameters and serum antioxidant activities for Ossimi ewes during different periods of pregnancy.

Keywords: Selenium, Nanoparticles, L-Carnitine, Ossimi ewes, Antioxidants.

Introduction

Pregnancy is considered metabolic stress. Mammalian metabolism is influenced by physiological stages such as the pregnancy stage (**Iriadam, 2007).** During pregnancy, females are more prone to oxidative stress caused by the imbalance between the pro-oxidant-antioxidant levels**.**

Selenium (Se) is an essential trace element important for many physiological processes, including immune and antioxidant defense functions. Nano-Selenium (SeNPs) has attracted more attention because of its high bioavailability, high catalytic efficiency, strong adsorbing ability and low toxicity compared with selenite (**Wang *et al.*, 2007 and Shi *et al.*, 2011).** Few studies showed that SeNPs intake could enhance the antioxidant activity of the animals **(Zhu *et al.*, 2010)**, ameliorates the negative effects of oxidative stress on the liver and positively influences immunoglobulin production.

Carnitines belongs to special classes of nutrients called ‘quasi-vitamins’ or ‘conditionally essential’ nutrients **(Vassiliadis and Athanassakis, 2011)**. L-Carnitine (L-Car) protects DNA against the damage induced by the free radicals **(Abdelrazik *et al.*, 2009).** It functions as an acetyl store to supply energy in carbohydrate and lipid metabolic pathways **(Infante *et al.*, 2002).** L-Carnitine can relief pathological ovarian disorders due to adenosine

triphosphate (ATP) depletion, which leads to insufficient axonal phosphorylation and lipid peroxidation **(Dokmeci, 2005).**

Blood is an important and reliable medium for indicating the physiological/pathological status (s) of animals. It is greatly altered by nutrition, disease, stress, parturition, and climate, etc. Therefore, the hematological tests could provide the basic information for animal health assistance (**Toescu *et al.*, 2002)**.

The aim of this study is to investigate the efficacy of SeNPs and LC on physiological performance and oxidative status of Ossimi ewes during pregnancy periods.

Material and methods

Animals, experimental design and management:

All experimental procedures were accomplished with reference to local Experimental Animal Care Committee and approved (20208) by the Institutional Committee of the Department of Animal Production, Faculty of Agriculture, Benha University, Egypt. Animals have been raised according to the standards for husbandry at Benha University. After an adaptation period (30 days), a total number of 27 mature nulliparous Ossimi ewes, 12 months old, with a comparable average body weight of 37.00 ± 1.44 kg, were randomly divided into 3 groups (n= 9). The first group was left as control (c) and, was treated with distilled water (10 ml/kg B.W./day), whereas the other two groups were orally supplied with 1mg /kg body weight /day Selenium Nanoparticles (SeNPs) according to **Kachuee *et al.*(2019),** and 350 mg/Kg/day L-Carnitine (L-Car) according to **Abdel-Khalek *et al*. (2015)**, respectively.

Throughout the experimental period, ewes were fed the same standard iso-caloric/ iso-nitrogenic diet and the drinking water were offered *ad libitum*. The basal diet composition and calculated analysis were performed according to the Nutritional Research Council Nutrient Requirements of sheep **NRC (1985)**. .

Blood samples:

Blood samples were drained through jugular vein puncture from all ewes at 45, 90 and 150 days of pregnancy. Blood Samples were allocated into two portions. The first portion was collected with an anticoagulant [10% ethylene diamine tetra acetic acid (EDTA)] to determine the full blood picture (hemoglobin, hematocrit, red blood cell (RBC) count, white blood cell (WBC) count, and platelet count) Hematological parameters were determined by using a veterinary hematology analyzer (HB 7021) using the standard methods described by **Jain (1993).** The second portion of the blood samples was collected without an anticoagulant and was allowed to clot at 4 ºC to separate the serum used to determine other biochemical parameters. The serum - tubes were centrifuged at 4000 r.p.m. for 20 min and the obtained serum was kept at -20 ºC until the measurements of the biochemical parameters.

Biochemical parameters:

Serum total cholesterol was quantified spectrophotometrically using Stanbio Cholesterol Liquid Color® Kit (Proc. No. 1010) produced by Stanbio Laboratory Inc., Boerne, Texas, USA according to **Allain *et al*. (1974).** Serum triglycerides (mg/dL) concentrations were quantified spectrophotometrically according to **Fossati and Prencipe (1982)** by using Stanbio Liquid Color®, Triglycerides (mg/dL) Kit (Proc. No. 2100) employed from, Stanbio Laboratory Inc., Boerne, Texas, USA. Serum high-density lipoprotein HDL-cholesterol (mg/dL) was determined by the method of **Lopez (1977)** and, the serum low-density lipoprotein LDL-cholesterol (mg/dL) was according to **Fossati and Prencipe (1982).** Concentrations of total protein and albumin (g/dL)were estimated using Biuret method in the presence of alkaline cupric sulfate according to **Doumas *et al* (1971).** Globulin (g/dL) value was obtained by subtracting the value of albumin from the corresponding value of total protein. Transaminase enzyme ALT and AST (U/L) activities were preformed according to **Reitman and Frankel (1957).** Serum urea (mg/dL) concentration was measured using the enzymatic colorimetric method described by **Patton and Crouch (1977).** Serum creatinine (mg/dL) concentration was measured using the enzymatic colorimetric method described by **Patton and Crouch (1977)**

Determination of antioxidants activity:

Determined the Malondialdehyde (MDA) in serum according to **Karatepe (2004)**. Determination of Oxidized Glutathione (GSSG) and Reduced Glutathione (GSH) in serum detected by using the method of **Jayatilleke and Shaw (1993)** and the determination of serum Nitric Oxide (NO) (µmol/ g) detected by using the method of **Papadoyannis *et al.* (1999).** The activity of SOD was determined according to the method of **Marklund and Marklund (1974)** and the Adenosine Tri-phosphate (ATP) determine according to the method of **Hai *et al*. (2006)**.

Statistical analysis:

All data were expressed as means with a standard error mean (SEM) and were subjected to analysis of variance (ANOVA) using **SAS (2004).** Duncan multiple-range tests ($P<0.05$) were used to define the differences among treatments. The applied static model is as follows:

Xijk = µ +Ti + eijk, whereas: µ = Overall mean, **Ti** = Effect of the i^{th} treatment (i, 1-3),

eijk = Random error associated with the individual observation.

Results and Discussion.

Hematological parameters:

The consequences of SeNPs and L-Carnitine administration on hematological variables of blood

are listed in Table 1. There were significant differences in MCV **(at Day 45, P= 0.0014)** and HCt **(at Day 90, P= 0.0299)** between treated groups. SeNPs and L-Car groups expressed lower MCV values at Day 45 than the control group. SeNPs group had a low HCt % compared with control and L-Car groups at Day 90 of pregnancy. Interestingly, there was a tendency (P= 0.058) for MCV values to be significantly higher in the treated groups compared with control at Day 90 of pregnancy.

Table 1. Effect of selenium nanoparticles (SeNPs) and L-Carnitine (L-Car) on blood hematological indices of Ossimi ewes during pregnancy**.**

Treatment	WBCs ($\times10^3$ /mm^3)	HB (g/dL)	RBCs ($\times10^3$ cells/ μl)	HCt (%)	MCV(fl/cell)	Plt ($\times10^3$/mm^3)
Day 45 of pregnancy						
Control	14.02±1.21	9.82±0.85	4.62±0.0.29	27.27±3.24	37.87±3.58a	694.7±25.63
SeNPs	14.12±1.37	9.30±0.74	4.64±0.34	26.88±3.69	35.15±4.21b	688.7±26.35
L-Car	14.36±1.28	9.32±0.84	4.44±0.0.27	26.96±3.27	32.26±3.96c	675.0±24.58
P-Value	0.9137	0.7790	0.9645	0.8828	0.0014	0.9700
Day 90 of pregnancy						
Control	13.20±1.89	9.90±0.93	4.75±0.59	28.02±3.85a	33.65±3.25b	687.5±24.66
SeNPs	13.95±2.11	9.42±1.09	4.41±0.64	25.50±2.79b	36.11±4.23a	684.7±24.74
L-Car	13.70±1.85	9.38±1.32	4.56±0.53	28.14±3.36a	35.34±3.62ab	668.6±25.67
P-Value	0.2621	0.7857	0.9177	0.0299	0.0580	0.9694
Day 150 of pregnancy						
Control	14.72±2.30	9.65±1.36	4.50±0.84	27.57±3.69	38.37±4.21	680.0±28.4
SeNPs	13.64±1.25	9.27±1.85	4.48±0.93	27.15±3.52	36.34±3.96	687.3±27.36
L-Car	14.46±2.41	9.36±1.56	4.56±0.87	26.04±2.95	37.34±3.89	702.2±30.21
P-Value	0.4370	0.8905	0.9948	0.2331	0.1207	0.9626

WBCs: White blood cells count, HB: hemoglobin, RBCs: red blood count, HCt hematocrit value, and Plt: platelet number. Means with different superscript (a, b, c) in the same column within the same period of pregnancy were significantly different at P<0.05.

According to **Puppel and Kuczyska (2016)** the blood biochemistry could be used as indicators of animal health and productivity. It is worthwhile to mention that both treatments had slight effects on erythrocytic indices; nonetheless, the interaction effect between treatments and pregnancy periods was more pronounced. **Gabr (2020)** indicated that the treatment with LC had no effect on hematological parameters. **Chen *et al.* (2008)** reported an increase in WBC count by LC in several experiments, observing an increase in WBC count when LC was added to the diet of finishing pigs. Hem-dilution occurred in late pregnancy without a significant drop in Hb levels. This could maintain and prevent a significant fall in blood O2 content. O2 diffusion from maternal blood to fetal blood is dependent on the difference in O2 tension between the maternal and fetal blood (**Guyton and Hall, 1996**), hence a significant decrease in Hb in the mother's blood may result in a reduction in O2 supply to the fetus.

Using selenium nanoparticles as a treatment for ewes during the pregnancy period did not show any changes in biochemical parameters; our data is in agreement with **Kumar *et al.* (2008),** who interpreted selenium deficiency as a contributing factor in inhibiting glutathione peroxidase activity and raising the levels of free oxygen radicals in tissues like RBCs, which causes more oxidative damage to the tissues**.** The number of RBCs and the hematocrit value in the group receiving SeNPs were a little higher than in the control group, but this difference was not statistically significant. Selenium

has been shown to play a role in increasing the resistance of RBCs, and its deficiency has been mentioned as a factor in the production of anemia.

Biochemical parameters:
Lipid Profile.

Table 2 shows the effects of SeNPs and L-Carnitine treatments on lipid profile variables**.** There were significant differences in triglycerides **(at day 45, P = 0.033)** and tendency differences in **HDL (at day 45, P = 0.0910)** between the treated groups. At Day 45, the L-Car group had the highest TG values compared to the SeNPs group. However, HDL showed the lowest mean in the SeNPs group. The obtained results demonstrated that TG varied significantly along pregnancy for L-Car group, while HDL at day 90, and TC and LDL at day 150 for SeNPs group.

Table2. Effect of selenium nanoparticles (SeNPs) and L-Carnitine (L-Car) on lipid profile of Ossimi ewes during pregnancy**.**

Treatment	Lipid profile			
	Triglycerides (mg/ dL)	Total cholesterol (mg/ dL)	HDL (mg/ dL)	LDL (mg/ dL)
Day 45 of pregnancy				
Control	88.50±7.42ab	87.0±5.69	32.5±2.58a	37.00±2.63
SeNPs	86..9±6.85b	86.7±5.87	30.30±3.25b	38.90±4.25
L-Car	89.80±7.36a	87.4±6.32	31.60±3.25ab	38.0±4.25
P-Value	0.033	0.705	0.0910	0.1450
Day 90 of pregnancy				
Control	86.30±4.52b	88.5±5.63	31.80±3.25a	39.80±5.36b
SeNPs	89.70±7.45a	89.40±6.35	29.10±4.21b	42.30±6.42a
L-Car	85.60±5.63b	89.40±7.52	30.80±3.63ab	41.40±7.52ab
P-Value	0.005	0.488	0.042	0.056
Day 150 of pregnancy				
Control	89.0±6.36a	86.30±7.86b	30.00±3.20	38.50±4.32b
SeNPs	86.40±7.52b	90.70±8.27a	30.10±3.96	43.10±5.32a
L-Car	85.80±6.98b	86.40±7.63b	30.60±2.89	38.60±3.99b
P-Value	0.0169	0.0026	0.7445	0.0020

TG: Triglycerides, TC: Total cholesterol, HDL: High density lipoprotein and LDL: Low density lipoprotein Means with different superscript (a, b, c) in the same column within the same period of pregnancy were significantly different at P<0.05.

The recent results disagree with the finding of **Citil *et al.* (2009**) who, reported that supplemental L-Carnitine in ruminants affected a selection of biochemical parameters such as cholesterol, LDL, and HDL, which act as indicators of energy metabolism.

According to **Çicek *et al.* (2021)**, supplementation with Se NPs increased HDL concentration while decreasing LDL in lamb. In other studies, **Ascaso *et al.* (2004)** demonstrated that inhibitions of cholesterol biosynthesis in the liver decreases intracellular cholesterol content, augments low-density lipoprotein-receptor (LDL-R) synthesis, increases cholesterol uptake by the liver, and diminishes serum total cholesterol concentration**.**

Liver Function:

The blood biochemistry of pregnancy ewes, as stated in Table 3, demonstrated alterations in AST and ALT. The AST levels decreased significantly (P = 0.0152) on day 45. When compared to L-Car and the control group, SeNPs had the lowest mean and a highly significant drop in AST **(at days 90 and 150, P = 0.0001)**. When compared to the control group, SeNPS decreased AST along pregnancy, while L-Car decreased AST in day 90 and 150. On the other hand, both SeNPs and L-Car decreased ALT during mid (day 90) and, late (day150) stages of pregnancy.

Albumin elevation in response to L-Carnitine treatment may be related to nitrogen absorption **(Talha *et al.*, 2009).** This result indicated that oral administration of SeNPs reduced concentrations of ALT and AST in the blood serum of the pregnant Ossimi ewes compared with L-Car administration

and the control group. On the contrary**, Qin *et al.* (2016)** found that Nano-Se supplementation increased ALT levels more than the control, where Nano-Se decreased AST compared with the control groups. **Kumar *et al.* (2008)** indicated that SeNPs had no effect on serum AST and ALT activities.

Table 3. Effect of selenium nanoparticles (SeNPs) and L-Carnitine (L-Car) on concentrations of total protein, albumin, globulin, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) of Ossimi ewes during pregnancy**.**

Treatment	Liver function				
	Total protein (g /dL)	**Albumin(g /dL)**	**Globulin (g /dL)**	**AST(U/L)**	**ALT (U/L)**
			Day 45 of pregnancy		
Control	9.57±1.52	4.80±0.43	4.77±0.46	72.00±5.63a	27.50±2.59
SeNPs	9.56±1.89	5.48±0.52	4.08±0.52	68.66±6.36b	27.88±2.87
L-Car	9.48±1.77	4.50±0.49	4.98±0.39	71.20±7.52a	27.60±2.10
P-Value	0.9927	0.5094	0.5484	0.0152	0.8921
			Day 90 of pregnancy		
Control	9.67±0.98	4.72±0.89	4.95±0.41	84.50±6.35a	34.75±2.63a
SeNPs	9.84±1.11	5.30±0.87	4.52±0.48	72.22±5.89c	29.22±2.51b
L-Car	9.04±0.85	4.60±0.91	4.44±0.39	79.00±6.87b	27.80±2.53b
P-Value	0.6123	0.6747	0.8044	<.0001	0.0003
			Day 150 of pregnancy		
Control	9.17±0.85	4.62±0.46	4.55±0.45	84.50±6.35a	35.00±3.25a
SeNPs	9.78±1.03	5.44±0.42	4.34±0.41	73.22±5.22c	27.88±3.63b
L-Car	8.70±0.89	4.70±0.49	4.00±0.49	77.00±5.96b	29.80±4.21b
P-Value	0.4623	0.5724	0.8004	<.0001	0.0003

AST: Aspartate aminotransferase and ALT: Alanine aminotransferase. (a , b, c) in the same column within the same period of pregnancy are significantly different at P<0.05.

Urea and Creatinine:

Table 4 shows the effect of oral administration of SeNPs and L-Car on urea and creatinie concentrations. Urea decrease tendency in SeNPs during mid(90 day) and during late period (150 day), but did not affect during 45 day of pregnancy while, creatinine decrease tendency in L-Car group, and significantly in SeNPs group during 90 day of pregnancy.

Using SeNPs and LC with Ossimi pregnant ewes, urea concentrations were slightly affected. These data agree with **Citil *et al.* (2009**), who demonstrated that using L-Carnitine in ruminants affected a selection of biochemical parameters such as urea and creatinine, which act as indicators of energy metabolism. The effect of L-Carnitine could be associated with the stimulation of lipid metabolism through the transfer of acyl groups across the mitochondrial membranes (**Carlson *et al.*, 2006**). A limited number of studies have dealt with the effects of supplemental carnitine on metabolism and performance parameters in healthy ruminants (**Pancarci *et al.*, 2007**).

While, **Abdel-Khalek *et al.* (2015)** showed that oral administration of LC at a dose of 350 mg/Kg/d as a therapy lowered NH3-N substantially (P<0.05) in treated groups without significantly (P<0.05) affecting TVFAs concentration, this investigation concurs with their findings. On the level of urea-N in lamb plasma, LC had no impact. In the same line, **Rincker *et al.* (2003)** observed no difference in urea-N in weanling pigs fed added LC. However, others reported that adding LC (500 mg) to ewe's diet resulted in a decrease in serum urea level **(Citil *et al.*, 2009).** While creatinine is regarded as the most important metabolite generated during protein degradation, other studies found lower (P<0.05) creatinine concentrations in the plasma of ewes treated with L-Carnitine compared with the control group, which could be attributed to the higher utilization of dietary protein in ewes treated with L-Carnitine. The significant reduction in urea and creatinine concentrations observed in ewe received

SeNPs, in particular 1 mg/kg B.W./day orally administration, as compared to control may indicate improvement in the normal kidney functions. These results may suggest a protective role of SeNPs against kidney dysfunctions. Similar results were reported on different animal species treated with SeNPs (**Qin *et al.*, 2016).**

Table 4. Effect of selenium nanoparticles (SeNPs) and L- carnitine (L-Car) on blood serum creatinine and urea activities of Ossimi ewes during pregnancy**.**

Treatment	Kidney Function	
	Urea (mg/dL)	**Creatinine (mg/dL)**
Day 45 of pregnancy		
Control	72.00±6.35a	0.87±0.04
SeNPs	68.66±5.63b	0.86±0.07
L-Car	71.20±7.21a	0.88±0.06
P-Value	0.0152	0.1250
Day 90 of pregnancy		
Control	84.50±6.53a	1.00±0.04b
SeNPs	72.22±7.89c	0.86±0.08b
L-Car	79.00±6.52b	0.94±0.05ab
P-Value	<.0001	0.0679
Day 150 of pregnancy		
Control	84.50±7.52a	1.05±0.06
SeNPs	73.22±6.35c	0.88±0.08
L-Car	77.00±6.85b	0.92±0.05
P-Value	<.0001	0.9322

[a,b,c] Means with different superscript in the same column within the same period of pregnancy are significantly different at P<0.05.

Oxidative stress markers:

The results in Table 5 revealed a significant **(P < 0.0001**) increase in SOD due to the treatment with SeNPs along pregnancy periods. According to GSSG decreased in the treated groups at 90 and 150 day of pregnancy. There were decreasing in NO in early and late pregnancy after treated with SeNPs and L-Car. ATP increased due to SeNPs supplementation during early and mid-pregnancy, but in L-Car during mid and late pregnancy.

It is clear that serum SOD, GSH, GSSG, and NO levels of ewes treated with antioxidants, especially L-Carnitine, are higher during the luteal phase compared with the follicular phase. This may be due to oxidative stress in the luteal phase when progesterone is the dominant steroid hormone. The female reproductive system is prone to oxidative damage, and without antioxidant intervention, the system would continue to deteriorate (**Sekhon *et al*., 2010).** L-carnitine prevents lipid peroxidation by helping to maintain mitochondrial integrity and reduce the chance of ROS production **(Kumaran *et al.*, 2005**). The increase of SOD enzyme in the cells and tissues keeps the superoxide anion concentration at a very low level. SOD act as the first line of antioxidant defense to prevent oxidative stress **(Ighodaro and Akinloye, 2018).** L-Carnitine administration reduced cytotoxicity by enhancing blood serum parameters, lowering oxidative stress, sustaining cell energy, and increasing ATP in blood serum (**Abd-Elrazek and Farid, 2018). Chen *et al.* (2008)** showed that Se nanoparticles have significant effects on scavenging of the free radicals and of DNA protection against oxidation, as selenium as a functional part of GSH-Px protects the neutrophils and other blood components against peroxidative damage (**Bickhardt *et al.*, 1999**). The current results are in opposition to those of **Abd Allah and Hashem, (2015),** who recorded no differences in NO level due to Nano-Se, although ours were significantly low (*P*<0.0002) as compared to control during late pregnancy. In a study by **Shi *et al.* (2011)**,

the results revealed an increase in ATP concentration in group treated with selenium, which concurs with the current ATP results.

Table 5. Effect of selenium nanoparticles (SeNPs) and L-Carnitine (L-Car) on blood serum oxidative stress markers of Ossimi ewes during pregnancy.

Level	MDA nmol/mL	SOD U/mL	GSH µmol/ml	GSSG µmol/ml	NO µmol/ml	ATP µg/g
Day 45 of pregnancy						
Control	3.30±0.31	44.70±3.69a	3.17±0.08	0.31±0.02	0.33±0.04a	73.10±6.35b
SeNPs	2.82±0.20	51.00±4.21b	3.56±0.06	0.30±0.04	0.28±0.03ab	78.50±7.52a
L-Car	1.98±0.35	57.90±4.96a	3.22±0.07	0.23±0.06	0.20±0.03b	67.80±6.32c
P-Value	0.3305	<.0001	0.8762	0.2640	0.0861	<.0001
Day 90 of pregnancy						
Control	3.35±0.22	51.3±5.21b	3.30±0.05	0.35±0.03a	0.30±0.05	67.6±7.52c
SeNPs	2.68±0.32	54.8±4.63a	3.84±0.06	0.28±0.04b	0.27±0.06	82.20±5.63a
L-Car	2.2±0.21	48.5±5.23c	3.31±0.07	0.19±0.03c	0.20±0.06	79.40±6.35b
P-Value	0.4686	0.0008	0.7608	<.0001	0.1790	<.0001
Day 150 of pregnancy						
Control	3.20±0.34	44.0±3.52c	3.12±0.04	0.33±0.07a	0.28±0.05a	76.00±6.3b
SeNPs	2.73±0.26	53.80±4.25b	3.57±0.08	0.28±0.06b	0.24±0.03b	75.50±7.4b
L-Car	2.39±0.28	59.20±4.32a	3.35±0.06	0.22±0.03c	0.20±0.3c	79.40±6.96a
P-Value	0.6317	<.0001	0.8623	<.0001	0.0002	0.0060

MDA: malondialdehyde, SOD: superoxide dismutase, GSH: reduced glutathione, GSSG: oxidized glutathione NO: nitric oxide and ATP: adenosine tri phosphate (a , b, c) in the same column within the same factor are significantly different at P<0.05.

Conclusion

The current study found that oral administration of SeNPs or L-Car had an effect in MCV concentrations during 45and 90 day of pregnancy, on total cholesterol, triglycerides, low-density lipoprotein, and high density-lipoprotein. Additionally, the data showed that oral administration of SeNPs and L-Car decreasing AST and ALT during pregnancy periods and reducing urea and creatinine and in addition to reducing serum oxidative markers GSSG and NO and increased SOD and ATP due to the use of antioxidants.

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التأثير المحسن لجزيئات السيلينيوم النانونية والكارنتين على المؤشرات الدموية البيوكيميائية ومؤشرات الإجهاد التأكسدي خلال فترات العشر في نعاج الأوسيمي.

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1. قسم الإنتاج الحيوانى – كلية الزراعة – جامعة بنها
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استخدم فى هذه الدراسه 27 نعجة أوسيمي ناضجة ,قسمت إلى ثلاث مجموعات بواقع 9نعاج لكل مجموعه. استخدمت المجموعة الأولى كمجموعة ضابطه عوملت بالماء المقطر (10 مل / كجم / يوم وزن الجسم) ، المجموعة الثانية عوملت بجزيئات السيلينيوم النانوية (1 مجم / كجم من وزن الجسم / يوم) ، المجموعة الثالثة عوملت بالكارنتين (350 مجم / كجم من وزن الجسم / اليوم) .

أظهرت النتائج أن هناك فروق معنوية لمعلمات الدم من الهيماتوكريت (عند اليوم 90 من الحمل عند مستوي معنوية 0.0299) وأظهرت متوسط خلايا الدم إختلافات معنوية (عند اليوم 45 و90 من الحمل عند مستوي معنوية 0.0014 و0.0580) على التوالى. تغيرت مستويات الدهون الثلاثية بشكل ملحوظ عند فترات العشرالمختلفة بينما تغيرت مستويات الكوليسترول الكلية بشكل ملحوظ في 150 يومًا ؛ تغيرت مستويات البروتين الدهني منخفض الكثافة في 45 و 90 يومًا من الحمل ؛ وتغيرت مستويات البروتين الدهني عالي الكثافة عند 45 و 90 يومًا من الحمل. انخفض AST و ALT نتيجه للمعاملة بالسيلينيوم نانو والكارنتين خلال 45 و 90 و 150 يومًا من الحمل ، بينما انخفض مستوي ALT خلال 90 و 150 يومًا من الحمل نتيجه للمعاملة بجزيئات السيلينيوم النانونيه والكارنتين مقارنة بالمجموعة الضابطه.

أظهر تركيز اليوريا انخفاضًا معنويًا نتيجه للمعاملات خلال 90 و 150 يومًا من الحمل ، وانخفض تركيز الكرياتينين بشكل ملحوظ في 90 يومًا من الحمل. علاوة على ذلك ، أظهرت البيانات انخفاضًا معنويًا في الجلوتاثيون المؤكسد (في الأيام 90 و 150 ، P = 0.0001) وأكسيد النيتريك (في اليومين 45 و 150نتيجه للمعاملة بالسيلينيوم نانو والكارنتين . ووجد أن هناك تحسن كبير في سيرم الدم للإيدينوسين ثلاثي الفوسفات وزيادة في انخفاض الجلوتاثيون وديسموتاز الفائق نتيجه للمعامله بالسيلينيوم نانووالكارنتين خلال فترات الحمل المختلفة. . ومن ثم فإن استخدام جزيئات السيلينيوم النانونية والكارنيتين لتجريع نعاج الأوسيمي خلال فترات الحمل المختلفة قدحسنت مختلف القياسات البيوكيميائية والحيوية ودلائل مضادات الأكسدة في الدم.