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Effect of Selenium Adminstration on Reproductive Outcome and Biochemical Parameters to Ewes and their Lambs

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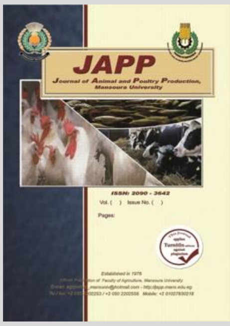

ABSTRACT

Sixty non-pregnant Rahmani x Romanov crossbred ewes used to study the effect of selenium on production and reproduction performance of ewes. The experimental ewes divided into five similar groups based on age, body weight, and physiological state (12 head/group), the first group (G1) used as control group without any addition. The second and third groups were injected with 0.1 mg (G2) or 0.2 mg/kg DM (G3) of selenium (sodium selenite), or oral of 0.1(G4) or 0.2 mg/kg DM (G5) of nano selenium. Fertility (%) of pregnant ewes were 83.3, 91.7, 100, 91.7 and 100% in G1, G2, G3, G4 and G5, respectively. Total protein (g/dl) blood were 7.1, 6.06, 6.4, 5.9 and 6.1 for G1, G2, G3, G4 and G5, respectively and corresponding values of globulin (g/dl) were 2.22, 2.54, 2.40, 2.05 and 2.38. The values of GOT were 79.2, 60.25, 69.07, 79.2 and 60.25 (U/L) and the values of GPT were 28.71, 15.61, 12.2, 16.5 and 20.6 (U/L). Thyroid hormones as T3 and T4 were 3.2, 4.2, 4.1, 4.36 and 4.65 (ng/ml) for T3 and 6.7, 6.6, 7.09, 6.84 and 7.33 (ng/ml) for T4 on G1, G2, G3, G4 and G5. The present study showed that giving Se to pregnant ewes improved the immunity of their lambs during the suckling period.. Finally, it can conclude that used of 0.1 or 0.2 mg/kg oral Nano-selenium could favorable effects on lambs performance.

***Keywords**:* Nanoselinum, fertility, growth rate, blood contents

INTRODUCTION

Selenium (Se), as selenocysteine(SeCys), is a significant dietary minor component for all living organisms. It is essential for antioxidant defense mechanisms. Se binds into proteins like selenocysteine (SeCys) and functions to prevent oxidative damage to body organs (Rotruck *et al.*, 1973). Selenium lack in feed is common in most countries; the shortage of selenium has plagued animal husbandry for many decades. Selenium reduction can lead to impaired heats, cystic ovaries, and the birth of unthrifty kids with weak immunity and white muscle disease, which causes stiffness and heart failure. (Hartikainen, 2005).

Selenium is important for animal nutrition, immunity, reproduction, protection, protein oxidation, thyroid hormone synthesis, and metabolism (Yatoo *et al.*, 2013)

Selenium is a trace mineral that is found in trace concentrations in the human body. Because the mineral cannot be synthesised by different organisms, it must be obtained through diet. Animals' Se is bound to proteins, depending on the amino acid type, these proteins are referred to as selenoproteins or seleno-containing proteins. The selenoprotein is made up of selenocystein (Se-Cys), which binds to the protein and is controlled at the ribosome level. and grater than 80% of the protein bound Se is Se-Cys (Ghany-Hefnawy and Tórtora-Péres, 2010). Most of the seleno proteins have enzymatic functions and therefore, they are also known as selenoenzymes. In the mammalian organism, these enzymes are involved in a variety of metabolic pathways (Ghany-Hefnawy & Tórtora-Péres, 2010). Se insufficiency is linked to a number of economically significant disorders, such as infertility, abortion, retained placenta and neonatal weakness (Vanegas *et al.*, 2004).

Selenium (dietary or injectable) has been found in several studies to enhance animal reproductive performance, Marin-Guzman *et al.* (1997, 2000) found structural anomalies in the spermatozoal mitochondrion, low ATP levels, and decreased GSH-Px activities in boars fed low-selenium diets.

In all mammals, selenium is a critical element for growth, reproduction, fertility, the immune system, metabolism, and antioxidant defense mechanisms. (Beck *et al.*, 2005; Beckett and Arthur, 2005; Pappas and Zoidis,2012; Surai, 2006; Tapiero *et al.*, 2003). Therefore, animal diets require supplemental Se in organic or inorganic forms to provide a margin of safety against deficiency and to keep productive performance up. (Dokoupilová *et al.*, 2007).

When compared to selenite, Se (NanoSe) has garnered a lot of attention in sheep and goats because of its high bioavailability, high catalytic efficiency, great adsorbing capacity, and low toxicity. (Shi *et al.*, 2011a). Organic forms such as Se enriched yeast, in which selenomethionine is utilized as the commercial Se source supplement in animal feeds in the United States, and inorganic mineral salts such as sodium selenite or selenate

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(Federal Register, 2002) and EEC (2006) Because nanometer particulates exhibit novel characteristics, such as a large specific surface area, high surface activity, a large number of surface active centres, and high catalytic efficiency, Nano-elemental Se has recently attracted widespread attention due to its high bioavailability and low toxicity and strong adsorbing ability and the character of low toxicity of routine Se (Zhang *et al.,* 2001). Following investigations found that nano-elemental Se is as effective as selenite, selenomethionine, and methylselenocysteine at upregulating selenoenzymes, with significantly lower acute toxicity. (Xu *et al.,* 2003; Zhang *et al.,* 2005, 2008; Wang *et al.,* 2007).

Among all possible options, using nanotechnology to create Nano-sized Se (NP-Se) is a viable alternative to both organic and inorganic Se sources. The purpose of this study was to see how selenium (sodium selenite) injections compared to oral administration of 0.1 or 0.2 mg/kg of Nano-selenium affected the productive and reproductive performance of ewes.

MATERIALS AND METHODS

Non-pregnant sixty Rahmani x Romanov crossbred ewes of the flock of Mehallet Mousa Experimental Station (3-5 years old and 50-55 kg body weight) were used to study the effect of injection with 0.1 or 0.2 mg/kg of selenium (sodium selenite) or oral of 0.1 or 0.2 mg/kg of Nano-selenium on production and reproduction performance of ewes which include estrus rate, pregnant rate, fertility percentage, litter size, birth weight of lamb, body weight of lamb at 15, 30, 60 and weaning age and mortality rate..

These ewes were selected at the breeding season, which starts from September with nature mating, so that the treatment with selenium gave at four stages: first: before mating, second: at 19 days after mating, third: 2 weeks pre lambing and forth: 2 weeks post lambing, the experiment continued until the completion of the birth of the ewes and weaning of lambs.

Sixty ewes were placed into five treatment groups based on their age, body weight, and physiological condition (12 head per group) as follows:

- First group (G1) the ewes was used as a control group without any treatment,
- Second group (G2) the ewes was injected with 0.1 mg/kg of selenium (sodium selenite),
- Third group (G3) the ewes was injected with 0.2 mg/kg of selenium (sodium selenite),
- Fourth group (G4) the ewes was given oral 0.1 mg/kg of Nano-selenium
- Fifth group (G5) the ewes was given oral 0.2 mg/kg of Nano-selenium

The estrus was monitored by the presence of a scout ram with the experimental ewes and the proportion of the estrous was recorded in each group, ewes were mated during the breeding season of six weeks in September and October.

The animals were housed in semi-open sheds and they were fed concentrate feed mixture and roughages according to NRC (1977). requirements all the year-round and During the winter, 5 kg Egyptian clover is fed, and 1.5 kg clover hay is fed during the summer, with unrestricted access to trace mineralized salt lick blocks and drinking water at all times.

Preparation of Nano-selenium (SeNPs):

Green synthesis of Nano-selenium spheres (SeNPs) was done as described by Prokisch and Zommara (2011). Pure yoghurt culture was obtained from Microbiological Resource Centre, Ain Shams University (MIRCEN), Cairo, Egypt. Yoghurt culture (*Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilu*) were mixed (1:1, w/w) and cultivated in whey yeast extract media as described by Kar and Misra (1999) fortified with 1% yeast extract and 0.1% skim milk powder (Parente and Zottola, 1991). The media were amended with 100 ppm selenium (sodium selenite, Na2SeO3. 5H2O, Sigma-Aldrich, Switzerland) that had been filter sterilised (Sartorius AG, Germany) and incubated at 40°C for up to 24 hours. SeNPs The average size was 122.6 34.6 (SD) or 122.6 8.6 nm, with a range of 55-238 nm (SE). The concentration of selenium in the final dry product was 7.5 mg/g.

Scan electron microscopy (SEM) photos of the produced SeNPs:

Scan electron microscopy SEM (JSM-IT100, JEOL Co. Japan) photos of a yoghurt culture-SeNPs suspension was done in accordance with the instructions Nagy *et al.* (2016).

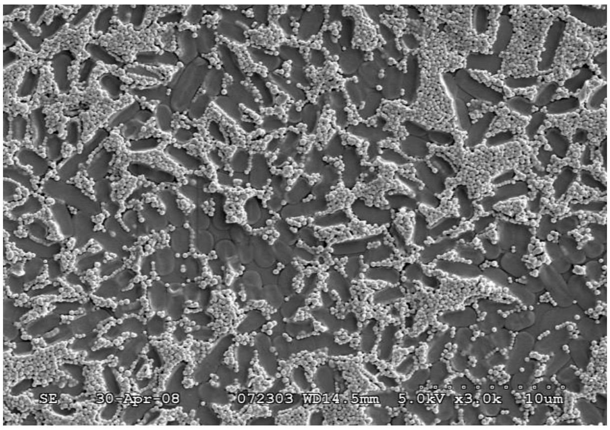

Fig. 1. SEM photos of the yoghurt culture-SeNPs suspension.

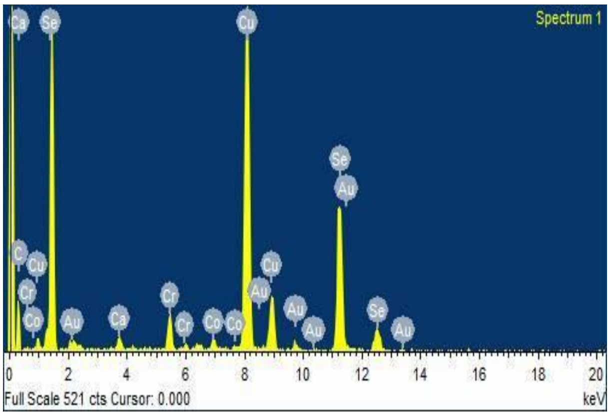

Fig. 2. Energy dispersive X-ray spectra of the produced metal spheres.

Selenium determination:

One gram dry samples were used for total selenium determination in heat-resistant glass digestion tubes. To each tube, 10 ml of 65% nitric acid were added and heated at 60°C for 30 min. using digestion block (KJELDATHERM®, Gerhardt, Germany). Then 3 ml of 30% hydrogen peroxide (Merck, Germany) was added, and digestion was carried out 90 minutes at 120 degrees Celsius before being cooled being cooled to a comfortable temperature. Samples were diluted with Milli-Q water, filtered using filter paper (Macherey-Nagel, Germany) and quantitatively transferred to 25 ml volumetric flasks. Inductively coupled plasma optical emission spectrometry (ICP-OES) was used to assess the content of selenium in the diluted digested samples (Prodigy 7, Teledyne Leeman Labs, USA) (Zommara *et al.*, 2007).

Blood sampling:

Blood samples were taken from lambs' jugular veins when they were weaned. The blood samples were centrifuged for 15 minutes at 4000 rpm. Clear serum was separated and kept at (-20 oC) until it came time to test it.Total protein, albumin, globulin and biochemical parameters (AST, ALT), were determined by spectrophotometer (Spekol 11, Carl Zeiss Jena, Germany) (Young, 2001) according to the manufacturer's instructions (Diagnostic diamond, Egypt). The globulin concentration was calculated using the differential between serum total protein and albumin.Blood samples were analyzed for some thyroid hormones which include T3, and T4 on Cobas e411 instrument of Roche company using chemiluminescence method.

Blood immunoglobulins:

Concentration of immunoglobulines (IgG) was determined in blood serum of lambs after 24, 48 and 72 hr after lambing by ELISA (enzyme-linked immune sorbent assay) technique of the Immuno Tech-Beckman Coulter Company according to Mancini *et al.* (1965).

Statistical analysis:

SAS (2003), was used to analysis the data. For the treatments under investigation, analysis of variance, Chi-squares, and regression were used. The mean separations among the effects of treatment for the studied parameters were determined using the Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Data in Table (1) demonstrated that there is no significant effect in both estrus rate and pregnancy diagnosis after 60 days of artificial insemination between different groups. Whereas the estrus rate and pregnancy level were recorded as one hundred percent in control group and all treated groups. This means that addition of Nano These findings agree with those of Koyuncu and Yerlikaya (2007),who found that the estrus response was about 100.0; 96.7 and 86.7% in groups supplemented with Se; Se plus VE and control group, respectively. This means that Se and Se plus vitamin E had a considerable useful effect on the estrus response in ewes. In compared to the control group, the NanoSe and Se + vitamin E injections enhanced fecundity in groups I and II (131.0 and 148.1 percent, respectively) (P 0.01). Similarly, Anke (1987) found that two injections (2.1 mg of Se/injection) before mating and lambing had a beneficial effect on reproductive rate in 3-year-old goats

Table 1.Effect of sodium selenite and Nano selenium on estrus and pregnancy rate of ewes.

Group	N0.	Ewes showed estrus	Pregnancy diagnosis of ewes after 40 days of mating	
		No.	No.	%
G1	12	12	12	100
G2*	12	12	12	100
G3*	12	12	12	100
G4**	12	12	12	100
G5**	12	12	12	100

*** Injection 0.1 or 0.2 mg/kg selenium ** oral 0.1 or 0.2 mg/kg Nano-selenium**

Results in Table (2) showed that the pregnancy rate in all experimental animals was 100%. While the birth rate varied among the different groups, the following percentages were recorded 83.3%, 91.7%, 100%, 91.7% and 100% in Grouop1, Group2, Group3, Group4 and Group5, respectively. This means that the higher doses (0.2 mg/kg) whether by injection or oral recorded the highest birth rate in G3 and G5 while the second and fourth group followed, and the control group recorded the lowest birth rate.

Table 2. Effect of treatments on ewes' pregnant survival and litter size

Group	Ewes treatments				Lambs produced	
	Number	Pregnant	Lambed	Fertility %	Number	Litter size
G1	12	12	10	83.3[b]	13	1.30[ab]
G2*	12	12	11	91.7[ab]	14	1.27[ab]
G3*	12	12	12	100[a]	17	1.41[a]
G4**	12	12	11	91.7[ab]	12	1.09[b]
G5**	12	12	12	100[a]	19	1.58[a]

*** injection 0.1 or 0.2 mg/kg selenium ** oral 0.1 or 0.2 mg/kg Nano-selenium**

a, b,… Means denoted within the same column with different superscripts are significantly different at P<0.05.

In the same trend, the data in Table (2) showed that the number of lambs produce recoded the highest rate in G5 followed by G3, G2 and G1,while the lowest number in G4.

These findings are consistent with those reported by Koyuncu and Yerlikaya (2007), who observed that giving Merino ewes Vitamin E and Selenium improved their estrus response and fertility rate significantly. In a similar trend. Segerson and Ganopathy (1980) Vitamin E and Selenium supplementation had a positive effect on experimental ewe fertility. These changes contribute to selenium's role as a co-factor in the glutathione peroxidase enzyme system, which is responsible for extracellular free radical detoxification. (Smith and Akinbamijo, 2000) .

Parturition-related losses account for roughly half of all losses in extensively grazed flocks, with stillbirth (21%), birth injury (18%), and dystocia (9%), followed by starvation-mismothering (25%), death in utero/prematurity (10%), predation (7%), and cold exposure (5%). (Refshauge *et al*., 2016). The deficiency of Se is influenced by the Se content in the vegetation (Saha *et al.,* 2016). Ruminants appear to be highly susceptible to Se deficiency with more severity in sheep and goats (Hefnawy and Perez, 2010). Selenium deficiency causes exudative diathesis and dietary necrotic liver degeneration in poultry. In pigs, Se deficiency causes mulberry heart diseases (Zarczynska *et al.,* 2013).

Rate of twins, type of sex and mortality rate of lambs

Results in Table (3) showed the effect of experimental treatments with selenium on the percentage of twins where's the highest value was recorded in G5 (63,2 %) followed by G3 (58.9 %), G1and G2 while, the lowest value recorded in G4 (50,0%).

Furthermore, the percentage of type of sex in selenium-treated ewes suggested that male of sex was higher percentage in all groups except in G3 which recorded that female sex was higher level in comparison with male sex

Moreover, the mortality rate in all different groups was zero at birth, 60 days and 90 days old. While, on 30-day old the mortality rate was 7.14, 5.26, 0, 7.14 and 5.26% for G1, G2, G3, G4 and G5 respectively and the corresponding values of the total mortality rate for lambs from birth upon 90- day (weaning) were 7.14, 5.26, 0, 7.14 and 5.26.

Table 3. Effect of experimental treatments on rate of twins, type of sex and mortality rate of lambs produce from ewes treated.

Treatment group	N	Type of lambs birth		Type of sex		Total lambs	Mortality rate				
		Single (%)	Twine (%)	Male (%)	Female (%)		at birth	30 d	60 d	90 d	Total
G1	10	7 (42.3)[a]	3 (57.7)[b]	7 (53.8)[a]	6 (46.2)[b]	13	0 (0)	1 (7.14)	0 (0.0)	0 (0.0)	1 (7.14)[a]
G2	11	6 (42.8)[c]	4 (57.2)[a]	7 (50.0)[c]	7 (50.0)[a]	14	0 (0)	1 (5.26)	0 (0.0)	0 (0.0)	1 (5.26)[b]
G3	12	7 (41.1)[b]	5 (58.9)[c]	8 (47.1)[b]	9 (52.9)[c]	17	0 (0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)[c]
G4	11	6 (50.0)	3 (50.0)	7 (58.3)	5 (41.7)	12	0 (0)	1 (7.14)	0 (0.0)	0 (0.0)	1 (7.14)
G5	12	7 (36.8)	6 (63.2)	12 (63.1)	7 (36.9)	19	0 (0)	1 (5.26)	0 (0.0)	0 (0.0)	1 (5.26)

a, b,… Means denoted within the same column with different superscripts are significantly different at P<0.05. N: Number of lamed ewes.

Dwyer *et al.* (2016) found that high pre-weaning mortality limits sheep production globally, with the proportion of lamb deaths remaining stable at 15–20 percent for the previous 40 years across various countries and systems. In Australian herds, singles and twins lambs had mean losses of 10% and 30%, according (Hinch and Brien, 2014). The most common causes of mortality vary by region, depending on risk factors such as sickness or extreme weather, however the majority of deaths happen during the first three days after delivery (Brien *et al*., 2009).

The main risk factors for neonatal loss in lambs are birth weight and litter size, as well as dam breed (Geenty *et al*., 2014). The relation between birthweight and survival is curved, with more deaths occurring in lambs born outside the optimum weight range (Oldham *et al*., 2011), while the primary causes differ between underweight and overweight lambs. Heavy lambs, especially single, have a higher prevalence of dystocia and stillbirth due to feto-pelvic huge disparity (Refshauge *et al*., 2016). Low birth weight lambs, on the other hand, have a higher risk of birth damage, hunger, and hypothermia, especially if they are the result of repeated pregnancies (Kenyon *et al*., 2019). This is due to lighter lambs taking longer to stand and suckle after birth, as well as being less able to maintain homeothermy (Dwyer and Morgan, 2006).

Suckling lambs' performance:

Figure 3 describes the variations in lambs' body weight from birth through weaning. Initial weight variations across treatments were not significant (P0.05), but body weight at weaning was substantially heavier with Se treatments than the control one. From data live body weight of lambs gradually increased from lambing to weaning throughout 60 to 70 days. At birth the overall mean body weight about 3.2 kg for the 5 treatment group and the increase gradually to reach 10.6, 11.2, 11.1, 12.9 and 11.2 kg at 60 days for G1, G2, G3, G4 and G5, respectively. The corresponding values were 12.4, 13.52, 14.02, 15.13 and 14.22 at 70 days of age (weaning on 12 kg).

The increased body weight caused by various kinds of Se could be attributable to an increase in digestion coefficients and feeding values, as well as an improvement in thyroid hormone secretion. T3 and T4 levels were inversely related to survive body weight, with lower levels in the lighter control group and higher levels in the larger ones (Nano-Se).In goat bucks, the final Body weight and daily gain was increased (P < 0.05) in nano-Se supplemented group compared to the Se and the control (Shi *et al.* 2011b)

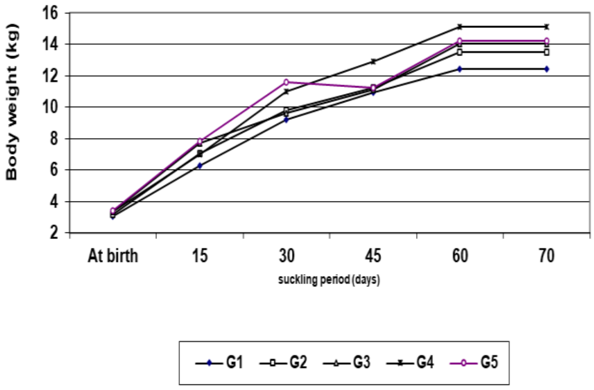

Fig. 3. Effect of treatments of body weight of lambs during the suckling period up to weaning.

The improved feed/gain ratio (FCR) of animals feed Nano-Se could be linked to the higher concentrations of the active form of thyroid hormone in the serum of these animals [Surai, 2006; Huffnann, 2007; Özkan *et al.,* 2007). These findings are consistent with those of Radwan *et al.* (2015), who demonstrated that Nano-Se treatment increased GR activity and TAC significantly when compared to the control and selenium groups.

Boscos *et al.* have previously measured the positive impact of Selenium and vitamin addition on lamb body weight and daily weight gain (2003). Akpa *et al.* (1994) found an average daily weight gain of 79.3 g, but Osinowo *et al.* (1991) found a daily weight gain of 91.8 g.The enhancing effects of Nano minerals on growth rate and daily weight gain can be regarding to their ability to beneficially change the alimentary duct microarchitecture of animals (Adegbeye *et al.,* 2019) and improve rumen fermentation, specifically fiber digestion and redox homeostasis (Mohamed *et al.,* 2017).

Blood serum parameters of lambs:

Table data (4) showed that blood serum parameters of lambs affected by experimental treatments. Total protein (g/dl) were 5.90, 6.06, 6.4, 7.10 and 6.1 for G1, G2, G3, G4 and G5, respectively and corresponding values of albumin (g/dl) were 3.68, 3.52, 4.00, 5.05 and 372 whereas the globulin values (calculated) were 2.22, 2.54, 2.40, 2.05 and 2.38 (g/dl), respectively. This means that addition of Nano-selenium led to improve metabolism in treated ewes in comparison with control group.

In the same trend, the value of GOT was 79.20, 60.25, 69.07, 51.14 and 60.25 (U/L) , while the values of GPT were 28.71, 15.61, 12.2, 16.50 and 20.6 (U/L) in G1,G2,G3,G4 and G5,respectively. The thyroid hormones were estimated in all lamb groups at the end of experiment, Triiodothyronine (T3) and Thyroxin (T4) were 3.2, 4.2, 4.1, 4.36 and 4.65 (ng/ml) for T3. While T4 concentration was 6.7, 6.6, 7.09, 6.84 and 7.33 (ng/ml) in G1,G2,G3,G4 and G5, respectively

Table 4. Blood serum parameters of lambs affected by experimental treatments at the end of experiment.

Item	Experimental treatments					MSE
	G1	G2	G3	G4	G5	
Total protein (g/dl)	5.90	6.06	6.4	7.10	6.1	±0.22
Albumin (g/dl)	3.68	3.52	4.00	5.05	3.72	±0.18
Globulin (g/dl)	2.22	2.54	2.40	2.05	2.38	±0.08
GOT (U/L)	79.20^{a}	60.25^{ab}	69.07^{a}	51.14^{c}	60.25^{ab}	±1.62
GPT (U/L)	28.71^{a}	15.61^{b}	12.2^{c}	16.5^{b}	20.6^{ab}	±2.51
T3 (ng/dl)	3.20	4.20	4.10	4.36	4.65	±0.32
T4 (ng/dl)	6.70	6.60	7.09	6.84	7.33	±1.22

a, b and c: means in the same row with different subscripts differed significantly (P<0.05) .

These study found that nano form of Se gotten better dietary metabolism coefficient values and feeding values better than usual particles, possibly owing to enhanced biological activity, as well as the large specific surface area, high surface activity, and high adsorption ability of parts in nano form (Zhang *et al*) (2008). It also increased ruminal viscosity and was thus easily destroyed by microflora in the large bowel, improved soluble fibre in cases of high water content, formed gel quickly, which increased ruminal viscosity, and was thus easily destroyed by microflora in the large bowel Insoluble fibre, on the other hand, had a low water holding capacity, sped up transit, was only partially degraded by microflora, and increased faecal volume (Swanson *et al.,* 2001). The current findings are consistent with those of Wang *et al.* (2011), who found that supplementing with nano-zinc oxide improves ruminal microorganism growth, increases ruminal microbial protein synthesis, and increases energy utilisation efficiency, all of which improve digestive processes and thus nutritional value.

Bunglavan *et al.* (2014) showed that minerals in nanoparticle form had a particle size of less than 100 nanometers, allowing them to pass through the stomach wall and into human cells faster than typical minerals with greater particle sizes. Nano-additions can also be found in protein micelles or capsules, as well as other natural food and feed ingredients. The bioavailability of these compounds is limited by the epithelial barriers of the gastrointestinal tract, and they are sensitive to gastrointestinal breakdown by digestive enzymes, making the development of acceptable carriers a problem. Manipulation of matter at the nanoscale also paves the way for bettering the functionality of food/feed molecules, which benefits product quality.

These results are in contrast those of Berg and Shi (1996) and Walsh *et al.* (1994), According to the researchers, MDA levels and zinc oxide Nano particles have an opposite relationship. The recent study, on the other hand, are in line with those of Abd-El Ghany *et al.* (2016), who observed that feeding a rabbit a diet supplemented with Nano-Se significantly increased total antioxidant capacity (P0.05). The results shwed the liver enzyme activities, an increase in AST activity and a decrease in ALT activity as a result of Nano-Se supplementation, are reliable with those of Mohapatra *et al.* (2014), who noticed that serum AST levels increased linearly and quadratically (P 0.05) as the amount of Nano-Se in the diet increased. On the other hand,other research According to Qin *et al.* (2016), Nano-Se and SSe supplementation raises ALT levels compared to the control group, but Nano-Se lowers AST levels more than the SSe and control groups. According to Changguang *et al.*, (2013), blood T3 levels in Nano-Se treated piglets increased by 23.08 percent and 24.08 percent, respectively, and were considerably higher than those in the sodium selenite group. When compared to the control group, serum T4 levels declined insignificantly (P 0.05) at the end of the experiment.

Immune response:

Data in the following table (5) shows that serum IgG level for lambs, treated with Se recorded the highest concentration (P<0.05) 9.47, 9.63, 11.52 and 10.96 (g/dl) for G2, G3, G4 and G5 respectively, compared to controls (7.96 g/dl). The rate of immunoglobulin in blood serum of lambs treated with Nano-Se was higher than that in blood serum of lambs treated with Se, while the control had the low concentration (P0.05). The concentration of immunoglobulin in blood serum of lambs treated with injection Se or oral Nano-Se decreased gradually followed by days with significant differences (P0.05), while the control had the potency (P0.05).

Table 5. Serum IgG levels in lambs during the period from 24- 36 hr. after suckling.

Item	Experimental treatments					MSE
	G1	G2	G3	G4	G5	
IgG (g/dl) :						
at 24 hr	7.96^{bA}	9.47^{abA}	9.63^{abA}	11.52^{aA}	10.96^{aA}	±1.53
at 48 hr	7.78^{bA}	8.88^{abA}	9.12^{abA}	9.13^{abAB}	10.02^{aA}	±1.02
at 72 hr	6.01^{bB}	7.77^{bB}	8.23^{abB}	8.72^{abB}	9.42^{aB}	±1.23

a, and b: means in the same row with different subscripts differed significantly (P<0.05) .

A, and B: means in the same column with different subscripts differed significantly (P<0.05) .

One of the most important immunological factors is immunoglobulin concentration (mainly IgG). Until the lamb's own immune system has been primed and produces significant amounts of antibodies, maternal immune-globulins in colostrum play an important role in its defense mechanism against neonatal illnesses (Khan and Ahmad, 1997). Nano particles of Se, when used as an alternative to conversional mineral sources, have a significant positive impact on animal growth, immunity, and reproductive function. Nano Se has been discovered to help sheep grow faster and eat more efficiently (Mohamed *et al*., 2015). These findings could be linked to the composition of colostrum. After sucking colostrum, the lamb's serum immunoglobulin levels were at their highest within the first 24 hours of life.Stott *et al.* (1979) According to the findings, lamb at birth receive little immunity from their mothers and are born with little protection against local microbial threats. The placenta prevents Ig from being transported from the mother to the foetus, so colostrum is the only source of immunoglobulin (Ig) for animals at birth. (Quigley and Drewry 1998). These absorbed proteins can be transferred to the basal cell via a tubule system and then released into the lymphatic and circulatory systems. Lamb gains transient immunity as a result of this absorption. By 24 hours, absorption had essentially ended, and IgG was no longer being released into the lymphatic system.

Nano-Se supplementation improved the reproduction performance of ewes and the growth rate of lambs in the current study. Se had a positive impact on their lambs' immunity during the suckling period. Finally, it may be concluded that 0.1 or 0.2 mg/kg Se injections or oral 0.1 or 0.2 mg/kg Nano-selenium could improve lamb performance.

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تأثير اضافة النانو سلنيوم علي الأداء التناسلى وبعض القياسات البيوكيميائية على النعاج وحملانها

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تم استخدام ستين (60) نعجة خليط غير حوامل رحماني x رومانوف لدراسة تأثير النانو سيلينيوم على الأداء التناسلي و الإنتاجي ، قسمت النعاج الى خمس مجموعات متساوية على اساس العمر والوزن وحالة الحيوان (12 رأس لكل مجموعة) ، المجموعة الأولى استخدمت كنترول بدون اي اضافات ، المجموعة الثانية والثالثة تم حقن 0.1 و 0.2 مجم /كج على الترتيب ، المجموعة الرابعة والخامسة 0.1 ، 0.2 مجم/كج بالفم من النانو سيلينيوم على الترتيب . أظهرت النتائج النسبة المئوية للخصوبة كانت 83.3 و 91.7 و 100 و 97.7 و 100% للمجموعات الاولى والثانية والثالثة والرابعة والخامسة على الترتيب . البروتين الكلي في الدم جرام لكل ديسيلتر 7.1 و 6.6 و 6.4 و 5.9 و 6.1 للمجموعات الاولى والثانية والثالثة والرابعة والخامسة على الترتيب ، وكانت قيمة الألبيومين (جرام لكل ديسيلتر) 3.68 و 3.52 و 4و5.5و3.72 للمجموعات الأولى والثانية والثالة والرابعة والخامسة على الترتيب وكانت قيمة ا الجلبيولين في الدم (جرام لكل ديسيلتر)2.22 ، 2.54، 2.40، 2.05، 2.38 للمجموعات الأولى والثانية والثالة والرابعة والخامسة على الترتيب وكانت قيمة ناقلة أسبارتات أمينوترانسفيراز (وحدة لكل لتر) 79.2 ، 60.25 ، 69.07 ، 79.5 ، 60.25 للمجموعات الأولى والثانية والثالة والرابعة والخامسة على الترتيب وكانت قيمة انزيم :ناقلة أمين الألانين28.71 ، 15.61 ، 12.2 ،16.5 ، 20.6 للمجموعات الأولى والثانية والثالة والرابعة والخامسة على الترتيب وكانت قيمة هرمون الثيرونين (نانو جرام/ ملي) 3.23 ، 4.2 ، 4.1 ، 4.36 ، 4.65 للمجموعات الأولى والثانية والثالة والرابعة والخامسة على التوالي وكان مستوى هرمون الثيروكسين (نانوجرام/ملي) 6.7 ، 6.66 ، 7.09 ، 6.84 ، 7.33 للمجموعات الأولى والثانية والثالة والرابعة والخامسة على الترتيب. أظهرت الدراسة الحالية أن مكملات النانو سيلينيوم للنعاج الحوامل لها تأثيرات مفيدة في زيادة مناعة الحملان خلال فترة الرضاعة. وأخيرًا ، نستنتج أن استخدام النانو سيلينيوم عن طريق الفم يمكن أن يكون له تأثير إيجابي على أداء الحملان.