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Effect of some minerals and vitamins on abortion occurrence in ewes

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ABSTRACT

The objective of current study to demonstrate the effect of some minerals (Iron, copper, Zinc, Calcium, magnesium and phosphor) and each of vit. E and D on the occurrence of abortion in ewes. The study conducted in Salahadin and Kirkuk province in October 2018 to January 2019 . 5 ml blood sample was collected from 75 ewes recently aborted and isolated serum then stored at 20C- till analyzed. The results showed (P≤05.0) decreasing of serum concentration of Iron, Phosphor and Zinc in the aborted ewes compared with healthy lambing ewes while there was significant (P≤05.0) increase of cooper in aborted ewes. Also the results indicate significant decrease in vitamin E and D level in the aborted ewes compared to healthy lambing ewes. We concluded that the concentration of Iron, Phosphor , Zinc, cooper, vitamin E and D have critical effect on occurrence abortion in ewes.

1.Introduction

The reproduction of small ruminants like goats and sheep managed under extensive range grazing conditions can be affected by nutrients availability and especially by the mineral content of the forages resources on the rangeland [1]. It has been particularly demonstrated that trace elements can have equally, beneficial or detrimental effects, depending on its balance, on reproductive functions in small ruminants [2]. Trace elements as copper, molybdenum, selenium and zinc play key role on the metabolism of carbohydrates, proteins and lipids [3]. There is considerable evidence in pregnancy highlighting their effects on oxidant/antioxidant balance, but also their other roles such as cell proliferation (zinc), protein synthesis (selenium, zinc), and hematopoiesis (copper) [4]. Trace elements [Copper (Cu), Selenium (Se), Zinc (Zn), Iron (Fe), Molybdenum (Mo), Manganese (Mn), Cobalt (Co), Chromium (Cr), and Iodine (I)], inorganic substances that are vital for sustaining life, are required in minute amounts every day (generally less than 100 mg/ day[5]. Minerals such as phosphorous (P), calcium (Ca), magnesium (Mg), iodine (I), manganese (Mn), copper (Cu), selenium (Se), and zinc (Zn) are all involved in governing successful reproductive processes [6]. Some trace minerals such as zinc (Zn), copper (Cu), manganese (Mn), and selenium (Se) have great roles in body metabolism and immune system function which make them vital for animals.

These elements function as cofactors for some metallo-enzymes. Therefore, any deficiency of these minerals due to low supply or some mineral antagonism creates problems for cattle's health, fertility, and performance [7].

Andrieu [8] reviewed the roles of organic trace element supplements in transitioning cow health and suggested that organic trace elements including Zn, Cu, Mn, Se, and Fe significantly improve transitioning dairy cows' immunity and reproduction. He also pointed that Zn or Cu deficiency or marginal diet pre-parturient may cause some health problems in calves. Therefor the present study conducted to evaluate the effect of Iron, copper, Zinc, Calcium, magnesium, phosphor and each of vit. E and D concentrations on the occurrence abortion in ewes.

2.Materials and Methods:

The study included (95) ewes, (20) were health (not aborted) as control and 75 aborted from different flocks in Salahadain and Kirkuk provence at the period between October 2018 to January 2019. Their ages ranged between 1.5 to 3.5 years and weighing between 30 to 45 kg at the sampling time of experiment. Jugular blood samples were taken from each animals of aborted (within 24 hours after abortion) and control animals using vacationer tubes Blood. 5 ml were drawn from controls and subjects by jugular vein puncture into tubes without anticoagulant. After clotting, the blood samples were centrifuged at 3,000rpm for 10 min to separate the sera, which was stored at −20°C until the time of analysis. Iron, phosphor and calcium were measured according to [9] by spectrophotometer wih special kit. Zinc, copper and magnesium were measured according to [10] spectrophotometer with special kit, while the vitamin E and D were measured by using ELISA technique with special kit.

Statistics analysis : Data were analysed using paired t-test (Analysis of variance One Way ANOVA) in SPSS (Version 19; SPSS). The differences were set at $p < 0.05$ [11].

3.Results and Discussion:

The results of the current study, as shown in Table (1), showed that the level of iron, in the serum of aborted animals (58.87 ± 6.76 mg/dL), was significantly low (0.05 > P) compared with the serum of healthy animals (86.98 + 4.78 mg/dL) these result was agreement with Frenke et al [12] who showed that the cause of iron deficiency in the event of pregnancy or abortion is due to the consumption of iron by the body, which increases the need for it during this period and the occurrence of cases of anemia frequently during pregnancy or abortion, as well as the bleeding that accompanies abortion, As for the researcher Pettit et al. [13] who shown in his study that the reason for the low level of iron in cases of abortion is due to a deficiency of the protein ferritin, which is responsible for storing and releasing iron in the body, which decreases in pregnancies, abortion s, and aging, and with a decrease in this protein the total iron level will be affected. Causing a decrease in the level of iron, and this is what we found in our current study. Our results also agreed with the researcher [14], who studied a Spanish low level of iron during pregnancy and abortion and indicated that the reason for this is due to the high level of estrogen and progesterone during this period and with the rise of these two hormones, it will be a stress factor on the immune system, causing a severe shortage of trace elements, which in turn contribute a major contribution to activating the immune system, and among these elements that contribute to revitalizing the immune system is the element of iron, and this may decrease its level during pregnancy and abortion.

Serum level of phosphorous (Table 1), in aborted animals (14.12 ± 138 mg/dL), was significantly decreased (P> 0.05) compared with the serum of healthy animals (6.43 +1.98 mg/dL), these results was agreed with [15] who explained the reason for the decrease in the level of phosphorus in aborted animals to the consumption of phosphorus stored in the body by the animal.

The results of present study showed significant (P≥0.05) decreases in the zinc concentration in the serum of aborted animals (87.14 ± 3.56 mg/dL) compared with the serum of healthy animals (94.75 + 3.17 mg/dL), this result is consistent with the results of [16] in humans and the results of the study [17]in sheep Zinc is one

of the essential elements for the functions of the immune system, especially the immune response to bacterial infections [18]. The decrease in zinc concentration can also be attributed to the role of a number of inflammatory products in regulating the balance of this element, as the interleukin released from Before activated macrophages lead to a decrease in the concentration of this element due to an increase in the manufacture of metallothionine in the liver and other affected tissues [19].

Among the elements that were measured in the current study, the results showed significant ($P< 0.05$) increases in copper in the aborted group (22.56 + 2.78 mg/dL) compared to its level in healthy group (18.76 +1.65 mg/dL), this result is differed with what, Mc Chowell [20] found, as he observed on two flocks of sheep the copper level in aborted sheep is not different from what it is in non-aborted sheep, as the abortion itself does not affect the copper level. The reason of decrease in the copper level may be due to the lack of copper in the diet provided to the animals. Anke et al. [2] has shown that the decrease in the copper level is not due to abortion, but rather the decrease in copper itself is a cause of abortion, as a diet containing a small percentage of copper is a cause of abortion, while our results agreed with the results of a study Kseyrek et al. [17] who observed a significant increase in the copper concentration in the serum of aborted infected sheep. The reason for this increase may be due to the fact that various infections increase the serum copper concentration due to the activity of the acute phase of interleukin, which increases the level of Copper concentrate [21]. On the other hand, the elevation could be due to an increase in the level of serum and Ceruplasmine, which is the main transporter of copper, as the high level of this transporter occurs in response to the infections associated with the disease, which leads to an increase in the copper concentration in the blood [17].

Table 1: levels of iron, phosphorous, zinc, magnesium, calcium and copper in aborted and healthy ewes.

Groups / parameters	aborted ewes (48 ewes)	healthy ewes (20ewes)
Iron (mg/dL)	58.87 ± 6.76 [b]	86.98 + 4.78 [a]
Phosphorous (mg/dL)	14.12 ± 138[b]	6.43 +1.98 [a]
Zinc (mg/dL)	87.14 ± 3.56 [b]	94.75 + 3.17[a]
magnesium (mg/dL)	0.67±2.21 [a]	1.38±8.89 [a]
Calcium (mg/dL)	8.24 ±1.87[a]	0.87±2.54 [a]
Copper (mg/dL)	22.56 + 2.78 [a]	18.76 +1.65 [b]

Mean ± stander error

Different small letters mean significant differences at P≤0.05

The result of current study revealed that the serum level of magnesium had slightly decreased in aborted animals (0.67±2.21 mg/dL) than healthy group (1.38±8.89 mg/dL), this result agreement with [1] in two groups of sheep that abortion does not affect the level of magnesium in the body, and they showed that the reason for this is that the magnesium stored in the body begins to gradually decrease after birth, starting from the fourth week to the sixth week, and at that time the animals must be fed well with an integrated package containing all the necessary elements for the body, as for abortion, the condition is usually not accompanied by diuresis in milk, so there is no decrease in the level of magnesium. As for the researcher [22], his results differed with the results that we obtained in our current study, as

he showed that the level of magnesium decreases in the body when the occurrence of abortion and attributed the reason for this to the exceptional activity of the phagocytes, which in turn activate and accompany the occurrence of the abortion due to the occurrence of some infections and injuries when the abortion occurs and this requires more macrophage cells in turn, you need the presence of magnesium because of its role as an antioxidant and auxiliary to macrophage cells.

As for calcium, the results showed low level in the aborted group (8.24 ±1.87 mg/dL) compared with healthy group (0.87±2.54 mg/dL), but at a non-significant level, this results are in agreement with the findings of the researcher [23], Who indicated that calcium decreased during pregnancy, as it was all samples in our study belonged to sheep that had aborted at different stages of pregnancy, as [24] denied that abortion causes a "significant" decrease in the concentrations of some elements, as happened in the significant decrease in the concentration of calcium in the serum of aborted ewes, and the decrease may be due to the effect of the concentration of free calcium present inside the host's cells when the causes of abortion have passed, so after the passage of 25 hours of infection, the pathogen becomes able to withdraw calcium from the endosperm of the host cells to the inner periphery of the surrounding vesicle, and that creates the tubule vesicular network with a high affinity for calcium [25] Another explanation for the low calcium concentration may be that animals suffering from hypocalcemia are more susceptible to bacterial infection, especially during pregnancy which is may cause low calcium due to the high calcium requirement in fetal growth [26].

The results of the current study, as shown in Figure (1) showed that the level of vitamin D was significantly lower (P ≤ 0.05) in the serum of aborted animals (19.64 + 2.94 ng/ml) compared to its level in the serum of healthy animals (33.16 + 2.76 ng/ml), this result was agreed with [15] who's explained that these decreasing in vit. D in aborted ewes to its consumption in the body by the animal in order to form the necessary milk for the lambs. As for researchers Mc Erlean and Mc Allister [27], we showed the decrease in the level of vitamin D to the stress during pregnancy and the total dependence of the fetus on the mother to provide sufficient quantities of vitamin D and necessary To build the bones and tissues of the fetus, as vitamin D has an important role in maintaining a balanced level of calcium in the blood by enhancing its absorption in the intestine, maintaining the level of calcium and phosphate in the bone, and helping the parathyroid gland to keep the calcium level balanced in the blood [28], as well as has an effect on immune function [29].

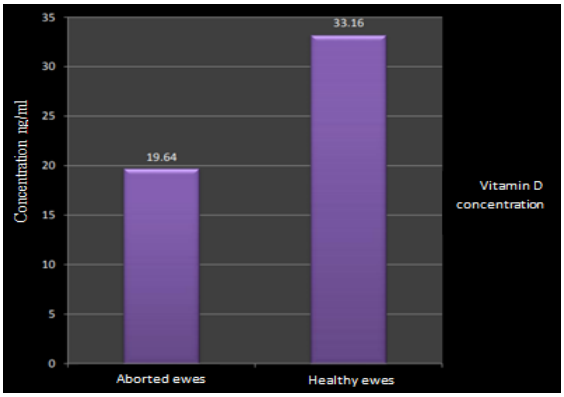

Figure 1: vitamin D concentration in the serum of aborted and healthy ewes

The study also showed, as shown in Figure 2 that the level of vitamin E was significantly decreased (P ≤0.05) in the serum of aborted animals (17.95 + 2.42 ng/ml) compared to its level in the serum of healthy animals (24.58± 2.75 ng/ml). these result was in agreement with the findings of the researcher [30] who conducted his study on a group of animals, and he indicated that the reason for the decrease in the level of vitamin E is due to the diet provided to the animals, as well as that pregnancy itself will be a stress factor on the animal, requiring large amounts of vitamin E as an antioxidant and a key vitamin in the immunity of the uterus through its role in the repair of the endometrium and preserving them, and upon abortion, its level decreases due to some disturbances in the endometrium, and the increase in vitamin E has an effect on pregnancy, as pregnant ewes were resistant to high stress and disease more than ewes that had a low level of this vitamin, and the times their birth weight

was also high. [31] found an improvement in the rates of birth and twins and a decrease in the percentage of newborn deaths after giving the ewes vitamin E. It was also observed that vitamin E deficiency causes some pathological conditions that occur as a result of fat oxidation, which leads to the formation of free radicals that damage cell membranes.

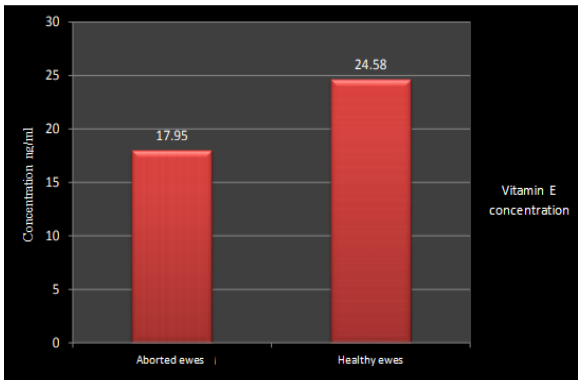

Figure 2: vitamin E concentration in the serum of aborted and healthy ewes

4. Conclusions:

we conclude that the concentrations of Iron, Phosphor , Zinc, cooper, vitamin E and D have critical effect on occurrence of abortion in ewes.

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تأثير بعض المعادن والفيتامينات على حدوث الاجهاض في الاغنام

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الخلاصة

تهدف الدراسة الحالية الى معرفة تأثير بعض العناصر المعدنية (الحديد، نحاس، زنك، كالسيوم، مغنيسيوم والفسفور) وكل من فيتامين D و E على حدوث الاجهاض في الاغنام. اجريت الدراسة في محافظتي صلاح الدين وكركوك في الفترة من تشرين الاول 2018 الى كانون الثاني 2019. تم جمع 5 مل من 75 نعجة اجهضت حديثا وتم عزل المصل وحفظه بدرجة حرارة -20 م لحين التحليل. اظهرت النتائج انخفاضا معنويا ($P\leq0.05$) في تركيز كل من الحديد والفسفور والزنك في النعاج المجهضة مقارنة مع النعاج السليمة الوالدة بينما كان هنالك ارتفاعا معنويا في تركيز عنصر النحاس في النعاج المجهضة. كذلك اظهرت نتائج الدراسة الحالية انخفاضا معنويا لكل من فيتامين D و E في النعاج المجهضة مقارنة مع النعاج السليمة . نستنتج من الدراسة ان لتركيز كل من عنصر الحديد والفسفور والزنك والنحاس اضافة الى مستوى كل من فيتامين D و E تأثيراً حاسما في حدوث الاجهاض في الاغنام