

Study the levels of Calcium and Magnesium in the blood of sheep infested with tapeworms.

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Abstract:

This study was carried out to estimate Calcium (Ca) and Magnesium (Mg) levels in the blood of lactating ewes infested with tapeworms in comparison with those of healthy sheep.

Worms were diagnosed by microscopic examination of stool samples to identify eggs and adult worms. Blood and stool samples of twenty two lactating Awassi ewes (aged between 18-24 months) were collected; 12 samples represented positive infestation with tapeworms by clinical investigation, fecal egg count (FEC) and packed cell volume (PCV reported as percent). The results for blood packed cell volume of an individual ewe of this group fell below 20%, while (FEC) were above 1000 eggs per gram (epg), and 10 samples represented the control group whose fecal sample shows very low epg, while PCV was higher than 20%, with no clinical signs of parasitic infection.

Tapeworms infestation in sheep causes a significant decrease in serum Ca levels, while no significant changes were observed in Mg level.

Keywords: Sheep; Tapeworms; Calcium; Magnesium.

Introduction:

Numerous physiological factors like infections (such as tapeworms) can produce variation in mineral concentrations in the blood of healthy sheep and cattle⁽¹⁾. There is no doubt that tapeworms cause ill effect to sheep and removing them gives a beneficial effect⁽²⁾.

Tapeworms still one of the major constraints to sheep health in the world. The tapeworm infection interferes directly on the productivity of sheep as well as is an important cause of death in lambs⁽³⁾. It competes with the host for the absorption of nutrient materials and vitamins such as vitamin B12, tapeworms lack the digestive tract and absorb nutrients directly across the skin or cuticle reducing the ability of absorption of the small intestines⁽⁴⁾. Due to the presence of the adult tapeworm common symptoms like Scours, diarrhea, fatigue, severe anemia and hypo-proteinemia are seen, leading to depression, loss of condition, loss of weight, reduced productivity, and eventual death. The disease tends to be more severe in young kids and lambs, but mature animals can also be severely affected⁽⁵⁾.

The aim of the study is to evaluate calcium and magnesium levels in blood serum of sheep infected with tapeworms and compared with that of normal healthy sheep.

Material and Methods:

Feces and blood were collected from 22 lactating Awassi ewes from a farm in Baiji city, feces were collected directly from the rectum and processed using a modified McMaster technique⁽⁶⁾ for determination of fecal egg count with a sensitivity of 50 eggs per gram (FEC).

Blood was collected by external jugular venipuncture using 10 ml disposable syringe with 21G needle, the blood sample was divided into two parts, 5 ml were put in EDTA tubes for PCV determination using hematocrit tubes spun in a microhematocrit centrifuge. The rest 5 ml of blood sample were put into clean dry plain tube, after allowing 30 min. at room temperature for blood to clot, the blood was centrifuged for 5 min. at 3000 rpm at room temp. to separate serum from blood cells for calcium and magnesium determination by atomic absorption spectroscopy.

Based on clinical manifestation and laboratory results which include fecal egg count and packed cell volume, serum samples were divided into two groups.

Group One:

Ten samples considered as control group which proved not to have tapeworms infection.

Group Two:

Twelve samples which proved to have tapeworms infestation.

Both groups samples were examined for estimation the level of Ca^{+2} and Mg^{+2} . The reference range for serum Ca and Mg is 5-10.0 mg/dL (2.1-2.5 mmol/l), and 15.8-25.5 mg/L (1.3-2.6 mEq/L) respectively^(7,8).

Procedure: Ca and Mg by Atomic Absorption Spectrophotometry (AAS)⁽⁹⁾.

Principle: Ca^{+2} and Mg^{+2} determination by AAS are based on the fact that atoms of an element in the "ground" or unexcited, state absorb light of the same wavelength (WL) as that emitted by the element in the excited state. Each element has its own characteristic absorption or resonance line.

Equipment: Perkin-Elmer AAS model 460 with a single slot burner head and calcium- magnesium hollow cathode lamp.

Statistical analysis: The data were examined for statistical differences using Students t-test, statistical significance levels were ($P < 0.05$).

Results:

The ewes were divided into two groups according to the clinical investigation, in addition to the results of (FEC) and (PCV) values, the ewe was consider infected with tapeworms when the results for PCV fell below 20%, and (FEC) were above 1000 eggs per gram (epg) as shown in figure (1) and table (1) respectively.

The mean serum Ca^{+2} level in the infected group was 6.72 mg/dL, which was lower than the level of serum Ca^{+2} in control group 11.88 mg/dL. The above difference was statistically significant with $p < 0.05$. As shown in table (2).

The mean value of serum Mg^{+2} in ewes in group two was 21.98 mg/L, while in control group the mean value of Mg^{+2} was 24.74 mg/L. the results was statistically

insignificant $p > 0.05$, despite serum Mg^{+2} concentration in infected group was lower than serum Mg^{+2}

concentration in control group as shown in table (3).

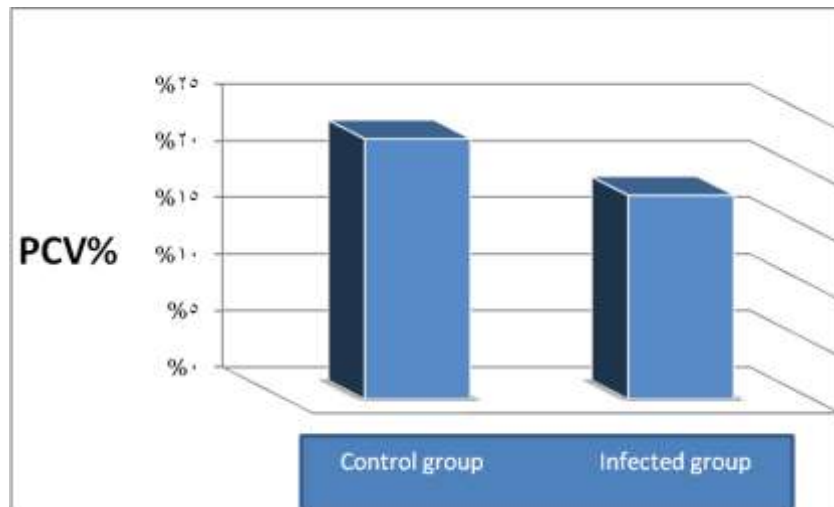


Figure (1) Packed cell volume in infected and control groups.

Table (1) Fecal egg count in infected and control groups.

Groups	Number	Fecal egg count (FEC) (epg)
Infected sheep	12	1177.4 ± 1.2
Control sheep	10	27.8 ± 0.9

Table (2) Mean of serum total Calcium concentration in infected and control groups.

Groups	Number	Calcium conc. mg/dL	
		Mean	±SD
Infected sheep	12	6.72	2.7
Control sheep	10	11.88	3.4

P < 0.05 Significant

Table (3) Mean of serum total Magnesium concentration in infected and control groups.

Groups	Number	Calcium conc. mg/dL	
		Mean	±SD
Infected sheep	12	21.98	16.3
Control sheep	10	24.74	11.8

P > 0.05 Nonsignificant

Discussion:

The PCV was lower and FEC greater in infected ewes compared with the ewes in control group, these results were likely due to an infection of GI tapeworms⁽⁶⁾.

In regarding to serum Ca level. Our results showed that serum total Ca level in sheep group infected with tapeworms was significantly lower than the level of serum total Ca.

Southey and Hosking⁽¹⁰⁾ mentioned that infection of sheep with tapeworms may lead to increased

susceptibility to pulpy kidney (enterotoxaemia), trace element and mineral deficiency. This may be due to the competition between the parasite worm with the host for the absorption of nutrient materials⁽⁴⁾.

A number of studies have shown inverse relationships of worm infection and minerals level in the body of the host.

Ortolani⁽¹¹⁾ report that the abomasal worm *H. contortus* infection increased the loss of sodium into the

abomasum. Haiba, et al.⁽¹²⁾ demonstrated that Liver fluke infestation in buffaloes auses a significant decrease in serum Ca levels.

The mean level of serum Mg in infected group were lower than in control group but it was statistically insignificant.

The result is similar to that of Haiba⁽¹²⁾. This result may be due to the fact that the body needs calcium twice as much as magnesium in normal conditions, also magnesium is needed for proper calcium absorpton. As

a result, no calcium intake can be occur without magnesium intake.

Conclusion:

Tapeworm infestation increased the loss of calcium from intestine and lead to decrease of serum Ca level in infected animals compared with that of normal healthy sheep.

This study confirms that Internal parasites, or worms, cause economic and sheep production losses in the world.

References:

- 1-Moodie E.W. 1975. Mineral metabolism in the blood of sheep; composition and function. Blunt Springer - Verlag Publication. P. 13-16.
- 2- Church, D.C., Pound, W.G. 1988. Basic animal nutrition and feeding. New York : John Wiley. p. 659.
- 3- Waller, P.J., Echevarria, F., Eddi, S. et al. The prevalence of anthelmintic resistance in nematode parasites of sheep in Southern Latin America: General overview. J. Vet Parasit. 62, 181-187, 1996.
- 4-Malan et al. Clinical evaluation of anaemia in sheep: early trials. Onderstepoort J. of Veterinary Research 68: 165 -174, 2001.
- 5- Mortensen, L.L., Williamson, L.H., Terrill, T.H., et al., Evaluation of prevalence and clinical implications of anthelmintic resistance in gastrointestinal nematodes of goats. J. Am. Vet. Med. Assoc. 23, 495-500, 2003.
- 6- Whitlock, H.V., Some modification of the McMaster helminth egg-counting technique apparatus. J. Coun. Sci. Ind. Res. 21, 177-180, 1948.
- 7- Zepperitz, H. and Guertler, H.1992. Ionized calcium and total calcium in the blood of cattle, sheep, swine and

- horses of different ages, reproductive stages and uses. Berl. Muench. Tieraerzt. Wochenschr. 105: 328-332.
- 8- Blood, D.C. ; Henderson, J.A. and Radostits, O.M. 1979. Veterinary Medicine. 5th ed., Bailliere Tindall, London. P. 703.
- 9- Pesce J. A., Kaplan L. A. 1987. Methods in clinical chemistry.C.V. Mosby Company, Washington. P. 1003-1026.
- 10- Southey, C.; Hosking, B. 1998. Liver fluke and tapeworm. Parasite Notes 7. A NZ Sheep Council and Merial NZ Ltd Publication: 23-26.
- 11- Ortolani, E. L. Effects of *Haemonchus contortus* infection on sodium status of sheep. Ciência Rural, 2000, vol.30, n. 3, ISSN 0103-8478.
- 12- Haiba M. H., El-Rawii K. A., and Osman H. G. A comparative study on the levels of Ca, inorganic P and Mg in the blood serum and bile of the normal healthy buffalo (*Bos bubalus*) and those of buffaloes infested with liver fluke (*Fasciola gigantica*). J. Parasitology Research.1964; 23; n 6; 527-531.

المخلص

الهدف من هذه الدراسة هو تقييم مستويات الكالسيوم (Ca) والمغنيسيوم (Mg) في مصل دم مجموعة من الأغنام الحلابة مصابة بالديدان الشريطية ومقارنتها بتلك في مجموعة صحية غير مصابة.

تم اخذ عينات الدم والبراز من اثنان وعشرون نعجة من نوع العواسي في طور الحلابات (أعمارها 18-24 شهرا)؛ مثلت 12 عينة منها مجموعة النعاج المصابة بالديدان الشريطية وتم تشخيص الحالات سريريا ومختبريا من خلال فحص إحصاء البيض في البراز ونسبة حجم الخلايا المضغوطة. وكانت نتائج هذه الفحوص في كل نعجة على حدا في هذه المجموعة بالنسبة لإحصاء البيض في البراز كانت النتيجة فوق 1000 بيضة لكل غرام، وكان حجم الخلايا المضغوطة في كل حالة اقل من 20%. والمجموعة القياسية التي اشتملت على 10 نعاج حلابة من نفس النوع والتي أظهرت نتائج عينات البراز مستوا" منخفضا" جداً من أعداد بيوض الديدان وارتفاع نسبة حجم الخلايا المضغوطة لأكثر من 20% وتخلو من علامات سريرية للإصابة الطفيلية. أظهرت نتائج هذه الدراسة أن الإصابة بالديدان الشريطية في الأغنام تؤدي إلى انخفاض ملحوظ في مستوى الكالسيوم في مصل دم هذه الحيوانات مقارنة بالأغنام غير المصابة. ولا تغييرات إحصائية في مستوى المغنيسيوم في الحيوانات المصابة عندما تقارن بمستوياتها في الأغنام غير المصابة.