

Some haematological and biochemical parameters assessments in sheep infection by *Haemonchus contortus*

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Abstract

The study was conducted on (100) sheep naturally infested with *Haemonchus contortus*, (1-3 years old), in Tikrit city, from 1st January 2014 to 31st May 2014. Affected sheep exhibited clinical signs included, emaciation, weakness, pale mucous membranes, rough, easily detached and lusterless coat. Ten ml of blood samples were collected from the jugular vein of all the sheep's using disposable syringes, then take 2.5 ml from blood sample was used to determine CBC the Red blood cells (RBC), white blood cells (WBC), Haemoglobin estimation (Hb), Packed cells Volume (PCV). The study showed reduction in RBC, hemoglobin, hematocrit and neutrophils (4.7 ± 0.68), (6 ± 0.74), (18 ± 0.19), and (20 ± 0.73) respectively. And revealed leukocytosis; Lymphocyte, eosinophil's and monocyte (11.6 ± 0.41), (65 ± 0.51), (10 ± 0.64) and (5 ± 0.29) respectively in infected sheep, and the remind samples were centrifuged at 3000 rpm for 10 minute and serum was separated and stored at -20°C until used for measure the biochemical change by use spectrophotometer. The results showed a significant decrease ($P < 0.05$) in the rates of total protein concentration, albumin, iron, and zinc (5.02 ± 0.59 g/dl), (1.7 ± 0.45 g/dl), (89.3 ± 12.41 $\mu\text{g/dl}$), (42.37 ± 16.22 $\mu\text{g/dl}$) respectively in the serum of infected sheep according to the compared with normal sheep.

Key word: *Haemonchus contortus*, some hematology, biochemical parameters assessments, sheep

Introduction

The most common parasite of sheep includes:- *H. contortus*, *Oesophagostomum*, *Ostertagia*, *Chabertia*, *Nematodirus*, *Trichuris*, *Moniezia* and *Fasciola*. The most important of these is *H. contortus* [1]. *H. contortus*, found in the abomasum of sheep and goats, causes blood loss resulting in decrease in erythrocytes, hemoglobin, packed cell volume, body weight and wool growth [2,3]. *H. contortus* penetrates the surface of the abomasal mucosa to feed on the blood of the host [4]. The average blood loss due to *H. contortus* infection is 0.03 ml/parasite/ day [5]. Even relatively light infections in adults cause various degrees of anaemia [6]. *H. contortus* causes hematological and biochemical alterations [7,8]. Eosinophils, another type of polymorphonuclear leukocytes, also perform an important parasitocidal function, notably through production of enzymes that poison and kill the helminths [9]. Decrease in protein [7,8]. [10] observed a significant decrease in total serum protein in an experimental infection with *H. contortus* in Barbari goats. The albumin decrease level in sheep infection with *H. contortus* [11]. [12] reported hypo-albuminaemia and associated it to protein losing gastroenteropathy of *Haemonchus* infection in small ruminants.

H. contortus causes iron reduction in serum [13]. [14] noted decrease in the serum iron levels of lambs receiving a single dose of 10000 L3 *H. contortus*. Zinc concentrations were significantly affected by parasite infection, *H. contortus* causes decrease in zinc level [15].

Materials and methods

Animals: A total of 100 stool and blood samples were collected from infected sheep with *H. contortus* and for control 10 samples from non-infected. From

different local areas in Tikrit city between January to May of 2014.

Stool collection: Stool samples were collected rectally using disposable gloves wherever possible, with minimal contamination from bedding, soil or plant material [16]. They were labelled and transferred to laboratory for examination. Faecal samples of infected sheep were qualitatively examined daily by wet preparation direct smear and concentration using sugar floatation technique and the fecal sample cultured at 27°C for 8 days [17]. The larvae were extracted from faeces by Baermann funnel method [18].

Haematological examination:

Ten ml of blood samples were collected from the jugular vein of all the sheep's using disposable syringes, then take 2.5 ml from blood sample was transferred into a container containing EDTA was used to assess CBC the Red blood cells (RBC), white blood cells (WBC), Haemoglobin estimation (Hb), Packed cells Volume (PCV) by the methods as described by [19, 20]. and the remind of the samples were centrifuged at 3000 rpm for 10 minute and serum was separated and stored at -20°C until used.

Biochemical examination:

Total serum proteins: measured in the serum spectrophotometrically using Biolabo SA kits made in France according to the methods described by [21]. Serum albumin: measured in the serum spectrophotometrically using Biolabo SA kits made in France according to the methods described by [21]. Serum iron: measured in the serum spectrophotometrically using Biolabo SA kits made in France according to the methods described by [21].

Serum zinc: measured in the serum spectrophotometrically using Spectrum kits made in Egypt according to the methods described by [22].

Statistical Analyses:

Results were analyzed statistically using the program (SPSS) for estimate, standard error and analyzed the data using a test (Independent sample t-test). Note that the significant difference for all the tests at the level of probability ($p < 0,05$) [23].

Result

The range of hematological measures was significantly different between infected and uninfected controls. The present study revealed a marked reduction in RBC, hemoglobin, hematocrit and neutrophils (4.7 ± 0.68), (6 ± 0.74), (18 ± 0.19), and (20 ± 0.73) respectively (Fig.1). The result of the hematology parameter appear increase in WBC, Lymphocyte, eosinophil's and monocyte (11.6 ± 0.41), (65 ± 0.51), (10 ± 0.64) and (5 ± 0.29) respectively (Fig.2).

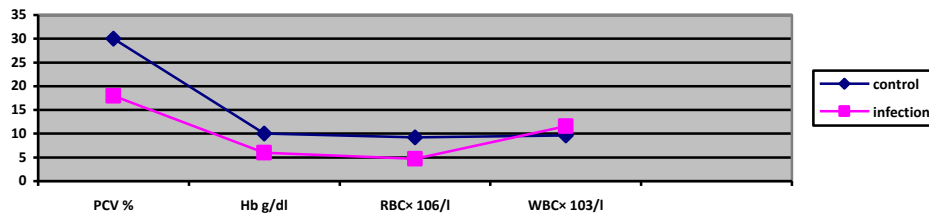


Fig.1. Hematology change in infected and control sheep.

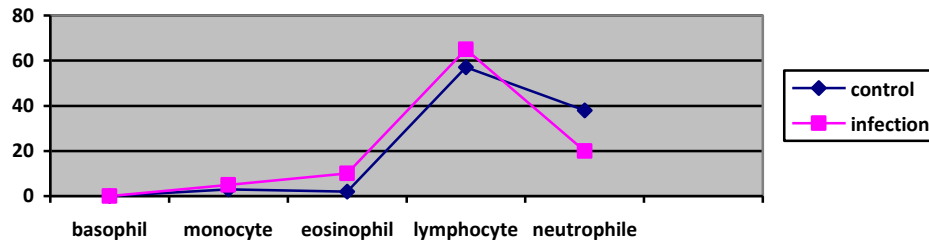


Fig.2. White blood cells count in infected and control sheep.

The results showed a significant decrease ($P < 0.05$) in the rates of total protein concentration, albumin, iron, and zinc (5.02 ± 0.59 g/dl), (1.7 ± 0.45 g/dl),

(89.3 ± 12.41 μ g/dl), (42.37 ± 16.22 μ g/dl) respectively in the serum of sheep infected according to the compared with sheep intact (Fig.3).

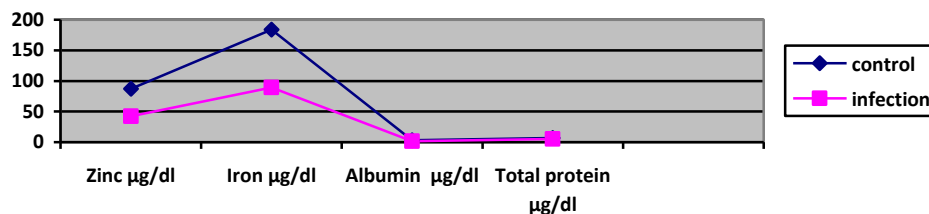


Fig.3. Biochemical change in infection and control sheep.

Discussion

H. contortus infection is known to cause significant changes of haematological parameters like Hb, PCV and RBC counts and which may cause an anaemia in infected animal [24, 25]. It is estimated that an adult *H. contortus* can suck 0.03 ml of blood/day [5], in addition to causing leakage of blood from the site of attachment. *H. contortus*, cause a decrease in RBC, Hb concentration and PCV [26, 3]. The decrease in RBC counts, Hb and PCV values in infected sheep may be because the bleeding of abomasa due to the injuries caused by the *H. contortus* similar to that

described by [27]. [28] reported decreased in Hb, PCV, RBC, and neutrophils in cattle infection by parasite.

Infected sheep showed significant increase in WBC count may be due to the immune response of body against the parasites and resistance to infection as a means of self defense [29,30]. Or it may be due to increase sensitivity to the protein of the parasite, which is a foreign body from the animal's body [31]. Total Leukocyte Count was found significantly elevated in infected animals and the increase was mainly due to greater count of lymphocytes,

otherwise neutrophils count was noticeably reduced in infected compared to non-infected animals. The changes in Total Leukocyte Count in the infected animals clearly show immunopathological response of the host [32].

Increased lymphocyte percent (%) observed in the present investigation and that agreement with the findings by [33]. The results of our study are similar to [3] and with increased lymphocyte percent (%) may be because proliferation lymphocytes due to excretory secretory product of *H. contortus*.

significant increase ($P < 0.05$) in the lymphocytes cells in infected young during first week of infection which was associated with hard depression in neutrophil cells, this was due to the infiltration of these cells in the abomasal infection spots, which play as a first defense line against the inflammatory process caused by larval activities [34].

Eosinophils are considered to be important elements in the response against *H. contortus* infections [35]. In this present study, there was an increased number of circulating blood eosinophils in the animals infected with *H. contortus* larvae. This was in agreement with [36]. The increase in the number of eosinophils is a common feature observed during infection with *H. contortus* [37, 38].

The significantly increased in monocyte percent (%) found in infected sheep may be due to appearance of monocytes as second line of

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defense after neutrophils [39]. This increase in monocyte cells may be due to the stress in the infected animals [40].

In this appear hypoproteinaemia and hypoalbuminemia in sheep infection by *H. contortus*, because these parasites stimulate the proliferation of intestinal epithelial cells and replacement of abomasal acid-producing cells by immature cells, this consequently leads to the loss of large quantities of serum protein into the gut. In addition, haemodilution which occurs after abomasal haemorrhage can cause relative hypoproteinemia and hypoalbuminemia [41,42]. [12] reported that in parasitic gastroenteritis, excessive amounts of serum proteins leak into the parasitized stomach and intestines as a result of increased mucosal permeability, thereby resulting in severe hypoalbuminaemia. Hypoproteinemia with decreased levels of total serum protein and serum albumen is an important consequence of haemonchosis, which is responsible for protein losing enteropathy [17].

The reduction of serum iron level in infected sheep could be attributed to the expanded erythropoiesis to compensate for blood loss leading to depression of iron stores [13].

Zn concentrations fall in a variety of diseases associated with anorexia [43]. Zn deficiency is associated with increased adult worm burdens [44].

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تقدير بعض القيم الدموية و القيم الكيموحيوية في الاغنام المصابة بالهيمونكس

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الملخص

أجريت الدراسة على (100) من الأغنام المصابة بطفيلي *Haemonchus contortus* ، في عمر (1-3 سنة)، في مدينة تكريت، من كانون الثاني 2014 الى ايار 2014. اذ عانت الاغنام المصابة من العلامات السريرية التي شملت الهزال والضعف، وشحوب الأغشية المخاطية، وخشونة الصوف، وسهولة نزعه وفقدان لمعانه. وتم جمع 10 مل من عينات الدم من الوريد الوداجي من الأغنام المصابة باستخدام المحاقن، ثم تم أخذ 2.5 مل من عينة دم لاستخدامها في تحديد CBC وعد كريات الدم الحمراء (RBC)، وكريات الدم البيضاء (WBC)، وتقدير الهيموغلوبين (خضاب الدم)، وحجم خلايا الدم المرصوفة (PCV). حيث اظهرت الدراسة انخفاض معنوي ($P < 0.05$) في كل من عدد كريات الدم الحمراء، الهيموجلوبين، وحجم الخلايا المرصوفة والعدلات (0.68 ± 4.7)، (0.74 ± 6)، (0.19 ± 18)، و (0.73 ± 20) على التوالي. كما اظهرت الدراسة زيادة معنوية في عدد كريات الدم البيض، الخلايا الليمفاوية، الحمضات والوحيدات (0.41 ± 11.6)، (0.51 ± 65)، (0.64 ± 10) و (0.29 ± 5) على التوالي في الأغنام المصابة. والمتبقي من عينات الدم تم وضعه في جهاز الطرد المركزي وفصل المصل ووضعها في -20 درجة مئوية لحين استخدامه في تقدير القيم الكيموحيوية بواسطة المطياف الضوئي. أظهرت النتائج انخفاضاً معنوياً ($P < 0.05$) في معدلات تركيز البروتين الكلي، الالبومين، والحديد، والزنك (0.59 ± 5.02 غرام / ديسي لتر)، (0.45 ± 1.7 غرام/ديسي لتر)، (12.41 ± 89.3 ميكروغرام / ديسي لتر)، (16.22 ± 42.37 ميكروغرام / ديسي لتر) على التوالي في مصل الأغنام المصابة مقارنة مع الأغنام سليمة.

الكلمات الدالة: الهيمونكس، بعض القيم الدموية، قيم الكيموحيوية، الاغنام