Effect of parasitic infection on levels of some biochemical parameters in serum of Cattle in Mosul city

Azhar Abbas Ashour
Research center for laser and photonics / Al-Hamdaniya University
drazharabbass@gmail.com

Doi 10.29072/basjs.201902016, Article inf., Received: 16/10/2019 Accepted: 5/12/2019 Published: 31/12/2019

Abstract

The objective of this study was to diagnose internal parasites in cattle, and examine the changes in total proteins and lipids associated to the parasitic infection. with total of 85 cow was included in this study. Fecal samples were examined by direct smear, flotation, and sedimentation methods to diagnose internal parasites and Blood samples were collected to harvest serum for estimation of total proteins (TP), total Cholesterol (TCHO), and triglycerides (TG) levels using commercial kits. High density lipoproteins (HDL), very low density lipoproteins (VLDL), and low density lipoproteins (LDL) were calculated using specific equations.The Results indicated that the overall prevalence of parasitic infection in cattle was 50.48% .with different trematodes, cestodes, nematodes eggs and larvae, protozoa oocysts were diagnosed, including single and mixed infection. In infected cattle, there was significant decrease in cholesterol, HDL, and LDL; no significant decrease in total proteins; and no significant differences in triglycerides and VLDL between infected and non-infected cattle. In conclusion, different internal parasites can infect cattle, and the parasitic infection can change the metabolism leading to changes in proteins and lipids metabolism.

Introduction

Gastrointestinal parasitic infection is considered one of the major issues affecting livestock profitability. The economic loss due to the parasitic infection can result from loss of weight, decreased growth rate and production, treatment and veterinary care costs, and potential mortalities [1, 2]. Cattle can be infected with different species of parasites. Prevalence of parasitic infection in cattle has been indicated in several studies worldwide.

In study of Iraq indicated that the prevalence of some nematodes in gastrointestinal was 61% in cattle,57.3% in goats,52.8% in sheep (3).

In study of Turkey showed there's about 81.3% of calves with diarrhea was infected with one or more types of parasites, like Isospora sp., *Toxocara vitulorum, Cryptosporidum sp. and Eimeria sp*. [4]

While In a study in Iran, researchers found various parasitic infections in young buffaloes and calves, which included Eimeria sp., *Cryptosporidum* sp. and *Toxocara vitulorum*, and the most common cases of calves were of *Eimeria sp*. [5]

In Egypt, researchers noticed prevalence of many types of parasite in both cattle and buffalo, of the 10055 animals examined, theres about 1.44% *Monizia spp*.,1.46%, and 1.70% *Toxocara vitulorum* parasites [6].

A study in Sudan, showed the prevalence of *paramphistomum sp*. and other parasites e.g. *Fasciola gigantica*, add to other internal parasites in cattle [7].

In another study conducted on cattle in Haa District, Bhutan (a small independent kingdom in southern Asia, north of India), about 44% were infected with gastrointestinal parasites, including helminthes 55%, protozoa 41%, and mixed 4% [8].

In Nigeria, astudy showed the high prevalence of gastrointestinal parasites infection such as *Trichostrongylidae, Monezia sp., Fasciola sp*. [9].

Most of the studies that showed prevalance of parasites in cattle did not shed light on the biochemical effects of these parasites on the levels of lipids,lipoproteins,and proteins in blood of cattle.

In fact, they are different biochemical parameters can giving us idea about the mechanisms of damage in animal infection, such as lipids, lipoproteins and proteins leves in blood.

They are seven types of lipoproteins based on size, lipid composition and apoliporoteins these includes, chylomicrons, chylomicrons remnants, very low-density lipoproteins, (VLOL), Low density lipogroteins (LDL), Intermediate density lipoprotein (IDP), High density lipoproteins (HDL), Alpha Lipoproteins (LP) [10].

Lipoproteins are complex particles with central core containing cholesterol- esters and triglycerides surrounding by free cholesterol which transports of cholesterol and other lipids [11].

Cholesterol is consider the essential to all cells and the major constituent of the brain, it's necessary for new cells to form and for older cell to repair themselves after injury, also it's important to form many hormones like cortizole in adrenal- gland and estrogens, progesterone in ovaries [12, 13].

Triglycerides these are formed from three fatty acids bound to glycerol molecule, and constitute one of the most important forms of energy storage of the body, and deposited in the adipose and muscles tissue [14].

Proteins are made up of hundreds or thousands of smallest units known as amino acids, they are 20 amino acid which linked together by peptide ponds, the sequence of amino acids determines type of protein, proteins alarge, complex molecules that lay many cirticalroles in the body, they do most of the work in cells and are required for the structure, function and regulation of the body tissues and organs [15, 16].

Although previous studies have determined the prevalence of parasitic infection in cattle in Iraq, the biochemical changes associated to these infections have not been examined. Therefore, the objective of this study was to diagnose internal parasites in cattle, and examine the changes in total proteins and lipids associated to the parasitic infection.

Materials and Methods

A total of 85 adult female cattle was included in this study, during the period (April to September). Fecal and blood samples were collected and examined as the following:

1. Fecal samples:

A total of about 5 g of feces was collected from each animal, and examined by using direct smear, flotation, and sedimentation methods as

previously explained [17]. In addition, dimensions of parasites eggs was determined by ocular micrometer [18]. The number of parasite eggs per gram feces was calculated by modified McMaster technique[19]

2. Blood samples

A total of 10 ml of blood was collected from jugular vein. Serum was harvested and kept in -20° C until biochemical examination performed. In this study, total proteins (TP) was estimated using Colorimetric kit cell biolabs/USA. Total Cholesterol (TCHO), Triglycerides (TG) and (HDL) were determined using a Colorimetric kit cell biolabs /USA. Very low-density lipoproteins (VLDL) was estimated as VLDL (mg/dL) = $\frac{concent.TG}{5}$. Finally, low density lipoproteins (LDL) was calculated as: LDL concent. (mg/dL) = TChO $_{Concent}$ - HDL $_{Concent}$ - VLDL $_{Concent}$ [20].

Statistical Analysis

Prevalence parasitic infection was calculated as the number of cattle tested positive for parasites by fecal examination divided by the total number of cattle that were tested. In this study, TP, TCHO, TG, HDL, VLDL, and LDL were presented as mean ± standard error. The difference between TP, TCHO, TG, HDL, VLDL, and LDL in infected and non-infected cattle was tested by t-test. Values of $P \leq 0.05$ were considered significant. Statistical analysis was performed using independent samples T test in SPSS.

Results

Types of parasitic infection in cattle

The overall prevalence of parasitic infection in cattle was 57.65% , Different trematodes, cestodes, nematodes eggs and larvae, protozoa oocysts were diagnosed, including single and mixed infection (Table 1). Some eggs of parasites are shown in Figures 1-6.

Table 1. Types of parasites diagnosed in fecal examination of cattle included in the study

Groups	Parasites species	Number of infections	Percent of infection (%)
Nematoda	*Trichostrogylus sp.*	9	10.5
Nematoda	*Toxocara vitulorum*	8	9.41
Trematoda	*Fasciola sp.*	7	8.23
Trematoda	*Paramphistomum sp.*	6	7.05
Protozoa	*Eimeria sp.*	8	9.41
Mixed infected	*Eimeria sp.+ Tristrogylus sp.*	5	5.88
Overall infection (out of 85 tested cattle)		43	50.48

2. Biochemical parameters

Total proteins level was lower in infected cattle with compared to non-infected (Fig 7); however, it did not reach the significant level. On the other hand, total cholesterol level was significantly decreased in infected cattle, compared with non-infected (Fig 8), while no significant differences were observed in the level of triglycerides in infected cattle, compared with non-infected (Fig 9). Moreover, a significant decrease in both HDL and LDL were revealed in infected cattle, compared with non-infected (Fig 10). Finally, VLDL did not significantly differences in infected cattle, compared to non-infected (Fig 10).

Table 2. Concentrations of some biochemical parameters in serum of infected and non-infected cattle

Parameters (mg/dL)	**Non-Infection**	**Infection**
Protein	7.2508 + - 0,7383	7.075 + - 0,985
Cholesterol	135.32 + - 33,736	96.44 + - 13,518
Trigliserides	61.250 + - 6,841	60.791 + - 5,107
HDL	71.416 + - 10,047	52.333 + - 15,161
LDL	47.041 + - 19,767	30.833 + - 11,358
VLDL	11.76 + - 1,451	12.600 + -2,309

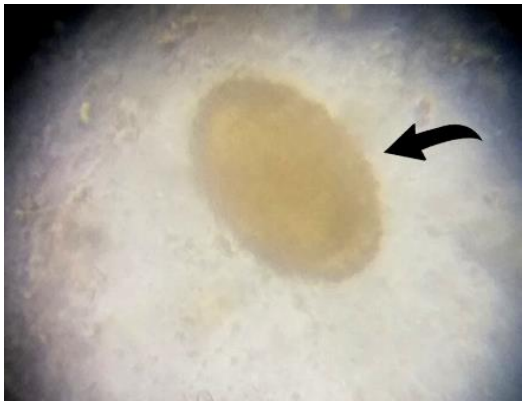

Fig. 1: *Fasciola sp*. egg measure 135×65µm

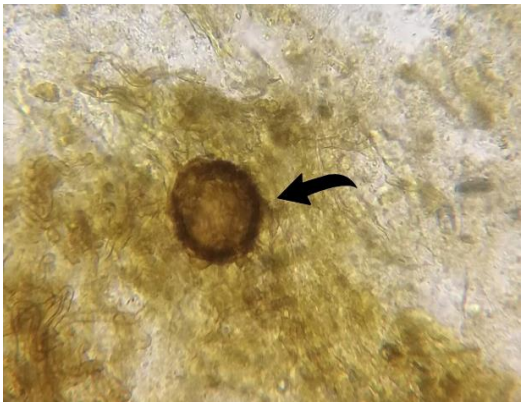

Fig. 2: *Toxocara vitulorum*. egg measure 32µm

Fig. 3: *Trichostrongylus sp*. egg measure 90µm

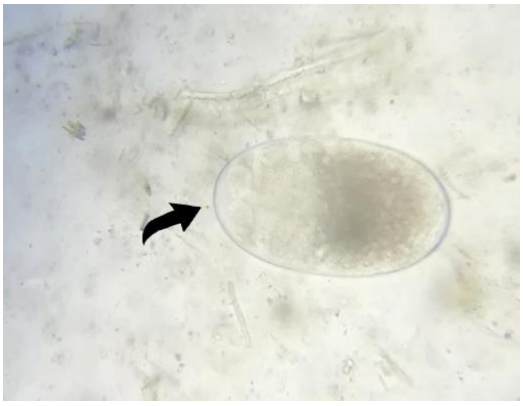

Fig. 4: *Tristrongylus sp*. egg measure 100µm

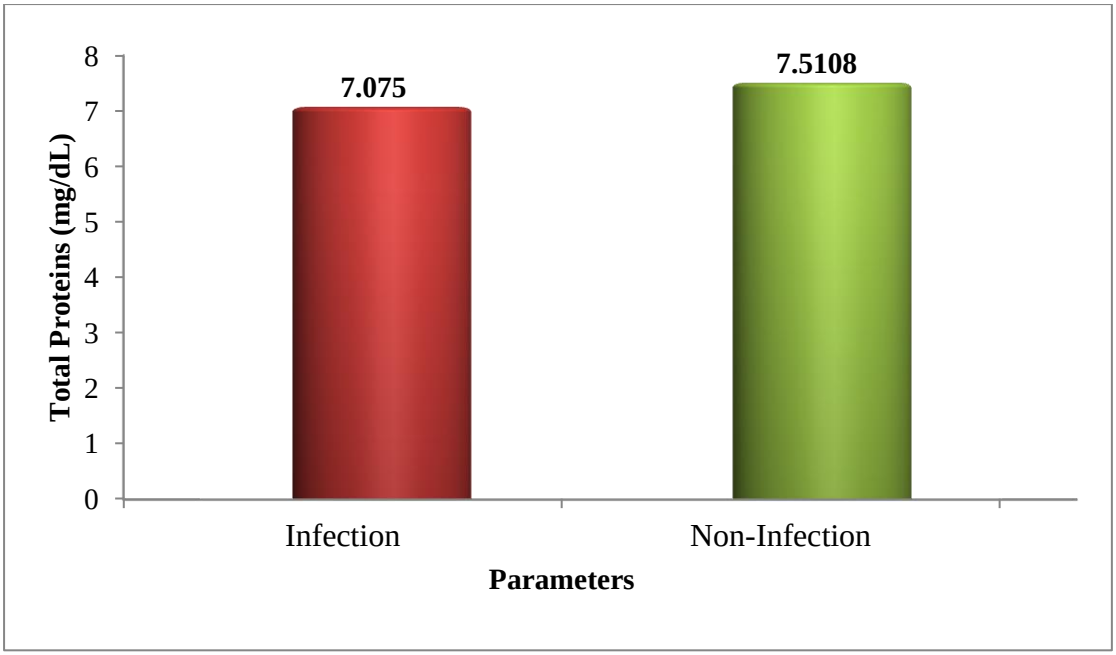

Fig. 7: Serum total protein levels in infected and non-infected Cattle

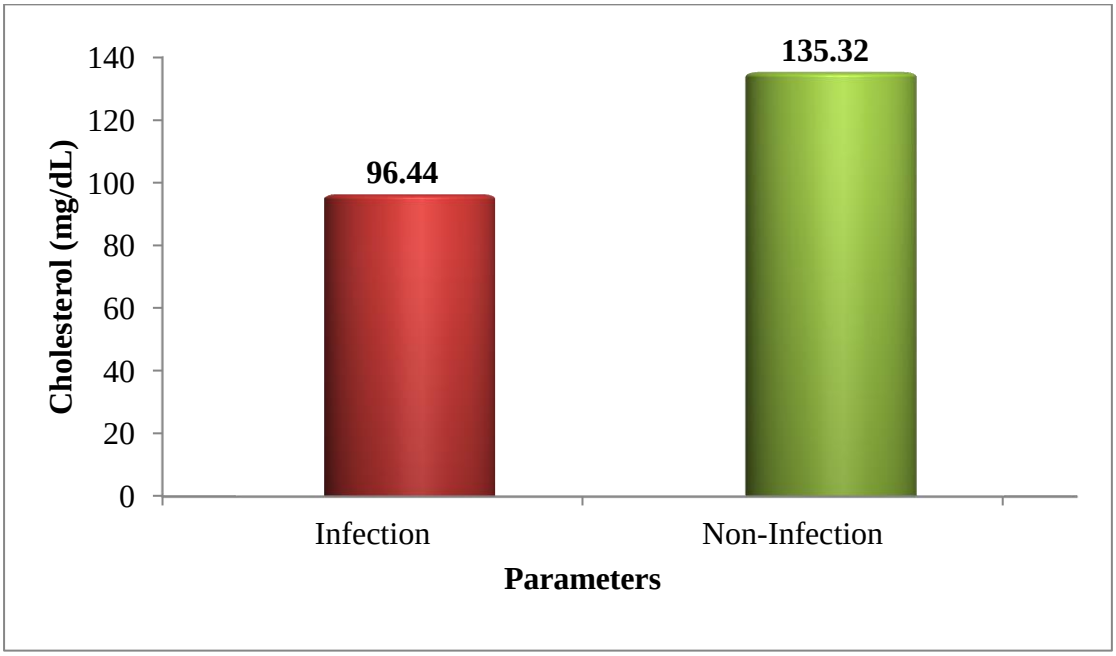

Fig. 8: Serum total cholesterol in infected and non-infected Cattle

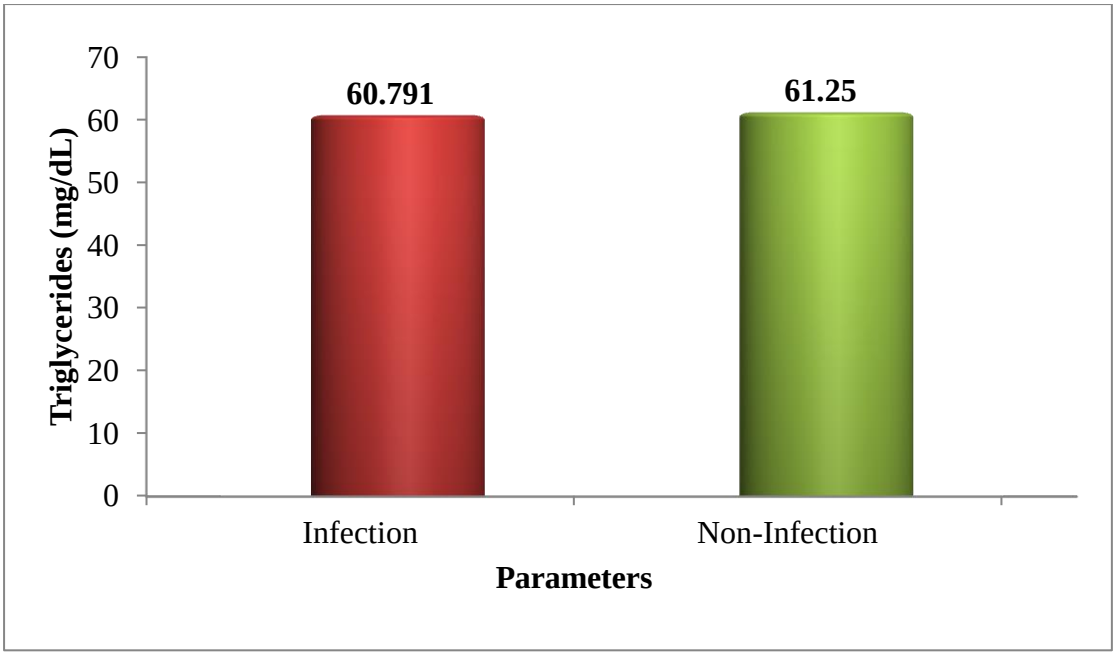

Fig. 9. Serum total cholesterol in infected and non-infected Cattle

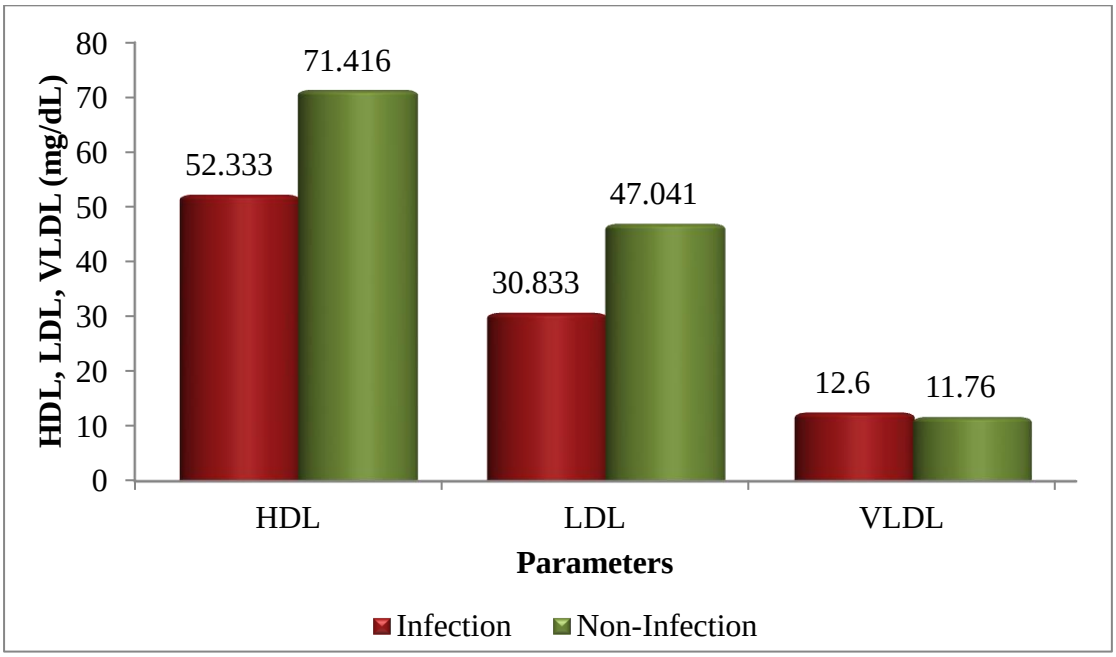

Fig. 10. Serum lipoprotein levels in infected and non-infected Cattle

Discussion

The current study showed that's many types of parasites are infected of Cow, this findings was agreement with [21] in south of Iraq which appears prevalence of gastro intestinal parasites in Cattle and Buffalo, also showed that Cattle were exposed to more than one type of parasites at the same time, causing mixed parasitic infections, these findings, were similar to [22] study which included 548 of Cattle, in the first year of theirs life, observed many number of Cattle infected by mixed infection of parasites such as trypanosome with Trichostrogylus sp.

In study [23] the researchers observed prevalence of GI parasitic infections Cattle and Buffalo, and the percentage of mixed parasitic infection was 8.76% in Cattle and 3.89% in Buffalo.

In study [24] there's showed the incidence of mixed infection with helminths and protozoa parasites were noticed in Cattle and Goats, also mixed infection of two types of parasite helminths.

After determining the different parasites infections, the levels of some biochemical parameters were measured to determine the effect of parasitism on the blood variables of the host body.

In the present study, the findings showed a significant decrease in TCHO, HDL, LDL levels in serum of infected Cattle while no significant differences in TG and VLDL between infected and non-infected cattle.

The results of current research were similar to study [25] which showed that calves infected with gastrointestinal and pulmonary parasites had a significant decrease in the levels of THO, HDL, LDL in blood serum while increase in level of lipids' compare with health animal.

Also, in previous studies on infected children with intestinal worms a significant decrease was observed in serum of TCHO, HDL, LDL, and TG levels compart with health [26,27].

Generally, in living organisms there's a balance between cholesterol synthesis in the body and absorption it's, in the gastrointestinal interact [28], that's mean, in healthy organisms interact balance in maintained between biosynthesis, utilization and transports of cholesterol [29].

Cholesterol synthesis and absorption critical determines the levels of LDL and total cholesterol in blood. It's be clear that's parasites infection has significant effect on host metabolism, intestinal barrier infections and

intestinal Microenvironment [28]. The review of [30] showed that parasites induce significant changes in lipids profile, exactly with patient having a cut infection, all parasites may be metabolizing the cholesterol, but the exact relationship with pathogenic, mechanisms in not clear, may be some factors or enzymes, which allow the parasites to breakup and consume lipids, these researches, generally explain the caucus of lowering of each cholesterol, LDL, HDL, but about levels of VLDL in serum of Cattle which didn't appears any differences between infected and uninfected Cattle, the reason is not clear, may be because of the VLDL quantity it's very little in Cattle serum, that’s make's difficult to showed the difference.

In the present finding the concentration of total protein didn't showed difference as statistical significance but, there is lowering in level of total protein in infection Cow.

Also, this finding similar to many studies, [31] which showed a significant low in level of total proteins, while in infection Sheep's and highly levels of pepsinogen in serum.

In [32], the authors showed significant differences of total protein, Albumin, urea, and calcium levels is Sheep. A study for [33] appears low in levels of total proteins in the serum of sheep.

In fact, all helminths, including parasitic helminths needs a large quantity of proteins during their life cycle, which takes from gastrointestinal tract. [34].

Conclusion

Different internal parasites can infect cattle, and the parasitic infection can change the metabolism leading to changes in proteins and lipids metabolism.

References

[1] T.S. Graig Impact of internal parasites on beef Cattle. Journal of Animal Science. 66(1988):1565-1569.

[2] R.S. Rajakaruna, Lasooriyaw., Gastrointestinal parasites in dairy Cattle in kandy district in srilenk. Annual Research Journal of Slsaj. 11. (2011):92-99.

[3] . M.j.Muhaidi, Prevalence of some nematodes in stomach and intestines in farm animals in Baghdad Governorate. AL-Anbar Journal of Veterinary Sciences.9(2) 2016:87-93.

[4] Y. Gos, G.N.Altu, N. Yuksek, C.Ozkan, Parasites detected in Neonate and young calves with diarhoea., Bull. Vet. Ins. Pulawy. 50(2006):345-348.

[5] M.Tavassol, , B.D.Naghaden, , S.Valipour, , M.Maghsoudlo, Prevalence of gastro intestinal parasite in water buffalo (Bublus bubalis) calves raised with cattle in smallholder farming system in the north-west of Iran., Acta. Vet. Eurasia. 44(2018):6-11.

[6] M.A.Yassien, S.A.Soliman, A.Youssef, Prevalence of parasitic infection of slaughtered cattle and buffalo in Municipal Abattior at Ismailia, Eygpt., Parasitc Zoonoses In Asian-pacific region, Edt1 (2013):19-24.

[7] G.I.B.Al-Kareem, A.E.Abdel Gadir, K.Elmalik, Study of prevalence of parasitic disease in Catttle, in Abyei area Sudan. J. Cell. Anim. Biol. 6(6) (2012):88-98.

[8] M.Babagana, S.S.Muhammad, N.I.Muhammad, B.Lawan, M.Ismaila, The prevalence of bovine gastrointestinal parasites in college of agriculture farm and surrounding farms of yobe state, Nigeria. Journal of Agriculture and Veterinary Sciences. 3(2) (2016):96-99.

[9] P.Marskole, Y.Verma, A.K.Dixit, M.Swamy, Preavalence and burder of gastrointestinal parasites in Cattle and buffaloes in Jabalpur, India. Veterinory world. 9(11)(2016):124-1217.

[10] K.R.Feingold, C.Krunfeld, Introduction to Lipids and Lipoproteins. Journal of Lipid Research. 57(8) (2016):1339-59.

[11] K.D.Biggeretaff, Understanding lipoproteins as transports of cholesterol and another lipid. Adv. Physiol. Edu. 28(1-4)(2004):105-1.

[12] T.Orth, S.Bellostia, Cholesterol it regulation and role in central nervous system disorders. Hintawi publishing corporation cholesterol.(2012)1-19.

[13] M.D.Dermott, Cholesterol and Triglycerides. University of Colorado, Health science center. Clordo (80262) 2018.

[14] A.Soult, Lipids and Triglycervides. Libre texts. California state University. https://status.libretexts.org.

[15] H. White, B. Venkatesh, Clinical review: ketones and brain injury. Critical care. 5(2)(2011):219.

[16] K R.H.han, P.Salahuddin, Protein structure and function. Basic Biochemistry 2017. www.austinpublishinggroup.com/ebooks.

[17] R.S.Chauhan, D.K.Agarwal, Textbook of Veternary clinical and Laboratory Diagnosis. 2nd. India. (2006) 184-185 pp.

[18] W.J. Froeyte, Veterinary Parasitology. Reference manual 5th. Ed. Jowa State University USA. (2001): 350pp.

[19] B.E.Storey, Fecal Egg Counts:Uses and Limitation.University of Georgia.USA,2015.

[20] Q.Y.Jameel, H F.F.ussein, E.Z.Naji, The role of some food in reducing the physiological and biochemical effect of y and x rays. Iraqi National Journal of Chemistry(2017).; 51:23-41.

[21] J.A. Gat, Z.S.Nejiban, R.M.Abed, R.A. Abbas, R.M.Hadi, Y.F. Mohsen, Prevalence of gastro intestinal parasites in Cattle and Buffalo in the Qar province, south of Iraq. Basrah Journal of Veternary Research. 17(3)(2018):381-390.

[22] C.Eckstein, , L.Lopes, L.Nicolino, , C.S. Oliveria, Economic impats of parasitic disease in Cattle Agriculture veterinary science nutrition and natural resources., 10(51) (2015).

[23] M.Das, D.K. Deka, P.C.Sarmah, S.Islam, Gastrointestinal parasitics infections in cattle and swamp buffalo of Guwahati, Assam, India-Indian J. Amin. Re. 10(2017):0976-0555.

[24] J.O.Nwigwe, O.O.Njoku, O.O.Odikamnoro, A.C.Uhuo, Comparative study of intestinal helminthes and protozoa of Cattle and Goats in Abakaliki metropolis of Ebonyi state, Nigeria. Pelagia Research Library, Advances in Applied Science Research, 4(2) (2013):223-227.

[25] M.C. de-Cezaro, A.Tvarijonaviciute, F.Tecles, J.Ceron, J.C.P. Ferreira, E.M.S. Schmidt, Changes in biochemical analytes in

calves infected by nematode parasites in field conditions veterinary parasitology. 216,(2016):1-6.

[26] O.A Jude., H.A.Oladele, O.M. Japhet, N.A.Sulaiman, A.A.Dienye, M.M.Abidemi, H.R. Olubunmi, O.E.Hohn, Plasma lipids and lipoproteins in selected primary school children infected with intestinal helminthiasis in a metroplitan area of south Nigeria. International Hournal of Biological & Medical Research, 2(4) (2011):933-937.

[27] M.H.J. Al-Bayati, The physiological changes in children infected with some intestinal parasites in Al-Diwaniya province. University of Al-Qadisia, (2013).

[28] D.E. Cohen, Balancing cholesterol synthesis and absorption in the gastrointestinal tract. Journal of clinical lipidology. 2(2)(2008): 21-23.

[29] T.M.McDermott, Cholesterol and Triglycerides, what you should know. University of Colorado Health Science Center. Denver, Colorado,(1999), 80262.

[30] D.Bansal, H.S. Bhatti, R.Sehgal, Role of cholesterol in parasitic infection. Lipids in health and disease, https: www.ncbi.nlm.nih.gov, , 4(10) (2005).

[31] M.L.Ganai, Evaluation of serum proteins in relation with parasitic infection, Adv Biotech. & Micro. J., 12(2) (2019).

[32] V.Pandey, J.K. Khajuria, J.S.Soodan, N Sharma., Impact to of Gasterointestinal parasites of certain blood components of sheep. Clin. Med. Nat. Journal. 8(2010):134-136.

[33] Z.K. Ebrahim, Gastrointestinal infestation on some hematological and biochemical parameters in sheep. Alexandria Journal of veterinary science, 59(1)(2018):44-47.

[34] T.S. Donohue, B.Qin, A.Smith, Parasites, nutrition, immune, responses and biology of metabolic tissues. Parasite Immunol., 39(5) (2017).

تأثير الاصابة الطفيلية على مستويات بعض المتغيرات البايوكيميائية في مصل دم الابقار في الموصل

أزهار عباس عاشور

المركز البحثي لليزر والفوتونات / جامعة الحمدانية

الخلاصة

هدفت الدراسة الحالية إلى تشخيص الطفيليات الداخلية في الماشية في الموصل، ودراسة التغيرات في مستويات البروتين الكلي والدهون في الماشية المصابة. شملت الدراسة 85 حيواناً من الماشية. فُحِصت عينات البراز بالطريقة المباشرة، طريقة التطويف، وطريقة الترسيب. جُمع مصل الدم وفحصت مستويات البروتين الكلي، الكوليستيرول، والكليسيرايد الثلاثية باستخدام عدد تجارية جاهزة. تم قياس البروتينات الدهنية عالية الكثافة، البروتينات الدهنية منخفضة الكثافة، والبروتينات الدهنية منخفضة الكثافة جداً باستخدام معادلات خاصة. بيّنت النتائج أن نسبة الإنتشار الإجمالية للإصابة الطفيلية في الماشية بلغت50.48%. أنواع مختلفة من بيوض ويرقات الطفيليات الداخلية (المثقوبات، الشريطيات، والخيطيات) فضلاً عن الأكياس البيضية للأوالي الطفيلية تم تشخيصها في الدراسة الحالية. تنوّعت الإصابات بين إصابات مفردة وإصابات مختلطة بأكثر من نوع من الطفيليات. شملت التغيرات الكيموحيوية انخفاضاً معنوياً في مستويات الكوليستيرول، البروتينات الدهنية عالية الكثافة، والبروتينات الدهنية منخفضة الكثافة في الحيوانات المصابة مقارنة بغير المصابة. إنخفض مستوى البروتين الكلي في الحيوانات المصابة مقارنة بغير المصابة، إلا أن الإنخفاض لم يكن معنوياً. فضلاً عن ذلك، لم تختلف اختلافاً معنوياً مستويات الكليسيريدات الثلاثية والبروتينات الدهنية منخفضة الكثافة جداً في الماشية المصابة عن غير المصابة.اجمالا استنتجت الدراسة الحالية أن الماشية يمكن أن تصاب بأنواع مختلفة من الطفيليات الداخلية، وأن هذه الإصابة يمكن أن تؤثر سلباً على الأيض في الحيوانات المصابة، بما في ذلك أيض البروتينات الكلية والدهون.