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Some hematological parameters of rabbits infested with hard ticks in Baghdad city

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Abstract

This study was conducted to investigate the hematological effect of hard ticks *Hyalommma anatolicum*, feeding on rabbit blood by measuring some hematological tests (Hemoglobin concentration Hb, Packed cell volume PCV, Red and White blood cell counts). 20 local rabbits were used housing in special cages under slandered environmental conditions, rabbits were divided into 2 groups each one containing 10, first group was infected with an adult hard tick *Hyalommma anatolicum*, the second is control, 3 months after infection, blood was withdrawn from the groups and some tests were performed (as mentioned above).T-test analysis was use in this experiment . Results showed that Hemoglobin, packed cell volume, and red blood cells were significantly decreased (6.1930, 2.4510 and 22.2200) respectively at ($p>0.05$) in the tick-infected group, the decrease was evident when comparing with control group (12.9910, 6.9310 and 42.1090) respectively. On the other hand, the number of leukocytes was significantly higher (17.4590) at ($p>0.05$) of infected animals when compared with healthy animals (10.5390). This indicate that ticks, which feed on the animals for a long time cause a defect in the functions of the body, especially blood, where there was a clear anemia in the infected rabbits due to (blood absorption and toxin excreted to the blood stream), this acute decrease of blood led to the occurrence of large infections in the body and which was clear through the increasing of WBC counts values, this confirms that there is a negative effect on the blood of ticks parasitize on animals.

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Introduction

Ticks come from super family: Ixodoidea and Ixodidae family. There are about 18 genera and 900 species of hard ticks (Ixodid). In general, tick is a small exoparasites and blood sucker lives feeding on organisms (human and animals), it is a permanent parasite has been attacking hosts from first stages of life cycle, where they are not visible because of the small size, glues to the host to feed on blood .The body is flat in dorsal-ventral side, oval shape, (3-23mm) length, has a posterior plate called the shield (scutum). This is larger in males than in females, covering most of the dorsal surface while in females it covers the ventral part of the body (Cox, 1993; Mehlhorn, 2001; Radostits, 2007).

Hard tick has four different stages: egg, larva, nymph, and adult, the male and female mate on the host and after fertilization the female falls on the soil, lays 3000 to 5000 eggs over three weeks in protected areas such as cracks and pits in animal pens or under tree leaves, the eggs hatch in(2 – 4) weeks, eggs hatch into larvae on leaves until they find the appropriate host where they feed on its blood, then larva falls on the ground , become a nymph and also feeds on the blood of the host for several more weeks, after which it slips on the ground to become an adult animal (Cambell and Glines,1979 ; Bank *et al*,1998 ; Elghali and Hassan, 2009 ; Bonnet and Liu ,2012).

Tick is an important vector for many bacterial, viral and parasitic diseases; both humans and animals are infected with these diseases ,causing many health problems (Alanazi *et al*, 2018), ,the tick feeds on the animal's blood , symptoms of itching, weakness and weight loss begin to affect on red and white blood cells ,anemia and infections, which in turn leads to reduce immunity of the animal's body (Stone, 1989; Stachurski, 2000; Taylor, 2007;Barker and Walker,2014 ; Habeeb *et al* ,2014).

The importance of physiological and epically hematological studies represented in diagnosis of diseases and health problems of human and animal body ,by measuring some blood parameters that determine the incidence of infection or not, so blood is one of the most important parts of the body because it transmits oxygen and food throughout all the organisms' body , the occurrence of any defect in the values of hematological parameters indicates the presence of a specific infection or disease and must be detected to be treated . (Togun *et al*, 2007; Manual, 2012; Etim*et al*, 2014).

The aim of this work is to identify and determine the effect of hard ticks on some physiological parameters: (Hemoglobin Hb, Packed cell volume PCV, Red and White blood cell count RBC and WBC).

Materials and methods

In this experiment, 20 local rabbits *Oryctolagus cuniculus* were used, housing in big cages at the Animal House of Iraq Natural History Research Center and Museum, University of Baghdad, Iraq during (June to September) 2018 . The animals were divided into (2) groups each consisting of (10) rabbits placed in two separate cages, the first group comprises tick-infected rabbits and the second one is the non-infected group, (control).

The first was infected with the adult hard tick of the genus *Hyalommma anatolicum* collected from ear and bladder of adult cow from south of Baghdad city (middle of Iraq) ,placed on the ear and back of the rabbits by using special technique to prevent the rabbit pick up them (Neitz *et al*.,1971) , three months after ticking, blood was drawn from infected and healthy ticks,(2) cc of blood was drawn from cardiac puncture of each animal, placed in test- anticoagulant tubes (EDTA), tests were performed as soon as possible.(Coles, 1986) according to methods of (Kuwahara,1974;Schalm, *et al*.1975).

Statistical analysis

All results of this study were analyzed including Means, Standard deviations and standard error of Hb concentration, PCV, WBC and RBC counts, As well as comparing the two groups of experiment and differences between them by using T-test analysis at ($p>0.05$) according to (Snedecor and Cochran, 1994).

Results and discussion

Table 1 showed Means, standard deviations and standard error of Hemoglobin values (Hb) for the two groups of experiment, control and infected, when observing the recorded results for hemoglobin test of the tick-infected group of rabbits and comparing it with the control group, there was a significant difference at (p>0.05) in the hemoglobin value of infected rabbits (6.1930) g/dl when compared to the hemoglobin values of the healthy group (control) (12.9910) g/dl.

Table 1. Means, Std. Deviation and Std. Error of Hb values.

	States	N	Mean	Std. Deviation	Std. Error Mean
Hb	Control	10	12.9910	2.26177	.71523
	Infected	10	6.1930	1.48371	.46919

Table 2. T-test of Hb (Independent Samples Test).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hb	Equal variances assumed	2.603	.124	7.947	18	.000	6.79800	.85539	5.00088	8.59512
	Equal variances not assumed			7.947	15.536	.000	6.79800	.85539	4.98023	8.61577

It is well known that ticks feed on the blood of the host where blood is considered the main meal of them, since the blood absorption by ticks lasted for about three months and is sufficient to cause a decrease in the concentration of hemoglobin and this in turn leads to acute anemia, In other words, ticks have a negative effect on rabbits caused a significant decrease in the Hb values in the infected rabbits when compared with the healthy (control) as summarized in (Table 2), This corresponds to the finding of (Hair *et al.,* 1992; Habeeb *et al.,* 2014) Who proved that ticks caused a severe hemoglobin deficiency of the animal that feeds on it.

Table 3. Means Standard deviation and Std. Error of RBC values.

	States	N	Mean	Std. Deviation	Std. Error Mean
RBC	Control	10	6.9310	1.28247	.40555
	Infected	10	2.4510	.67265	.21271

Table 5. Means, Standard deviations and standard error of (PCV) values.

	States	N	Mean	Std. Deviation	Std. Error Mean
PCV	Control	10	42.1090	5.73380	1.81319
	Infected	10	22.2200	7.41048	2.34340

When blood samples were taken from rabbits and the erythrocyte count was performed, the results showed a significant reduction at (p>0.05) in the number of red blood cells of infected rabbits (2.4510) 10^6 cell/µL when compared to the control group (6.9310) 10^6 cell/µL; this is a normal result for rabbits that have been infected with ticks and has an acute anemia. This is illustrated in Table 3 which explains Means of (RBC) count values for the two groups of experiment control and infected, As well as Table 4 which explains the clear differences between the two experimental groups.

The results of this test are consistent with the findings

of (Aster, 2004; Habeeb *et al.,* 2014) and there have been no studies that give opposite results, because all the studies on this specific line proved the same results reached in the current work and if proven contrary, then the study is incorrect, animals such as rabbits tick feeds on their blood for three months. It is normal for them to infect with acute anemia.

Table 6. T-test of (PCV) control and infected groups (Independent Samples Test).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PCV	Equal variances assumed	.904	.354	6.713	18	.000	19.88900	2.96297	13.66404	26.11396
	Equal variances not assumed			6.713	16.933	.000	19.88900	2.96297	13.63580	26.14220

Table 7. Means _+ Standard deviation and Std. Error of WBC.

	States	N	Mean	Std. Deviation	Std. Error Mean
WBC	Control	10	10.5390	1.52380	.48187
	Infected	10	17.4590	2.30726	.72962

The same results were obtained from the test (PCV) where the values were significantly lower at ($p>0.05$) in the infected rabbits (22.2200)% compared with control (42.1090)%, as illustrative in table (5) and the table (6) also show the comparison between the two groups using statistical analysis (T-test). of these results, it can be said that the infection of rabbits by hard ticks can cause losing of large amounts of blood and this usually leads to anemia specially the type of macrocytic normochromic anemia leading to death (Abdel-Shafy *et al.*,2011;Bonnet and Liu,2012;Amaral *et al.*,2012;Isaac,2013).

This is what happened in this study, where most infected rabbits died after withdrawing blood from them due to an acute deficiency in blood ratio.

Table 8. T-test of WBC(Independent Samples Test).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
WBC	Equal variances assumed	5.404	.032	-7.914-	18	.000	-6.92000-	.87438	-8.75701-	-5.08299-
	Equal variances not assumed			-7.914-	15.596	.000	-6.92000-	.87438	-8.77751-	-5.06249-

With regard to (WBC) counts, as is clear in the results of this study, we found, a significant increase at ($p>0.05$) in the count of white blood cells of the group of tick-infected rabbits (17.4590) $10^3/mm^3$ as shown in Table 7, when comparing the means with the non-infected group (10.5390) $10^3/mm^3$. In table (8), there is a significant difference between two groups. And this is similar to the findings of (Hair *et al.,* 1992) who also noted a significant increase in the number of (WBC) of rabbits infected with ticks, this indicates that there is an important effect of ticks on the leukocytes number of infected rabbits because of the presence of a large inflammation in the body, which led to an increase of WBC which help in turn to

defend the body and attack inflammation to remove it, this is because the function of leukocytes is a defensive function (Hussain, 2011;Etim *et al.* , 2014). From all above, the study showed the negative impact of ticks on the blood of infected rabbits. This has been proven in the studies mentioned above.

Conclusion

In the current study, rabbits *Oryctolagus cuniculus* were infected with adult hard ticks *Hyalomma anatolicum*, for three months, then blood was drawn from the infected group and some blood measurements were carried out to determine the effect of these ticks on the rabbit. It was concluded that ticks had a significant negative effects on animals, there was acute anemia in infected rabbits, and the number of leukocytes was significantly higher in exposed rabbits when compared to non-infected rabbits.

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