

ELEVATIONS IN SERUM CORTISOL IN DOGS WITH HEARTWORM DISEASE AS A BIOMARKER OF STRESS

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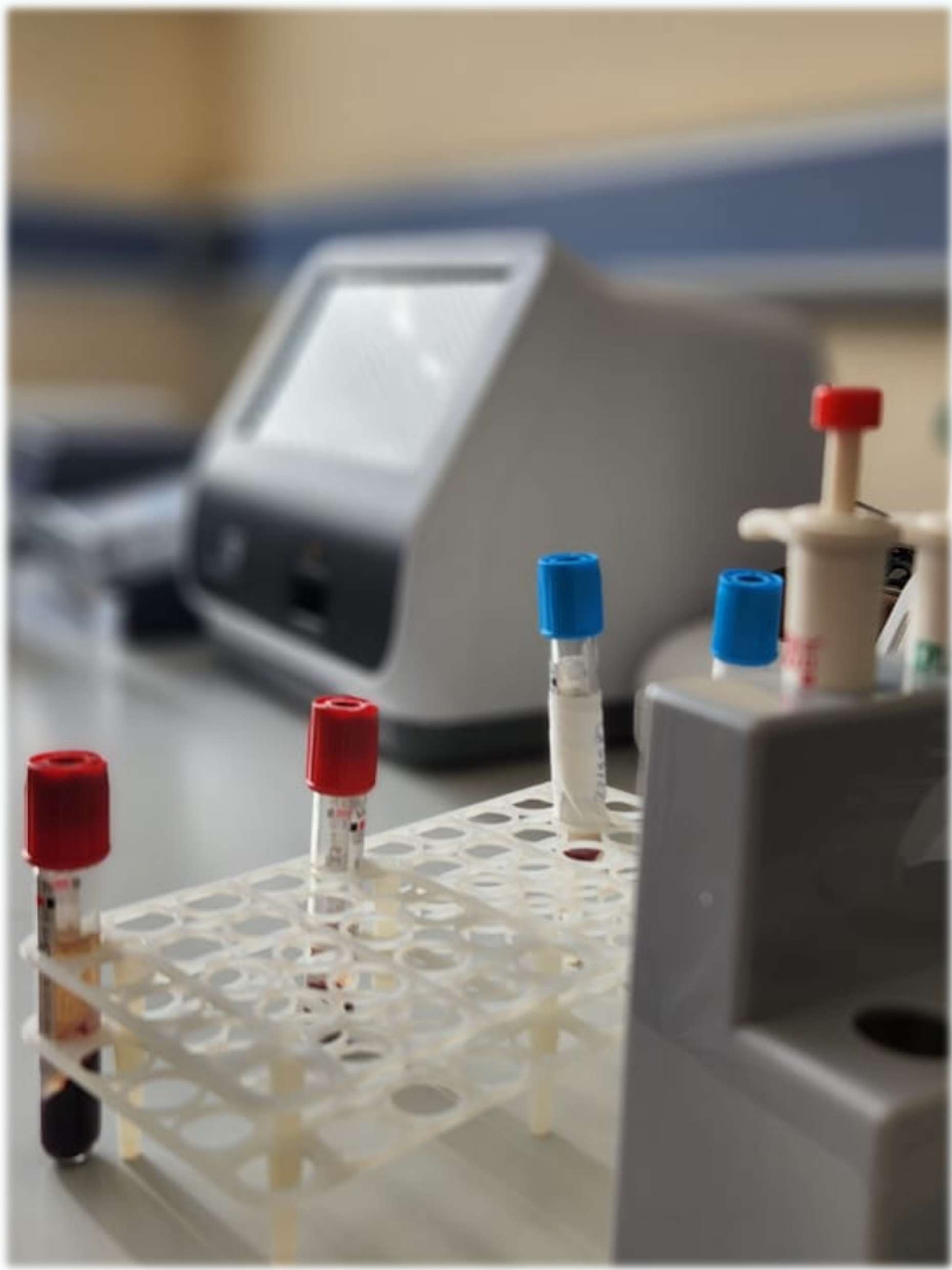
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Introduction

Cortisol is a glucocorticoid which production and secretion is regulated by the hypothalamus-pituitary-adrenal axis (HPA) and is released in response to stress. It has been described that chronic elevations of glucocorticoids can directly influence the impairment of the immune response, being detrimental to the organism. Moreover, high cortisol levels have been associated with infectious diseases, and it has been demonstrated its utility as a biomarker of chronic stress in cardiovascular disease in humans. Furthermore, previous studies relate the presence of parasites and cortisol levels in several species.

Methodology

The aim of this study was to evaluate the cortisol levels in dogs with heartworm disease (*Dirofilaria immitis*) in sera from 92 dogs with heartworm. The parasite load was echocardiographically assessed and the presence/absence of microfilariae was determined by using the modified Knott test. Serum cortisol was measured by using VCHECK V200 Veterinary Immunoassay Analyzer (Bionote, Minnesota, USA). Reference ranges for healthy dogs were established as 2.3±1.1 ng/ml.



References

Cerón J.J., Eckersall P.D., Martínez-Subiela S. (2008). Acute phase proteins in dogs and cats: current knowledge and future perspectives. <https://doi.org/10.1111/j.1939-165X.2005.tb00019.x>

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	NOMBRE	NHC	SEXO	EDAD	RAZA	CARGA PARASITARIA	HP (SI/NO)	MICROFILARIAO	MICROFILARIAI	MICROFILARIAZ	MICROFILARIAALTA	CORTISOL0	CORTISOL1	CORTISOL2	CORTISOLALTA
1	JACKSON	3332/21	MACHO	5 AÑOS	STAFFORDSHIRE BULL TERRIER		2 NO	POSITIVO	NEGATIVO			2.47	1.49		
2	MIL0	1717/21	MACHO	3 AÑOS	PODENC0		3 SI (LEVE)	NEGATIVO	NEGATIVO	NEGATIVO		<1.00	<1.00	<1.00	<1.00
3	SAMBA	3828/21	HEMBRA	3 AÑOS	MESTIZO		3 NO	POSITIVO	POSITIVO	POSITIVO	POSITIVO	1.56	2.23	2.09	<1.00
4	MALA	3098/21	HEMBRA	9 AÑOS	MESTIZO		2 NO	NEGATIVO	NEGATIVO	NEGATIVO		3.47	6.66	4.35	
5	YACO	4574/21	MACHO	13 AÑOS	MESTIZO		4 SI (GRAVE)	NEGATIVO	NEGATIVO	NEGATIVO		5.73	2.64	5.23	
6	BIMBA	4909/21	HEMBRA	7 AÑOS	MESTIZO		2 SI	NEGATIVO	NEGATIVO	NEGATIVO		<1.00	<1.00	2.21	
7	GARA	344/22	HEMBRA	1 AÑO	MESTIZO		2 NO	NEGATIVO	NEGATIVO	NEGATIVO		1.93	<1.00	<1.00	
8	POLLUX	373/22	MACHO	6 AÑOS	MESTIZO		2 SI (LEVE)	POSITIVO	POSITIVO	NEGATIVO	NEGATIVO	2.37	5.29	9.55	
9	CAQUI	240/22	MACHO	4 AÑOS	MESTIZO		3 NO	POSITIVO	POSITIVO	NEGATIVO		6.54	9.03	<1.00	9.59
10	JANNA	1559/19	HEMBRA	5 AÑOS	MESTIZO		2 NO	NEGATIVO	NEGATIVO	NEGATIVO		2.09	<1.00	1.41	
11	NORA	3224/16	HEMBRA	5 AÑOS	ROTTWEILER		2 NO	NEGATIVO	NEGATIVO	NEGATIVO		3.08		4.11	
12	TITAN	380/22	MACHO	7 AÑOS	CHIHUAHUA		3 NO	POSITIVO	POSITIVO	POSITIVO		2.61	1.88	2.96	
13	LOUIE	1104/22	MACHO	7 AÑOS	MESTIZO		2 NO	NEGATIVO	POSITIVO			4.89	3.48		
14	LEWIS	1105/22	MACHO	7 AÑOS	MESTIZO		2 NO	NEGATIVO	POSITIVO	POSITIVO		1.39	<1.00	1.75	
15	SAMBA	1137/22	HEMBRA	8 AÑOS	PODENC0		2 NO	NEGATIVO	NEGATIVO	NEGATIVO		3.11	1.43	4.17	
16	SULTAN	1136/22	MACHO	3 AÑOS	MESTIZO		2 NO	POSITIVO	POSITIVO	NEGATIVO		4.25	1.47	<1.00	
17	LOOYI	1142/22	HEMBRA	1 AÑO	MESTIZO		2 NO	NEGATIVO	NEGATIVO	NEGATIVO		10.58	4.73	3.38	
18	MIKI	1180/22	MACHO	6 AÑOS	MESTIZO		2 NO	POSITIVO	NEGATIVO			<1.00	1.29		
19	LEO	1269/22	MACHO	5 AÑOS	PASTOR ALEMÁN		3 NO	POSITIVO	NEGATIVO	NEGATIVO		2.02	<1.00	2.52	
20	NEWTON	394/22	MACHO	4 AÑOS	LABRADOR RETRIEVER		3 SI (MOD)	NEGATIVO	NEGATIVO			1.00	<1.00		
21	BOBBY	1659/22	MACHO	8 AÑOS	MESTIZO		3 NO	NEGATIVO	NEGATIVO	NEGATIVO		5.55	1.91		
22	LARA	1441/22	HEMBRA	6 AÑOS	MESTIZO		2 NO	POSITIVO	POSITIVO			4.15	10.60	5.77	
23	CHIPPY	1927/22	MACHO	6 AÑOS	MESTIZO		3 NO	POSITIVO	POSITIVO			6.66	4.12		

Results

Of the studied dogs, 39.1% were females and 60.9% were males; 54.3% were microfilaremic and 30.4% showed high parasite burden. Mean cortisol levels were 20.2±10.1 ng/ml, being significantly higher than in healthy dogs (p<0.05). No statistically significant differences were found by sex or microfilaremic status, although dogs with high parasite burden showed higher levels of cortisol (p<0.05).

Conclusion

These results suggest that *D. immitis* increases the systemic levels of cortisol. Infectious diseases, including parasitic infections, produce a joint action of neuroendocrine and immune networks to facilitate the host response. Immunological changes have been studied in depth; however, the impact on immunoendocrine circuits has been less studied. In canine heartworm, it has been published that the presence of the parasite and its endosymbiotic bacteria *Wolbachia pipientis* stimulate the production of interleukins and other inflammatory mediators. Since other studies have shown that interleukins stimulates the production of C-reactive protein (CRP) and cortisol in humans, and CRP elevations have been previously described in canine heartworm, the presence of cortisol elevations were to be expected. The results of this study show that cortisol levels are higher in dogs with high parasite load. Similar results have been described for other parasites, being considered as an indicator of severity by some authors. The results encourage continuing studying the presence of disorders in the hypothalamic-pituitary-adrenal (HPA) axis with the presence of canine heartworm, in order to determine the usefulness of this glucocorticoid in the management of the disease.