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A clinical study on the hemato-biochemical changes in Sirohi goat infected with Johne's disease in an organized livestock farm

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Abstract

A clinical study on the prevalence of *Mycobacterium avium* subspecies paratuberculosis (MAP) was carried out in an organized livestock farm in goat population, Jamdoli, Rajasthan state using acid fast method, single intra dermal test (SID), ELISA followed by hemato-biochemical parameter studies. Out of 37 goats, one goat was found positive with ELISA. Detailed studies of this goat on the hemato-biochemical variations were carried out for additional information for better management of the rest of the population of the livestock farm. The hematological studies revealed significant decreases in neutrophil and platelet counts and elevated lymphocytes, MCV and MCH values. The biochemical reactions showed elevated values of direct bilirubin contents followed by low level values of SGOT, total protein, albumin, A/G ratio, calcium and phosphorus.

Keywords: Johne's disease-goat-Sirohi-biochemical

Introduction

Paratuberculosis (Johne' disease), a chronic infective disease of ruminants, has been recognized in the United States for about 75 years ago. Kundan Kumar Chaubey *et al.* (2017) ^[4] reported a bio- load of 23% in goats for *M. avium* sub species paratuberculosis during the last 31 years in India.

Ganesan *et al.* (2023) ^[2] reported an overall prevalence rate of 13.1% in goats for the years 2019- 2022 in an organized farm in Rajasthan state for *M. avium* sub species paratuberculosis. The causative agent is *Mycobacterium para tuberculosis*, an acid fast bacterium. Infection with this organism is difficult to control because of its long incubation period, the absence of clinical signs in the early stages, the lack of applicable antibiotics or other drugs, and the lack of earlier diagnostic methods. JD has no cure and it is ultimately fatal. The lack of effective treatment options, such as vaccine, has hampered JD control resulting in its increasing global prevalence (Whitelock *et al.* 1985) ^[17]. Johne's disease is seen in all ruminants including sheep and goats and occurs worldwide causing staggering losses to the livestock industry particularly in third world countries (Sherman 1985) ^[15]. The abnormalities reported are often characteristic of JD but certainly not diagnostic.

Plain and Whittington (2015) ^[12] reported that Johnin skin test, ELISA and other tests like acid fast, AGID,CFT and culture examinations can be used in the diagnosis of JD in ruminants. Animals in the early stages of infection may not be recognized with any one of the current tests (OIE 2020) ^[8]. Patterson *et al.* (1965) ^[9] reported that early stages of infection are not associated with any characteristic bio-chemical or enzymatic changes. Shalini Sharma *et al.* (2022) ^[14] reported that country is slowly losing rich diversity of germplasm due to deaths caused by JD in buffaloes. Disease being endemic and spectral in nature the animals will be in different stages of incubation period for the disease. Comparative blood profiles of MAP positive and negative animals could aid in identification of disease for early detection. Studies are lacking in actual cases of goats suffering from JD and suspected for MAP infection. This study was carried out in a JD infected Sirohi goat for its hemato bio-chemical reactions where information's are scanty in this aspects in goat population.

Materials and Methods

The study was carried out in an organized livestock farm at Jamdoli area, Jaipur. The farm possesses 18 Sirohi and 19 Beete goats. All the goats were found normal in their feeding habits and few goats noted with weight loss only. All the goats were subjected to rectal pinch examination with acid fast staining and Johnin skin test and were found negative. Sera samples were collected from all these goats and were subjected to ELISA. In this program one goat was found positive to JD infection and a detailed hemato-biochemical study were carried out in this ELISA positive Sirohi goat for JD in order to assess the actual metabolic status of the animal for better management program and the outcome of the hemato-biochemical changes are discussed here.

Results and Discussion

Hematology

The hematological parameters (Table 1) revealed significant decreases in neutrophil and platelet counts and elevated lymphocytes, MCV and MCH values. Shalini Sharma *et al.* (2022) [14] reported significant differences in neutrophils and lymphocyte numbers in JD infected buffaloes. Ahmed M. Abdelaal *et al.* (2019) [1] reported non-significant changes in MCV and MCHC levels in sub clinically infected cows. M. Anwarullah *et al.* (2022) [5] reported non-significant change of MCV and MCH values in their studies on larger ruminants. Patterson *et al.* (1965) [9] reported anemic conditions of JD infected animals in advanced stages and these observations are in concurrence with the findings of this study.

Biochemical reactions

In this study the biochemical reactions (Table 2) showed elevated values of direct bilirubin contents and low-level values of SGOT (AST), total protein, albumin, A/G ratio, calcium and phosphorus. Ahmed *et al.* (2019) [1] studied the biochemical changes in cattle infected with JD bacilli and reported that clinically affected cows showed non-significant changes in the levels of albumin, ALT, AST & ALP as enzymes markers of the liver function.

Nuzhat Hassan *et al.* (2022) [7] reported lower level of total protein and albumin in clinical JD animals. The low level of protein is attributed to protein-losing enteropathy which might be due to the impaired integrity of the mucosa of the gastro-intestinal tract as reported by Sweeny *et al.* (2012) [16]. Brady *et al.* (2008) [18] reported low values of albumin with normal globulin level which are in agreement with this study. The low level of albumin could be due to decreased liver function. These observations are in concurrence with the findings of this study except the decreased level of phosphorus. Nielson (1966) [6] reported elevated plasma phosphorus levels in animals with marked muscle loss, whereas in this infected goat the phosphorus level was not elevated that could be attributed for absence of weight loss. Patterson *et al.* (1965) [9] reported that goats show few clinical signs other than weight loss (emaciation) and diarrhea as a rare sign of J.D in sheep & goats.

Patterson (1967, 1968) [10, 11] and Rice (1969) [13] reported that animals in advanced disease of JD are hypo proteinemic with reduced total serum proteins of all types and albumin due to decreased absorption of nutrients and loss of plasma proteins due to increased protein catabolism. These observations are in concurrence with the findings of this study. Patterson *et al.* (1965) [9] reported that animals in advanced stage of JD are often anemic with concurrent low level calcium, sodium and potassium. In this study the level of sodium and potassium

maintained and the level of calcium was insignificantly low. Jone's and Kay (1996) [3] reported a decrease of calcium, total protein and albumin from cattle and sheep with clinical Para tuberculosis. These observations are in concurrences with the outcome of the present study.

Table 1: Hematology

S. No	Parameters	Finding	Units	Normal values	Diagnostic Interpretation
1	Complete blood count				
	Hb	9.30	g/dl	8.0-12.0	
	TLC	12.60	thou/cu.mm ³	4.0-13.0	
2	Differential count				
	Neutrophils	20	%	30-48	Low
	Lymphocytes	75	%	50-70	High
	Eosinophils	3	%	1-8	
	Monocytes	2	%	0-4	
	Basophils	0	%	0-1	
3	RBC parameters				
	RBC	8.32	mill/mm ³	8-18.0	
	PCV	25.90	%	22-38	
	MCV	31.10	Fl	16-25	High
	MCH	11.10	Pg	5.2-8.0	High
	Platelets	155.00	thou/cu.mm ³	300-600	Low

Table 2: Biochemical –Liver function tests

S. No	Parameters	Finding	Units	Normal values	Diagnostic Interpretation
1	Bilirubin total	0.19	mg/dl	0-0.4	
2	Bilirubin-direct	0.17	mg/dl	0-0.10	High
3	Bilirubin-indirect	0.02	mg/dl	0-0.30	
4	SGOT (AST)	69.10	U/L	75-400	Low
5	SGPT (ALT)	15.80	U/L	6-19	
6	Alkaline phosphatase	95.60	U/L	93-387	
7	Total protein	5.62	g/dl	6.4-7.0	Low
8	Albumin	2.42	g/dl	2.7-3.9	Low
9	Globulin	3.20	g/dl	2.7-4.1	
10	A/G ratio	0.76			Low

Table 3: Bio-chemical –Kidney function tests

S. No	Parameters	Finding	Units	Normal values	Diagnostic Interpretation
1	Blood urea	23.70	mg/dl	21.5-42.8	
2	BUN	11.07	mg/dl	10-20	
3	Creatinine	0.88	mg/dl	0.8-1.8	
4	Uric acid	0.30	mg/dl		
5	Calcium	8.70	mg/dl	8.9-11.7	Low
6	Phosphorus	3.74	mg/dl	4.2-9.1	Low
7	Sodium	148.50	mEq/l	142-155	
8	Potassium	4.90	mEq/l	3.5-6.7	
9	Chloride	104.10	mEq/l	99-110.3	
10.	Glucose random	73.40			

Conclusion

Studies on the confirmation of J.D infection in a goat was carried out by its clinical signs & ELISA, followed by hemato-biochemical parameters studies. The study observed haematological changes in the neutrophils, lymphocytes, platelet counts, MCV and MCH values. The biochemical studies revealed changes in the direct bilirubin, SGOT level, total protein, albumin, A/G ratio and in calcium and phosphorus levels. The hemato-biochemical changes observed in this study may be taken as additional parameters for confirmation of J.D in such infected goat population.

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