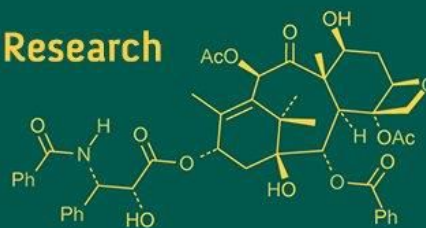


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Dr. P Roja
Ph. D. Scholar, Department of
Veterinary Parasitology
College of Veterinary Science,
SVVU, Tirupati, Andhra
Pradesh, India

Dr. P Malakondaiah
Professor and University Head
Department of Veterinary
Parasitology, NTR College of
Veterinary Science,
Gannavaram, Andhra Pradesh,
India

Dr. K Jalajakshi
Assistant Professor,
Department of Veterinary
Parasitology, College of
Veterinary Science, SVVU,
Tirupati, Andhra Pradesh,
India

Dr. D Rani Pameela
Professor & Head, State Level
Disease Diagnostic
Laboratory, SVVU, Tirupati,
Andhra Pradesh, India

Dr. TS Moni Thersesa
Department of Pharmacology
and Toxicology, College of
Veterinary Science, Proddatur,
Andhra Pradesh, India

Biochemical alterations in *Cryptosporidium* infected calves

P Roja, P Malakondaiah, K Jalajakshi, D Rani Pameela and TS Moni Thersesa

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Abstract

Cryptosporidiosis is a significant enteric infection in calves, particularly in pre-weaned animals, causing severe diarrhoea, economic losses, and potential zoonotic transmission. This study aimed to assess the biochemical alterations associated with *Cryptosporidium* infection in calves to aid in diagnostic and therapeutic interventions. A total of 30 calves were included in the study, comprising 20 infected and 10 healthy individuals. Blood samples were aseptically collected from the jugular vein using clot-activated vials, and biochemical parameters were analyzed using an Automatic Biochemical Analyzer.

The results revealed notable deviations in key biochemical markers among the infected group. Specifically, the infected calves exhibited significantly increased levels of serum glutamic-oxaloacetic transaminase (SGOT), serum glutamic-pyruvic transaminase (SGPT), creatinine, urea, and C-reactive protein (CRP), alongside a marked decrease in total protein levels compared to healthy controls. These alterations suggest the presence of hepatic and renal dysfunction as well as systemic inflammation due to the parasitic infection. The elevated SGOT and SGPT levels likely indicate hepatocellular damage and inflammation, while increased creatinine and urea levels reflect renal impairment potentially linked to dehydration and acute kidney injury. The heightened CRP values support the existence of a systemic inflammatory response. Conversely, the reduced protein levels may be due to poor nutrient absorption or protein loss associated with diarrhoea.

In conclusion, the biochemical profile of *Cryptosporidium*-infected calves demonstrates distinct deviations from normal values, emphasizing the importance of routine biochemical monitoring in diarrhoeic calves. These findings can assist in early diagnosis, prognosis, and therapeutic management of cryptosporidiosis in bovine populations.

Keywords: *Cryptosporidium parvum*, diarrhoea, calves, biochemical alterations, liver enzymes

Introduction

Livestock is an integral part of the agricultural production system in Indian economy as well as in socio-economic development of millions of rural households. Diarrhoea, being the leading cause of death in calves aged less than six months, is a major source of economic loss to the cattle industry. It can be caused by a variety of pathogens including bacteria, viruses, protozoa and intestinal parasites.

Cryptosporidium species are widely recognized as the most common pathogens responsible for diarrhoea in calves, surpassing other enteric infections like rotavirus, bovine coronavirus, and enterotoxigenic *Escherichia coli* (Karanis *et al.*, 2010) [1]. These species exhibit a distinct age-related distribution in bovine hosts, with *Cryptosporidium parvum* (*C. parvum*) being the most prevalent in pre-weaned calves (1-3 months old) across various countries. In contrast, *C. bovis* and *C. ryanae* are more commonly found in calves aged 3 to 11 months (Qi *et al.* 2020) [3].

Additionally, *Cryptosporidium parvum* infection is considered a significant zoonotic risk, as it often causes watery diarrhoea in newborn calves and can be easily transmitted to humans. Hematological analyses are essential tools for diagnosing diseases, making medical decisions, and providing valuable insights during the diagnostic process. By comparing the test results from affected animals with the normal reference values of healthy animals, these analyses help in identifying abnormalities and guiding appropriate treatment strategies (Shehata *et al.* 2024) [4].

Corresponding Author:
Dr. P Roja
Ph. D. Scholar, Department of
Veterinary Parasitology
College of Veterinary Science,
SVVU, Tirupati, Andhra
Pradesh, India

Several parameters are recognized or suggested as useful indicators of a calf's susceptibility to illness or death. Among these are the total red blood cell count (tRBC), hemoglobin (Hb) levels, and packed cell volume (PCV), which are commonly used to assess the animal's health status (Lykkesfeldt and Svendsen, 2006) [2].

Materials and Methods

Blood was collected aseptically by jugular veni puncture. Five milliliters of blood of 20 infected and 10 healthy calves were collected clot activated vials (Accuvete-PLUS, Quantum biologicals Pvt. Ltd) for complete seriological parameters with Automatic Biochemical Analyser.

Results

The biochemical findings for the *Cryptosporidium* infected calves and the control group are presented in Table: 1. There is increased in values of SGOT, SGPT, Creatinine, urea and C reactive protein and decreased values of protein were recorded in the animals infected with cryptosporidiosis

Table 1: The biochemical findings for the *Cryptosporidium* infected calves and the control group are presented

Parameters	Cattle calves	
	Obtained values (N= 15)	Normal values (N= 15)
SGOT (IU/L)	5.65±0.15	12.05±0.09
SGPT (IU/L)	3.60±0.06	9.17±0.04
Total protein (g/dL)	25.07±1.91	6.11±0.09
Creatinine (mg/dl)	17.93±0.31	36.88±0.31
Urea (mg/dl)	67.10±0.64	64.67±0.37
C-reactive protein (mg/dl)	41.63±0.18	37.50±0.35

Discussion

increased SGOT, SGPT, Creatinine, urea and C reactive protein and decreased value protein recorded in the present studies whereas similar findings were reported by Khan *et al.* (2020) [7], Mahmoud *et al.* (2018) [6], Wali *et al.* (2020) [5, 7] and Sateesh *et al.* (2024). Increased ALT and AST values in domestic ruminants with cryptosporidiosis can result from a combination of hepatocellular injury, inflammatory responses and endotoxemia. Further, elevated hepatic enzymes may serve as important biomarkers for assessing liver involvement and the severity of infections in ruminants. The liver's response to infections, toxins, or secondary complications often leads to these enzyme elevations, which should be considered in the broader context of the animal's clinical condition and diagnostic profile. Increased urea, creatinine and C reactive protein values are commonly seen in *Cryptosporidium* infection in animals due to several factors, including dehydration, renal hypoperfusion, acute kidney injury (AKI) and systemic inflammatory responses.

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