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Evaluation of Therapeutic Regimens for Theileriosis-Affected Buffaloes in the Malwa Region of Madhya Pradesh, India

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Abstract

Three groups of 15 clinical cases of theileriosis in buffaloes from various villages in the Malwa region of Madhya Pradesh underwent therapeutic trials. Oxytetracycline (20 mg/kg IV, once daily) was used to treat five early and moderate cases of theileriosis in Group I. After receiving therapy, three made a full recovery, while two others did not. Buparvaquone was administered alone at 2.5 mg/kg IM as a single dose to Group II (n = 5) buffaloes with moderate to severe illnesses, and all five animals recovered completely. The hematological, biochemical, and clinical markers all returned to normal. Five patients in group III received oxytetracycline (20 mg/kg IV daily for five days) combined with buparvaquone 2.5 mg/kg intramuscularly. Out of the five patients in this group, three made a full recovery; one case's condition did not totally improve, and one case with severe anemia (6.8 g/dl) passed away. The findings of this study showed that buparvaquone medication is 100% successful in the early stages of the disease but fails to improve the clinical condition in the later stages.

Keywords: buffaloes, theileriosis, oxytetracycline, buparvaquone,

Introduction

The buffalo, sometimes known as the "Black Diamond," is a magnificent Asian dairy animal that contributes significantly to the socioeconomic development of rural farming communities. It is India's top producer of milk and lean meat (Gupta and Singh, 2002). *Theileria annulata*, which causes bovine tropical theileriosis, can develop in situ in the Indian subcontinent under the best conditions, and the intermediate acarine host (*H. anatolicum anatolicum*) can spread most quickly.

The apicomplexan parasite has been limiting the export of high-yielding buffalo breeds to other nations as well as the transborder movement of cattle and buffalo. Nearly 70% of bovine mortality is caused by the disease, which results in annual global losses of US$800 million (Brown, 1997). According to projections, India could lose up to INR 8092 crore a year as a result of tropical theileriosis (Narladkar, 2018).

Theileriosis in cattle, particularly in crossbred cattle, has been documented by numerous researchers from around the world (Preston *et al*., 1992; Omer *et al*., 2002; Col and Uslu, 2006; Kohli *et al*., 2014; Jagtap *et al*., 2015; Devadevi *et al*., 2018). A few reports of theileriosis in buffaloes, however, have been documented (Singh et al., 2012; Vahora et al., 2012; Chaudhari *et al*., 2013). In order to better understand how bubaline theileriosis is treated therapeutically in the Malwa region of Madhya Pradesh, the current study was created.

Materials and Methods

Location of work: The study was carried out at the Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh.

Source of Animals: The buffaloes were presented from different villages in the Malwa region at the Veterinary Clinical Complex (VCC), Veterinary College, Mhow, Madhya Pradesh.

Duration of work: The study was conducted from February 2021 to January 2022.

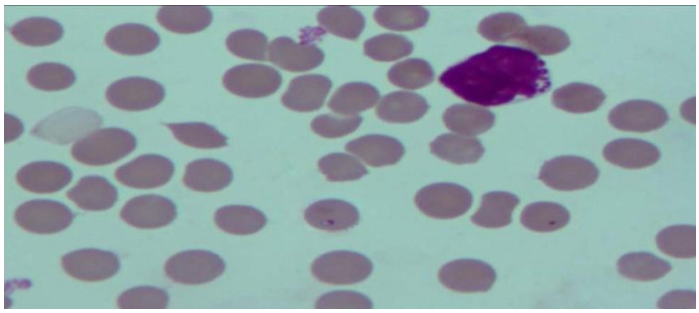
Research methodology and experimental design

Selection of Animals: The buffaloes for the study selected on the basis of history and clinical signs like high fever, enlargement of superficial lymph node, pale mucosae, anorexia, weight loss and no response to usual antibiotics and suspected for theileriosis were screened by using blood smear examination. Positive samples were selected based on the presence of intra-erythrocytic theilerial piroplasms and Koch's Blue bodies in blood smears.

Blood sample collection: The animal was adequately secured in a travis for the blood sample collection. Before and 20 days after therapy, approximately 10 ml of blood were taken under aseptic circumstances from the jugular vein of sick buffaloes. For haematological and serum biochemical analyses, blood was drawn from the jugular vein using a vacutainer and placed in EDTA and plain vials, respectively.

Methods of blood smear examination:

Thin smears : Two glass slides were taken, out of which one with rounded edges acts as a spreader. A drop of blood was placed at one end of the slide and touched it with the spreader at an angle of 30º. The blood spreaded evenly along the edge of the spreader. Spreader was drawn smoothly and steadily so that small amount of blood was drawn and a thin smear was stained with Giemsa and examined under oil immersion for the presence Theileria. Results were interpreted as Theileriosis when piroplasm of theileria or intra lymphocytic schizonts (Koch's blue bodies) developing stages were found in at least one cell of erythrocyte.



All hematological parameters were measured using an automatic analyzer (Abacus 380 hematology analyzer) as per the standard methods by **Wills (2010)** and **Benjamin (1985)**. The serum was separated immediately after blood collection and subjected to biochemical analysis. Total protein, albumin, SGOT, SGPT, total bilirubin, direct bilirubin, indirect bilirubin, ALP, BUN, and creatinine tests were performed using an automatic biochemical analyzer (Erba, Chem7).

Plate.1. Mild Positive: Two signet ring/crescent and dot shaped *theileria spp*. Piroplasm in blood smear from buffalo along with intracytoplasmic Koch's blue bodies in lymphocytes (Giemsa stain 1000X)

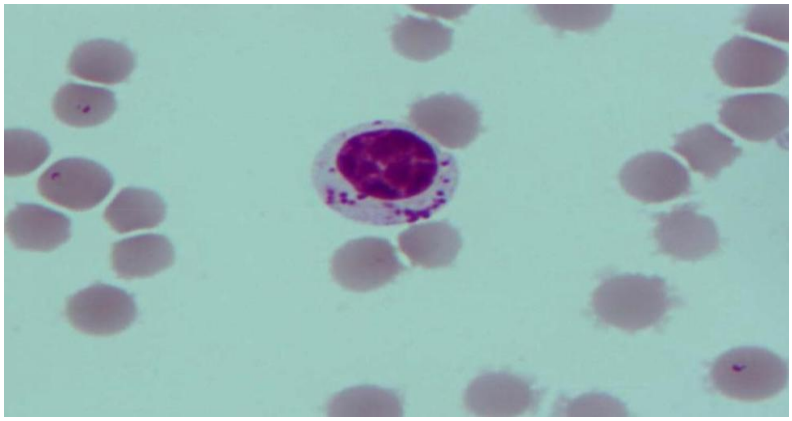


Plate.2. Moderately Positive: Note three pyriform signet ringt shaped *Theileria spp.* Piroplasm in blood smear from buffalo along with intracytoplasmic Koch's blue bodies in lymphocytes (Giemsa stain 1000X)

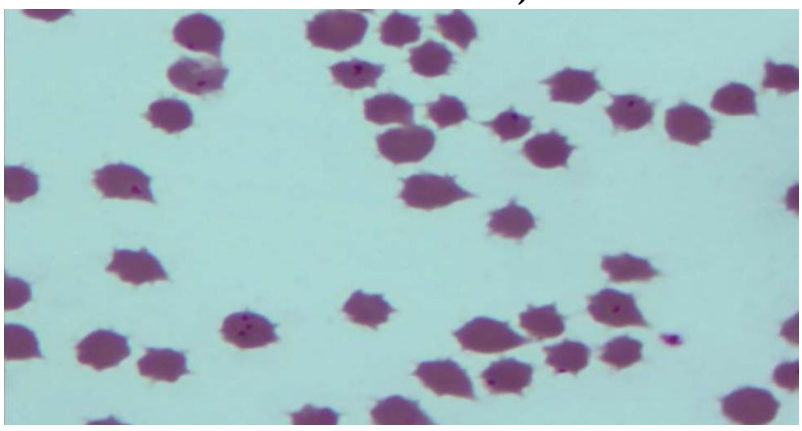


Plate.3. Highly Positive: Note numerous rod, dot pyriform and signet ring shaped *Theileria spp* piroplasm along with marked poikilocytosis and acanthocytosis in blood smear from buffalo (Giemsa stain 1000X)

Therapeutic regimens

According to the severity and stage of the infection, treatment is primarily divided into three groups: early and mild cases of theileriosis being treated with oxytetracycline and being included in Group I; moderate to severe and somewhat recently presented cases being treated with buparvaquone in Group II; and very chronic cases being treated with both oxytetracycline and buparvaquone in Group III.

Groups	Specific treatment	Supportive treatment
I	Inj. Oxytetracycline[1] @ 20 mg I/V for 5 days in early stage.	• Inj. Dextrose 5% 1 lit I/V for 5 days • Inj. B-complex[3] @ 10 ml I/M daily for 10 days • Bol. Ferrous fumarate[4] @1 PO BID for 10 days.
II	Inj. Buparvoquone[2] @2.5mg/kg I/m as a single dose in late stage.	
III	Oxytetracycline[1] and buparvaquone[2] combination	

1. Each 100-ml vial contains: oxytetracycline 50 mg/ml
2. Zubion, each mL, contains buparvaquone 50 mg/mL, manufactured by INTAS Pharmaceuticals Ltd., Ahmedabad, Gujarat.
3. Each ml of Tribivet contains Vitamin B1 (50mg), B6 (50 mg), and B12 (500 mg). Manufactured by INTAS PHARMA, village Lalpur, Kichha Road, Rudrapur, Uttarakhand.

Results and Discussion:

Therapeutic regimens for theileriosis in buffaloes

Elimination of the parasite and reversal of the lethal anemia are the main targets of treatment for animals with theileriosis. Theileriosis has been treated with a variety of medications. The two medications that are now used most frequently to treat theileriosis in cattle are buparvaquone and oxytetracycline (Syed et al., 2014). 15 clinical cases of theileriosis in buffaloes from various villages in the Malwa district of Madhya Pradesh were subjected to therapeutic trials. In accordance with the treatment regimen, the buffaloes were split into three groups. Group I (n = 5) buffaloes received only oxytetracycline treatment; group II (n = 5) buffaloes received only buparvaquone treatment; and group III (n = 5) buffaloes received both buparvaquone and oxytetracycline treatment.

1 Group I was treated with oxytetracycline alone (mild cases of theileriosis).

Table 1 shows the specifics of group I buffaloes with theileriosis who were only given oxytetracycline. Plate 1. Five clinically afflicted buffaloes in this group were given oxytetracycline at a dose of 20 mg/kg given intravenously with a dose of 1 lit of D 5% once daily for five days. The illness lasted anywhere from three to eight days. Three of the five treated instances made a full recovery following treatment, whereas two did not.

Tetracyclines at 20 mg/kg are less effective in animals with theileriosis, according to Radostits et al. (2010), who also suggested buparvaquone at 2.5 mg/kg IM along with supportive anemia therapy.By the third day after treatment, the buffaloes' appetite and water consumption were back to almost normal levels. By the third or fourth day of treatment, the buffaloes, who were previously dull and depressed, had become alert and active.

Table 1. Details of clinical cases of theileriosis-infected buffaloes treated with oxytetracycline alone (n = 5)

Sr. No	Breeds	Age (Years)	Sex	Duration of illness (In days)	Hb (g/dl)	PCV (%)	Severity of infection	Results
Treated with Oxytetracycline								
1	Murrah	2	F	3	7.8	24.01	+++	Cured
2	Non-descript	5	F	5	7.7	19.75	++	Partially Cured
3	Murrah	5	F	4	7.8	24.01	+++	cured
4	Murrah	3	F	5	7.0	28.15	++	Partially cured
5	Non-descript	3	F	4	7.5	24.20	+++	cured

Following theileriosis treatment with oxytetracycline alone, clinical values such as body temperature (101.50±0.30 vs. 100.65±0.15 ºF), heart rate (69.50±1.00 vs. 52.00±3.05 per min), respiratory rate (29.70±0.50 vs. 22.00±3.00 per min), and ruminal motility (3.50±0.20 vs. 5.00±1.00 per 5 min) demonstrated satisfactory changes and were returned to normal (Table 2).

Table 2. Details of the mean clinical values before and after treatment of theileriosis-affected buffaloes with oxytetracycline (n = 5)

Sr. No.	Parameters	Treatment		't' value
		Before (n=5)	After (n=5)	
Treated with Oxytetracycline (n=5)				
1	Body temperature (ºF)	101.50±0.30	100.65±0.15	5.667 ^{NS}
2	Heart rate (Per minute)	69.50±1.00	52.00±3.05	9.00 ^{NS}
3	Respiration (Per minute)	29.70±0.50	22.00±3.00	3.40 ^{NS}
4	Ruminal motility (Per 5 inute)	3.50±0.20	5.00±1.00	-3.00 ^{NS}

*NS: non-significant; *: significant (P 0.05); **: highly significant (P 0.01).*

Table 3 lists the hematological findings made in buffalo with theileriosis both before and after therapy with oxytetracycline alone. Hb (7.70±0.05 vs 12.85±1.15 g/dl), PCV 21.85±2.13 vs 38.65±4.75%), TEC (3.65±0.09 vs 6.55±1.05 × 10^6 /µl), TLC (12.11±1.64 vs 8.36±0.09 × 10^3 /µl), The reduction of intravascular hemolysis and the addition of hemostatics may be responsible for the improvement in Hb, PCV, and TEC levels.

Table 3. Mean haematology values before and after treatment of theileriosis-affected buffaloes with oxytetracycline (n = 5).

Sr.No	Parameters	Treatment		't' value
		Before (n=5)	After (n=5)	
Treated with Oxytetracycline (n=5)				
1	Hb (g/dl)	7.70±0.05	12.85±1.15	-6.132^{NS}
2	PCV (%)	21.85±2.13	38.65±4.75	-2.004^{NS}
3	TEC (× 10^6 /µl)	3.65±0.09	6.55±1.05	-3.438^{NS}
4	MCV (fl)	59.50±4.50	59.50±2.50	1.002^{NS}
5	MCH (pg)	21.25±0.40	19.95±1.40	1.563^{NS}
6	MCHC (g/dl)	35.95±3.25	33.45±1.05	3.006^{NS}
7	TLC (× 10^3 /µl)	12.11±1.64	8.36±0.09	4.509^{NS}
8	Lymphocyte (%)	57.90±2.30	65.35±1.95	-8.957^{NS}
9	Monocyte (%)	2.35±1.55	0.80±0.00	1.863^{NS}
10	Neutrophil (%)	19.80±16.20	33.85±1.95	-1.689^{NS}
11	PLT (× 10^5 /µl)	204±44.0	176±3.0	3.367^{NS}

$^{NS:}$ *non-significant*

Table 4 shows the serum biochemical levels before and after theileriosis treatment in buffaloes given oxytetracycline. There was a reduction in serum total bilirubin (1.95±0.35 vs. 0.95±0.20 mg/dl), direct bilirubin (1.25±0.10 vs. 0.25±0.05 mg/dl), and indirect bilirubin (0.75±0.45 vs. 0.10±0.00 mg/dl), as well as urea nitrogen (22.75±2.95 vs. 13.85±1.95 mg/dl). These results demonstrated normalization of biochemical parameters towards the physiological normal range and termination of intravascular hemolysis as causes of liver and kidney function restoration.

Table 4. Mean biochemical values before and after treatment of theileriosis-affected buffaloes with oxytetracycline (n = 5).

Sr. No	Parameters	Treatment		't' value
		Before	After	
Treated with Oxytetracycline (n=5)				
1	Total Bilirubin (mg/dl)	1.95±0.35	0.95±0.20	1.312^{NS}
2	Direct Bilirubin (mg/dl)	1.25±0.10	0.25±0.05	1.121^{NS}
3	Indirect Bilirubin mg/dl)	0.75±0.45	0.10±0.00	1.320^{NS}
4	BUN(mg/dl)	22.75±2.95	13.85±1.95	1.110^{NS}
5	Creatinine (mg/dl)	2.05±0.35	0.55±0.45	1.801^{NS}
6	SGPT(U/L)	68.50±0.50	31.50±3.50	4.462^{NS}
7	SGOT (U/L)	74.26 ± 1.7	57.43±1.4	2.112^{NS}
8	ALP (U/L)	198.3 ± 12.6	98.12 ± 6.2	1.200^{NS}
9	TP (g/dl)	5.45±0.10	6.24±0.09	-9.225^{NS}

$^{NS:}$ *non-significant*

Group II treated with buparvaquone (moderate infection of theileriosis)

Table 5 and Plate 2 show the specifics of theileriosis-affected buffaloes treated with buparvaquone alone. Five clinical instances of theileriosis in buffaloes in this group were treated with buparvaquone at a dose of 2.5 mg/kg IM once, along with supportive care. The disease lasted between two and fifteen days.Buparvaquone treatment resulted in a full recovery in each of the five buffaloes, representing a 100% success rate. Recovery happened more quickly in mild cases than in intermediate and severe ones. Within 4 to 15 days following therapy, clinical indicators like body temperature, respiration rate, hunger, and conjunctival mucus membrane gradually improved and returned to normal (Table 6).

Treatment with buparvaquone at 2.5 mg/kg body weight administered intravenously has been successful. Buparvaquone was found to be 86.6–100% effective in treating cattle and buffaloes with tropical theileriosis by numerous researchers (Al-Gaabary, 1991; Muhammad et al., 1999; Zahid et al., 2005; Osman and AI-Gaabary, 2007; Bhojne et al., 2010; Raguvaran et al., 2016; Syed et al., 2014).

In buffaloes treated with buparvaquone, appetite and water intake improved 3–5 days after treatment began and returned to almost normal on the 7th or 8th day. The animals, who were dull and despondent before treatment, became up and active by the fourth or fifth day. Two weeks following therapy, the skin coat returned to normal, and the body's health progressively improved.

Table 5: Details of clinical cases of theileriosis treated with buparvaquone (n = 5)

Sr. No	Breeds	Age (Years)	Sex	Duration of illness (in days)	Hb (g/dl)	Severity of infection	Results
1	Non-descript	7	F	5	9.6	++++	Cured
2	Murrah	4	F	15	8.5	++	Cured
3	Non-descript	6	F	6	5.3	+++	Cured
4	Non-descript	3	F	3	9.7	+++	Cured
5	Murrah	3	F	14	7.5	+++	Cured

In group II theileriosis-affected buffaloes treated with buparvaquone alone, there was a significant (P 0.05) decrease in body temperature (102.48 ± 0.57 vs. 100.6±0.15 ºF) as well as a highly significant (P 0.01) decrease in heart rate (72.66 ± 1.58 vs. 56.44±1.08 per min) and respiratory rate (29.33 ± 0.86 vs. 21.55±0.64 per min)

According to the findings of Dhar et al. (1987), the body temperature practically returned to normal 2 to 3 days after buparvaquone treatment. Buparvaquone causes theilerian piroplasms to degenerate over the course of 1-4 days (Unsoren and Kurtededе, 1998).

Table 6: Mean clinical values before and after treatment of theileriosis-affected buffaloes with buparvaquone (n = 5)

Sr. No.	Parameter	Treatment		't' value
		Before (n=5)	After (n=5)	
1	Body temperature (ºF)	102.48 ± 0.57	100.6±0.15	3.006*

2	Heart rate (Per minute)	72.66 ± 1.58	56.44±1.08	8.894**
3	Respiration (Per minute)	29.33 ± 0.86	21.55±0.64	6.549**
4	Ruminal motility (Per 5 minute)	3.22 ± 0.22	4.66±0.37	-4.914**

*NS: non-significant; *: significant (P 0.05); **: highly significant (P 0.01).*

Hematological results are shown in Table 7 for buffaloes with theileriosis before and after receiving only buparvaquone therapy. Hb (7.48±0.62 g/dl) increased with a highly significant (P 0.01) increase. The reduction of intravascular hemolysis and the addition of hemostatics may be responsible for the improvement in Hb, PCV, and TEC levels.

When compared to pre-treatment values, recovery was followed by a significant (P 0.01) decline in TLC (10.35±1.44 vs. 7.28±0.68 × 10^3 /µl) and a significant (P 0.05) rise in absolute lymphocyte count (47.46 ±6.37 vs. 52.41±2.05 %). Neutrophil (48.30±6.52 vs 41.24±2.65%), monocyte (4.24±0.63 vs. 5.32±1.18%), counts did not change significantly.

Table 7. Mean hematological values before and after treatment of theilerioisis-affected buffaloes with buparvaquone (n = 5)

Sr.No.	Parameters	Treatment		't' value
		Before (n=5)	After (n=5)	
1	Hb (g/dl)	7.48±0.62	12.31±0.68	-7.349**
2	PCV (%)	21.55±1.85	37.97±2.36	-7.266**
3	TEC (× 10^6 /µl)	3.42±0.39	5.99±0.33	-5.933**
4	MCV (fl)	65.11±2.72	63.00±1.29	0.962 NS
5	MCH (pg)	22.35±1.10	20.58±0.55	1.737 NS
6	MCHC (g/dl)	34.35±0.58	32.74±0.79	1.982 NS
7	TLC (× 10^3 /µl)	10.35±1.44	7.28±0.68	0.611 **
8	Lymphocyte (%)	47.46 ±6.37	52.41±2.05	-0.824 NS
9	Monocyte (%)	4.24±0.63	5.32±1.18	-0.791 NS
10	Neutrophil (%)	48.30±6.52	41.24±2.65	1.228 NS
11	PLT (× 10^5 /µl)	189.77±23.31	229.47±20.55	1.520 NS

*NS: non-significant; *: significant (P 0.05); **: highly significant (P 0.01).*

Table 8 show the serum biochemical values before and after buparvaquone treatment for theileriosis in buffaloes. In comparison to pre-treatment values, recovery was associated with significant (P 0.05) decreases in direct bilirubin (0.90± 0.19 vs. 0.35±0.064 mg/dl), indirect bilirubin (0.63±0.08 vs. 0.36±0.05 mg/dl), and SGPT (70.57±4.13 vs. 33.07±2.32 U/L), as well as highly significant (P 0.01) decreases in blood urea nitrogen (31.13±3.10 vs 17.83±0.87 mg/dl). Normalization of bilirubin, BUN, creatinine, and SGPT readings upon recovery denotes the return of the liver's and kidneys' typical physiological processes.

Buparvaquone was therefore effective in treating buffaloes with theileriosis.

Table 8. Mean biochemical values before and after treatment of theileriosis-affected buffaloes with buparvaquone (n = 5)

Sr.No	Parameters	Treatment		't' value
		Before (n=5)	After (n=5)	
1	Total Bilirubin (mg/dl)	1.53±0.24	0.86±0.22	1.807 NS
2	Direct Bilirubin (mg/dl)	0.90± 0.19	0.35±0.064	2.760*
3	Indirect Bilirubin mg/dl)	0.63±0.08	0.36±0.05	2.286 NS
4	BUN(mg/dl)	31.13±3.10	17.83±0.87	8.389**
5	Creatinine (mg/dl)	1.96±0.34	0.76±0.30	4.791**
6	SGPT(U/L)	70.57±4.13	33.07±2.32	2.932*
7	SGOT (U/L)	78.26 ± 1.9	59.43±1.4	2.919*
8	ALP (U/L)	200.3 ± 15.6	100.12 ± 6.2	1.345*
9	Total Protein (g/dl)	4.45±0.06	6.14±0.07	-2.032**

*NS: non-significant; *: significant (P 0.05); **: highly significant (P 0.01).*

Group III treated with oxytetracycline and buparvaquone

Table 9 and Plate 3 show the specifics of theileriosis-affected buffaloes treated with a buparvaquone and oxytetracycline combination.

Five clinical cases of theileriosis in buffaloes were treated in this group. Case No. 1 had been ill for two days when oxytetracycline, 20 mg/kg I/V with 5% dextrose, was administered. After five days, there had been no improvement, so buparvaquone, 2.5 mg/kg IM, was administered on the sixth day. Because Cases No. 2 (45 days) and No. 3 (30 days) were chronic illnesses, doctors prescribed oxytetracycline at a dose of 20 mg/kg IV once a day along with two doses of buparvaquone at 2.5 mg/kg IM spaced 48 hours apart. Five days were given.

Three of the five buffaloes that received therapy fully recovered. One patient with low hemoglobin (6.8 g/dl) died after 30 days, while another patient (45 days) showed clinical improvement but did not fully recover.

Three of the buffaloes in this group began to eat and drink more by the fourth day of their buparvaquone treatment, and by the seventh to tenth day, they were almost back to normal. By the sixth or seventh day of treatment, the buffalo, who had been dull and dejected prior to treatment, had become awake and active.

Table 9 provides information on the clinical cases of buffaloes with theileriosis who were given oxytetracycline and buparvaquone (n = 5).

Sr. No	Breeds	Age (Years)	Sex	Duration of illness (In days)	Hb (g/dl)	PCV (%)	Severity of infection	Results

Treated with oxytetracycline and buparvaquone combination								
1	Non-descript	6	F	2	8.6	25.82	+++	Cured
2	Murrah	3	F	45	8	24.22	+++	Partially improved
3	Non-descript	1	F	30	6.8	21.11	+++	Died
4	Murrah	5	F	7	7.8	24.20	+++	cured
5	Non-descript	7	F	15	8.5	26.00	+++	cured

Following theileriosis treatment with buparvaquone and oxytetracycline, clinical values such as body temperature (104.25±0.75 vs. 101.25±0.25 ºF), heart rate (65.0±1.0 vs. 44.0±4.0 per min), respiratory rate (25.00±1.0 vs. 21.0±1.0 per min), and ruminal motility (3.00±0.00 vs. 4.50±0.50 per 5 min) increased, indicating a return to normal (Table 10).

Table 10. Mean clinical values before and after therapy with oxytetracycline and buparvaquone for buffaloes with theileriosis (n = 5)

Sr.No.	**Parameters**	**Treatment**		**'t' value**
		Before (n=5)	**After (n=5)**	
Treated with oxytetracycline and buparvaquone combination (n=5)				
1	Body temperature (ºF)	104.25±0.75	101.25±0.25	6.00 ^{NS}
2	Heart rate (Per minute)	65.0±1.0	44.0±4.0	4.20 ^{NS}
3	Respiration (Per minute)	25.00±1.0	21.0±1.0	2.00 ^{NS}
4	Ruminal motility (Per 5 minute)	3.00±0.00	4.50±0.50	-3.00 ^{NS}

*NS: non-significant; *: significant (P 0.05); **: highly significant (P 0.01).*

Table 11 shows hematological observations made in buffaloes with theileriosis before and after receiving a combination of buparvaquone and oxytetracycline treatment. There was also an increase in Hb (8.30±0.30 g/dl vs. 11.55±0.35 g/dl), PCV (25.02±0.80 vs. 36.79±0.32%), TEC (4.39±0.47 vs. 6.60±0.05 × 10^6 /µl) TLC (11.49±2.74 vs. 14.49±0.68 × 10^3 /µl), and MCV (54.00±4.00 vs. 56.0±1.00 fl), while there was a decrease in MCH (19.15±2.85 vs 17.50±0.70 pg).

Table 11 shows the average hematological results of buffaloes with theileriosis who were given oxytetracycline and buparvaquone (n = 5) before and after therapy.

Sr.No	**Parameters**	**Treatment**		**'t' value**
		Before (n=5)	**After (n=5)**	
Treated with oxytetracycline and buparvaquone combination (n=5)				
1	Hb (g/dl)	8.30±0.30	11.55±0.35	-3.907^{NS}

2	PCV (%)	25.02±0.80	36.79±0.32	-1.415^{NS}
3	TEC (× 10^6 /µl)	4.39±0.47	6.60±0.05	-2.637^{NS}
4	MCV (fl)	54.00±4.00	56.0±1.00	-2.404^{NS}
5	MCH (pg)	19.15±2.85	17.50±0.70	1.983^{NS}
6	MCHC (g/dl)	35.50±2.60	31.45±0.75	4.869^{NS}
7	TLC (× 10^3 /µl)	11.49±2.74	14.49±0.68	-3.607^{NS}
8	Lymphocyte (%)	29.45±5.45	75.95±5.45	-5.591^{NS}
9	Monocyte (%)	2.55±1.05	7.75±0.85	-6.216^{NS}
10	Neutrophil (%)	68.00±5.10	16.30±6.30	6.216^{NS}
14	PLT (× 10^5 /µl)	167.50±5.00	153.50±4.00	1.683^{NS}

NS: non-significant

Table 12 shows serum biochemical values before and after theileriosis in buffaloes was treated with combinations of buparvaquone and oxytetracycline. SGPT (76.50±10.50 vs 46.0±6.0), urea nitrogen (22.45±3.05 vs 12.35±2.45 mg/dl), creatinine (2.35±0.25 vs 0.45±0.35 mg/dl), direct bilirubin (1.30±0.80 vs 0.40±0.10 mg/dl), and indirect bilirubin (1.05±0.05 vs 0.25±0.05 mg/d).

According to Osman and Al-Gaabary (2007), early treatment with buparvaquone is 100% effective in removing protozoan parasites from the blood and lymph nodes, whereas in the later stages of the illness it is unable to remove them. The current finding regarding the effectiveness of buparvaquone in chronic cases of theileriosis is in agreement with their findings.

Table 12. Mean serum biochemical values before and after treatment of theileriosis-affected buffaloes treated with oxytetracycline and buparvaquone (n = 5)

Sr.No	**Parameters**	**Treatment**		**'t' value**
		Before (n=5)	**After (n=5)**	
Treated with oxytetracycline and buparvaquone combination (n=5)				
1	Total Bilirubin (mg/dl)	2.35±0.85	0.65±0.05	2.044^{NS}
2	Direct Bilirubin (mg/dl)	1.30±0.80	0.40±0.10	1.082^{NS}
3	Indirect Bilirubin mg/dl)	1.05±0.05	0.25±0.05	9.619^{NS}
4	BUN(mg/dl)	22.45±3.05	12.35±2.45	1.214^{NS}
5	Creatinine (mg/dl)	2.35±0.25	0.45±0.35	2.284^{NS}
6	SGPT(U/L)	76.50±10.50	46.0±6.0	3.667^{NS}
7	SGOT (U/L)	84.26 ± 2.9	60.43±1.7	2.865^{NS}
8	ALP (U/L)	210.3 ± 17.6	100.12 ± 6.2	1.324^{NS}
9	TP (g/dl)	4.15±0.02	6.05 ±0.09	-3.284^{NS}

NS: non-significant

4: Supportive Treatment

Dextrose was used to treat theileriosis-affected animals in the current therapeutic trial because anorexia results in hypoglycemia; B complex was given daily to promote appetite and metabolism; and iron supplements were given orally to promote erythropoiesis.

Similar to this, dextrose, B complex, and iron preparations have been employed by Sarma et al. (2008), Masare et al. (2009), and Syed et al. (2014) for supportive treatment management of theileriosis in cattle.

Conclusion: According to the current study, early lactation in the buffalo population of Madhya Pradesh's Malwa region is also affected by theileriosis. Buffaloes should be checked for theileriosis and given an effective line of treatment if they display fever, enlargement of superficial lymph nodes, pale mucous membranes, or are not responding to antibiotic treatment. Buffaloes should also be tested for theileriosis if their hemoglobin and PCV levels are low or moderately reduced. Buparvaquone is 100% successful in treating the early stages of theileriosis in buffaloes, but it is ineffective in treating the disease's later, more advanced stages.

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