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Original Research
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Safety Assessment of Cefquinome on Repeated Administration in Buffalo Calves

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Abstract

Experiment was performed on six healthy buffalo calves of either sex of age above 6 months and weighing between 80 to 120 kg each to study the safety of cefquinome after repeated intramuscular administration @ 2 mg/kg body weight. After repeated intramuscular administration of the drug, blood was collected from jugular vein on 0, 5th, 10th and 15th day of drug administration and on 8th day of last administration of drug in the EDTA containing tubes and clot activator tubes respectively for hematological and biochemical studies respectively. The biochemical studies such as estimation of SGOT/AST, SGPT/ALT, ALP, creatinine, blood urea nitrogen were carried out in blood plasma. It is found that there was no significant difference in hematological except Hb and PCV and biochemical parameters except ALT of buffalo calves on repeated administration of cefquinome. All the values reported in the present study were in the normal physiological range. The results on safety assessment indicated that there was no or very little effect which came to normal on 8th day after discontinuation of the treatment indicating cefquinome administration for fifteen consecutive days has no adverse effects or toxicity on buffalo calves which proved the safety of cefquinome at dosage rate of up to 2 mg/kg in buffalo calves.

Keywords: Buffalo Calves, Cefquinome, Intramuscular, Safety

1. Introduction

In veterinary medicine, the cephalosporin cefquinome is approved and used for several animal species in many countries worldwide[1]. Cephalosporins are antibacterial agents that are active against many strains of Gram-positive and Gram-negative bacterial species. The key features of 4th generation cephalosporins include their wide range of spectrum, having resistance against degradation by β-lactamase enzymes and improved pharmacokinetic properties[2]. It is effective against the treatment of calf septicemia, foot rot in cattle, acute mastitis and pulmonary infections[3].

The pharmacokinetics of cefquinome is studied in different animals such as camel, sheep, goats, buffaloes, piglets, chicken, mice, dogs, pigs and calves. However, there is less data available on safety of cefquinome in animals. For judicious use of antibiotics, proper dose regimen is required. Before actual use of any antibiotic, adverse effects or toxicity of that drug if any should be checked. Therefore, the present study was planned to study the safety of cefquinome in buffalo calves after repeated administration @ 2 mg/kg body weight.

2. Materials and Methods

It is stated that this research work was approved by Institutional Animal Ethical Committee constituted under CPCSEA at College of Veterinary and Animal Science, Udgir dist. Latur Maharashtra.

To assess the safety, cefquinome was administered continuously for fifteen days in six buffalo calves of either

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sex of age above 6 months and weighing between 80 to 120 kg each and blood was collected from jugular vein on 0, 5th, 10th and 15th day of drug administration and on 8th day of last administration of drug in the EDTA containing tubes and clot activator tubes (M/s Ambica Diagnostics, Parbhani), respectively for hematological and biochemical studies, respectively.

2.1 Hematological Studies

The hematological studies such as estimation of Hemoglobin concentration (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leucocyte Count (TLC) and Differential Leucocyte Count (DLC) were carried out using fully Automated Cell Counter (Abacus Junior Vet. Diatron, GMBH, Austria).

2.2 Biochemical Studies

The biochemical studies such as estimation of SGOT/AST, SGPT/ALT, ALP, creatinine, blood urea nitrogen were carried out using Automatic Biochemical Analyzer (Statfax-20, Awareness Technology, INC, Palm city, Florida, USA).

2.3 Liver Function Tests

Serum Glutamate Oxaloacetic Transaminase (SGOT) or Aspartate Transaminase (AST) levels, Serum Glutamate Pyruvate Transaminase (SGPT) or Alanine Transaminase (ALT) levels in the serum were measured[4]. Alkaline phosphatase (ALP) level in serum was measured by pNPP (p-Nitrophenyl Phosphate) method as described[5].

2.4 Kidney Function Tests

Creatinine level in serum was measured by alkaline picrate method as described[6] and Blood Urea Nitrogen levels in serum were estimated by Berthelot method as described[7].

2.5 Statistical Analysis

The hematological, biochemical parameters, serum enzymes were analyzed by completely randomized design and the significance was tested at 5% and 1% levels as per[8].

3. Results

The various hematological, biochemical parameters estimated were depicted in Tables 1, 2 and 3. Before the experiment,

Table 1. Effect of repeated intramuscular administration of cefquinome on Hb, PCV, TEC, TLC in buffalo calves

Haematology indices	0 Day	5th Day	10th Day	15th Day	23rd day	Signif-icance	C.D.
Hb (g/dl)	9.12 ± 0.21	9.48 ± 0.24	9.45 ± 0.30	14.11 ± 0.94	10.54 ± 0.73	**	2.35
PCV (%)	28.04 ± 0.20	31.18 ± 0.53	32.09 ± 0.43	39.81 ± 1.79	32.78 ± 1.36	**	3.03
TEC (106/µl)	5.50 ± 0.16	5.94 ± 0.22	6.18 ± 0.17	8.86 ± 0.65	6.62 ± 0.44	**	1.578
TLC (103/µl)	9.24 ± 0.21	12.37 ± 0.74	10.21 ± 0.93	12.55 ± 1.42	11.09 ± 1.05	*	2.143

average Hemoglobin (Hb) was 9.12 ± 0.21 g/dl which increased significantly ($p<0.05$) on 15th day of treatment to 14.11 ± 0.94 g/dl and thereafter decreased on 8th day after discontinuation of the treatment to 10.54 ± 0.73 g/dl. The average Packed Cell Volume (PCV%) which was 28.04 ± 0.2% which increased ($p<0.05$) continuously up to 15th day of treatment to 39.81 ± 1.79% and thereafter decreased up to 8th day after discontinuation of the treatment and these values were 32.78 ± 1.36%. Before the experiment, average TEC (106/µl) and TLC (10^3/µl) values were 5.50 ± 0.16 106/µl and 9.24 ± 0.21 103/µl which increased significantly ($p<0.05$) up to 15th day of treatment to 8.86 ± 0.65 10^6/µl and 12.55 ± 1.42 10^3/µl thereafter decreased on 8th day after discontinuation of the treatment and these values were 6.62 ± 0.44 106/µl and 11.09 ± 1.05 103/µl, respectively.

As shown in Table 1, DLC values also did not show any significant change during the treatment period of fifteen days except monocyte count was increased significantly (but, monocyte count was within the normal physiological range) on 15th day of administration which indicates that the continuous fifteen days administration of cefquinome in buffalo calves has some adverse effects on Hb, PCV during administration but the effect subsides within 8 days of last administration of cefquinome in buffalo calves @ 2 mg/kg body weight.

Table 2. Effect of repeated intramuscular administration of cefquinome on DLC in buffalo calves

Differential leucocytes	0 Day	5th Day	10th Day	15th Day	23rd day	Significanc	C.D
Lymphocyte (%)	63.11 ± 1.02	63.19 ± 1.19	63.57 ± 0.84	64.19 ± 1.85	63.65 ± 1.81	N. S.	
Monocyte (%)	4.31 ± 0.21	4.05 ± 0.15	4.11 ± 0.12	5.23 ± 0.22	4.46 ± 0.26	**	0.79
Neutrophil (%)	32.78 ± 0.95	32.42 ± 1.27	32.47 ± 0.67	30.58 ± 1.87	31.83 ± 1.71	N. S	

In the present study as represented in Table 3, liver function test were performed to assess the toxicity of cefquinome on liver of buffalo calves. SGOT/AST levels observed on different days of treatment ranged between 32.67 ± 2.7 to 35.33 ± 1.92 IU/L and did not show significant difference among the values on different days. Similarly, SGPT/ALT values shows significant difference ($p<0.05$) on 10th day of continuous administration of cefquinome but these ALT values were within the normal physiological range. Also did not show any significant change during the other days of treatment as compared to the initial value of 0 day. This indicated that the cefquinome administration continuously for fifteen days in buffalo calves did not alter the liver functions.

Similarly, in the present study to assess the effect of cefquinome on kidney, kidney function tests were performed at different time intervals during the treatment. It was observed that the creatinine values were observed between 1.13 ± 0.03 to 1.22 ± 0.07 mg%, urea ranged between 5.77 ± 0.24 to 6.22 ± 0.29 mg% and ALP values were between 148.33 ± 2.60 to 158.33 ± 3.73 IU/L and ALP values showed that there was significant decrease in the value of ALP value on 5th day of administration but, all ALP values reported

in the present study were within the normal physiological range. All these parameters did not show any significant change during the treatment indicating no adverse effect of fifteen days cefquinome treatment on kidney functions of buffalo calves.

4. Discussion

The hematological and biochemical parameters of blood are considered to be good indicators of the physiological and pathological status of animals exposed to drugs, toxins, and other adverse conditions[9–11]. Hematological parameters are related to the blood and blood-forming organs. Many antimicrobial agents, such as the cephalosporins, can affect the hematopoietic system leading to hematopoietic suppression, which can cause potentially life-threatening thrombocytopenia, anemia, and neutropenia[12]. Hematological values showed little effect on Hb and PCV during treatment but this effect was subsided after discontinuation of cefquinome administration and these value reported in the present research were within the normal physiological range which indicated that the continuous fifteen days administration of cefquinome in buffalo calves had no adverse effects on hematological parameters. Rajput and Yadav[13] studied safety of cefquinome on multiple intramuscular administrations in cow calves and reported findings regarding hematological parameters in agreement with the findings as reported in the present study in buffalo calves. Whereas, Mangal and Sharma[14] reported significant increase in the values of MCV, MCH, MCHC, ESR and decrease in values of hemoglobin, TEC, PCV after repeated administration of cefquinome for 7 days in buffalo calves.

Table 3. Effect of repeated intramuscular administration of cefquinome on biochemical parameters in buffalo calves

Parameters	0 Day	5th Day	10th Day	15th Day	23rd day	Significance	C.D.
Creatinine (mg %)	1.17 ± 0.06	1.18 ± 0.05	1.22 ± 0.07	1.14 ± 0.04	1.13 ± 0.03	N. S.	
Urea (mg %)	5.77 ± 0.24	6.22 ± 0.29	5.98 ± 0.28	5.82 ± 0.28	5.85 ± 0.17	N. S.	
SGOT (IU/L)	32.67 ± 2.07	34.83 ± 1.71	34.67 ± 1.79	35.33 ± 1.92	31.00 ± 1.68	N. S.	
SGPT (U/L)	26.5 ± 1.41	29.17 ± 1.73	30.67 ± 1.46	27.83 ± 1.33	27.17 ± 1.23	*	2.436
ALP (IU/L)	158.33 ± 3.73	150.67 ± 3.00	149.83 ± 1.23	152.83 ± 2.76	148.33 ± 2.60	*	6.7

Biochemical evaluations are useful in assessing the health status or functioning of the animals following repeated administration of antimicrobial drugs[14–16]. Like the values of biochemical parameters reported in the present study[14] reported no significant changes in most of the biochemical parameters except significant increase in the value of BUN after repeated administration of cefquinome for 7 days in buffalo calves.

5. Conclusion

The results on safety assessment indicated that there was no or very little effect which came to normal on 8th day after discontinuation of the treatment indicating cefquinome administration for fifteen consecutive days has no adverse effects or toxicity on buffalo calves which proved the safety of cefquinome at dosage rate of up to 2 mg/kg in buffalo calves.

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7. References

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