

Evaluation of Biochemical Alterations Induced by Intramuscular Long-Acting Moxifloxacin in Sheep

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Abstract

The present study was conducted with objective to study biochemical alterations induced after single intramuscular administration of long acting moxifloxacin at the dose rate of 7.5 mg/kg body weight in six healthy male sheep. After deep intramuscular injection of moxifloxacin, blood samples in collected K₃EDTA at 0, 6, 12 hour and 2, 3, 4, 5, 6, 7th day after treatment were analyzed for biochemical Aspartate Aminotransferase (AST) Alanine aminotransferase (ALT), Alkaline Phosphatase (AKP), Acid Phosphatase (ACP), plasma creatinine, plasma Creatine kinase-MB, Blood glucose and Total bilirubin) analysis. The results of the study clearly demonstrated that single intramuscular administration of long acting moxifloxacin in sheep at 7.5 mg/kg body weight did not cause any significant change in values of biochemical parameters in sheep with total absent of clinical signs of adverse reactions or toxicity.

Keywords: Long acting moxifloxacin; Sheep; Fluoroquinolone; Antibacterial

Introduction

The fluoroquinolones are the fastest growing antibacterial class in terms of global revenue, increasingly being used in dairy animals to treat a wide range of infectious diseases [1]. Moxifloxacin is a novel fourth generation with a broad spectrum of antibacterial activity against organisms Gram-positive and Gram-negative bacteria, anaerobes and atypical organism such as *Mycoplasma* and *Chlamydia* spp. [2]. It has the highest potency in its class against *Staphylococcus aureus* and *Staphylococcus epidermidis* which are the common pathogens causes mastitis and other bacterial infections in domestic animals including in sheep [3]. It's spectrum of activity and pharmacokinetic properties favour its use in veterinary practice. Long acting moxifloxacin advantage over conventional moxifloxacin with respect to its longer duration of effect and frequency of dosing. Biochemical alteration as a part of safety profile induced by moxifloxacin needs to be assessed before it is recommended for clinical application in treatment of infections caused by sensitive organism in sheep. So present study was planned to investigate the biochemical alteration induced after single intramuscular administration of long acting moxifloxacin in sheep.

Materials and Methods

Experimental animals

The present study was conducted on six healthy male sheep weighing 35-40 kg. The study protocol was approved by the animal ethics committee. Animals were procured from Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Dantiwada, and housed in separate pan at research station. All animals were maintained on standard ration, and water was provided *ad libitum*. All animals were acclimatized for period of 15 days and observed clinically daily to rule out presence of any disease.

Drugs and Chemicals

Long acting moxifloxacin (10% moxifloxacin in solution with L-arginine, N-butyl alcohol and benzyl alcohol) injectable solution and moxifloxacin base powder were obtained from INTAS Animal health, Gujarat, India. Reagent kits for biochemical studying were purchased from Merck specialities private limited, Mumbai.

Experimental design and drug administration

All the six animals were treated with long acting moxifloxacin at a dose rate of 7.5 mg/kg body weight after intramuscular administration in deep gluteal muscle. Blood samples were collected from jugular vein into sterile K₃EDTA test tubes at 0 day (before drug administration) and on 6h, 12 h, 1, 2, 3, 4, 5, 6, and 7th day for biochemical analysis. The biochemical parameters of Aspartate Aminotransferase (AST) Alanine Aminotransferase (ALT), Alkaline Phosphatase (AKP), Acid Phosphatase (ACP), plasma creatinine, plasma Creatine kinase-MB, Blood glucose and Total bilirubin) were analyzed by using automatic Clinical Analyzer (Systronics). Analysis of variance was used to detect differences between means for biochemical parameters. Statistical analysis of data was done by software SPSS (Version 12.0.1).

Results and Discussion

The safety study of long acting moxifloxacin in large animal has not been reported but safety profile of other fluoroquinolones like ciprofloxacin, enrofloxacin and levofloxacin was investigated in different species of domestic animal by different research group [4-6]. Fluoroquinolone as class are generally well tolerated with mild adverse reaction. The adverse reactions are of cell limiting in nature and does not need treatment to be discontinued [7,8].

In our study, it has been demonstrated that long acting moxifloxacin at the dose of 7.5 mg/kg of body weight in sheep does not cause any significant biochemical alteration. So single intramuscular administration of long acting moxifloxacin at the dose rate of 7.5 mg/kg body weight in sheep was found safe and well tolerated.

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Received: June 06, 2024; Accepted: July 03, 2024; Published: July 10, 2024

Citation: Chirag M Modi, Shailesh K Mody & Hitesh B Patel. Evaluation of Biochemical Alterations Induced by Intramuscular Long-Acting Moxifloxacin in Sheep. *J Pharmacol Drug Deliv* (2024):104. DOI: [10.59462/JPDD.1.1.104](https://doi.org/10.59462/JPDD.1.1.104)

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Parameters	Days (Mean \pm S.E)								
	0	6 h	12 h	2	3	4	5	6	7
ALT (IU/L)	53.21 \pm 0.34	53.65 \pm 0.42	51.20 \pm 0.40	52.98 \pm 0.86	53.79 \pm 0.36	53.62 \pm 0.40	53.89 \pm 0.35	53.75 \pm 0.29	52.09 \pm 0.50
AST (IU/L)	55.03 \pm 0.43	56.37 \pm 0.40	53.28 \pm 0.24	54.13 \pm 0.41	54.01 \pm 0.74	53.35 \pm 0.22	54.31 \pm 0.53	54.11 \pm 0.33	54.21 \pm 0.18
AKP (IU/L)	105.32 \pm 0.52	103.71 \pm 0.94	109.01 \pm 0.69	107.61 \pm 0.66	107.89 \pm 1.34	107.49 \pm 0.58	111.52 \pm 1.15	110.73 \pm 1.08	111.12 \pm 0.89
ACP (IU/L)	6.41 \pm 0.06	6.34 \pm 0.11	6.21 \pm 0.07	6.46 \pm 0.15	6.23 \pm 0.11	6.51 \pm 0.12	6.37 \pm 0.08	6.44 \pm 0.09	6.40 \pm 0.08
Creatine kinase – MB (IU/L)	12.53 \pm 0.32	13.23 \pm 0.98	13.16 \pm 0.87	12.39 \pm 0.20	12.26 \pm 0.24	12.70 \pm 0.20	12.46 \pm 0.13	12.58 \pm 0.15	12.52 \pm 0.13
Creatinine (μ mol/L)	2.50 \pm 0.12	2.00 \pm 0.12	2.14 \pm 0.05	2.35 \pm 0.11	2.22 \pm 0.15	2.06 \pm 0.12	2.10 \pm 0.13	2.08 \pm 0.08	2.09 \pm 0.10
Glucose (mg/dL)	74.49 \pm 0.73	70.53 \pm 0.57	76.45 \pm 0.81	76.41 \pm 0.83	77.85 \pm 0.69	75.43 \pm 0.76	74.45 \pm 0.79	73.49 \pm 0.52	76.64 \pm 0.60
Total bilirubin (mg/dL)	0.25 \pm 0.02	0.26 \pm 0.03	0.26 \pm 0.03	0.20 \pm 0.02	0.25 \pm 0.02	0.23 \pm 0.03	0.21 \pm 0.03	0.20 \pm 0.02	0.25 \pm 0.03

Table 1: Biochemical parameters (Mean \pm S.E) after single intramuscular administration of long acting moxifloxacin (7.5 mg/kg of body weight) in male sheep.

The biochemical parameters of sheep treated with single dose of long acting moxifloxacin (7.5 mg/kg) were given in Table 1.

It is evident that of biochemical parameters observed before treatment and after treatment did not offer significant ($P < 0.05$). The results are in agreement with study repeated by Sadaria et al. [9] in wister rats. Similarly Kubin and Reiter [10] also concluded that moxifloxacin is safe and well tolerated in human. Other fluoroquinolones like ciprofloxacin when given repeated in calves at intramuscular dose in calves did not cause any significant alteration in the values of biochemical parameters [4]. The same conclusion was also obtained for enrofloxacin in yak [5] and levofloxacin in layer birds [9].

In conclusion, lack of clinical signs of adverse reactions and absence of significant biochemical alteration following intramuscular administration may be open a new avenue for insight into the strategy for clinical treatment of various bacterial diseases in sheep. In future the drug may be potential candidates to be used in the treatment of infectious diseases in sheep.

Acknowledgement

The authors are highly grateful to Sardarkrushinagar Dantiwada Agriculture University, Sardarkrushinagar, North Gujarat, India for providing fund and facilities for smoothly conducting of research work. Animal facilities along with housing and feed provided by Livestock Research Station, SD Agricultural University, Gujarat, India is highly acknowledged. All values in treatment groups are not significantly different ($p < 0.05$) when compared to control (0 h).

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