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Excretion of enrofloxacin residues in poultry droppings after pulse water medication in broiler chicken – an environmental concern

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Abstract
The presence of antibiotics in manures can represent an environmental and human health concern. Residues of antibiotics excreted into animal manures enter the environment either by spreading of livestock wastes onto agricultural fields as fertilizer or in the form of sludge after manure collection and storage. Livestock manure is a major source of veterinary antibiotics residues in agricultural fields as well as in the overall environment; hence analysis of these antibiotics is obviously important. Twelve one-day old broiler chicks were randomly divided into control (6 nos) and treatment group (6 nos). Treatment group received enrofloxacin @ 10 mg/Kg body weight, through drinking water for five consecutive days from 43rd to 47th day of age, whereas control group received non-medicated water. Dropping samples of control and treatment group were collected at different time points during the withdrawal period at 48 hours interval on day 1, 3, 5, 7 and 9 post treatments. Enrofloxacin and ciprofloxacin residues in poultry dropping samples were analysed by a validated High Performance Thin Layer Chromatography-Fluorescent Densitometry method. Enrofloxacin residues could be detected in droppings even up to 7th day after treatment. Owing to the presence of antibiotics in droppings even after cessation of the administration of enrofloxacin, it warrants environmental concern. These antibiotic residues in animal faeces may potentially bring ecological risks. The present study stresses the need for stringent regulation for the use of antimicrobial drugs in the poultry industry.

Keywords: Enrofloxacin residues, poultry droppings, environment, HPTLC

Introduction
The incidence of antimicrobial residues in poultry droppings poses environmental and human health concern. The antimicrobial residues find it way to environment when these poultry droppings are used as fertilizer in agriculture or stored as manure pit and sludge waste [1]. Worldwide literature survey revealed that the existence of veterinary antibiotics in animal wastes, water bodies, river deposits and in soils could disturb the ecosystems [2-4]. Most of these studies suggested that manure applications to the soil and subsequent degradation are cyclic events that resulted in quantities of antibiotics being continually released to the environment. Livestock droppings are a key source of veterinary antibiotics residues in agriculture and environment as a whole; hence testing and monitoring of these residues in poultry droppings is obviously important to prevent the further occurrence of antibiotic residues in food chain [5].

Materials and Methods
The Institutional Animal Ethics Committee (IAEC), Madras Veterinary College, TANUVAS has granted the permission to conduct the present study. Day old broiler chicks (Broiler strain B_1) of twelve numbers were obtained from Institute of Poultry Production and Management, Madhavaram Milk Colony, Chennai-600051 and were kept as control (six numbers) and

treatment group (six numbers). Enrofloxacin at the recommended therapeutic dose rate of 10 mg/Kg body weight was administered through drinking water for a period of five days (i.e. on 43rd to 47th day of age) to the treatment group, while the control group was administered with enrofloxacin free water. Dropping samples were collected at five time points with forty eight hours gap after the last dose of enrofloxacin i.e. on first, third, fifth, seventh and ninth day post treatments. Enrofloxacin and ciprofloxacin residues in poultry dropping samples were analysed by a validated High Performance Thin Layer Chromatography-Fluorescent Densitometry method as reported by us earlier [6].

Results and Discussion

The presence of antimicrobial residues in poultry dropping is a major source of residual veterinary antibiotics in agriculture and the ecosystem, there fore monitoring of these residues in poultry droppings is imperative to prevent the further occurrence of antibiotic residues in food chain [5].

When given orally, enrofloxacin was slowly and incompletely absorbed from the gastrointestinal tract [7]. In broiler chicken the bioavailability of enrofloxacin after oral administration at 10 mg Kg^{-1} was 64% [7] and 89.2% [8], 84.5% after single orally administered dose of 5mg/Kg [9]. The unabsorbed enrofloxacin excreted in the faeces could be the reason for the presence of high levels of enrofloxacin in droppings after 1st dose (3074.18±65.93 µg/Kg), attaining maximum level after 4th dose (4289.63±29.14 µg/Kg).

Presence of ciprofloxacin in the droppings of broiler chicken in the present study is very well justified by the fact that enrofloxacin is metabolised in the liver via deethylation of the ethyl group on the piperazine ring into the major metabolite ciprofloxacin [10] and were primarily excreted via the kidneys by glomerular filtration and tubular excretion [11]. In poultry, dropping is comprised of urine and feces; these are not separate. In cloaca, the rectum and ureter terminates to discharge their contents. Thus, the parent compound enrofloxacin as well its metabolite ciprofloxacin excreted via the urine was voided along with faeces. The plants growing in the antibiotic contaminated soil absorbs these residues thereby finds it way to enter in to the food chain leads to the development of bacterial resistance, deleterious impact on humans, animals and the environment [12]. Further, they pointed out that enrofloxacin and ciprofloxacin could be mainly measured in chicken and turkey droppings and should be regarded critically in terms of ecotoxicity.

The enrofloxacin is the predominant residue among the fluoroquinolone antimicrobial residues extensively found in poultry droppings rather than in pig or cow dung. These residues in animal faeces may potentially bring ecological risks if the animal manure is not treated effectively [13].

Conclusion

In the present study, enrofloxacin residues could be detected in droppings even up to 7th day after treatment. Owing to its presence in the droppings even after cessation of the administration of enrofloxacin, it warrants environmental concern.

Enrofloxacin residues (µg/Kg) in droppings of broiler chicken (Mean ± SE, n = 6)

Days after treatment	Enrofloxacin	Ciprofloxacin	Enrofloxacin + Ciprofloxacin
1	3785.41±66.00	195.58±9.13	3980.99±64.05
3	143.54±2.16	58.93±5.42	202.48±6.05
5	51.04±2.25	18.37±0.86	69.41±2.35
7	19.91±1.06	ND	19.91±1.06
9	ND	ND	ND

ND – Not detected

Limit of detection – 2 ng/band for enrofloxacin; 3 ng/band for ciprofloxacin

Limit of quantification – 5 ng/band for both compounds

References

1. Zhao L, Dong YH, Wang H. Residues of veterinary antibiotics in manures from feedlot livestock in eight provinces of China. Sci. Total Environ. 2010; 408:1069-1075.
2. Campagnolo ER, Johnson KR, Karpati A. Rubin CS, Kolpin DW, Meyer MT *et al*. Antimicrobial residues in animal waste and water resources proximal to large-scale swine and poultry feeding operations. Sci. Total Environ. 2002; 299:89-95.
3. Hamscher G, Sczesny S, Hoper H, Nau H. Determination of persistent tetracycline residues in soil fertilised with liquid manure by high-performance liquid chromatography with electrospray ionization tandem mass spectrometry. Anal Chem. 2002; 74:1509-1518.
4. Yang W, Carlson K. Evolution of antibiotic occurrence in a river through pristine, urban, and agricultural landscapes. Water Res. 2003; 37:4645-4656.
5. Pan X, Qiang Z, Ben W, Chen M. Residual veterinary antibiotics in swine manure from concentrated animal feeding operations in Shandong Province, China. Chemosphere. 2011; 84:695-700.
6. Sureshkumar V, Sarathchandra G. A HPTLC-Fluorescent Densitometry Assay for Simultaneous Detection of Enrofloxacin and Ciprofloxacin in Broiler Chicken Tissues. Food Analytical Methods. 2018; 11(4):1076-1085.
7. Anadon A, Martinez-Larranaga MR, Diaz MJ, Bringas P, Martinez MA, Fernandez-Cruz ML *et al*. Pharmacokinetics and residues of enrofloxacin in chickens. Am. J Vet. Res. 1995; 56:501-506.
8. Knoll U, Glunder G, Kietzmann M. Comparative study of the plasma pharmacokinetics and tissue concentrations of danofloxacin and enrofloxacin in broiler chickens. J Vet. Pharmacol. Therap. 1999; 22:239-246.
9. Conzelman GM, Babish JG, Davidson JN, McMillan RA, Copeland DD. Pharmacokinetics of 1-cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-7-(4-ethyl-1-piperazinyl)-3-quinoline-carboxylic acid in chickens. Proc. West Pharmacol. Soc. 1987; 30:393-395.
10. Prescott JF, Baggot JD, Walker RD. Fluoroquinolones. In: Antimicrobial Therapy in Veterinary Medicine, 3rd Edn., Eds., Prescott J.F, J.D. Baggot and R.D. Walker, Iowa State University Press, Iowa. 2000, 315-339p.
11. Bregante MA, Saez P, Aramayona JJ, Fraile L, Garcia MA, Solans C. Comparative pharmacokinetics of enrofloxacin in mice, rats, rabbits, sheep and cows. Am. J Vet. Res. 1999; 60:1111-1116.
12. Carballo EM, Barreiro CG, Scharf S, Gans O. Environmental monitoring study of selected veterinary antibiotics in animal manure and soils in Austria. Environ. Pollut. 2007; 148:570-579.
13. Li Y, Zhang X, Lu X, Liu B, Wang J. The residues and environmental risks of multiple veterinary antibiotics in animal faeces. Environ. Monit. Assess. 2013; 185:2211-2220.