Pharmacokinetic Modeling and Distribution of Doxycycline in Healthy Female Donkeys After Multiple Intragastric Dosing

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Doxycycline at 10 mg/kg PO q12h may not achieve therapeutic concentrations in donkeys. Authors’ addresses: Department of Clinical Sciences (Chapuis, French, Peterson, Little), Department of Biomedical Sciences (Toka), Ross University School of Veterinary Medicine, Basseterre, St. Kitts, West Indies; Large Animal Clinical Sciences, College of Veterinary Medicine, University of Tennessee, Knoxville, TN 37996 (Smith); e-mail: elittle@rossvet.edu.kn. *Corresponding author; †presenting author. © 2021 AAEP.

1. Introduction
Donkeys have a different metabolism, and dosage should not be extrapolated from horses. Doxycycline is administered to horses for the treatment of bacterial infections but has never been investigated in donkeys. The aim of this preliminary study was to describe the population pharmacokinetics of doxycycline in donkeys.

2. Materials and Methods
Doxycycline hyclate (10 mg/kg, PO, q12h, 5 doses) was administered to eight non-fasted, healthy, adult jennies. Serum, urine, synovial fluid, and endometrium were collected. Serum doxycycline concentrations were measured with ELISA. Non-linear mixed effects model was used to analyze serum concentration.

3. Results
A one-compartment model with linear elimination and first order absorption best described the available serum pharmacokinetic data. Final parameter estimates suggested that doxycycline has a high volume of distribution (108 L/kg) as well as high absorption (10.3 h⁻¹) in donkeys. However, results suggest that the concentration of doxycycline reached in all fluids and tissues analyzed would not result in therapeutic

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concentrations compared to the minimum inhibitory concentration (MIC) of common equine pathogens.

4. Discussion

This study indicates that doxycycline dosed at 10 mg/kg PO q12h in donkeys results in lower blood and tissue concentrations than reported in horses. As a result, concentrations effective for treatment of equine pathogenic bacteria may not be reached in the donkey. Further studies are necessary to confirm the findings and find a therapeutic and safe dosage regimen of oral doxycycline in donkeys.

Acknowledgments

Declaration of Ethics

The Authors have adhered to the Principles of Veterinary Medical Ethics of the AVMA.

Conflict of Interest

The Authors have no conflicts of interest.