

# Pharmacokinetics and tissue elimination of flunixin in veal calves

G.W. Smith, DVM, PhD, DACVIM<sup>1</sup>; P.D. Brinson, BS<sup>1</sup>; R. Gehring, BVSc, MMedVet, DACVCP<sup>2</sup>;  
R.E. Baynes, DVM, PhD<sup>1</sup>; L.W. Kissell, PhD<sup>1</sup>; L.A. Tell, DVM<sup>3</sup>

<sup>1</sup>Department of Population Health and Pathobiology, North Carolina State University, Raleigh, NC 27607

<sup>2</sup>Department of Anatomy and Physiology, Kansas State University, Manhattan, KS 66502

<sup>3</sup>Department of Medicine and Epidemiology, University of California-Davis, Davis, CA 95616

## Introduction

Currently flunixin is one of the leading violative drug residue found in veal calves. Although it is approved for use in adult cattle, there is not a specific approval for use in calves that are to be processed for veal. However the drug is often used in an extralabel manner as supportive therapy associated with calf diarrhea or pneumonia. Unfortunately pharmacokinetic data regarding the use of flunixin in young calves is not available. Therefore the primary objective of this study was to examine the pharmacokinetics and tissue elimination of flunixin following administration to veal calves.

## Materials and Methods

Twenty Holstein bull calves between 3 and 6 weeks of age were used in this study. Each calf received flunixin at the label dose of 2.2 mg/kg IV once a day for 3 days. Blood samples were collected at 0, 15 min, 30 min, 1, 2, 4, 8, 12, 24, 48 and 96 hours after flunixin administration. Following the administration of the third dose, calves were divided into 5 groups of 4 calves. Each group of 4 calves was euthanized at 24, 48, 72, 96, and 120 hours following administration of the last flunixin dose. Liver, kidney and muscle tissue were harvested and flunixin concentrations were determined by UPLC. Withdrawal interval calculations were made based on the tolerance limit method.

## Results

Plasma pharmacokinetics of flunixin in veal calves were somewhat similar to what has previously been reported for adult cattle. Flunixin had an apparent volume of distribution ( $V_{ss}$ ) of  $0.734 \pm 0.100$  L/kg, a terminal elimination half-life of  $1.81 \pm 0.23$  hours and a clearance of  $62.6 \pm 6.8$  mL/h/kg. However tissue elimination of flunixin from veal calves was much slower than has been previously reported for cattle (22 and 27 hours for liver and muscle, respectively).

## Significance

Based on the tolerance in the United States a withdrawal time of 10 days would be recommended. However since flunixin is not specifically approved for use in veal calves, the established tolerance would not apply to these calves. Therefore any detectable residue could be considered as a residue violation. Based on the data from this study, flunixin appears to have a very slow terminal and variable elimination phase from tissues in some animals and may persist at detectable concentrations for an extended period of time. We are unable to predict an accurate time where flunixin concentrations would be reliably depleted to undetectable levels from this data and therefore would recommend extreme caution when using flunixin in calves intended for veal production. It is probable that flunixin residues could be at detectable levels for several weeks after administration.