

# Comparative plasma and urine concentrations of flunixin and meloxicam in show goats

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## Introduction

The allowable tolerance for a drug is based on edible tissue, yet a majority of livestock shows use urine samples to test for the presence of performance enhancing drugs. Currently, there is limited data on the relationship between urine and plasma or target tissue concentrations used for withdrawal time calculations in food animal species. Therefore, the objective of this study was to compare plasma and urine concentrations in goats administered 1 of 2 non-steroidal anti-inflammatory drugs, flunixin meglumine and meloxicam, in order to determine withdrawal intervals for animals where urine is routinely tested at livestock shows.

## Materials and Methods

Eleven goats were housed in individual metabolism cages to facilitate complete urine collection. All animals were randomly divided into 1 of 2 treatment groups and received either a single dose of 2.2 mg/kg flunixin meglumine in the muscle ( $n = 5$ ) or 0.5 mg/kg meloxicam by mouth ( $n = 6$ ). Plasma and urine samples were collected over 360 hours and analyzed by tandem mass spectrometry (UPLC-MS-MS). Goats were euthanized at the end of the study, and liver samples were collected at necropsy 15 days post dose in order to quantify any potential residues.

## Results

Drug levels in urine reached peak concentrations between 8 and 12 hours after dosing for both drugs. Flunixin urine concentrations were higher than maximum levels

determined in plasma, while this was variable between goats administered meloxicam. Urine concentrations for both flunixin and meloxicam fell below the limit of detection (LOD) of 1 ng/mL by 240 hours in all goats. Mean  $\pm$  SD renal clearance from 12 to 24 hours were  $1011.9 \pm 380.9$  and  $33.9 \pm 28.6$  mL/hour for flunixin and meloxicam respectively. Apparent elimination half-life in plasma based on non-compartmental analysis was  $6.9 \pm 4.9$  hr and  $11.8 \pm 4.1$  hr for flunixin and meloxicam respectively. Five of 6 liver samples for goats administered meloxicam fell below the LOD (5.0 ng/mL) by 364 hours. Four of 5 liver samples for goats administered flunixin fell below the LOD (5.0 ng/mL) by 364 hours. All goats administered flunixin were found to be below the lower limit of the analytical range for cattle liver determined by the Food Safety and Inspection Service (62.5 ng/mL).

## Significance

Flunixin and meloxicam administered to healthy goats exhibited prolonged elimination from urine than plasma, but followed a similar and linear depletion profile. The issue with zero-tolerance testing is that many times the drugs can still be found in the urine even though the labeled withdrawal times for tissue have been followed. Liver concentrations may not correlate with urine or plasma concentrations. These data will inform stakeholders involved in livestock shows about judicious use of NSAIDs and assist in determination of suitable withdrawal intervals for urine residues.