

Determination of the milk pharmacokinetics and depletion of milk residues following intramammary administration of cephapirin sodium in lactating dairy goats

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Introduction

In the United States, between 2007 and 2017, the US Department of Agriculture's National Agricultural Statistics Service reported dairy operations that had milk goats to be the fastest growing operations in the nation. The most impactful and economically important health challenge to dairy goat herds is mastitis. Currently, there are no labelled products for the treatment of mastitis in dairy goats and minimal research has been conducted to evaluate the pharmacokinetics of intramammary-administered antimicrobials. The objectives of this study were to determine the pharmacokinetics in milk of dairy goats treated with intramammary (IMM) cephapirin sodium and determine an appropriate withdrawal time for milk.

Materials and Methods

A total of 20 Saanen-Alpine cross-bred dairy goats free of clinical mastitis were enrolled. Study animals were milked twice per day at 12 h intervals. Each study animal received 200 mg of cephapirin sodium (ToDAY[®], Boehringer Ingelheim Vetmedica Inc., Duluth, Georgia) via IMM infusion in each udder half at 24-hour intervals, for 2 treatments. Bucket milk samples were collected at 0, 12, 24, 36, 48, 72, 96, 144, 192, 240, 336, and 432 h. Milk concentrations of cephapirin (CEPH) were determined using liquid chromatography coupled with mass spectrometry (Analytical Chemistry Section, Iowa State University Veterinary Diagnostic Laboratory,

Ames, Iowa). Milk concentration-time data after IMM infusions will be modeled using noncompartmental methods (Pkanalix v.2019, Lixoft, France).

Results

The geometric mean maximum CEPH concentration in milk was 22.8 µg/mL (range = 2.7 - 77.7 µg/mL) and occurred at a T_{max} of 30 ± 10.6 h (mean ± SD). The mean CEPH concentration dropped below the US tolerance for cattle of 0.02 µg/mL between 72 and 120 hours after the final administration. Further data analysis is ongoing at this time.

Significance

The mean CEPH concentrations in milk were found to be below the current approved tolerance of 0.02 µg/mL in the US by 120 h after the last IMM infusion. While data analysis is ongoing, it appears that longer withdrawal times would be judicious for goats following intramammary infusion of cephapirin compared to cattle. Withdrawal time data generated from this study will be useful in the establishment of milk withhold periods for extra-label use of cephapirin sodium in dairy goats by veterinarians.