



Depletion and Bioaccumulation of Ractopamine Hydrochloride (RH) in the Gastrointestinal Tract of Bovine

H. E. Davis^{1*}, I. Geornaras¹, T. Engle¹, J. E. Prenni², H. Yang¹, V. Lindstrom¹, A. M. Budde¹, A. N. Arnold³, K. B. Gehring³, P. K. Riggs³, H. R. Cross³, and K. E. Belk¹

¹Department of Animal Sciences, Colorado State University, Fort Collins, CO, USA

²Department of Horticulture and Landscape Architecture, Colorado State University, Fort Collins, CO, USA

³Department of Animal Science, Texas A&M University, College Station, TX, USA

*Corresponding author. Email: hedavis@rams.colostate.edu (H. E. Davis)

Keywords: depletion and bioaccumulation, fistulated steers, ractopamine
Meat and Muscle Biology 3(2):143

Objectives

Due to developing meat trade issues associated with use of the β -agonist ractopamine hydrochloride (RH) as a growth-promoting agent in livestock production, this project was developed to provide recommendations of best practices to beef cattle producers in the United States who intend to export to China. This study is critically important in better understanding the bioaccumulation and depletion of RH in live animals, and how this may relate to depletion in differing tissues on animal harvest.

This study was designed to determine dose response and depletion curves in the lower gastrointestinal (GI) tract of fistulated (i.e., cannulated- both rumen and duodenal) steers either receiving or not receiving ractopamine hydrochloride as part of the daily ration. There were originally five steers in this study, but due to performance challenges and scarring issues, one animal was removed from the study for a total of four test subjects.

Materials and Methods

In the dose and depletion study, four steers ($n = 2$ not receiving RH and $n = 2$ receiving RH at the approved dosage) were assessed from -3 d (still receiving RH if on the RH treatment) to 13 d post-withdrawal to determine the amount of RH present and length of time required for

RH to clear the GI tract should a contamination event of low levels occur. Residues were quantified using liquid chromatography mass spectrometry (LC-MS).

Results

For the dose and depletion study, RH residues were quantified in rumen fluids, rumen solids, fecal material, and duodenal fluids. Overall, the RH present in the two control steers (which did not receive RH) declined from approximately 30 ppb in all matrices 3 d before withdrawal to below the limit of quantitation at the end of withdrawal. Furthermore, samples tended to be below the limit of quantitation by Day 4 post-withdrawal. The steers that received RH also exhibited a decline of RH throughout the withdrawal period for all matrices (e.g., 5800 ppb in rumen fluids at day -3 versus 1.81 ppb 13 d post-withdrawal).

Conclusion

The dose and depletion study results suggest that RH declines rapidly in the lower GI of beef cattle, with levels below detection by day four. There are events in which RH declines and then spikes, so further research may be necessary to determine why this rapid increase occurs.