



# Comparative effects of zilpaterol hydrochloride and ractopamine hydrochloride on growth performance, carcass characteristics, and longissimus tenderness of feedlot steers fed barley-based diets

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## ABSTRACT

A randomized complete block design experiment was conducted with 4,114 beef steers in a commercial feedlot in western Canada that were fed barley-based diets to evaluate the effects of ractopamine hydrochloride (Optaflexx) and zilpaterol hydrochloride (Zilmax) on health, performance, carcass traits, and LM tenderness. Treatments consisted of feeding ractopamine hydrochloride at 30 mg/kg (100% DM basis) for 32 d at the end of the feeding period or zilpaterol hydrochloride at 8.3 mg/kg (100% DM

basis) for 20 d at the end of the feeding period, followed by the required minimum 4-d meat withdrawal period before slaughter (range 6 to 10 d). No differences ( $P > 0.05$ ) were detected in mortality, number of railers (animals shipped to slaughter before the rest of their pen), ADG, G:F, or DMI between steers fed zilpaterol hydrochloride or ractopamine hydrochloride. Steers fed zilpaterol hydrochloride had heavier HCW (8.4 kg,  $P < 0.0001$ ), greater percentage of overweight carcasses (2.1 percentage units,  $P = 0.006$ ), greater DP (1.0 percentage unit,  $P = 0.0001$ ), greater percentage of YG 1 carcasses (7.0 percentage units,  $P = 0.01$ ), lower percentage of YG 3 carcasses (4.8 percentage units,  $P = 0.02$ ), lower percentage of prime carcasses (0.32 percentage units,  $P = 0.05$ ), and a lower percentage of Canadian AAA car-

casses (5.6 percentage units,  $P = 0.04$ ) compared with steers fed ractopamine hydrochloride. No differences in LM tenderness ( $P > 0.05$ ) were detected between steers fed zilpaterol hydrochloride or ractopamine hydrochloride. Based on the marketing grid on which these feedlot steers were sold, the additional economic value of zilpaterol hydrochloride at 8.3 mg/kg to ractopamine hydrochloride at 30 mg/kg was \$30.36 (Canadian) per steer. Feeding zilpaterol hydrochloride for 20 d to finishing steers resulted in leaner carcasses and greater carcass weight without compromising tenderness compared with feeding ractopamine hydrochloride at 30 mg/kg.

**Key words:** beta-agonist, ractopamine hydrochloride, performance, tenderness, zilpaterol hydrochloride

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<sup>2</sup>Research supported by Merck Animal Health, De Soto, Kansas.

## INTRODUCTION

Optaflexx (ractopamine hydrochloride, Elanco Animal Health, Greenfield, IN) is a  $\beta$ -agonist approved for use in both steers and heifers fed in confinement during the last 28 to 42 d before slaughter in the United States and Canada. Ractopamine hydrochloride increases BW gain, G:F, YG, and HCW without affecting QG (Mersmann, 2002).

Zilmax (zilpaterol hydrochloride, Merck Animal Health, De Soto, KS) is a  $\beta$ -agonist approved for use in cattle fed in confinement during the last 20 to 40 d before slaughter in the United States and Canada. Previous research conducted in the United States and Canada has shown that zilpaterol hydrochloride increases BW gain, G:F, YG, and HCW but may reduce QG in feedlot steers (Montgomery et al., 2009).

Ractopamine hydrochloride is typically fed to Canadian feedlot cattle at 20 mg/kg for 28 to 42 d, even though it is labeled to be fed at 10 to 30 mg/kg in final feed for increased rate of BW gain and improved G:F or at 20 to 30 mg/kg in final feed for improved carcass leanness. There are few data showing the economic returns of feeding ractopamine hydrochloride to feedlot steers at the higher dose (Vogel, 2009; Boler et al., 2012). A recent publication from the United States suggests that feeding ractopamine hydrochloride to feedlot steers at 30 mg/kg may result in similar economic returns to feeding zilpaterol hydrochloride at 8.3 mg/kg (Elanco Animal Health, 2012).

There are no published large-scale commercial experiments that have been conducted with Canadian feedlot steers fed typical barley-based diets that evaluate performance and carcass merit or economic returns of feeding ractopamine hydrochloride at 30 mg/kg and feeding zilpaterol hydrochloride at 8.3 mg/kg. In Alberta and Saskatchewan, there are only 42 feedlots with a feeding capacity of 10,000+ animals (Canfax, Calgary, Alberta, 2013). A feeding capacity of over 10,000 animals is considered

a large feedlot in Alberta and Saskatchewan. Field trial experimental data that has both internal and external validity and is generated at large commercial feedlots is vitally important to help feedlot veterinary and nutritional consultants and cattle feeders make informed and timely economic decisions.

The objectives of the present experiment were to evaluate performance responses, carcass characteristics, LM shear force, and economic returns in steers fed either zilpaterol hydrochloride at 8.3 mg/kg or ractopamine hydrochloride at 30 mg/kg in a large commercial feedlot in western Canada.

## MATERIALS AND METHODS

### *Animals and Management*

Animals were handled in compliance with applicable local regulations and in accordance with the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (FASS, 1999). A total of 4,114 yearling steers from a 15,000-animal-capacity feedlot in southern Alberta was allocated to the experiment from June 5 to July 23, 2012. All steers received the same basal diet consisting on a DM basis of barley silage (10.68%), barley grain (65.03%), dry corn distillers grains (20.06%), and a base supplement (4.24%) containing minerals, vitamins, and monensin (33 mg/kg) for the entire experiment. Tylosin phosphate (11 mg/kg) was fed in the starter ration. The diets were formulated to meet NRC (2000) requirements. Separate supplements containing zilpaterol hydrochloride and ractopamine hydrochloride were prepared by a commercial feed mill that was identical in composition except for the  $\beta$ -agonist medication. All diets were manufactured immediately before feeding with on-site mixer feed trucks (Roto-Mix, Dodge City, KS). Feed was delivered 3 times daily and offered in sufficient quantities to allow for ad libitum intake. Feed bunks were emptied before placing animals into experiment pens. Dry matter intake

was recorded by pen at the time of feed delivery in a computerized data management system (DG Pro, ITS Global, Okotoks, Alberta, Canada). Bunks were managed to have bunks empty by the next morning. There were no storm events during the experiment that required removal of feed from the bunk.

### *Experimental Design*

The eligible pool of cattle included pens of crossbred feedlot steers with the same days on feed, average BW, and terminal TBA implant that were approximately 40 to 50 d from slaughter. Steers from these pens were combined and weighed individually. Steers weighing >636 kg were not eligible for the experiment because of their higher potential for overweight carcasses. The chute scale was checked with standardized weights before the start of the study, and the scale was tared to zero after every 10 to 20 animals through the chute. Scale resolution was set to 2.5 kg. Single animals were systematically randomized to 1 of 2 matched pens (block) through the processing chute. Pens were randomly assigned to treatment within a block. This process was repeated until 10 blocks (20 pens) were obtained. Both pens within a block contained approximately 174 steers (2 blocks) or 212 steers (8 blocks) to represent either 4 or 5 livestock truckloads for shipment to slaughter.

Day 0 was approximately 10 d after animals were randomized to treatment pens and approximately 29 d before slaughter. At this time, each pen within a block was weighed on a government-certified group scale that had a scale resolution of 5 kg. This group pen weight served as the start weight for the experiment.

### *Treatments*

Treatments included 8.3 mg/kg of zilpaterol hydrochloride (DM basis; Zilmax) and 30 mg/kg of ractopamine hydrochloride (DM basis; Optaflexx). Treatments began with the first feeding on d 1. Ractopamine hydro-

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