



EXTENSION

BEEF CATTLE RESEARCH UPDATE

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Effect of Ractopamine Hydrochloride on Environmental Gas Emissions, Growth Performance, and Carcass Characteristics in Feedlot Steers

Ractopamine hydrochloride (RAC) is a β -adrenergic agonist (β AA) that is FDA approved for increased rate of weight gain, improved feed efficiency, and increased carcass leanness in cattle fed in confinement for slaughter during the last 28 to 42 days on feed. A 2016 survey of consulting feedlot nutritionists indicated that approximately 84.8% of the clients serviced by the nutritionists used some type of β -adrenergic agonist in their finishing cattle diet.¹ Numerous studies have demonstrated improvements in feedlot performance and carcass composition when feeding RAC to finishing beef steers. A meta-analysis looking at performance characteristics of feedlot cattle supplemented with β AA found that on average cattle supplemented with RAC had about a 17.6 lb increase in body weight, a 0.42 lb/day increase in average daily gain (ADG), and no substantial difference in dry matter intake (DMI) compared to cattle not supplemented with RAC.² The effects of RAC on performance, but not environmental gas emissions, are well known. Research conducted at the University of California, Davis determined the effect of RAC on gaseous emissions, growth performance, and carcass characteristics when fed to beef feedlot steers over the last 42 days of the finishing period.³

In this study, 112 Angus and crossbred Angus steers (initial body weight = 1248 lb) were allocated to 8 cattle pen enclosures. The pens (4 pens per treatment, 14 steers per pen, and 56 steers per treatment) were randomly assigned to one of two treatments: 1) Controls; finishing ration containing no RAC, 2) RAC; finishing ration containing 27.3 g/ton of RAC on a dry matter (DM) basis. The ractopamine hydrochloride used in this study was generic Actogain 45 (Zoetis, Parsippany, NJ). Treatment rations were mixed and delivered daily. Measured emissions included ammonia (NH_3), nitrous oxide (N_2O), methane (CH_4), hydrogen sulfide (H_2S), and carbon dioxide (CO_2). The primary response variables assessed were emissions standardized by live weight (LW) and hot carcass weight (HCW).

These researchers reported that from day 0 to 42 the RAC fed steers tended to gain 17.3% faster (3.59 vs 3.06 lb/day ADG, $P = 0.066$) and tended to eat 4.2% less (22.89 vs. 23.90 lb/day DMI, $P = 0.069$) than control steers. As a result, the RAC fed steers had a 20.0% greater gain to feed ratio (G:F) compared to controls (0.1539 vs. 0.1283, $P = 0.012$). On day 42, steers fed RAC tended to weigh 21.5 lb more than controls ($P = 0.107$). In addition, steers fed RAC had an average of 27.6 lb greater HCW ($P = 0.006$) and an increase of 1.93 percentage units in dressing percent ($P = 0.004$) vs. controls. The level of RAC consumed per head per day in this study was ~300 mg. The improvements in performance observed in this study were comparable to that reported in an Elanco Animal Health 32 trial summary in which RAC (Optaflexx[®]) was fed for the last 28 to 42 days at a level of 300 mg/head/day.⁴ In this summary, compared to controls, feeding RAC improved feed efficiency by 16.4%, increased LW gain by 22.5 lb, increased HCW by 20.3 lb, and increased dressing percent by 0.7 units.

In reference to air emissions, these researchers reported that steers fed RAC reduced NH_3 emissions by 17.21% from day 0 to 28 ($P = 0.032$) and tended to reduce NH_3 from day 0 to 42 by 11.07% ($P = 0.070$) vs. controls. When standardized for LW, NH_3 was reduced by

23.88% from day 0 to 14 ($P = 0.018$), 17.80% from day 0 to 28 ($P = 0.006$), and 12.50% for day 0 to 42 ($P = 0.027$) in steers fed RAC vs. controls. Furthermore, steers fed RAC had 14.05% ($P = 0.013$) lower cumulative NH_3 emissions when standardized by HCW vs. controls. In addition., feeding RAC to steers reduced H_2S by 29.49% from day 0 to 14 ($P = 0.009$) and tended to reduce H_2S over day 0 to 28 by 11.14% ($P = 0.086$) vs. controls. When H_2S emissions were standardized for LW, RAC fed steers had a 28.81% reduction from day 0 to 14 ($P = 0.008$) vs. controls. Ractopamine did not have an effect on CH_4 , N_2O , or CO_2 emissions.

These authors concluded that overall RAC shows great potential for mitigating NH_3 and improving steer performance and efficiency. “Given that livestock are one of the largest contributors of NH_3 emissions in the United States, comprising 50% of the total NH_3 from terrestrial systems (NRC, 2003)⁵, RAC could play a major role in reducing the environmental footprint of beef cattle in feedlots.” They also noted that since RAC improves cattle performance that animals reach slaughter weight at a faster rate spending less time on feed. Thus, fewer air emissions are produced overall.

¹ Samuelson, K. L., M. E. Hubbert, M. L. Galyean, and C. A. Löest. 2016. Nutritional recommendations of feedlot consulting nutritionists: The 2015 New Mexico State and Texas Tech University survey. *J. Anim. Sci.* 94: 2648-2663.

² Lean, I. J., J. M. Thompson, and F. R. Dunshea. 2014. A meta-analysis of zilpaterol and ractopamine effects on feedlot performance, carcass traits and shear strength of meat in cattle. *PLoS One* 9:e115904. Available at: [doi:10.1371/journal.pone.0115904](https://doi.org/10.1371/journal.pone.0115904).

³ Ross, E. G., J. J. Ball, S. J. Werth, S. E. Mejia-Turcios, Y. Zhao, Y. Pan, P. C. Taube, T. R. Meinert, N. K. Van Engen and F. M. Mitloehner. 2021. Effect of ractopamine hydrochloride on environmental gas emissions, growth performance, and carcass characteristics in feedlot steers. *J. Anim. Sci.* 99. Available at: <https://doi.org/10.1093/jas/skab143>.

⁴ Elanco Animal Health. 2021. Optaflexx Research Brief 5 - Effects of Optaflexx® on Performance and Carcass Characteristics in Finishing Steers: 32-Trial Summary. Available at: <https://assets-us-01.kc-usercontent.com/2de3931d-61f2-00a3-6635-b7b29fac0245/01c69762-dd8b-4e76-8f5c-d1d09c1e154e/Updated%202.28.21%20-%20Optaflexx%20Research%20Brief%205%20PM%20US%2018%200165.pdf>.

⁵ NRC. 2003. Air emissions from animal feeding operations: current knowledge, future needs. Washington (DC): The National Academies Press. <https://www.nap.edu/catalog/10586/air-emissions-from-animal-feeding-operations-current-knowledge-future-needs>.