



# BEEF CATTLE RESEARCH UPDATE

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## **Environmental and Economic Impact of Removing Growth-Enhancing Technologies from U.S. Beef Production**

Researchers from Washington State University and Iowa State University recently analyzed the environmental and economic impact of withdrawing growth-enhancing technologies (GET) from the U.S. beef industry.<sup>1</sup> In this study, a deterministic model based on the metabolism and nutrient requirements of animals within all sectors of the beef production system was used to quantify resource inputs and waste outputs per one billion lb of beef produced in a year. Two production systems were compared: one using GET and the other without GET use. The growth-enhancing technologies considered in the model were growth implants, in-feed ionophores (Rumensin, Bovatec), in-feed hormones (MGA), and beta agonists (Optaflexx, Zilmax). These growth-enhancing technologies were assumed to be used at current industry adoption rates.

These researchers reported that withdrawing GET from U.S. beef production reduced productivity (growth rate and slaughter weight) by 9.2% and increased the population size required to produce one billion lb of beef by 11.8% (385,000 animals). Feedstuff and land use were increased by 10.6% (3.12 million tons) and 10% (~1013 sections), respectively, by GET withdrawal, with 5.32 billion more gallons of water being required to maintain beef production. In addition, manure output increased by 10.1% (1.98 million tons) and carbon emissions increased by 9.8% (787,396 tons) as a result of GET withdrawal. They noted that the projected increased costs of U.S. beef produced without GET resulted in the effective implementation of an 8.2% tax on beef production, leading to reduced global trade and competitiveness. Thus, to compensate for the increase in U.S. beef prices and maintain beef supply, it would be necessary to increase beef production in other global regions, with a projected increase in carbon emissions from deforestation, particularly in Brazil.

A 2011 study comparing the environmental impact of modern (2007) US beef production with production practices characteristic of the US beef system in 1977 showed that modern beef production requires considerably fewer resources than the equivalent system in 1977, with 69.9% of animals, 81.4% of feedstuffs, 87.9% of the water, and only 67.0% of the land required to produce 1 billion kg of beef.<sup>2</sup> Waste outputs were similarly reduced, with modern beef systems producing 81.9% of the manure, 82.3% of the methane, and 88.0% of the nitrous oxide per billion kilograms of beef compared with production systems in 1977. The carbon footprint per billion kilograms of beef produced in 2007 was reduced by 16.3% compared with equivalent beef production in 1977.

In conclusion, these studies clearly illustrate that modern technology has both improved production efficiency and reduced the environmental impact of beef production. Withdrawing growth-enhancing technologies from U.S. beef production would reduce both the economic and environmental sustainability of the beef industry.

## **Effect of Timing of Deworming on Response to Vaccination in Calves**

Gastrointestinal parasite burden is a major health concern for ruminants worldwide. Research has shown that cattle performance declines in relationship to parasite burden.<sup>3</sup> Most calves are vaccinated for respiratory-type infections and dewormed at weaning. Colorado State University research determined whether the timing of deworming relative to vaccination influences antibody titer response to vaccine components and rectal temperature.<sup>4</sup> In this study, 33 colostrum-deprived Holstein bull calves (average weight = 289 lb and average age = 130 days) were randomly assigned to three treatment groups: 1) dewormed 2 weeks before vaccination, 2) dewormed at the time of vaccination, and 3) control, vaccinated but not dewormed. All of the calves were orally inoculated 5

times with infective larvae of brown stomach worms (*Ostertagia ostertagi*) and intestinal worms (*Cooperia* spp.) on d 1, 7, 10, 14, and 18 of the study. The dewormed calves were dewormed orally with Safe-Guard (Intervet, Millsboro, DE) on day 21 or 35. On day 35, all calves were vaccinated subcutaneously with a modified-live virus respiratory vaccine containing IBRV, BVDV-1, BVDV-2, PI-3, and BRSV (Vista 5SQ, Intervet-Schering Plough Animal Health, and De Soto, KS). During the 103-d experiment, weekly fecal egg counts, blood, and rectal temperatures were collected. On day 88, all of the calves were challenged intranasally with IBR virus and blood samples were obtained on days 88, 89, 90, 93, 95, 98, 99, and 103.

As was expected, the control calves had greater ( $P < 0.01$ ) fecal egg counts during the experiment. During the post-vaccination phase of the study (day 35 through 87), control calves had greater rectal temperatures than dewormed calves. All calves had increased rectal temperatures during the final 7 days of the IBRV challenge. However, the control calves had greater ( $P < 0.01$ ) rectal temperatures on each sampling day except day 90 compared with the dewormed calves. These researchers concluded that deworming before or at vaccination reduced parasite burden and decreased rectal temperature increase after an IBR virus challenge. They also reported that the timing of deworming relative to vaccination had no effect on antibody response an IBR virus challenge.

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<sup>1</sup> Capper, J. L. and D. J. Hayes. 2012. The environmental and economic impact of removing growth-enhancing technologies from u.S. Beef production. *J. Anim. Sci.* 90:3527-3537.

<sup>2</sup> Capper, J. L. 2011. The environmental impact of beef production in the United States: 1977 compared with 2007. *J. Anim. Sci.* 89:4249-4261.

<sup>3</sup> Reinhardt, C. D., J. P. Hutcheson and W. T. Nichols. 2006. A fenbendazole oral drench in addition to an ivermectin pour-on reduces parasite burden and improves feedlot and carcass performance of finishing heifers compared with endectocides alone. *J. Anim. Sci.* 84:2243-2250.

<sup>4</sup> Schutz, J. S., J. A. Carroll, L. C. Gasbarre, T. A. Shelton, S. T. Nordstrom, J. P. Hutcheson, H. Van Campen and T. E. Engle. 2012. Effects of gastrointestinal parasites on parasite burden, rectal temperature, and antibody titer responses to vaccination and infectious bovine rhinotracheitis virus challenge. *J. Anim. Sci.* 90:1948-1954.