



## Effects of chromium propionate on broiler performance in antibiotic free production<sup>1</sup>

### Abstract

Chromium supplementation has been shown to improve broiler body weight, weight gain and carcass yield by decreasing the impact of stressors experienced by the bird. The objective was to evaluate the effects of chromium propionate (Cr Prop) on broiler performance and livability in a commercial antibiotic free complex. The entire complex was supplemented 200 ppb Cr Prop from December 2016-April 2017. Cycle duration was approximately 40 d, producing approximately 6 lb broilers. Data collected was compared to historical data from December 2015-June 2016. The supplementation of Cr Prop improved average feed conversion ratio (FCR) by 2 points compared to historical data. Moreover, Cr Prop improved livability by 0.45%. The net return for broilers supplemented with Cr Prop equated to an annual complex savings of \$1,000,000. One major contributing factor to the improved net return was an improvement in FCR, which resulted in a savings of \$10,600 per week (Corn: \$3.45-\$3.60/bushel, Soybean: \$9.20-\$9.55/bushel). Overall, supplementation of Cr Prop improved broiler performance and livability, reducing production costs in an antibiotic free complex.

### Introduction

Stress has been defined as the sum of all biological reactions to mental, emotional and physical stimuli that disrupt an individual's homeostasis, as it relates to bodily functions. There are a myriad of internal and external stimuli that can affect the homeostasis of an individual. Once homeostasis is disrupted, the body elicits physiological stress responses involving the immune system in an attempt to reestablish homeostasis.

Undoubtedly, broilers experience various stressors everyday of production. When broilers encounter a stressor, the neurogenic system is activated.<sup>2</sup> Failure to combat or flee from the stressor immediately results in the activation of the hypothalamic-pituitary-adrenal cortical system.<sup>2</sup> Activation of this system eventually leads to the proliferation of adrenal cortical tissue, which in turn secretes corticosteroids.<sup>3</sup> Previous research has shown that corticosteroids have a negative impact on broiler growth.<sup>4</sup> Chromium included in broiler feed as chromium propionate (Cr Prop) can be added to broiler diets at a concentration of 200 parts per billion (ppb).<sup>5</sup> Chromium has been shown to reduce the levels of corticosteroids in birds, alleviating the negative impacts of stress.<sup>6</sup>

Previous research has shown Cr Prop positively effecting performance of broilers during heat stress.<sup>7,8</sup> Additionally, Cr Prop has been shown to improve performance of broilers raised during the fall at a stocking density of 1.00 square foot.<sup>9</sup>

The objective was to evaluate the effects of Cr Prop on broiler performance and livability in a commercial antibiotic free (ABF) complex.

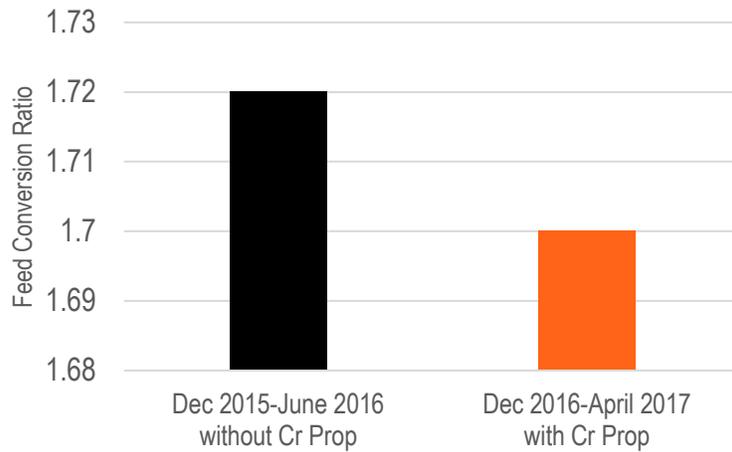
### Materials and Methods

The trial was conducted at an ABF complex utilizing Ross 708 broilers. Cr Prop was added to the rations from December 2016-April 2017 at a concentration of 200 ppb. During that time of the year, a chemical coccidiostat was used for the coccidiosis control program. Cycle duration was approximately 40 d, producing approximately 6 lb broilers.

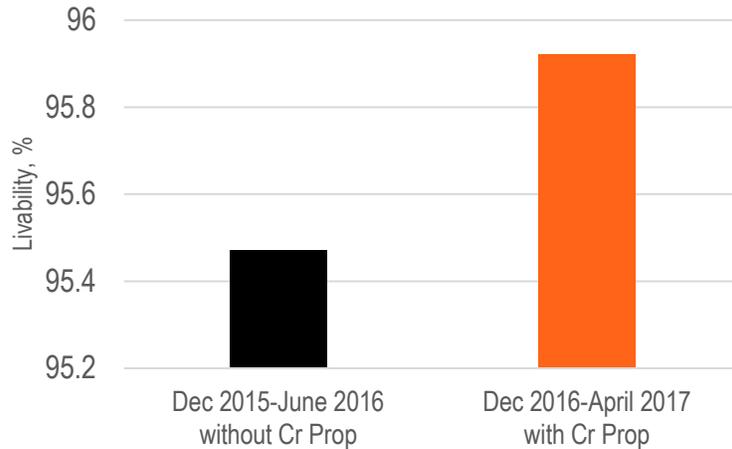
The stocking density at all farms was 1.10 ft<sup>2</sup>. The ventilation system used in the houses was tunnel ventilation with solid walls. There was a 14 d out time throughout the trial. Data collected included livability, feed conversion ratio (FCR) and cost/lb of broiler. The data was compared to historical data from December 2015-June 2016. Due to the uniqueness of the trial, no statistical analysis was performed.

## Results and Discussion

Supplementation of Cr Prop improved average FCR by 2 points (Figure 1). In addition, livability of broilers supplemented Cr Prop was improved by 0.45% when compared to the historical data average. The net return for broilers supplemented with Cr Prop resulted in an annual savings of \$1,000,000 for the complex. One major contributing factor to the net returns was an improvement in FCR, which resulted in a savings of \$10,600 per week (Corn: \$3.45-\$3.60/bushel, Soybean: \$9.20-\$9.55/bushel). These results agree with previous research that has shown improvements in growth performance and cost/lb of broilers (Cobb 500 and Ross 708) supplemented Cr Prop.<sup>7,8,9</sup>



**Figure 1.** Effect of chromium propionate (Cr Prop; 200 ppb) on feed conversion ratio of broiler Ross 708 (0-40 d).



**Figure 2.** Effect of chromium propionate (Cr Prop; 200 ppb) on livability of broiler Ross 708 (0-40 d).

## Conclusions

Previous research has shown that corticosteroids have a negative impact on broiler growth.<sup>9</sup> Chromium has been shown to reduce the levels of corticosteroids in birds alleviating the negative impact of stress.<sup>5</sup> Cr Prop supplementation resulted in an improvement in feed conversion ratio, livability and total live cost per pound for the broilers when compared to the historical data.

## References

1. Kemin Internal Document, 17-00720.
2. Siegel, H. S. (1980). Physiological stress in birds. *Bioscience* 30:529–534.
3. Holmes, W. N., and J. G. Phillips (1976). The adrenal cortex of birds. Pages 293–420 in *General, Comparative and Clinical Endocrinology of the Adrenal Cortex*. I. Chester Jones and I. W. Henderson, ed. Academic Press, New York, NY.
4. Dupont J., M. Derouet, J. Simon and M. Taouis (1999). Corticosterone alters insulin signaling in chicken muscle and liver at different steps. *Journal of Endocrinology* 162, 67-76.
5. 21 CFR Part 573.304, Chromium Propionate.
6. Mirfendereski E. and R. Jahanian (2015). Effects of dietary organic chromium and vitamin C supplementation on performance, immune responses, blood metabolites, and stress status of laying hens subjected to high stocking density. *Poultry Science* 94: 281-288.
7. Vignale, K, Koltas D., Weil J., West S., Weimer S.L., Iseri V. and Christensen K.D (2017). The effect of chromium propionate on performance responses in heat stressed male broiler chickens. 2017 International Poultry Scientific Forum. Atlanta, GA. Abstract T181, page 53.
8. Kemin Internal Document, 17-00187.
9. Kemin Internal Document, 17-00208.