

2100 Maury Street • Des Moines, Iowa, USA 50317 • tel: 515.559.5100 • www.kemin.com

## Effects of feeding increasing levels of an encapsulated source of butyric acid and zinc to broiler diets<sup>1</sup>

Encapsulated butyric acid has been shown to provide improvements to the efficiency of broilers in past trials.<sup>2</sup>

Zinc is an essential mineral providing benefits to the microbiota and intestinal barrier.<sup>3</sup>

This data could indicate by adding a source of encapsulated butyric acid and zinc at 500 ppm to broiler diets, it may be possible to:

- Improve feed conversion.
- Improve foot pad scores.

This data shows an encapsulated source of butyric acid and zinc can improve efficiency and gut health of broilers.

the upregulation of cell tight junction proteins and increases the microbial diversity of the intestines<sup>4</sup>. In addition to being a source of energy for epithelial cells, butyric acid also upregulates the cellular tight junction proteins and increases epithelial cell proliferation<sup>5,6</sup>. Previously conducted studies by Kemin have shown zinc and encapsulated butyric acid to be effective toward improved poultry production when treated as two separate components<sup>2</sup>. Together butyric acid and zinc oxide yield a gut health product with multiple modes of action.

### Methods and Materials

**Experimental Facility:** The trial was conducted at Southern Poultry Research (SPR) in Athens, Georgia, USA. The test house was divided into pens of equal size, arranged along a central aisle and the pens were the experimental units. The flooring of each pen had approximately four inches of built-up litter. The diets were provided ad libitum in one tube-type feeder per pen. Water was provided ad libitum.

### ABSTRACT

This study evaluated the effects of an encapsulated source of butyric acid and zinc (EBZ) on the performance of broiler chickens. The four treatment diets included three different feeding levels of EBZ (250, 500 and 750 g/MT) and a control diet with no EBZ added. Treatments were replicated with 15 floor pens of 20 male Cobb x Cobb 500 broilers per pen. The study was conducted over a 49 day study period. The bird weights and feed intake were measured at 21, 35, 42 and 49 days. A statistically significant improvement in feed conversion over the control was observed for each feeding level of EBZ at 42 days. No differences were observed for weight gain or feed intake. Foot pad scores were significantly improved at 49 days for all EBZ doses. Overall, the inclusion of EBZ in the diet improved growth efficiency and foot pad score.

### Introduction

Discussion regarding livestock and poultry gut health is an important topic in the efficiency and growth of production animals. There are many factors contributing to gut health, ultimately affecting the growth of the animal. One of the key areas to address is intestinal integrity. Short chain fatty acids, specifically butyric acid, and essential minerals, such as zinc, have critical roles in maintaining the intestinal barrier. Zinc plays an important role in



Layer of epithelial cells

**Diet Formulation:** The birds were fed a medicated corn-soybean based pelleted diet. The diets were formulated for three growth phases, starter, grower and finisher. All treatments contained BioCox® (50 g/t), BMD® (50 g/t) and Ronozyme P® Phytase (0.019%). The basal diets contained 29 ppm of Zn from inorganic sources which came through the premix formulation used by the University of Georgia.

**Treatments:** The experiment consisted of 60 pens of 20 male Cobb × Cobb 500 broiler chicks. The treatments were replicated in 15 blocks; the 4 treatments were randomized within each block. Treatments 2-4 (Table 1) were made including encapsulated butyric acid and zinc (EBZ).

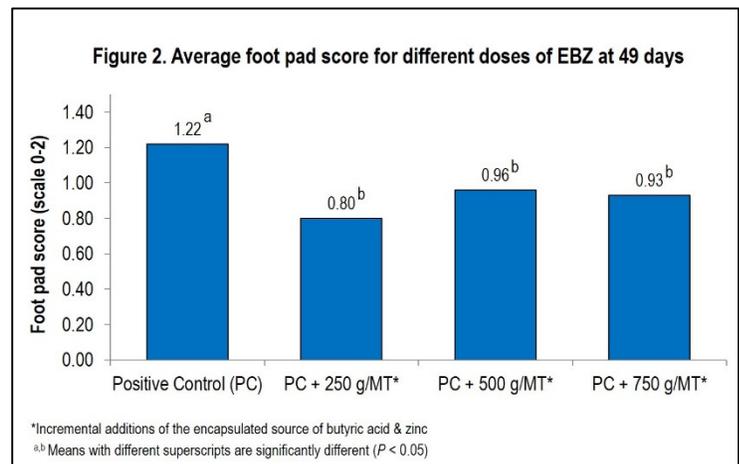
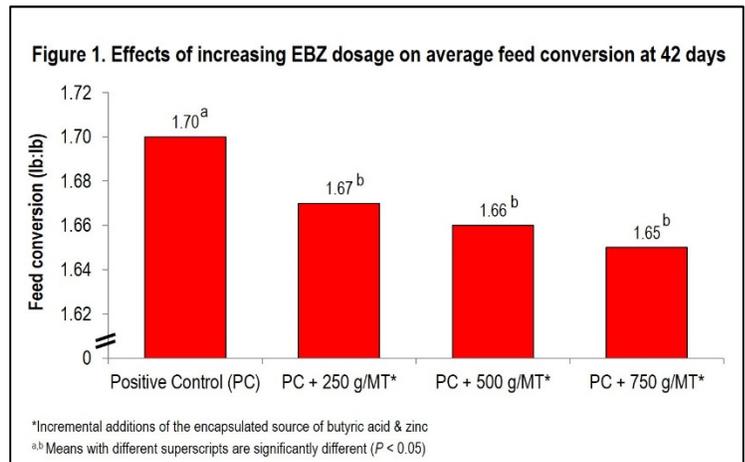
Table 1. Treatments used

Treatment	Description
1	Control
2	250 g/MT EBZ
3	500 g/MT EBZ
4	750 g/MT EBZ

**Trial Setup and Performance Parameters:** The total trial length was 49 days. Starter feed was fed from day of trial (DOT) 0 to 21. Grower feed was fed from DOT 21-35 and finisher feed was fed DOT 35-49. The feed was weighed by pen. Means for pen weight gain, feed consumption, and feed conversion ratio (FCR) were then calculated for the following time periods: Day 0-21, 0-35, 0-42 and 0-49. FCR was adjusted to account for mortality occurring during the study.

## Results

Adding an encapsulated source of butyric acid and zinc oxide to the broiler diets provided an improvement in feed conversion at each feeding level throughout the duration of the trial. At 42 days, statistically significant improvements were observed for all three EBZ feeding levels vs the control. There were no differences between the zinc levels with the most numerical improvement at the 750 g/MT level as shown in Figure 1. Foot pad scores were also measured on the last day of the trial. Food pad scores showed a statistical reduction of scores, as compared to the birds fed the control diet as shown in Figure 2. This suggests a drier excreta may lead to fewer lesions on the feet of birds.



## CONCLUSIONS

Feeding broiler diets a source of encapsulated butyric acid in combination with zinc resulted in improvements in FCR and foot pad scores in one study. This could be a result of a healthier GI tract, leading to drier litter in the house, potentially improving foot pad scores for the birds in this study.

## References

1. Kemin Internal Document, 15-00101.
2. Kemin Internal Document, 12-00035.
3. Katouli M, et al. The effect of zinc oxide supplementation on the stability of the intestinal ora with special reference to composition of coliforms in weaned pigs. 1999. J of Applied Microbiology. 87:564–573
4. Zhang B, et al. Zinc prevents Salmonella enterica serovar Typhimurium-induced loss of intestinal mucosal barrier function in broiler chickens. 2012. Avian Pathology. 41: 361-367.
5. Peng L, et al. Butyrate Enhances the Intestinal Barrier by Facilitating Tight Junction Assembly via Activation of AMP-Activated Protein Kinase in Caco-2 Cell Monolayers. 2009. J. Nutr. 139:1619-1625.
6. Kotunia A, et al. Effect of sodium butyrate on the small intestine development in neonatal piglets fed by artificial sow. J Physiol Pharmacol. 2004. 55: 59-68.

BioCox® is a registered trademark of Zoetis, Inc.

BMD® is a registered trademark of Zoetis, Inc.

Ronozyme P® is a registered trademark of DSM International Products, LLC.