



## IMPROVING SHELL QUALITY FOR LATE-CYCLE LAYING HENS

---

### Introduction

Poor egg quality is a major concern for egg producers and the total number of noncollectable eggs is thought to be the largest problem associated with egg shell quality (Roland 1988). Calcium metabolism and shell formation are dependant upon enzyme systems. Various trace minerals are required as co-enzymes in these enzyme systems. Zinc-dependant carbonic anhydrase is required for the formation of carbonate ions from carbon dioxide and water. Carbonate ions are required in the shell gland fluid to form calcium carbonate required for eggshell formation (Austic and Nesheim 1990). Zinc is also required for the synthesis of keratin, which is the primary protein of the shell membranes (Siske et al. 2000). The use of more bioavailable forms of trace minerals may improve eggshell quality (Gomez-Basauri 1997).

### Trial

This study was conducted to evaluate the efficacy of Bioplex Poultry® (BP) when added at different ages in late cycle. White Leghorn (Babcock B 300) late cycle (55 weeks of age) laying hens housed in 60 cages were fed either a control diet or a diet supplemented with 0.05% BP (20,000 mg kg<sup>-1</sup> zinc, 5000 mg kg<sup>-1</sup> copper, and 25,000 mg kg<sup>-1</sup> iron). Diets were formulated for 2 periods of production: 55

weeks of age - 80% production (4.1% calcium) and below 80% production (4.25% calcium). Each cage of hens was assigned 1 of 5 treatments: control (C), BP 55 weeks (BP55), BP 59 weeks (BP59), BP 63 weeks (BP63) and BP 67 weeks (BP67) of age. The weeks represented for each treatment indicate the timing of introduction of the BP® to the diet. Feed consumption, body weights and hen-day production were measured every 28-d and egg quality data (specific gravity, and egg weights) was measured every 14-d. Calcium balance was determined for the hens at 75 weeks of age.

### Results

BP® did not affect ( $P>0.05$ ) average hen-day production for the trial (Table 1). BP® had no effect ( $P>0.05$ ) average egg specific gravity (Table 3) or average egg weight (Table 2) for the trial. Initial specific gravity of the eggs at 55 weeks of age was comparable to production objectives for this strain of birds. The decrease ( $P<0.05$ ) in specific gravity observed as the birds aged was expected. The grams of calcium retained (Figure 1) by the bird at 75 weeks of age was affected ( $P<0.05$ ) by BP® supplementation. Birds fed the diet supplemented with BP® at 55, 59 and 63 weeks of age retained more calcium than those fed the

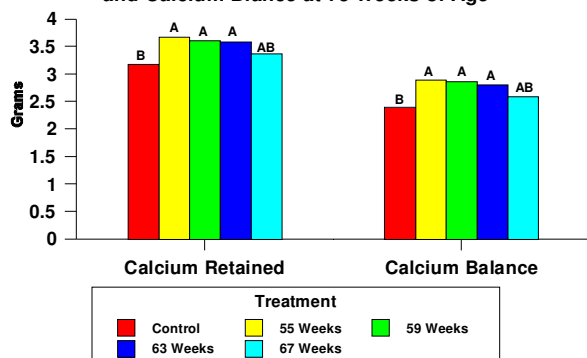
control. Each dietary treatment was able to maintain a positive calcium balance (Figure 1) at 75 weeks of age. However, birds supplemented with BP® at 55, 59, and 63 weeks of age maintained a higher ( $P<0.05$ ) calcium balance than the control diet. Supplementing the diet with BP® after 63 weeks of age did not improve ( $P>0.05$ ) calcium balance. Production standards for Babcock B 300 hens predict a specific gravity value of 1.077 at 80 weeks of age. Although there were no improvements observed in eggshell quality, improvements in calcium balance may have been beneficial for later eggshell quality if the length of the current trial was extended beyond 75 weeks of age.

**Table 1. Effect of supplementation age for Bioplex Poultry® on egg production**

Age at Supplementation (week)	Average Hen-Day (%) for the Trial
Control	82.5
55	82.2
59	84.4
63	84.9
67	79.1
Age of Hens (weeks)	Mean Hen-Day (%) at each 28-d Period
55-59	88.5 <sub>a</sub>
60-63	87.3 <sub>a</sub>
64-67	79.1 <sub>b</sub>
68-71	82.3 <sub>b</sub>
72-75	79.0 <sub>c</sub>

*a-c* means within a main effect with different letters differ significantly ( $P<0.05$ )

**Figure 1. Effect of Bioplex Poultry on Calcium Retained and Calcium Balance at 75 Weeks of Age**



*a-b* Means with different letters are significantly ( $P<0.05$ ) different

**Table 2. Effect of supplementation age for Bioplex Poultry® on egg quality**

Age at Supplementation (week)	Average Specific Gravity for the Trial	Average Egg Weight (g egg <sup>-1</sup> ) for the Trial
Control	1.081	67
55	1.081	67
59	1.082	67
63	1.082	67
67	1.081	68
Age of Hens (weeks)	Average Specific Gravity at each 14-d Period	Average Egg Weight (g egg <sup>-1</sup> ) at each 14-d Period
55	1.085	68 <sub>a</sub>
57	1.084	67 <sub>b</sub>
59	1.082	64 <sub>c</sub>
61	1.082	67 <sub>b</sub>
63	1.080	69 <sub>ab</sub>
65	1.080	67 <sub>b</sub>
67	1.082	68 <sub>a</sub>
69	1.079	68 <sub>a</sub>
71	1.081	67 <sub>b</sub>
73	1.081	67 <sub>b</sub>
75	1.080	69 <sub>a</sub>

*a-c* means within a main effect with different letters differ significantly ( $P<0.05$ )

## Industry Impact

Medullary bone acts as a readily available source of calcium during eggshell formation. The higher calcium retention and balance values observed at 75 weeks of age for the birds supplemented with Bioplex Poultry® at 55, 59, and 63 weeks of age compared to the control diet may suggest that the Bioplex Poultry® could have improved calcium metabolism placing less of a demand on the medullary bone. Further research is required to evaluate the effect of Bioplex Poultry® on bone characteristics of laying hens, especially during the latter stages of their laying cycle.

### Researchers:

J.L. MacIsaac<sup>1</sup>, S.J. Butt<sup>2</sup> and D.M. Anderson<sup>2</sup> <sup>1</sup>Atlantic Poultry Research Institute, <sup>2</sup>Nova Scotia Agricultural College

### Funding Provided By:

Nova Scotia Dept. of Agriculture (Technology Development Program) and the Nova Scotia Egg Producers. The Bioplex Poultry® was supplied by Alltech, Inc., Lexington, Kentucky

For more information on this project or any other project contact please contact [apri@nsac.ca](mailto:apri@nsac.ca) or phone 893-6657. These along with other fact sheets are available in PDF on our website.