ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 7 (3): 211-214, 2008
ISSN 1682-8356

Effect of an Early Nutritional Supplement on Broiler Performance

S.N. Henderson, J.L. Vicente, C.M. Pixley, B.M. Hargis and G. Tellez
Department of Poultry Science, University of Arkansas, Fayetteville, AR 72701, USA

Abstract: Chicks are commonly held for up to 72 h from the time of actual hatch to placement under commercial industry practices. Delaying access to feed and water has been documented to increase susceptibility to pathogens and weight loss, leading to poorly starting flocks with reduced weight gains. Seven experiments were conducted to compare the use of EarlyBird™ (EB; Sigrah-Zellet, LLC.) to no supplementation (NS) in chick boxes when chicks were held for a 24 h simulated shipping period. In each experiment, broilers were obtained from a commercial hatchery, neck tagged, individually weighed and randomly placed in boxes of 100 chicks. Treated chicks received 2 g/chick of EB. Following 24 h, chicks were individually weighed and placed with feed and water *ad libitum*. In all experiments, chicks that received EB during simulated shipping experienced significantly less body weight loss during the 24 holding period ($p<0.05$) and were significantly heavier at 7 d. At slaughter, EB treated broilers were 58 g heavier than the controls. The results are consistent with earlier reports indicating that the dependence of chicks on residual yolk sac during the first few days post hatch limits the growth potential of modern broilers. Early feeding can not only impact the general well being of the chick but also can have significant effects on early growth, leading to increased weight gains that persist through broiler production.

Key words: Early feeding, supplement, simulated shipping, delayed feeding

Introduction

In a commercial hatchery, chicks will hatch over a 24 to 36 h period of time. Chicks that hatch early usually remain in the hatcher until a large portion of the egg population has hatched. During this period, hatched chicks are without food and water and the chicks that hatch early are at a disadvantage because of the prolonged fasting period and potential dehydration (Tweed, 2005). As the hatch period increases, the number of chicks that are without feed and water for extended periods of time increases (Tweed, 2005). Once the hatch is pulled, other procedures such as sex determination and sorting, vaccinations, beak trimming, comb dubbing and shipping are performed which further increases the fasting period experienced by the chicks (Batal and Parsons, 2002).

Holding hatchlings without food and water for more than 24 h can have lasting negative effects on both broilers and turkeys (Tarvid, 1992; Knight and Dibner, 1998; Noy and Sklan, 2001; Batal and Parsons, 2002; Juul-Madsen *et al*., 2004). When delaying access to feed and water, hatchlings become more susceptible to pathogens (Dibner *et al*., 1998), increased weight loss (Noy and Sklan, 1999) and the development of critical tissues is restricted (Halevy *et al*., 2000).

In an attempt to reduce the adverse effects of delayed feeding, relatively recent research has evaluated the usage of supplements known as early feeding supplements. The concept behind the use of the early feeding supplements is to provide the neonate with additional nutrient sources prior to full access to feed and water. Providing early feeding supplements has been shown to improve body weights (Noy and Sklan, 1999), increase satellite cell proliferation (Halevy *et al*., 2003) and retain passive immunity (Dibner *et al*., 1998). The present study examines the effect of a commercially available neonatal nutritional supplement on broiler performance.

Materials and Methods

General procedures: These experiments were approved by the Institutional Animal Care and Use Committee of the University of Arkansas. In each experiment, Cobb 500 males from the female line were obtained from a local hatchery after sex determination and sorting was complete. Chicks were transported to the University of Arkansas facilities where they were randomly assigned to respective treatment groups, neck tagged for identification throughout the remainder of the experiment and individually weighed. Chicks were then randomly placed into commercial plastic chick boxes of 100 per box for a 24 h simulated shipping period. Treated chicks were provided with 200 g per box of hydrated EarlyBird™ by sprinkling the product over the top of the chicks (EB; Sigrah-Zellet, LLC). During the simulated shipping period, room temperature (25.5 C) was maintained with constant air flow to ensure the chicks were comfortable. Following the 24 h simulated shipping period, chicks were weighed and placed into floor pens with fresh wood shavings at a placement with a stocking density of 0.15 M^2/chick. Age appropriate environmental temperatures were maintained and supplemental heat

lamps were provided for each pen. Chicks had access to feed and water *ad libitum* and chicks were fed a corn-soybean meal based starter diet that was formulated to meet or exceed National Research Council recommendations (1994).

Experiment 1: A total of 200 chicks were used in this experiment. The chicks were held for 24 h with EB or with no supplementation (NS) (n = 100 per treatment group). After 24 h, chicks were placed into 2 replicate floor pens per treatment consisting of 50 chicks per pen until 7 d of age. Body weights were measured at 1, 2 and 7 d of age.

Experiments 2 and 3: A total of 500 chicks were used in each experiment. Chicks were randomly assigned to one of five treatment groups (n = 100 per treatment group). These experiments utilized the EB in the chick boxes and as a supplemental top dressing (TD) (2 g/chick) on the chick starter so that the chicks could potentially be attracted to the feed more quickly if the supplement was available. Chicks were either placed immediately (PI), held for 24 h with no supplementation (NS), held for 24 h with no supplementation in the chick box but were placed with feed top dressed with 2g EB per chick (TD), EB in chick box (EB), or EB in the chick box with and top dressed feed (EB+TD). After the 24 h simulated shipping period, chicks were placed into 2 replicate floor pens per treatment containing 50 chicks per pen until 7 d of age. Body weights were measured at 1, 2 and 7 d of age.

Experiments 4-7: A total of 600 chicks were used in each of these experiments. Upon arrival at the University of Arkansas facility, chicks were randomly assigned to three replicate groups of 100 chicks per treatment. Chicks were held for 24 h with or without EB supplementation in the chick boxes during the simulated shipping period. Following 24 h, chicks were weighed and placed in floor pens containing 50 chicks per pen until 7 d of age. At 7 d, chicks were co-mingled in one common area at a stocking density of 0.3 M^2/chick with feed and water provided *ad libitum*. Body weights for each experiment were determined at 1, 2, 7 and 21 d of age and also at 42 d of age for experiment 7.

Statistical analysis: Data from each experiment were subjected to analysis of variance procedures within ages using the general linear models procedure of SAS software (SAS Institute, 2002). Statistically different means were separated using Duncan's Multiple Range Test ($P<0.05$).

Results and Discussion

In all experiments, the use of EB in chick transportation boxes significantly reduced body weight loss during the simulated shipping period ($p<0.05$) and resulted in greater body weights and body weight gains at 7 d (Tables 1-4). In Experiment 1, EB treated chicks were 7.5 g (4.7%) heavier at 7 d than chicks that received no supplementation (Table 1). In Experiments 2 and 3, single application of EB in chick boxes(EB) or as top dressing (TD) were compared with either no treatment during simulated shipping (NS) or chicks that were placed immediately upon arrival (PI). An additional group was treated with EB both in the chick box and with feed top dressed with EB (EB+TD). In both Experiments 2 and 3, chicks that were placed immediately with full access to feed and water were markedly and significantly heavier than EB treated and non-treated chicks at all time points ($p<0.05$; Table 2). Chicks that received supplementation in the chick boxes and additional top dressing of feed (EB+TD) were the heaviest chicks subjected to simulated shipping when weighed at 7 d in each experiment. Supplementation of EB in the chick boxes alone caused significantly improved performance in Experiment 3 but not Experiment 2. In these two experiments, the most effective treatments involved treatment of chicks with EB during shipment and application of EB top dressing at placement. Top dressing with EB alone was not as effective.

Experiments 4, 5 and 6 examined the effect of EB on broiler performance to 21 d of age and experiment 7 was continued to 42 d of age. At 21 d, EB treated chicks were approximately 15 g heavier than the controls in Experiment 4 and 24 g in Experiment 7 (Tables 3). However, no significant differences were seen at 21 d in Experiments 5 and 6. In Experiment 7, evaluation was continued to 42 d where chickens were 58 g ($p<0.05$) heavier than controls.

These studies indicate that the use of an early feeding supplement during a 24 h simulated shipping period reduced the weight loss associated with simulated transport. Noy and Sklan (1998) demonstrated that providing chicks with an exogenous nutrient source immediately after hatch increased body weights at 4 d of age. Using a hatchery nutritional supplement during a 24 h post hatch period, Dibner *et al.* (1998) demonstrated significantly heavier body weights in chicks fed the hatchery nutritional supplement compared to fasted chicks.

Various methods of early feeding have been investigated. Using EB, our data show that significant increases in body weight can be seen at 21 and 42 d of age. Noy and Sklan (1999) have demonstrated that providing chick starter, water or a different commercial nutritional supplement, Oasis™, decreased body weight loss in the 48 h post hatch period and chick starter and Oasis™ treated chicks maintained this advantage through 21 d and 39 d of age with a higher breast yield. Batal and Parsons (2002) similarly found that Oasis™ for 24 or 48 h resulted in significantly heavier body

Table 1: Effect of EarlyBird (EB) on early broiler performance, experiment 1

	Body Weight			Body Weight Gain	
Treatments	Day 1	Day 2	Day 7	Day 2	Day 7
Control	48.3±0.40	43.8±0.35[b]	158.3±1.40[b]	-4.5±0.25[b]	110.0±1.26[b]
EB3 Treated	47.7±0.40	46.7±0.37[a]	165.2±1.90[a]	-1.0±0.15[a]	117.5±1.80[a]

Values presented as mean±SE. Means presented represent the mean of 100 chicks per treatment group. Different letters within a column indicate significant differences between treatments (P<0.05).

Table 2: Effect of various EarlyBird applications on early broiler performance, experiments 2 and 3

	Experiment 2					Experiment 3				
	Body Weight			Body Weight Gain		Body Weight			Body Weight Gain	
Treatments	Day 1	Day 2	Day 7	Day 2	Day 7	Day 1	Day 2	Day 7	Day 2	Day 7
Place immediately	42.1±0.37	48.3±0.49[a]	143.3±1.96[a]	+6.2±0.44[a]	101.1±1.93[a]	43.9±0.41	50.0±0.48[a]	235.8±3.83[a]	+6.1±0.44[a]	191.9±3.70[a]
No supple-mentation	42.7±0.44	39.2±0.32[c]	123.9±1.49[c]	-3.5±0.25[c]	80.3±2.48[c]	43.6±0.39	39.6±0.38[c]	187.5±3.32[c]	-4.0±0.25[c]	143.9±3.16[c]
Top dress (TD)	42.9±0.34	39.3±0.30[c]	126.4±1.53[b,c]	-3.6±0.29[c]	83.5±1.44[c]	42.4±0.41	38.9±0.39[c]	183.6±4.73[c]	-3.5±0.29[c]	141.2±3.26[c]
EarlyBird (EB)	43.1±0.40	40.7±0.36[b]	124.9±1.49[c]	-2.4±0.16[b]	81.8±1.37[c]	43.6±0.37	41.6±0.35[b]	195.0±4.49[b]	-2.0±0.16[b]	151.4±4.36[b]
TD+EB	42.1±0.37	40.3±0.32[b]	131.6±1.41[b]	-1.8±0.18[b]	89.5±1.39[b]	43.9±0.37	41.3±0.34[b]	197.1±4.07[b]	-2.6±0.18[b]	153.2±3.95[b]

Values presented as mean±SE. Means presented represent the mean of 100 chicks per treatment group. Different letters within a column indicate significant differences between treatments (P<0.05).

Table 3: Effect of EarlyBird on body weights of broilers experiments 4, 5, 6 and 7

Day of	Experiment 4		Experiment 5		Experiment 6		Experiment 7	
Age	Control	Early Bird	Control	Early Bird	Control	Early Bird	Control	Early Bird
Day 1	40.0±0.19	39.3±0.19	49.1±0.26	49.6±0.23	47.7±0.24	47.6±0.22	46.4±0.22	46.3±0.22
Day 2	36.4±0.18[b]	37.6±0.19[a]	45.1±0.22[b]	46.4±0.21[a]	43.9±0.22[b]	44.6±0.21[a]	42.1±0.32[b]	43.7±0.21[a]
Day 7	119.6±0.87[b]	127.7±0.97[a]	146.7±0.94	148.0±0.98	143.4±0.81[b]	147.2±0.81[a]	131.3±08.2[b]	134.8±0.77[a]
Day 21	622.7±4.75[b]	638.0±4.03[a]	746.0±5.06	738.9±5.59	775.4±5.38	777.3±5.65	700.7±3.08[b]	724.8±3.94[a]
Day 42	NA[1]	NA	NA	NA	NA	NA	2149.2±19.2[b]	2207.1±16.7[a]

Values presented as mean±SE. Means presented represent the body weight mean of 300 chicks per treatment group. Different letters within rows of experimental columns indicate significant differences between treatments (P<0.05). [1]NA = not applicable.

Table 4: Body weight gain[1] of broilers given EarlyBird during holding, experiments 4, 5, 6 and 7

Day of	Experiment 4		Experiment 5		Experiment 6		Experiment 7	
Age	Control	Early Bird	Control	Early Bird	Control	Early Bird	Control	Early Bird
Day 2	-3.6±0.12[b]	-1.7±0.11[a]	45.1±01.2[b]	46.4±0.12[a]	-3.8±0.10[b]	44.6±0.21[a]	42.1±0.13[b]	43.7±0.11[a]
Day 7	79.6±0.83[b]	88.4±0.97[a]	146.7±0.89	148.0±1.00	95.7±0.77b	99.6±0.77[a]	131.3±0.78[b]	134.8±0.69[a]
Day 21	582.7±4.72[b]	598.7±4.02[a]	746.0±5.02	738.9±5.62	727.75.36±	734.9±5.63	700.7±3.03[b]	724.8±3.88[a]
Day 42	NA[2]	NA	NA	NA	NA	NA	2149.2±19.1[b]	2207.1±[a]

Values presented as mean±SE. Means presented represent the body weight gain mean of 300 chicks per treatment group. Different letters within rows of experimental columns indicate significant differences between treatments (P<0.05). [1]Body weight gain determined by body weight - initial weight.
[2]NA = not applicable.

weights at 7 d than fasted controls. Additionally, chicks that received Oasis™ for 24 h and then placed with feed and water *ad libitum* were able overcome their weight lost during the 24 h holding period by 7 d of age, suggesting compensatory gain might be possible with chicks given an early feeding supplement.

The holding of neonatal chicks or poults is often inevitable. Our data indicate that early provision of an exogenous feed and water supplement resulted in greater body weights and body weight gains. Providing EB as an early feeding supplement during simulated shipping resulted in a 2.7% increase in body weight at slaughter age. Although early feeding supplementation doesn't completely compensate for the delayed exposure to feed and water *ad libitum*, providing an early feeding supplement may help alleviate the negative effects of delayed feeding.

References

Batal, A.B. and C.M. Parsons, 2002. Effect of fasting versus feeding oasis after hatching on nutrient utilization in chicks. Poult. Sci., 81: 853-859.

Dibner, J.J., C.D. Knight, M.L. Kitchell, C.A. Atwell, A.C. Downs and F.J. Ivey, 1998. Early feeding and development of the immune system in neonatal poultry. J. Appl. Poult. Res., 7: 425-436.

Halevy, O., A. Geyra, M. Barak, Z. Uni and D. Sklan, 2000. Early posthatch starvation decreases satellite cell proliferation and skeletal muscle growth in chicks. J. Nutr., 130: 858-864.

Halevy, O., Y. Nadel, M. Barak, I. Rozenboim and D. Sklan, 2003. Early posthatch feeding stimulates satellite cell proliferation and skeletal muscle growth in Turkey Poults. J. Nutr., 133: 1376-1382.

Juul-Madsen, H.R., G. Su and P. Sorensen, 2004. Influence of early or late start of first feeding on growth and immune phenotype of broilers. Br. Poult. Sci., 45: 210-222.

Knight, C.D and J.J. Dibner, 1998. Nutritional programming in hatchling poultry: Why a good start is important. Poult. Dig. Aug./Sept., pp: 20-26.

National Research Council, 1994. Nutrient Requirements for Poultry. 9th Rev. Edn. National Academy Press, Washington, DC.

Noy, Y. and D. Sklan, 1998. Metabolic responses to early nutrition. J. Appl. Poult. Res., 7: 437-451.

Noy, Y. and D. Sklan, 1999. Different types of early feeding and performance in chicks and poults. J. Appl. Poult. Res., 8: 16-24.

Noy, Y. and D. Sklan, 2001. Yolk and exogenous feed utilization in the posthatch chick. Poult. Sci., 80: 1490-1495.

SAS Institute Inc., 2002. SAS user's guide: Statistics. SAS Institute Inc., Cary, N.C.

Tarvid, I., 1992. Effect of early postnatal long-term fasting on the development of peptide hydrolysis in chicks. Comp. Biochem. Physiol., 101: 161-166.

Tweed, S., 2005. The Hatch Window. Cobb-Vantress Technical Focus. Vol. 2. Siloam Springs, AR.