Multi-State Poultry Meeting
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EARLY POST-HATCH NUTRITION FOR POULTRY

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Introduction

Early access to feed and water after hatching are important to ensure that young poultry have a good start and are able to realize their growth potential under the circumstances in which they are raised. Early hatch in the incubator, hatchery services and transportation to the farm contributes to the challenge of exposing young birds to nutrition soon after exiting the egg. Time spent in transportation can be a very significant factor leading to dehydration and yolk depletion as birds are hauled for 48 to 72 hours in the case of international destinations. Retardation of gastrointestinal development may be observed in young chicks and poults deprived of feed for 36-48 hr after hatch. Uni et al. (1998) reported that broiler chicks held for 36-40 hr immediately posthatch had depressed mucosal development for several days.

Hatchling supplements are now marketed that can be provided to chicks/poults at the hatchery and/or at placement at the farm. Products such as Oasis (Novus International) and Gro-Gel (Dawe's Laboratories) are being used to promote early growth and livability of poultry. Many nutrients are added to these products. However, water primarily and carbohydrates secondarily are being supplemented to help the young birds through this stressful period.

Supplementation of posthatch products have been shown to not only boost early intake and growth, but also the relative growth of internal organs such as the small intestine, liver and pancreas in poults fasted for 72 hr (Knight and Dibner, 1998). Denial of early nutrition for 48 hr can also result in reduced satellite cell activity and DNA synthesis in muscular tissue and lower breast yield of broilers at 41 d of age (Halevy et al., 2000). Mozdziak et al. (1994) found that there is an early phase of turkey skeletal muscle growth (0-9 wk of age) characterized by an increase in DNA units via increased satellite cell mitotic activity. Mozdiak (2001) also observed a decrease in satellite cell activity in poults denied feed for 72 hr. He suggested that a loss in DNA

units in myofibers of chicks starved for 72 hr was related to an increase in apoptosis (programmed cell death) and is an important factor in muscle development.

University Trials

Benefits of feeding posthatch supplements have been documented in controlled research settings. Noy and Sklan (1999) reported that broiler chicks and poults denied access to feed or water for 34 (chicks) or 48 (poults) hr after arrival at the research facilities had reduced body weight and breast yield compared to birds given either immediate access to feed and water or Oasis. Batal and Parsons (2002) showed that feeding Oasis to broiler chicks that had been fasted for 48 hr improved growth performance and energy utilization of a corn-soybean meal diet. Although there was no difference in body weight between fasted and fed birds, chicks that had been provided Oasis were heavier at 7 and 21 days of age. Feed efficiency was improved by feeding Oasis at 7 days, but this effect was not consistent at the end of 21 days. The authors suggested that improvements in nutrient utilization of growth were due to the ability of Oasis to stimulate early gut development in the chick.

A study conducted at Michigan State University in 2000 (Rahn and Roberson, unpublished data) investigated the ability of NMAN Concentrate (at that time distributed by Bayer Corp.) to improve performance of stressed poults (Table 1). Poults were kept for a 36 hr stress instead of the usual 8-12 hr at Cooper Hatchery in Ohio. Half the poults (B.U.T.A. Big 6 toms) were given a dosage of 1 g per poult in the boxes used to transport the birds. The poults were placed in brooding pens with feed (crumbles) and water within 5 hr after departure from the hatchery. The poults weighed an average of 0.12 lb (53 g) at placement. There were no significant differences in body weight, feed conversion or livability at 2, 4 or 6 wk of age in this study.

Mortality was about 4, 8 or 9.5 % at 2, 4 or 6 wk, respectively. The high mortality rate was primarily due to roundheart disease that was first detected at the end of the first week.

A second trial was conducted in 2001 using Gro-Gel top-dressed on pre-starter feed at a concentration of 1 g per poult (Table 2). Tom poults of the same strain at the previous trial were picked up at the same hatchery. The poults were transported on the same day the hatch was pulled with no added holding time and were administered the posthatch product immediately after placement in the brooding pen. The average starting weight was 0.13 lb (57 g). Due to problems at our facility with roundheart, poults were given either mash or crumbled feed with the same nutrient composition to assess if textured feed was creating the problem. Hence, the trial was a 2 X 2 factorial with Gro-Gel added at 0 or 1 g/poult to either a mash or crumbled diet up to 21 days of age. Crumbles were fed to all birds from 21 to 42 days of age. Gro-Gel did not significantly affect any growth parameters or mortality throughout the 42 day trial. Body weight was greater for crumbles fed poults at 7 d and this effect remained significant at 42 days. Net feed conversion was improved with crumbles at 14 d, but this effect was lost at 21 d due to high mortality associated with feeding crumbles (12.5%) compared to feeding mash (2.5%) at 21 d of age. Mortality was 8% at 7 d of age when crumbles were fed. The diagnosis of 90% of the deaths was due to roundheart mortality when crumbles were fed. There were no interactions between feed form and Gro-Gel addition.

A third trial was conducted in 2002 using Oasis as a supplement to the feed at the farm when poults were minimally stressed (Table 3). In this trial, Hybrid Converter toms were procured from the same hatchery as before and placed within 5 hr of beginning transport from the hatchery. Oasis was sprinkled over the feed at 2.5 g/poult in half of the brooding pens immediately upon placement (about 5 p.m.) and the following morning (about 8 a.m.). Mash feed

was provided for the first 14 d and crumbles were fed from 14 to 35 d of age. Growth performance was improved by Oasis supplementation after 7 d, but the benefit disappeared at 14 d. The toms weighed about 4 lb at 35 d of age regardless of whether or not the birds received Oasis supplementation. Mortality was not significantly affected by Oasis in this trial. At 7 d of age, mortality was 1.0 % when Oasis was not top-dressed on the feed and 0.5 % with Oasis. At the end of 35 d, mortality was 2.5% without Oasis and 1.5% with Oasis. The birds in this study as well as the previous two were placed on other nutritional studies after the brooding period which confounded any analysis of long term effects of posthatch supplementation.

When Noy and Sklan (1999) held poults for 48 hr in transportation boxes (or chicks for 34 hr), they found that Oasis improved body weight of both species at the first weighing at 4 d of age and this benefit continued through the grow-out of the birds. In one trial, the broilers that had been deprived of feed after hatch weighed 1.61 lb at 21 d of age and were about 1.75 lb when Oasis had been provided at placement. The poults that had beed deprived feed for 2 d weighed 1.23 lb at 21 d. Hence, the poults were very light and had plenty of room for improvement which was about 10 % in this trial. In grow-out trials, body weight was still improved by about 10 % for broilers at 39 d of age (5 lb BW) and about 5 % for toms grown to 140 d of age that were an appropriate size at market (38 lb BW). Breast yield was improved by about 10 % for both broilers and turkeys. This supports the concept that early nutritional events have some control over muscular development and the results will be realized late in the grow-out cycle. However, Viera and Moran (1999) did not observe a change in carcass yield when broilers were delayed access to feed for 24 hr.

Nir and Levanon (1993) showed that there is an inverse relationship between the amount of time broiler chicks are denied access to feed and water and early growth. There was no

compensatory growth and this relationship continued at market (40 d) age. When chicks were held 24 hr after hatch, time needed to reach market was delayed by one day. Marketing was delayed by 2 d when chicks were held for 48 hr. observed that chicks delayed access to feed and water for 24 hr had lower body weight at 21 d of age and this difference was still present at market (49 d). However, Pinchasov and Noy (1993) observed that broiler chicks deprived of feed for 24 hr did not significantly reduce body weight but a 48 hr delay did reduce body weight from 2 d of age until the end of the study at 14 d. Body weight of poults was reduced similarly at 14 d when the birds were denied feed for 24 or 48 hr and were exposed to heat stress (98.6° F) for the first 48 hr after hatch.

Field Studies

Dr. Al Hollister of Dawe's Laboratories has kindly provided information on Gro-Gel field trials with U.S. turkey producers. Preempt has been added to their posthatch nutrition product called GroGel Plus. Results will be discussed for grow-out, hatchery and early growth trials. As is the nature of field trials conducted in the industry, statistical analysis is not reported and many variable factors can be affecting the results.

In one study, GroGel Plus/Preempt was provided to Nicholas toms and hens and growth performance was monitored from the 10th week of growth until market. Body weight was 25.21 lb for toms given GroGel Plus/Preempt at 102 d of age compared to 24.91 lb without post-hatch supplementation which was the largest difference in body weight detected in the trial. At market (144 d) the advantage was reduced to 0.07 lb (39.42 vs. 39.49 lb). Feed conversion was not affected by dietary treatment. Mortality and culls were 19.0 % for the control toms and 16.6 % for supplemented toms at the end of the trial. Hen body weights were 14.15 lb at 81 d for control

birds and 14.39 lb for GroGel Plus/ Preempt fed birds. However, body weights were similar (ca. 23.5 lb) at market age (121 d). Hen mortality was 6.5 % for control birds and 5.0 % for treated birds. Feed conversion was on average 1 point (0.01 lb feed:lb gain) lower for toms and 3 points lower for hens when GroGel Plus with Preempt was provided after hatching of poults. Considering final body weight and livability only and assuming a live weight price of 35 cents/lb and no difference in condemnations, GroGel Plus/Preempt would have yielded an increase in returns of 14.3 cents/tom placed and 12.5 cents/hen placed. Obviously most of the difference would be more birds getting to the processing plant. A list of other brief testimonials showed a consistent 1 percentage unit improvement in livability of toms and hens.

In a hatchery field study, Nicholas hen poults were hatched in Missouri and shipped to Fort Dodge, Iowa. Half the poults were fed GroGel Plus at the hatchery and half were transported normally (no feed and water). The poults were weighed at the hatchery and 24 and 48 hr afterwards. Control poults lost 8.7 % of body weight the first 24 hr and 18.0 % after 48 hr. Poults given GroGel Plus lost 7.3 % of body weight at 24 hr and 13.8 % 48 hr after leaving the hatchery. Thus, there was about a 20 % difference between the two responses. There was no mortality at 24 hr, but control birds had 4 % mortality at 48 hr after leaving the hatchery. There were no deaths recorded for poults receiving GroGel Plus. Saving one poult per thousand pays for the expense of adding GroGel plus (cost is 0.62 cents/poult).

Published literature has demonstrated the benefit of posthatch nutritional supplements to early growth and development of young poultry. Controlled pen studies at MSU in which tom poults were in most cases minimally stressed on a relative basis to other studies showed little benefit at the end of the brooder stage (5 wk of age). However, field studies by companies that have developed posthatch nutritional supplements are able to show economic benefits for

growers, especially by reducing mortality. Posthatch nutritional supplements may be used to overcome reduced breast yield when young birds are held without nutrition for ~36 to 72 hr.

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.

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.

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

Mozdziak, P.E. 2001. Modulators of muscle development and meat yield. Proc. of Carolina Poultry Nutr. Conf., Raleigh, NC, pp. 77-79.

Mozdziak, P.E., E. Schultz, and R.G. Cassens. 1994. Satellite cell mitotic activity in posthatch turkey skeletal muscle growth. Poult. Sci. 73:547-555.

Nir, I., and M. Levanon. 1993. Research Note: Effect of posthatch holding time on performance and on residual yolk and liver composition. Poult. Sci. 72:1994-1997.

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

Pinchasov, Y., and Y. Noy. 1993. Comparison of post-hatch holding time and subsequent early performance of broiler chicks and turkey poults. Br. Poult. Sci. 34:110-120.

Uni, Z., S. Ganot, and D. Sklan. 1998. Posthatch development of mucosal function in the broiler small intestine. Poult. Sci. 77:75-82.

Viera, S.L., and E.T. Moran, Jr. 1999. Effects of delayed placement and used litter on broiler yields. J. Appl. Poult. Res. 8:75-81.

Table 1. Lack of effect of addition of NMAN Concentrate in boxes of tom poults held for 36 hr at the hatchery and fed crumbles at the farm on growth performance.

	NMAN (1 g/poult)	
	No	Yes
Body Weight (lb)		
14 d	0.81	0.83
28 d	2.55	2.59
43 d	5.79	5.79
Net Feed Conversion (lb:lb)		
14 d	1.25	1.22
28 d	1.42	1.42
43 d	1.60	1.59
Feed Conversion (lb:lb) –mortality corrected		
14 d	1.22	1.19
28 d	1.40	1.39
43 d	1.57	1.57
Mortality (%)		
14 d	3.3	4.5
28 d	6.8	8.9
43 d	9.1	10.1

Table 2. Effects of feed type (mash vs. crumbles) with or without gro-gel addition at the farm to tom poults delivered immediately to the farm from the hatchery.

Treatment		BW-7 d lb	mortality7 %	BW-14 d lb	F:G net lb:lb	F:G adj lb:lb	mortality14 %	BW-21 d lb	F:G net lb:lb	F:G adj lb:lb	mortality21 %
mash		0.36[b]	2[bc]	0.79[b]	1.14	1.14[a]	2[b]	1.43[c]	1.37	1.37[a]	2[c]
mash + gro-gel		0.36[b]	1[c]	0.80[b]	1.16	1.15[a]	2[b]	1.49[bc]	1.36	1.35[ab]	3[bc]
crum		0.40[a]	6[ab]	0.91[a]	1.09	1.05[b]	8[ab]	1.59[ab]	1.35	1.31[ab]	10[ab]
crum + gro-gel		0.41[a]	9[a]	0.92[a]	1.10	1.06[b]	10[a]	1.64[a]	1.36	1.28[b]	15[a]
average		0.38	4	0.85	1.12	1.10	6	1.54	1.36	1.33	8
SEM		0.01	2	0.01	0.02	0.01	2	0.04	0.03	0.02	2
trt, p=		<0.001	0.012	<0.001	0.066	<0.001	0.037	0.007	0.964	0.047	0.007
	df										
feed type	1	<0.001	0.002	<0.001	0.011	<0.001	0.006	0.001	0.668	0.009	0.001
gro-gel	1	0.728	0.598	0.279	0.525	0.187	0.637	0.151	0.932	0.321	0.277
feed * gg	1	0.439	0.290	0.636	0.831	0.901	0.761	0.977	0.797	0.858	0.352
feed type											
mash		0.36[b]	1[b]	0.80[b]	1.15[a]	1.14[a]	2[b]	1.46[b]	1.37	1.36[a]	2[b]
crum		0.40[a]	8[a]	0.91[a]	1.10[b]	1.06[b]	9[a]	1.61[a]	1.36	1.30[b]	13[a]
gro-gel											
no		0.38	4	0.85	1.12	1.09	5	1.51	1.36	1.34	6
yes		0.38	5	0.86	1.13	1.11	6	1.57	1.36	1.32	9

Table 2, continued.

	BW -42 d	Net F:G
mash	5.46	1.60
mash + gro-gel	5.52	1.57
crum	5.58	1.54
crum + gro-gel	5.68	1.56
avg,	5.56	1.57
SEM	0.06	0.02
trt , p=	0.100	0.411
feed type	0.031	0.173
gro-gel	0.712	0.796
feed * gro-gel	0.702	0.354
feed type		
mash	5.49[b]	1.59
crum	5.63[a]	1.55
gro-gel		
no	5.52	1.57
yes	5.60	1.57

Table 3. Influence of supplemental Oasis at the farm on poult growth when delivered immediately to the farm from the hatchery.

	Oasis			
	No	Yes	SEM	trt, p=
Body Weight (lb)				
7 d	0.31	0.34	0.01	0.099
14 d	0.72	0.73	0.01	0.682
22 d	1.56	1.57	0.02	0.684
35 d	4.02	3.98		
Feed Conversion (lb:lb)				
7 d	1.13	1.08	0.01	0.017
14 d	1.31	1.32	0.03	0.883
Mortality (%)				
7 d	1.0	0.5	0.4	0.438
14 d	1.5	0.8	0.6	0.375
21 d	1.8	1.0	0.7	0.447
28 d	2.5	1.5	0.8	0.405
35 d	2.8	1.5	0.8	0.281