breeding stock for growth and other traits. This process of rearing males to a defined age or body weight using broiler type diets is referred to as "broilerization" and is frequently associated with some level of continued unrestricted feed intake for "feed conversion efficiency" trials. The end result is that these elite males may be heavier at 7-8 weeks of age than natural mating may allow in adult males. Thus, the operational response has been to apply strict feed restriction protocols to males following an initial screening. This type of procedure has had deleterious effects on the reproductive performance of a large proportion of males following "broilerization". In one study, a large proportion of broilerized males fail to either develop or to maintain normal testis function. These males are characterized by reduced testis weight, sperm production and fertility, in the presence of circulating testosterone levels that are sufficient to maintain normal secondary sexual characteristics and behavior. Further, we have found that there is a strong positive correlation between testis function and circulating FSH levels in breeder males at sexual maturity. In males at 28-30 weeks of age, FSH levels appear to be the single best single-point indicator of testis function. Currently, we are investigating the regulation of and photoperiod induced stimulation of FSH secretion in breeder males. This research should provide additional information into the role of FSH in testis maturation and function.

Key Words: Testis Symposium, FSH, Spermatogenesis, Breeder, Fertility

Monday, AM, John Q. Hammonds Hall I, ENVIRONMENT AND MANAGEMENT

21 An attempt to improve heat stress infertility of broiler breeder males with dietary ascorbic acid. C. D. McDaniel*, J. E. Hood, A. Gumus-Karaca, and H. M. Parker, Mississippi State University, Mississippi State, MS.

Broiler breeder male fertility declines drastically during heat stress. Ascorbic acid has been shown to improve fertility of many different animals in both stressful and non-stressful environments. However, research on the use of ascorbic acid in combating broiler breeder male infertility is limited. Therefore, the objective of the current research was to determine if dietary ascorbic acid could improve the reproductive performance of broiler breeder males that are maintained in a heat stress environment. Seventy two broiler breeder males (18 weeks old) were divided equally among six controlled temperature rooms (21 C) and individually caged. Seven weeks after bird placement, two dietary treatments, 0 and 250 ppm of ascorbic acid, were each randomly allocated in every room to a group of six roosters. Nine weeks after bird placement, the temperature in three of the six rooms was elevated to create an 11 wk environmental treatment period divided into the following three phases: mild stress phase (29 C); severe stress phase (32 C); and recovery phase (21 C). On a weekly basis, semen and fertility characteristics were obtained for every rooster group. As expected, heat stress decreased semen quality and fertility. Temperature treatment by diet interactions revealed that ascorbic acid improved semen characteristics of males under control conditions but was detrimental to semen characteristics of heat stressed males. In addition, dietary ascorbic acid improved the fertility of males in the control environment by 10% but was ineffective at combating male heat stress infertility. In conclusion, dietary ascorbic acid does appear to improve semen quality and fertility but not when males are exposed to high environmental temperatures.

Key Words: Heat stress, Fertility, Broiler breeder, Semen, Ascorbic acid

22 Egg size and egg production of broiler breeder hens on long achemeral days. A. A. B. Spies*, F. E. Robinson1, R. A. Renema1, J. R. Feddes2, M. J. Zuiddhof2, and R. C. Fitzsimmons3, 1University of Alberta, Edmonton, Alberta, Canada, 2Alberta Agriculture, Food, and Rural Development, Edmonton, Alberta, Canada, 3Fitzsimmons Consulting & Research Services, Surrey, British Columbia, Canada.

Shaver Starbro broiler breeder pullets were used to study the effect of day length (24 h and 28 h) on egg production parameters and egg traits from 22 to 30 wk of age and ovarian and morphological characteristics at 30 wk of age. Floor housed pullets were raised in a light tight facility from 1 d of age until housing in individual lit cages at time of photo-stimulation (22 wk). Cages were equipped with hardware to monitor egg laying time. The photoperiod during rearing was 24L:0D for the first 3 d followed by 8L:16D, from 3 d to photostimulation. BW was monitored throughout the trial to maintain weights at targets set by Shaver Poultry Breeding Farms Ltd. The experimental design was a 2x2 factorial with two day lengths (hemeral [24 h] and achemeral [28 h]) and two BW groups (HBW [lower BW, LBW] and HW [higher BW, HBW]) with the LBW group having 327 g less than the HBW birds at 22 wk of age. The hemeral photoperiod was 14L:10D while the achemeral photoperiod was 14L:14D. Differences in BW remained throughout the trial. Egg numbers were not increased with the 28 h day (24 h=25.4 eggs;28 h=23.1). The 24 h hens had laid more double yolked eggs (0.9% of total egg production) than did the 28 h birds (0.5%). Egg formation time was consistently longer for the 28 h hens (26.8 h at 25 wk of age and 25.8 h at 29 wk of age) as compared to the 24 h hens (25.4 h at 25 wk of age and 24.8 h at 29 wk of age). Egg weight was higher for the 28 h birds (55.1 g) as compared to the 24 h birds (53.0 g). Egg specific gravity was higher in eggs from all 28 h hens than from the 24 h hens. The increase in egg weight between the 28 h and 24 h birds proved to be due to shell weight. Absolute and proportional weights of the egg shell were 5.5 g and 10.0% of the total egg weight for the 28 h birds, and 4.9 g and 9.3% for the 24 h birds, consecutively. The 28 h hens had higher proportional breast muscle weight, smaller livers and oviducts and lower ovary weight as compared to the 24 h birds. The data indicated that while egg size can be increased with the use of a long achemeral days early in lay this may be at the expense of egg numbers. Early in lay follicular maturation rates are fast and hens may be held to 1 ovulation per 28 h.

Key Words: Achemeral, Egg Weight, Broiler Breeder, Egg Production, Lighting

23 Effects of dietary protein on restrict fed broiler breeder pullets during a coccidial challenge. J. E. Yaisley*, T. Y. Morishita, and M. S. Liburn, Department of Animal Sciences, The Ohio State University/OARDC.

In two experiments, restrict-fed broiler breeder pullets were fed diets containing either 15 or 19% CP and challenged with 3 concentrations of Coccivac® (0, 1X, 3X). The first experiment was conducted in battery brooders and a coccidial infection was not induced. The pullets fed the 19% CP diet were heavier and had significantly heavier Pectoralis major weights. Experiment 2 was conducted in floor pens where coccidial oocysts were capable of recycling and there was oocyst invasion of the mucosal cells within the villi in the upper small intestine. The infection was mild, however, with no weight loss, feed intake depression, or other clinical symptoms. There were no significant effects due to level of dietary protein or infection on villus height or crypt depth within the intestine. It is concluded that while dietary protein may have an effect on the potential for BW gain in restrict fed broiler breeder pullets, there appears to be no benefit to increasing dietary protein to offset the effects of a treatment with Coccivac®.

Key Words: Broiler breeders, Coccidiosis, Protein, Intestine


In order to assess effects on skeletal and carcass component development and the onset of lay, breeder pullets were provided different CP intakes to 6 wk of age, followed by identical intakes thereafter. Day-old breeder pullets were provided isocaloric (2865 kcal ME/kg) starter feeds containing low (L), medium (M) and high (H) levels of CP (12, 16 and 20%) from 1 to 6 wk. Common developer (2865 kcal ME/kg, 15% CP) and breeder diets (2865 kcal ME/kg, 16% CP, 3% Ca) were provided in equal allotments to all treatments from 6 to 22 wk and 22 to 31 wk, respectively. Target BW of all treatments were 0.64, 1.36 and 2.32 kg at 6, 14 and 21 wk, respectively. Pullets were reared in floor pens (33 pullets/pens, 4 pens/treatment) and weighed weekly. Feed was provided ad libitum to 2 wk and in controlled feed allotments to 31 wk. Cumulative CP intake of the L, M and H treatments differed markedly at 6 wk (0.177, 0.231 and 0.278 kg, respectively), but cumulative feed intake was similar (1.476, 1.444 and 1.389 kg). Body weight uniformity, shank
length, keel length, breast weight, femur length and medullary cavity di-
ameters were all higher at 6 wk in birds provided higher CP intakes; but
most of these effects were not evident at 14 and 20 wk. Abdominal fat
pad weight was higher in birds provided lower CP intakes at 6 and 14
wk, but not at 21 wk. Although shank length had a direct relationship
with CP intake at 6 wk, it was inversely related at 21 wk. Percentage
ash of femur heads and keels was considerably lower than that of the femur
shafts at 6, 14 and 21 wk, with all ash values increasing with age. Cu-
mulative eggs per hen to 29 wk was higher in birds provided higher CP
intakes (14.79, 16.34, 17.11). Although nonsignificant (p>0.05), lower
CP intakes was associated with increased double-yolled egg production
per hen to 29 wk (0.66, 0.62, 0.49) and increased number of days post-
photostimulation to reach 50% HDP (33.75, 31.50, 31.25). These results
indicate that most physical effects caused by different early CP intakes
are reduced after prolonged feeding of comparable nutrient intakes, but
egg production may still be influenced.

Key Words: broiler breeder pullet, crude protein, femur, keel, egg produc-
tion

25 The effect of dietary crude protein level during
the pre-breeder period on breeder hen performance. N. S.
Joseph*, F. E. Robinson, D. R. Korver, and R. A. Renema,
University of Alberta, Edmonton, AB, Canada.
The effects of crude protein intake in the pre-breeder diet (20-29.5 wk of
age) on broiler breeder hen performance was evaluated. A flock of Cobb-
500 pullets were reared in floor pens from 0 d to 20 wk of age. At 20 wk
of age, 96 pullets were randomly placed in individual laying cages. Each
cage was assigned to one of three feeding regimens containing either 14,
16 or 18% dietary CP. Feed allocation was identical for all three treat-
ments and was based on average weekly BW of the birds fed the 16% CP
diet. Photostimulation occurred at 22 wk of age when the photoperiod
was increased from 8L:16D to 14L:10D. At 29.5 wk of age, the hens were
processed. Carcass traits including pectoralis major and minor weight,
and ovarian morphology were determined.
The birds fed 18% CP reached sexual maturity 20.6 d post-lighting, prior
to birds on the other two treatments (22.5 and 23.3 d, post-lighting for 14
and 16%, respectively). Dietary protein did not influence BW throughout
the trial. The crude protein level in the diet did not affect the weights of the p
major and minor. The number of large yellow follicles [LYF] was not different between treatments. From 25 to 28 wk of age, the hens on the
16 and 18% treatments had a significantly higher mean egg weight than the
14% group. There was no difference in egg weight between the 16 v 18% CP treatments during this time. By 29 wk of age, hens fed 18% CP produced heavier eggs than the 16% treatment. The increase in mean
egg weight because of additional protein in the diet was mainly a result of an increased albumen content of the egg. The number of hatchable eggs
were not affected by protein level however total egg production (including
and ovarian morphology were investigated in ad libitum (AL) fed hens. Four
strains of pullets (Shaver Starbro, Cobb 500, Hubbard Hi-Y and Avian 24k)
were raised in floor pens and feed-restricted to a common growth curve.
Although pullets may be of similar body weights at photostimulation the
rate of sexual development without affecting first egg weight.

Key Words: Growth curve, Pullet, Sexual maturity, Ultrasound

27 Egg production and fertility traits of broiler
breeder hens as influenced by strain and early feed allo-
cation. F. E. Robinson1, R. A. Renema1, J. R. R. Feddes1, M. J.
Zuidhof2, and J. L. Wilson3, 1University of Alberta, Edmonton, AB,
Canada, 2Alberta Agriculture, Food, and Rural Development, Edmon-
ton, AB, 3University of Georgia, Athens, GA.
Egg production, laying patterns, and fertility traits were recorded in
broiler breeder pullets to examine variability due to strain and feed allo-
caction. Four strains of pullets (Avian 24-K, Cobb-500, Hubbard Hi-Y
and Shaver Starbro) were used, and randomly assigned a code of "W",
"X", "Y" or "Z". Pullets were individually housed at 22 wk of age and three
feed allocation treatments were imposed at photostimulation (22 wk)
(ad-libitum (data not presented), fast feed [FF, weekly increases in feed
allocation based on BW and rate of lay] and slow feed [SF, daily small incremental increases in feed intake, based on BW]). Individual
BW, egg production, egg weight, and hatchability records were main-
tained until 60 wk of age. Hen-day production from 24 to 60 wk of age was
174.6 (W), 181.5 (X), 157.0 (Y), and 157.0 (Z), with Strain W and X
laying significantly more eggs than Strain Y and Z. Settable egg produc-
tion followed a similar pattern, and feeding program did not affect total
egg production (FF=169.5, SF=165.2). Egg production of Strain W did
not differ from that of Strain Y or Z by 47 wk of age, but increased late
in lay due to superior persistency of lay. Mean weekly sequence length
was greater in Strain X (7.18 d) compared to other strains (4.62, 3.12,
and 4.42 for Strain W, Y, and Z, respectively). Whereas hatchability was
not affected by feed, hatch of fertile eggs in SF hens was 90.7 com-
pared to 89.3 in FF hens. Hatchability was similar in Strain W, X, and Z
(mean=82.9%), and greater than that of Strain Y hens (79.9%). Strain
Y had an elevated proportion of embryonic mortality at Stage 2 (8-14d),
Stage 3 (15-21d), increased incidence of dead-in-shell, and culls, com-
pared to Strain X and Z. There are significant strain related differences in
egg production traits, indicating the need to closely match breeder
management systems with genetics.

Key Words: Genetic Strain, Egg production, Feed intake, Hatchability

28 Effects of strain on feed intake, reproductive ef-
ciciency, fertility, and carcass characteristics at 49 wk of
age in ad-libitum fed broiler breeder hens. R. A. Renema1, F. E.
Robinson1, N. V. Freiskatch1, and M. J. Zuidhof2, 1University of
Alberta, Edmonton, AB, 2Alberta Agriculture, Food, and Rural Devel-
opment, AB.
Broiler breeder strain effects on feed intake, egg production, fertility, and
ovarian morphology were investigated in ad libitum (AL) fed hens. Four
strains of pullets (Shaver Starbro, Cobb 500, Hubbard Hi-Y, Avian 24k)
were raised in floor pens and feed-restricted to a common growth curve.
Strains were assigned the anonymous labels “W”, “X”, “Y”, or “Z”. At
20 wk of age, 20 pullets from each strain closest to the target BW were
individually caged. At 22 wk of age birds were photostimulated and AL
feeding began. Individual records of feed intake, BW, egg production,
and mortality were kept for 14 wk. The BW of age at sexual maturity was
terminated at 49 wk of age due to increasing mortality and leg problems.
Breeder period sequence length, pause length, production, fertility, and
carcass characteristics were determined for each hen. Time from photo-
stimulation to sexual maturity (mean first egg) was faster in Strain W
(23.6 d) and Y (24.9 d) than in Strain Z (30.7 d). Feed intake for the
22 to 48 wk period was similar (totaling 34.1kg per bird (195 g/d)), al-
though feed intake was higher for strain W than for other strains from

Key Words: Genetic Strain, Egg production, Feed intake, Hatchability
26 to 28 wk of age. Strain W and Y, after responding quickly to AL feeding at photostimulation, had numerically more shell defects than the other strains, and significantly poorer hatchability (W=50.8%, X=81.9%, Y=71.1%, Z=77.4%). Strain W produced fewer settable eggs (94.5%) than other strains (X=115.3, Y=115.7, Z=110.0), and had the highest production of infertile eggs (25.9%). Strain Y hens had 1.3 fewer large yellow follicles on their ovaries (5.55) by 49 wk than other strains. This strain had the highest peak production (106%), and then dropped off at a faster rate than Strain X and Z, likely due to follicular insufficiency. Effects of AL feeding were strain dependent, indicating that some strains are more tolerant of AL conditions.

Key Words: Broiler breeder, Genetic Strain, Egg Production, Ad libitum

29 The effects of feed allocation pre-peak and post-peak on carcass and production traits in broiler breeders. M. S. Liburn* and J. E. Nixon, Department of Animal Sciences, Ohio State University/OARDC.

Two commercial strains of Arbor Acres broiler breeders were utilized in this experiment. The pullets were photostimulated at 22 wk and beginning at the onset of lay (5% hen-day production), feeding allocations were increased quickly (FAST) or slowly (SLOW), such that peak feed allocation (16 g/ hen/d) was reached two wk earlier in the FAST treatment. There were 6 replicate pens per strain and treatment combination with 20 to 22 hens/pen. There were no significant differences between strains in BW, carcass wt, Pectoralis major or minor wt, or abdominal fat at 20, 22, or 25 wk of age. At 30 wk, hens in the FAST treatment had a non-significant increase in abdominal fat (106.8 vs 86.3; P ≤ 0.118). At 30 wk, the ovary was significantly heavier in Strain 1 hens (43.0 vs 32.5 g) whereas oviduct wt was significantly greater in FAST hens (55.2 vs 43.7 g). There were no significant treatment effects on cumulative hen-day egg production from 26 to 30 or 30 to 34 wk but Strain 1 had a higher rate of cumulative hen-day production, particularly from 30 to 34 wk (86.2 vs 70.4%). Egg wt was significantly increased in Strain 2 but there were no treatment effects. At approximately 35 wk of age, half the pens in each pre-peak treatment/strain combination were switched to one of two post-peak feed treatments. A standard breeder diet (BRD-1) and the same diet with supplemental enzyme (AVIZYME® 15000, 2 lbs/ton; BRD-2) were fed. Over the course of 5 wk, hens in the BRD-1 treatment had their feed allocations decreased from 159 to 136 g whereas those in the BRD-2 treatment decreased from 159 to 136 g. There were no significant differences between strains in BW closest to their pen mean were killed to determine bone-in breast yield (BRD-2) were fed. Over the course of 5 wk, hens in the BRD-1 treatment had their feed allocations decreased from 159 to 136 g whereas those in the BRD-2 treatment had their feed more aggressively reduced to a final allocation of 127 g/d. At 4 and 10 wk after the onset of the study, BW was significantly greater in hens in the BRD-1 treatment but there were no treatment effects on egg production or egg weight. Similar to the pre-peak results, hens in Strain 2 had a lower rate of hen-day egg production but produced heavier eggs.

Key Words: Broiler breeders, Feed allocation, Carcass traits, Production, Egg weight

30 Influence of post-peak feed allotment decrease rate on body composition of broiler breeder hens. R. J. Lien* and J. B. Hess, Auburn University, Auburn, AL.

Body component weights of breeder hens of low (L) or high (H) BW were determined as they were subjected to slow (S) or fast (F) feed allotment decrease rates during the post-peak production period. At 20 wk, BW of L and H groups were 1.7-1.9 and 2.0-2.2 kg, respectively. The difference between BW groups was maintained by different allotments of 16% CP and 2915 kcal ME/kg feeds. At 29 wk, peak feed allotments of 154.4 and 161.2 g/hen/d were provided to L and H groups, respectively. Half of each BW group was then subjected to decreases in daily feed allotments of either: 1.36 g/hen weekly for 3 wk beginning 3 wk after peak production (33 or 34 wk) and 0.68 g/hen weekly thereafter (S), or 2.27 g/hen biweekly for 2 wk immediately after peak production (30 or 31 wk) and 1.14 g/hen weekly thereafter (F). BW groups and feeding trt made up a 2X2 factorial arrangement. There were 4 pens of 40 hens in each trt (LS, LF, HS and HF). At 33, 45 and 59 wk, 2 hens/pen with BW closest to their pen mean were killed to determine bone-in breast (BBB), abdominal fat pad (FP), ovary (OW), and oviduct weights (OD) and large yellow follicle number (LYF). Whole body compositions were determined by proximate analysis. It was previously reported (SPSS, 1999) that total production to 60 wk was decreased about 5 eggs/hen by F vs. S trt but unaffected by BW group. However, total feed/hen was 3.1 kg less in L than H group and 2.8 kg less in F than S trt. At 45 and 59 wk, BW was affected by BW group and feed trt. At 50 wk, BW was 0.27 kg lower in L than H group and 0.43 kg lower in F than S trt. At 33 and 45 wk BBB was affected by BW group. From 33 to 45 wk BBB of H trt decreased while that of L increased. At 59 wk, BBB was 74 g lower in F than S but unaffected by BW group. At 45 wk FP was affected by feed trt. At 59 wk there was an interaction effect on FP in which LS hens had the heaviest FP and LF hens had the lightest. At 59 wk, OW were heavier in the H than L trt and S than F trt. At this time, OW, LYF and DW were lowest in the LF trt while egg production was greatest. These results indicate that more rapid decreases in post-peak feed allotments may decrease or limit increases in body component weights without having marked negative effects on egg production.

Key Words: Broiler breeder, Body composition, Feed restriction

31 Broiler breeder hens will use body energy stores to maintain egg production and egg size. D. R. Sloan*, D. P. Eberst, and R. H. Harms, University of Florida.

An experiment was conducted, utilizing 168 Arbor Acres Classic broiler breeder hens 60 weeks of age in an energy intake reduction study for 2, 28-week periods. All nutrients except energy. Energy was reduced 40 calories per bird per day in the three dietary regimes (430, 390 and 350 calories per hen per day for treatments 1, 2 and 3 respectively). Hens on all treatments exhibited weight loss with those receiving diets 2 and 3 losing significantly more weight than those hens receiving diet 1. The study and process to determine average abdominal fat pad weight. Average fat pad weights were 144.9, 126.7 and 88.3g from hens processed from treatments 1, 2 and 3 respectively. It was concluded that broiler breeder hens would utilize body energy stores to maintain egg production and egg size under these conditions of this study.

Key Words: Broiler breeders, Energy restriction

32 Evaluation of field reproduction performance parameters of the heavy broiler breeders when force molted. A. H. Nilipour1, R. Quiroz2, and J. Brake1, 1Grupo Melo, S.A., & R. & D, P. O. Box 333, Panama City, Panama 1, Rep. of Panama, 2Dept. of Poultry Science, North Carolina State University, Raleigh, NC 27695-7608.

Due to the current incidence of Myeloid Leukosis in a majority of the heavy broiler breeders, the production of fertile eggs worldwide has been severely affected. This has caused many poultry integrators to force molt their healthy flocks for a second production period. At the Grupo Melo, S.A. two Peterson X Arbor Acres brooder flocks of about 13,000 females ages 61 and 66 wk, respectively, were chosen to be force molted. The males were separated and moved to the end of the house. About 10% of the males were culled and replaced with new 32 wk of age roosters. The females were taken off water for 1-2 days and feed for 14-16 days. By the termination of fasting each hen had lost about 25% of her original body weight reaching 2.9 kg. Production reached 0% by 12 days into fasting and returned to production 18 days after return to feed. No hen mortality was reported. After the production ceased fully, hens were light stimulated and received gradual feed increments reaching 150 g/hen/day through the production period. For both flocks maximum peak reached 67%, with maximum hatchabilities of about 85%. Flocks were maintained through 99 and 96 wk, producing 81 and 61 more chicks per hen moloted. Average egg and chick weights were 68 and 46 grams respectively. Our results indicate that it is economically feasible to molt when there is a need for fertile eggs, however, eggshell problems and contamination can increase. It is recommended not to exceed the second production cycle more than 20-25 weeks.

Key Words: Heavy broiler breeders, Force molt, Fertile eggs, Broiler

33 Comparison of ten breed crosses of broilers for egg shell properties and embryo growth. M. J. Wineland*, B. D. Fairchild, V. L. Christensen, and K. M. Mann, North Carolina State University, Raleigh, NC USA.

Most broiler hatcheries use multiple stage incubation and as a result all eggs are incubated similarly. Many different breed crosses are available for use by the broiler industry and hopefully all are similar in their response to the incubation environment. The improved genetic selection and development of broilers for different markets though may of resulted in changes to the egg and to the embryo developing within it. The egg shell has been found to be an important influence for moisture loss, metabolism, length of incubation period and subsequent hatch.
The objective of this experiment was to determine differences between 10 breed crosses with regards to eggshell properties and embryo metabolism. Eggs from the flocks (51 to 54 weeks of age) were incubated in a single machine, moisture loss measurements were recorded. Additionally, embryo weight with out yolk (EMB) and residual yolk weight (YLK) were determined at 15, 18 and 21 d. Average daily moisture loss (% of initial egg weight) demonstrated significant differences and ranged from 0.665% to 0.561%. Significant differences in EMB and YLK existed at 15 and 18 d but not at 21 d. Correlation between EMB and YLK at 21 d ranged from $r = -0.99$ to $-0.54$. This information demonstrate differences between breed crosses for the functional properties of the eggshells. These differences may also influence metabolism and embryo growth.

Key Words: Egg shell properties, Moisture loss, Embryo growth

34 Profiling egg storage: The effects on egg weight loss, egg characteristics, and hatchability. G. M. Fasenko* and F. E. Robinson, University of Alberta.

Broiler breeder eggs (n=4032) were collected from a commercial flock at peak production. Eggs were divided into preincubation storage treatments of 2, 4, 6, 8, 10, 12, 14, and 16 d. All eggs were identified and weighed at the time of collection, and after storage, and at transfer. After storage was complete, a sub-sample of eggs (n=72) from each storage treatment group were analyzed for egg quality characteristics. Remaining eggs were incubated and any unhatched eggs remaining after 21 d were broken open to assess fertility, hatchability and embryo mortality. Egg weight loss was significantly affected by storage length ($P=.0001$). Egg weight loss was .61g greater in 16 d versus 2 d stored eggs. Haugh units were also significantly lower in 16 d (5.2±1) versus 4 d stored eggs (6.2±1). Hatch of fertile eggs significantly decreased as length of storage increased. The hatch of fertile eggs for 2 d (82.5%) was significantly higher than both 8 d stored (70.5%) and 16 d stored eggs (68.0%). The results of this experiment provide a profile of hatchability which can be used to estimate the hatchability of stored eggs.

Key Words: Broiler breeders, Egg weight loss, Egg storage, Hatchability, Egg quality characteristics


A total of 2800 broiler breeder eggs were collected from a commercial flock and divided into storage treatments of 4 or 14 d. Prior to egg storage, the eggs were further divided into prestorage incubation (PRSI) treatments of 0, 6, 12, or 18 hr. Embryos (n=30) from each of the storage x PRSI treatments were examined after storage to determine the stage of embryonic development. All eggs were weighed prior to and after storage, then incubated, and weighed again at transfer. After 21 d of incubation, all unhatched eggs were broken open to determine fertility, hatchability, and stage of embryonic death. Significance was measured at $P<.05$. Prior to the 21 d of incubation, stage of embryonic development was not influenced by the duration of storage ($P=.6710$). As the number of hours of PRSI increased, embryonic development advanced in both the 4 d ($P=.00001$) and 14 d ($P=.00001$) storage groups. Hatch of fertile was significantly lower in 14 d (60.9%) versus 4 d (91.3%) stored eggs. Eggs incubated prior to storage for 0 hr had a hatch of fertile of 89.7% in 4 d stored eggs, and a hatch of fertile of 72.2% in 14 d stored eggs. The PRSI treatment of 6 hr numerically improved hatch of fertile of 4 d stored eggs (93.7%), and significantly improved hatch of fertile in 14 d stored eggs (81.9%) when compared to PRSI 0 hr treatments. The PRSI treatment of 18 hours also numerically improved hatch of fertile in 4 day stored eggs (94.4%), but significantly decreased hatch of fertile in 14 day stored eggs (11.5%) when compared to the PRSI 0 hr treatments. These results not only show that prestorage incubation of 6 hr improves hatchability over no prestorage incubation, but that the two storage treatments respond differently to long hours of prestorage incubation.

Key Words: Broiler breeders, Embryo mortality, Hatchability, Prestorage incubation, Egg storage

Monday, AM, John Q. Hammons Hall II, NUTRITION A

37 The effect of ethoxyquin on the quality of ground poultry mortality preserved by lactic acid fermentation and phosphoric acid stabilization. T. F. Middleton*, L. C. Boyd, and P. R. Ferket, North Carolina State University, Raleigh, NC.

The nutritional value and shelf life of poultry by-products depend upon the protein quality and lipid oxidative stability. The protein quality of poultry mortality preserved by lactic acid fermentation and acidification with phosphoric acid has been documented, but no information has been reported on the effects of these preservative systems on lipid stability. The objective of this research was to determine the effect of an antioxidant, ethoxyquin, on lipids in poultry mortality silages. Ground poultry mortality, with and without the addition of 183 PPM ethoxyquin (wt./wt., as is basis), was stored for 14 days following stabilization by (1) lactic acid fermentation and (2) acidification with various levels of feed grade phosphoric acid. All treatments were monitored for various parameters reflective of silage quality, including pH, volatile nitrogen, oxidative stability, and levels of free fatty acids. The changes in pH and the content of volatile nitrogen compounds were not significantly affected by ethoxyquin addition ($p = 0.246$). However, the addition of ethoxyquin to the poultry silages significantly improved lipid quality as indicated by increases in the oxidative stability index (OSI) induction period ($p < 0.001$). Ethoxyquin addition had no effect ($p = 0.144$) on nutrient proximate analysis values. This experiment demonstrated that the addition of ethoxyquin to preservation systems for the storage of ground poultry mortality improves the lipid quality of the ground material without compromising protein quality or affecting nutrient parameters.

Key Words: Poultry Mortality, Ethoxyquin, Lactic Acid Fermentation, Phosphoric Acid, Oxidative Stability


Recent legislation has banned the use of ruminant by-products in ruminant rations. As a result, turkey producers will likely have more access to these by-products. Experiments were conducted to determine the effects of feeding high levels of ruminant by-product meal to male turkeys to 18 weeks of age. Floor pens were used to house 1500 Nicholas toms, which were randomly assigned to 6 treatments with 5 replicate pens. Treatments consisted of diets containing the by-product meal as 0, 10, 20, 30, 40 and 50% replacement of soybean meal in the ration. Performance was judged on the basis of weight gain (BW), feed:gain (F:G), mortality, and carcass yield. At three weeks of age, the 10, 30, 40 and 50% treatments had increased BW and decreased F:G compared to the 0% ($P<0.05$). During this period, the 40 and 50% treatment groups exhibited lower F:G than the 0% ($P<0.05$). Eighteen week data will be reported as well. The data indicates that ruminant by-product meal can replace up to 40% of the protein source in rations for male turkeys without compromising performance. An important consideration when using high levels of ruminant by-product meal is that of Ca and P levels. Since these minerals are present in high concentration in the by-products, NRC requirements must be exceeded when using increased amounts of the ruminant by-product meal in turkey rations.

Key Words: Turkey, By-product, Performance, Digestible formulation