Onion consumption and bone density in laying hens. H. W. Cheng* and R. L. Dennis, Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN.

Onion and its flavonoid component, quercetin, increase bone density in rabbits, rodents, and humans. The purpose of this study was to determine whether there is a similar effect of onion on laying hens. Thirty-two Hy-line W36 White Leghorn hens at 30 weeks of age were randomly divided into 2 groups, i.e., control and treatment (n = 16). The hens were kept at 2-hen cages, each cage providing 658 cm² per hen. The hens were fed regular layer diet or layer diet containing 5% onion powder (by wt) for ad libitum consumption for 4 weeks. The hens were evaluated for body weight (BW) at wk 1, 2, 3, and 4; egg production and eggshell weight at wk 2 and 4; and blood calcium and bone mineral contents at wk 4. Data were analyzed using an ANOVA and repeated measures analysis when required. There was no difference in BW between the controls and treated hens from wk 1 to 3 (P > 0.05) while it was reduced in the treated hens at wk 4 (P < 0.05). Compared with the controls, both egg production and eggshell weight of the treated hens were increased at wk 2 (P < 0.05) but eggshell weight was reduced at wk 4 (P < 0.05). Blood calcium concentrations were lower at wk 4 in the treated hens compared with those of controls (P < 0.05). The weight of bone ash of the femur, tibia, and ulna was not affected (P > 0.05); but the levels of phosphorus in P-reduced at wk 4 (< 0.05). Blood calcium concentrations were lower (P < 0.05) but eggshell weight was reduced (< 0.05). Com-

Key Words: onion, bone density, calcium, phosphorus, laying hens

Evaluation of heterophil lymphocyte ratio and relative asymmetry as welfare parameters for broiler breeders. M. J. Da Costa*1, E. O. Oviedo–Rondón1, P. E. Eusebio–Balcazar1, V. Moraes2, N. A. Barbosa2, and K. Claassen1, 1North Carolina State University, Raleigh, 2Universidade Estadual Paulista, Jaboticabal, SP, Brasil.

This study was conducted to evaluate the adequacy of heterophil lymphocyte ratio (H/L) and relative asymmetry (RA) as welfare parameters for broiler breeders. Samples and data from one breeder experiment with 198 observations were used. Treatments included broiler breeders of 2 strains (A, B) housed in 16 pens and fed either corn (C) or wheat (W) based diets during rearing and production. At 21 wk, hens and roosters representing the BW distribution from each treatment were moved to a cage breeder house. Hens were placed at either 1 or 2 hens/cage to cause concurrently competition for feeder space and changes in stocking density which can be associated with commercial stress conditions. Hen shank length, thickness and circumference of both legs were measured at 22 and 39 wk of age in approximately 24 hens per treatment. The RA of each trait was calculated. At 51 wk, blood samples were collected and H/L was evaluated. Statistical analyses included the pairwise correlations among all variables and ANOVA according to a 2 × 2 × 2 factorial arrangement of treatments in a CRD design with strain, diet type, and hens per cage as main factors. Results indicated that there were no significant (P > 0.05) correlations among the RA traits of shanks taken at the 2 age periods. There were no significant (P > 0.05) correlations between H/L and any of the shank RA parameters. Breeder BW was affected by the 3 way interaction (P ≤ 0.05), but the most important factor was hens/cage suggesting some effect on welfare. However, the H/L was not influenced (P > 0.05) by treatments. In the literature, H/L is accepted as indicator of chronic stress. In contrast, the RA of shank length and thickness were impacted (P ≤ 0.05) by the interaction of diet by cage space. Diet by strain interaction had an effect (P ≤ 0.01) on shank circumference. These treatments seem to affect symmetry of bone development but this effect was not correlated with H/L. The lack of correlations between H/L and RA leads to the conclusion that these parameters may not be interchangeable as measurements of stress and welfare in broiler breeders.

Key Words: welfare parameters, broiler breeder, H/L, relative asymmetry, stress

Effects of different housing environment on neural plasticity in the chicken. H. Taira*, M. M. Beck, S. C. Chapman, and P. A. Skewes, Clemson University; Clemson, SC.

Exposure to an enriched environment has been thought to have positive effects on welfare, and may be accompanied by changes in neural development. There is a continuing debate over the effect of housing systems on the well-being of laying hens. The debate includes the use of cages, modified cages, and aviaries. This study, therefore, was conducted to determine if different housing environments affect neural development as it relates to improving overall welfare of laying hens. Hy-Line W-36 Variety hens were kept in different housing systems from one day of age to 34 weeks of age; battery cage system (brooder, grower, and layer cages) and floor pens (enriched with perches, dust baths and nest boxes). At wk 36, half of the hens from each treatment were switched to the other treatment, and kept them until the age of 45 weeks. Brain samples (n = 5 per treatment) were collected at wk 1, 3, 5, 9, 13, 18, 22, 26, 30, 34, 38, 42, 45. The Golgi-Cox technique was used to examine total dendritic length of neurons in the hippocampus. Data were analyzed using PROC MIXED procedure of SAS. From wk 1 to 34, there were no significant differences between 2 housing systems, except at wk 5 (floor > cage; P < 0.05). The cage chicks were moved from battery brooders at 4 weeks of age to battery growers, which might have contributed to this difference. At wk 38, hens moved from their original environment to alternative showed a significant increase (P < 0.05) in total dendritic length compared with birds maintained in their original environment. This increase was also observed at wk 42 and 45 (P < 0.05). Although conventional cages are considered impoverished environments for laying hens, the results showed that different housing systems did not affect dendritic arborization. Changes to dendrites did occur, however, when the birds were moved from a known environment to a novel environment. Although enriched environments may benefit the welfare of laying hens in other ways, it appears that changes to the environment have a greater influence on modifications of brain structure than does the environment itself.

Key Words: laying hen, hippocampus, dendrite, housing environment, laying hen welfare