Strategies for Improving Immune Responses against Disease

11 Nutritional modulation of immune function in broilers.

M. T. Kidd*, *Mississippi State University, Mississippi State, MS.*

Over half of the live performance cost in commercial chicken production is derived from diet and milling. Keeping this in mind it is not surprising that nutritional research makes up a large percentage of papers at some scientific forums and in journals. Most nutritional reports in broilers investigate its impact on growth and carcass traits, and rightly so because these traits are directly linked to profitability of poultry operations. However, research evaluating the impact of nutrition on immune responsiveness and the mechanisms behind this response is becoming commonplace in some laboratories. This research is of importance because it yields nutritional regimes that promote improved disease resistance in commercial broilers while maintaining good growth. Continued research in the area of nutrition and immune function interactions in broilers will lead to feeding strategies that can be implemented by the nutritionist. Specific nutrients impact immune cell metabolism and function. However, dietary modifications of these nutrients should not only consider the nutrient-immune function interaction, but the disease status and environment of the bird. Research reports addressing nutritional modulation of immunity in broilers and the commercial applicability of these reports will be discussed.

Key Words: Broiler, Immunity, Nutrition

12 Selection for avian immune function: A commercial breeding company challenge.

J. E. Fulton*, *Hy-Line International, Dallas Center, IA.*

Selection for immune function in the commercial breeding environment is a challenging proposition for commercial breeding companies. There are several factors that must be carefully considered in any breeding program. Immune response is only one of many traits that are under intensive selection, thus selection pressure needs to be carefully balanced across multiple traits. The selection environment (single bird cages, biosecure facilities, controlled environment) is a very different environment than the commercial production facilities (multiple bird cages, potential disease exposure, variable environment) in which birds are to produce. The testing of individual birds is difficult, time-consuming and expensive. It is essential that the results of any tests be relevant to actual disease/environmental challenge in the commercial environment. The use of genetic markers as indicators of immune function is being explored by breeding companies. Utilizing genetic markers would eliminate many of the limitations currently encountered by commercial breeding companies in enhancing immune function. Information on genetic markers could allow selection to proceed without subjecting breeding stock to disease conditions, and could be done before production traits are measured. These markers could either be candidate genes with known interaction/involvement with disease pathology, or DNA markers that are closely linked to genetic regions that influence the immune response. The current major limitation to this approach is the paucity of mapped chicken immune response genes and the limited number of DNA markers mapped on the chicken genome. These limitations should be removed once the chicken genome is sequenced.

Key Words: Lelection, Immune response, Genetic markers, DNA analysis

Environment and Management - Breeders and Incubation

13 The impact of varying nutrient allocation from photostimulation on carcass and reproductive traits of conventional and high-yield broiler breeder females.

R. A. Renema* and F. E. Robinson, *University of Alberta, Edmonton, AB., Canada.*

This study assessed the reproductive impact of genetic selection for growth and breast muscle yield on the sensitivity to overfeeding in female broiler breeders. Birds of three strains: Random-bred Strain 20 (RB20, unselected since 1977), Ross 308, and Ross 508 were assigned to one of three feeding levels from photostimulation (100%, 120%, and 140% of the amount needed to maintain the standard Ross 508 growth curve [Aviagen]). Pullets were reared on a common growth curve in light-tight conditions, 78 birds per strain were randomly assigned to a feeding treatment and individually caged at 20 wk, and photostimulated at 22 wk. A group of 90 birds were dissected at sexual maturity (SM) (first oviposition) to assess carcass and reproductive traits. An additional 144 birds were kept until 58 wk to monitor egg production, fertility and hatchability. Timing of SM was affected by strain, with the RB20, Ross 508 and Ross 308 birds laying eggs 16.5, 20.2, and 27.4 d after photostimulation, on average. The 120 and 140% treatments added 5.3% and 9.7% to BW at SM, respectively. The Ross 508 birds had the highest amount of breast muscle at SM (17.9%). RB20 hens were the fattest, reflecting the less efficient growth of their older genetics. Strain did not affect the number of ovarian large yellow follicles (LYF) ($>$10 mm diameter), although the Ross 308 ovary (59 g) was bigger than that of Ross 508 (51 g) or RB20 (46 g) birds. Egg production was most affected by feed, with 166, 159, and 137 settable eggs produced by the 100, 120, and 140% groups, respectively. Ross 508 birds were most sensitive to overfeeding, producing 177 eggs with the 100% feed compared to 123 eggs on the 140% feed, while unsettable eggs increased from 1.7 to 6.7%. Only 2.3% of RB20 eggs were unsettable compared to 5.1 and 4.0% of Ross 308 and 508 eggs, on average. The detrimental effects of overfeeding are more pronounced in modern, high breast yield strains.

Key Words: Broiler breeder, Sexual maturity, Feed allocation, Egg production, Genetic strain

14 Effect of nutrient density and time of photostimulation on reproduction in fast- and slow-feathering turkey hens.

V. R. Sikur*[1], F. E. Robinson[1], D. R. Korver[1], R. A. Renema[1], and M. J. Zuidhof[2], [1]*University of Alberta*, [2]*Alberta Agriculture, Food and Rural Development.*

Chickens have been sexed on the basis of feather growth for many years, but the slow feathering gene has only recently been incorporated into a line of turkeys. This study was conducted to compare fast and slow feathering turkey females in regard to body weight (BW) gain, carcass composition and reproductive fitness. A total of 864 fast-feathering (FF) and slow-feathering (SF) poults were fed either a control (CON) or a high-energy, high-protein (HIGH) diet. Birds were photostimulated at 29 or 31 wk. Data on body weight (BW) and carcass characteristics (girth, shank, keel, breast width, breast muscle, fatpad, liver, ovary and oviduct) and egg production were assessed over the course of the trial. At photostimulation (PSTIM), FF birds had increased shank length (2.6%) and breast width (5.6%) when compared to SF birds. After photostimulation, FF birds were heavier than SF birds, to a maximum of 7.8%. FF hens had greater stroma weight (25%), ovary weight (49%), oviduct weight (52%), keel length (2.8%), number of LYF by one follicle at the end of lay, and BW in both strains during peak egg production. Number of LYF was higher in delay photostimulated birds (8.3) compared to birds photostimulated 2 wk earlier (7.8). Absolute ovary weight and oviduct weight increased by 21% and 18% respectively in 31 wk birds compared to 29 wk birds. These effects of delayed photostimulation were magnified in SF birds. FF hens had significantly higher % egg production (55 vs. 33%), peak production (76 vs. 68%), sequence length (5.7 vs. 3.3 d) and persistency, as well as increased pause length (1.5 vs. 1.8 d) compared to SF hens. Delaying photostimulation did not affect total egg production but reduced the number of double-yolked eggs. These data suggest that FF birds are heavier and have increased egg production when compared to SF birds, but delaying photostimulation has a positive effect on reproductive fitness.

Key Words: Turkeys, Feather sexing, Reproductive efficiency, Carcass composition