Nutritional Influences on Turkey Poult Performance

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The studies outlined in this paper were the result of further exploration of "Light Turkey Syndrome" (LTS) from a nutrition and management standpoint. Observations from field trials (Calvert, 2012) in commercial and research turkey flocks yielded several important conclusions regarding differences in light and heavy populations of poults from various farms. Not entirely unexpectedly, flock differences were more apparent than differences among heavy and light poults within the same flock. Differences among flocks and weight group were found in various parts of the gut relative to immune development and response. Heavy weight poults appeared to have a faster maturing and healthier immune system because of the presence of gut lymphocytes. In contrast, light poults tended to have increased heterophils in the gut and bursal atrophy probably due to infection. The results of the field trial indicated that in some flocks, light weight poults in comparison to heavy weight poults had more disease challenge and had an immature gut immune system development but this was not consistent across all flocks. The development of the gut in poultry after hatch is of tremendous important as related to its function. One as alluded to earlier is that the gut is one of the major immune organs of the bird. Secondly, and probably more obvious is the function of digestion and nutrient absorption. Several reviews have been written on these topics (Bohorquiez & Ferket, 2011; Choct, 2009; Friedman and Bar-Shira, 2005). An important take-home message from these reviews is that there is a critical window of opportunity both before hatch and shortly after hatch to develop the gut and its functionality. Provision of nutrition and/or Intake of food shortly after hatch is necessary to start the development of the gut and establish the microbial community. Lack of access to feed shortly after hatch or lack of feed intake delays both the development of gut for digestive purposes as well immunity.

Other fast growing livestock species (broilers and swine) are examining if specialized starter diets are needed. Approaches include increasing nutrient density, specialized feed additives, and highly digestible feed ingredients. The funded studies examined inclusion of specific amino acids and protein level for testing in poults from early lay and mid to late lay turkey breeders; along with an assessment of protein source in the starter diet. Threonine was examined because of its importance in gut integrity and health, amino acid density because of its role in growth, and finally, protein quality source. The objective of the studies was to determine the impact of the dietary regimen fed up to 6 wks of age on brooding and subsequent tom market performance.

The design of each study was similar with two feed formulation periods (0-2 wks and 2-6 wks) followed by rearing all the turkeys in a group setting and fed commercial type diets to market age. Diets were fed to male turkey poults obtained from early (1 to 2 wks of lay) and older aged breeder hens (Nicholas). Body weights were taken at the end of each feeding period and at market; and, sampling of the gastrointestinal tract at various ages was obtained to assess gut development. Portions of this data were presented in 2012 but the studies were incomplete.

Study 1. Different ratios of threonine to lysine (digestible) were used to formulate diets with a range in ratio of 54 to 66%. Amino acids other than threonine approximated Nicholas recommendations with threonine above and below Nicholas primary breeder recommendations.

Thr affected weight to 2 wks of age with no carry over effect to for body weight at 18 wks of age but gain during 6-18 wks of age was greater at the higher ratio (66%) especially for poults from mid-lay breeders. Based on performance to 6 wks of age, the optimal ratio of thr to lysine was found to be 58% but there was some benefit to feeding a ratio of 66% on gain post 6 wks of age particularly for the poults from older breeders. Poults from early lay breeders had lowered weights at placement and also at market but still exceeded the breed performance standards.

Study 2. Different dietary amino acid densities were fed to male turkeys using the thr ratio of 58% and diets were formulated on an ideal amino acid basis with the level ranging from NRC (1994) and then increasing to Nicholas primary breeder commercial recommendations (L1, L2, L3, L4). Starter dietary protein affected body weight to 6 wks of age and continued to influence growth to market at 18 wks of age despite all birds being fed the same diet after 6 wk of age. Amino acid density affected intestinal weight and length in a non-linear manner. In general, depending on age, L3 or L4 diets tended to have heaviest gut weight and longer length particularly in the jejunal and ileal sections. Poults from early lay breeders had lowered weights at placement to 3 wks of age but weight at 6 wks and market was no different for poults from older breeders. However, poults from older breeders responded to higher levels of amino acids with a heavier body weight than those poults from young breeders.

In summary, starting diet amino acid density played the largest role in terms of early nutrition impacting market weight. The one study showed that turkeys are very responsive to amino acid levels with changes in body weight and that initial diet amino acid density has long term effects to market. While diet nutrient density is important, feed intake level needs to be considered as well. In Study 2, the **difference** in amino acid intake between diets L1 and L4 (low to high amino acid density) was an increase in poult intake of approximately 11.1 grams and 6.4 grams of digestible lysine and threonine, respectively, per turkey poult over the 42 day experimental period which ultimately resulted in a difference of .74 lbs body weight at 42 days of age and an improved market weight at 18 wks of age. These are very small differences in amino acid intake. As such it is important then to get poults started on feed as soon as possible in the brood barn and to keep birds on feed after placement. Feed quality, presentation, access, bird density, poult feeding behavior, and environmental conditions will determine actual intake levels. Additional studies are needed to determine the appropriate amino acid density to energy level for poults from different age breeders since there were some indication of differences in response for the tom poults from different aged hens such that poults from young hens didn't respond as well to the higher amino acid levels.

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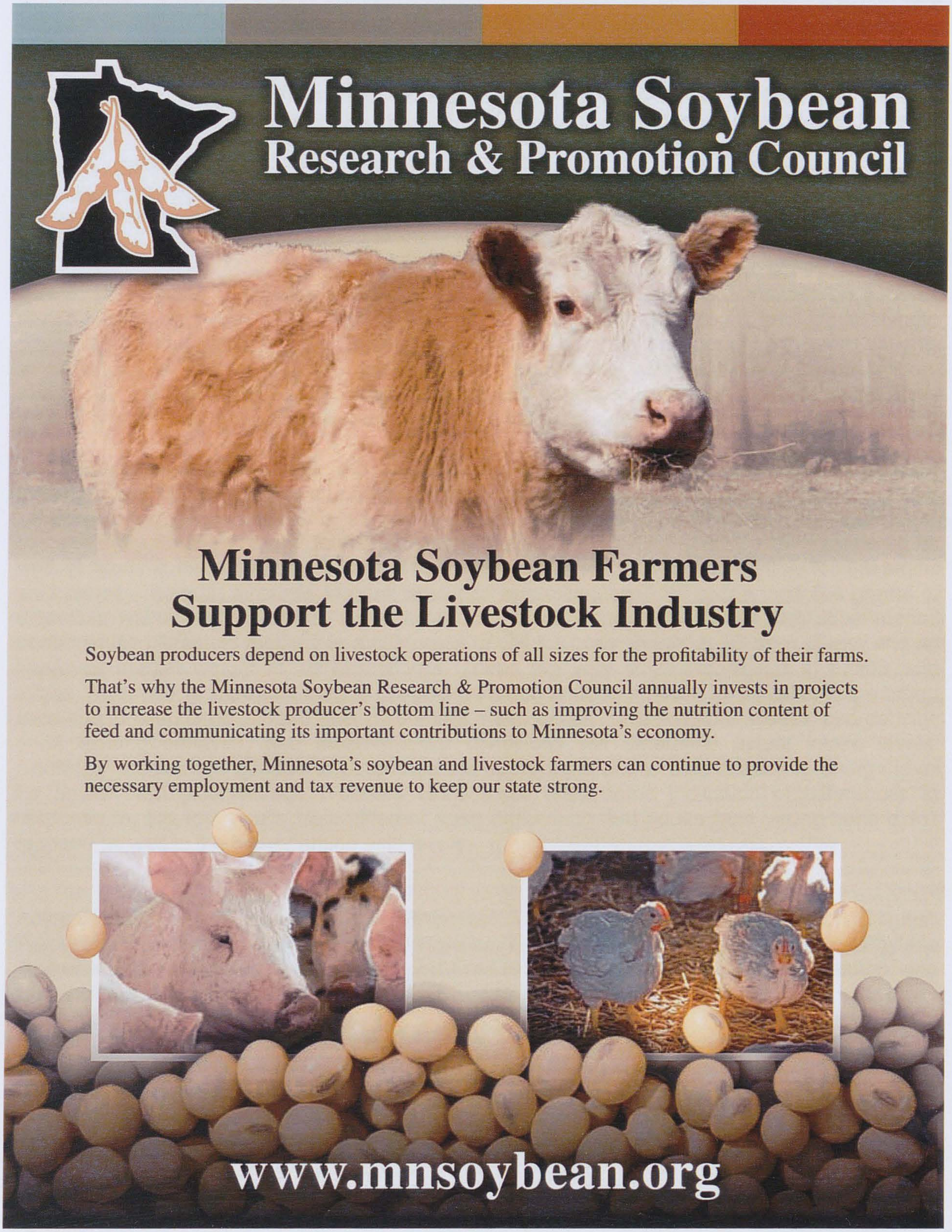
Notes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