ORGAN DIMENSIONS FOR BROILERS HATCHED FROM EGGS FROM DIFFERENT BREEDER AGES AND FED INCREASING LEVELS OF DIGESTIBLE THREONINE IN PRE-STARTER DIETS

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Abstract. Threonine is an amino acid present in higher concentration in mucus, which affects muscular and intestinal development. We conducted this experiment to evaluate broiler chicks from different breeder ages, fed increasing levels of digestible threonine. In the experimental facilities of UFG in Goiania, Brazil, we raised 480 day-old Cobb 500 chicks obtained from breeders at 36 and 52 weeks of age. Chicks were fed experimental diets containing 800, 900, 1000 and 1100 mg/kg of digestible threonine per kg of diet, according to nutritional requirements proposed by the Brazilian tables. After fasting for six hours, five chicks per treatment at seven days of age were sampled to obtain proventriculus + gizzard, liver and spleen relative weights and small and gross intestine relative weights and length. The experiment was analyzed by ANOVA as a completely randomized design in a 2 x 4 factorial arrangement with five replicates of 12 birds each. No interaction was observed among treatments. Total intestine decreased with the increase in digestible threonine levels, and the higher results were observed for 800 and 900 mg/kg in diet. We observed no effect of breeder age and digestible threonine levels on the other variables. It is possible to conclude that organ dimensions were not affected by increased digestible threonine levels in pre-starter diets and breeder age.

Keywords: amino acid, gastrointestinal tract, intestines, organ development

Introduction

Brazilian broiler industry has been growing faster since the 1970’s, which has turned the country into the third world producer and the first in exporting. In 2010, Brazilian productivity reached 12.23 million tons of meat, resulting in an increment of 11.4% compared to the amount produced in 2009, 10.98 million tons (UBABEF, 2011). According to the Brazilian Ministry of Agriculture, it is expected that the broiler meat will represent 48.1% of the world exportations. These expectancies must be the result of a great increment in the research on health, nutrition and management, which resulted in competitive gains in the meat protein world market.

Breeder age has been evidenced as one of the most important factors that influence pre-hatching, which affects the eggshell and egg internal quality, egg weight and the quality of newborn chick. Differences related to the breeder age can explain why chicks hatched from young breeders show increased mortality rates and reduced performance (VIEIRA & MORAN Jr., 1998).

In the broiler industry, feeding represents about 70% of the production cost, and is a factor of importance and concern for poultry producers and nutritionists (NASCIMENTO et al., 2005). Considering this fact, lots of measures must be taken, such as the use of synthetic amino acids in diets applying the ideal protein and digestible amino acid concept, in order to increase performance and productivity. In this way, it is possible to increase the conversion of
dietetic protein into body protein (SOARES, 1997). To increase digestion and absorption, the intestinal mucosa must present the adequate functional and morphological characteristics. Absorption process depends on the mucosal transport mechanisms, which occur through the epithelial cells of the intestinal mucosa, and the intestinal integrity is fundamental because of the importance of this tissue in chick development (MAIORKA, 2004). Threonine, the third limiting amino acid for broilers, is required due to its participation in body protein and feather formation, protein turnover and body maintenance, and its assistance in collagen and elastin formation, which act in antibodies formation (FERNANDEZ et al. 1994; SÁ et al., 2007). This amino acid may present different functions, such as to constitute mucosa cells, to participate in mucus and digestive enzymes formation. Moreover, some proteins of the immune system are particularly rich in this amino acid (WU, 1998).

In this work, we aimed to evaluate the interaction of breeder age and increasing levels of digestible threonine supplementation in pre-starter diets and their effect on gastrointestinal organs dimensions.

Material and Methods

The experiment was conducted in the experimental facilities of the Veterinary and Animal Science College EVZ/UFG – Goiania, Goias, Brazil. We used a total of 480 Cobb 500 day-old chicks, vaccinated against Marek disease in the hatchery, obtained from eggs produced by 36 and 52 weeks of age breeders. Chicks were fed diets containing four levels of digestible threonine, 800, 900, 1000 and 1100 mg/kg. Diets were based of corn and soybean meal, attending the nutritional recommendations and feed composition proposed by the Brazilian tables (ROSTAGNO et al., 2011)

A total of five chicks per treatment at seven days of age were euthanized after six hours of fast, for the collection and weighing of viscera. The organs collected were proventriculus + gizzard (PVG), liver, spleen, bursa and total intestines (PIT). The intestinal length were obtained for small (SIL), gross (GIL) and total intestines.

Statistical analysis was performed by the GLM procedure of SAS for the completely randomized design in a 2 x 4 factorial arrangement (breeder age x digestible threonine levels), totaling eight treatments and five replicates with 12 chicks each. Tukey test (5% probability) and polynomial regression were used for average comparison.

Results and Discussion

The results (Table 1), showed no statistical interaction between digestible threonine and breeder age for the tested variables. Digestible threonine levels in diets influenced the total intestine weight at seven days of age and the best results were observed for 800 and 900 mg/kg. These results can be explained by the positive effect in the intestinal villus and muscle cells development promoted by amino acid supplementation (SOUZA et al., 2005).

Lymphoid organ weight can reflect the immunological ability of chicks in a challenge (HECKERT et al., 2002). This immune system is mediated by chemical compounds based on protein, such as antibodies, immunoglobulins and cytokines, and these compounds depend on nutrient availability (LI et al., 2007). We observed no effect of threonine levels on bursa relative weight, but the older breeders produced chicks with higher bursa weight, which is a good indicator of the immune function of these animals.
Conclusion

In the experimental conditions, it is possible to conclude that breeder age and digestible threonine levels do not affect organ dimensions of chicks at seven days of age.

Literature cited


Table 1 – Relative weights and organ lengths for broilers obtained from eggs of two breeder ages and fed increasing levels of digestible threonine in pre-starter diets

<table>
<thead>
<tr>
<th>Breeder age</th>
<th>Proventriculus+gizzard</th>
<th>Liver</th>
<th>Spleen</th>
<th>Bursa</th>
<th>Total intestines</th>
<th>Small intestine</th>
<th>Gross intestine</th>
<th>Total intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 weeks</td>
<td>7.23</td>
<td>4.00</td>
<td>0.08</td>
<td>0.17 B</td>
<td>7.14</td>
<td>75.21</td>
<td>12.00</td>
<td>87.21</td>
</tr>
<tr>
<td>49 weeks</td>
<td>7.19</td>
<td>4.04</td>
<td>0.10</td>
<td>0.21 A</td>
<td>7.16</td>
<td>79.71</td>
<td>10.66</td>
<td>90.38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digestible threonine levels</th>
<th>Proventriculus+gizzard</th>
<th>Liver</th>
<th>Spleen</th>
<th>Bursa</th>
<th>Total intestines</th>
<th>Small intestine</th>
<th>Gross intestine</th>
<th>Total intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>7.22</td>
<td>4.02</td>
<td>0.07</td>
<td>0.18</td>
<td>7.33</td>
<td>73.60</td>
<td>11.10</td>
<td>84.70</td>
</tr>
<tr>
<td>900</td>
<td>7.60</td>
<td>4.18</td>
<td>0.08</td>
<td>0.18</td>
<td>7.90</td>
<td>80.10</td>
<td>10.50</td>
<td>90.60</td>
</tr>
<tr>
<td>1000</td>
<td>7.00</td>
<td>3.95</td>
<td>0.09</td>
<td>0.21</td>
<td>6.58</td>
<td>76.00</td>
<td>12.70</td>
<td>88.70</td>
</tr>
<tr>
<td>1100</td>
<td>7.00</td>
<td>3.91</td>
<td>0.11</td>
<td>0.19</td>
<td>6.99</td>
<td>80.60</td>
<td>10.90</td>
<td>91.50</td>
</tr>
</tbody>
</table>

Averages followed by similar letters indicates no significant different results by Tukey test (p<0.05). \(^1 Y = -6.8265 + 0.0066377X / R^2 = 0.82 \)