STUDY OF THE INTESTINAL STRUCTURE OF BROILERS FED WITH DIFFERENT LEVELS OF SODIUM BUTYRATE

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ABSTRACT
Comparisons of 5 different levels of sodium butyrate (SB) were carried out, with or without the associated minerovitamins mixture supplemented with essential amino acids (eAA) and additives for phase I (P I), 1-15 days old, resulting in ten treatments in total, to determine the best dosage for SB on a starter feed. In the diets for phase II (P II), 16-36 days old, there was no feed mixture and just one level of SB in the treatments for samples 2 to 5 and 7 to 10. The samples 1 and 6 were the control group without SB. We used a total of 960 chicks that were distributed into ten experimental treatments, with 8 repetitions per cage per treatment and 12 birds per cage, with a total of 80 cages. At 15, 25 and 35 days, 1 animal per cage was weighed and slaughtered. The size of the duodenum, jejunum and ileum were taken and the measured. The intestinal epithelium (duodenum and jejunum) was observed by optical microscopy to determine the morphometric variables, such as longitudes of villosities and width of the muscular wall. In conclusion, although there were few statistically significant responses, the use of SB added with a mixture of eAA in a starter feed showed a positive result, especially in P I. In P II, the results at 35 days demonstrated a subtle, but not significant trend for the animals that had consumed feed II, possibly due to a residual effect at this age.

KEYWORDS: broilers, sodium butyrate, intestinal epithelium, amino acids.

INTRODUCTION
The incorporation of additives in the manufacture of compound feed depends on different factors such as logistics, handling and various industrial processes that make up the manufacture of feed, since the ultimate goal of the inclusion of any feed additive is present in I think the whole game previously made to the dose calculated by the nutritionist in a homogeneous way (Gonzalez, 2006). With the ban in the European Union preventively the use of antibiotic growth promoters (AGC), emerged the need to propose alternatives broiler producers to enable them to produce healthy animals, maintain production yields and obtain microbiologically safe products (Gregori, 2007). The natural acids present in the gastrointestinal tract (GIT) may be alternatives as substitutes for antibiotic growth promoters, even products that would be present naturally in small quantities; we feel that synth can be a good option. The incorporation of different organic acids to think this is one of the alternatives to antibiotic growth promoters used more pigs (Partanen, 2001). Recent studies suggest that sodium butyrate may be an effective alternative to antibiotic growth promoters in both piglets (Manzanilla et al. 2006) and in broilers (Hu and Guo, 2007).

The exogenous contribution of undissociated sodium butyrate (SB) seems
to be increasing the size of the intestinal villi, thus increasing the surface absorption of nutrients (Galfi and Bokori, 1990, Hu and Guo, 2007), favors local immunity of the intestinal system (Roselli et al., 2005) and stimulates increased amylase secretion by pancreatic exocrine system (Sileikiene et al., 2005).

**MATERIALS AND METHODS**

Experimental development has been conducted in the Superior Technical School of Agricultural Engineering of the Universidad Politecnica de Madrid and The pathological and histological analysis performed at the Department of Animal Medicine and Surgery, Faculty of Veterinary Medicine, Universidad Complutense de Madrid, Spain. We work with a total of 960 chicks (Cobb-500) 1 day old, from a commercial hatchery. The objective was to determine the best utilization of sodium butyrate in the diet of chickens. The animals were divided into ten experimental treatments (TMT), with 8 replicates / cages per treatment and 12 chicks per cage, with a total of 80 cages and 960 chicks. The factorial design was composed of 2 feed with 5 levels of SB according to Table 1. The TMT / feed were supplemented with SB at different levels (% SB / feed) only in the first age (feed start). Treatments 7 to 10 were added a core or a commercial spell incorporation of minerals and essential amino acids (EAA). Factorial design was used to check whether there is any interaction between sodium butyrate supplementation and the use of EAA.

The chicks were reared in two phases, called Phase I of zero to 15 days and Phase II from 16 to 35 days. All chickens were monitored daily and weighed once a week. The days 15, 25 and 35 were weighed and sacrificed an animal per cage, and measured duodenum, jejunum and ileum. Of each slaughtered bird was taken a sample of duodenum and jejunum 5 cm for histology, the area of sampling was the midpoint between the insertion of the bile ducts and Meckel’s diverticulum. Samples fixed in formalin 10% clogged, were embedded in paraffin. Serial cuts of 5 microns thick were stained with hematoxylin-eosin. After carving the duodenum and jejunum, bowel fragments were elected washed with water (Photo 01) to remove all the contents of the intestinal lumen before starting the tapes properly identified.

The morphometric variables of the intestinal epithelium that were evaluated (Photo 02) are the height (from the apex of the villus to the crypt junction) and width of the muscle. In morphometric measurements were taken into account only the villi with a well-defined vertical orientation were measured 10 villi from

<table>
<thead>
<tr>
<th>Table 1</th>
<th>0</th>
<th>0,15%</th>
<th>0,30%</th>
<th>0,45%</th>
<th>0,60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pienso I (sin Núcleo AAe)</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
<td>T4</td>
<td>T5</td>
</tr>
<tr>
<td>Pienso II (sin Núcleo AAe)</td>
<td>T6</td>
<td>T7</td>
<td>T8</td>
<td>T9</td>
<td>T10</td>
</tr>
</tbody>
</table>
each section and the average value was used in the statistical analyzes that were performed using Statistical procedures Analyses Systems (SAS INSTITUTE, 1990). Separations of means, when the effects of a factor were significant, tests were performed by Duncan’s multiple range (RUÍZ-MAYA, 1986).

RESULTS AND DISCUSSION

For measures of length of bowel, duodenum, jejunum and ileum in centimeters during the phase I trial with 15 days of age (Table 2 and Grafic 01), no statistically significant difference occurred.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intestino cm</td>
<td>Duodeno cm</td>
<td>Yeuno cm</td>
</tr>
<tr>
<td>I</td>
<td>114,44</td>
<td>19,38</td>
</tr>
<tr>
<td>II</td>
<td>113,43</td>
<td>19,52</td>
</tr>
<tr>
<td>P</td>
<td>0,415</td>
<td>0,631</td>
</tr>
</tbody>
</table>

(P<0,05) 1N: número de observaciones.

The use of organic acids in chicken diets, requires adaptations, occurring essential anatomical and physiological differences in their GIT’s. We must consider the aspects related to lower lengths and food transit time in GIT and its large pepsinogénio secretory capacity and hydrochloric acid in the proventriculus (Long, 1967, quoted by Rutz, 1994) and the activity of enzymes from the first day of life (Klasing, 1998). For microscopic measurements of villus of duodenum, muscle of duodenum, jejunum and villi of jejunum muscle in millimeters during the phase I trial with 15 days of age there were no significant differences. The lengths of the total intestine, duodenum, jejunum and ileum in centimeters and weight of chickens with 25 days of age, depending on the feed and of the dose of butyrate showed no significant difference. It can be a small positive trend for feed II in all measures of intestine length, duodenum, jejunum and ileum. Measurements of length of bowel, duodenum, jejunum and ileum in centimeters and weights of chickens 35 days old, depending on the feed and the dose of butyrate, no significant differences. No significant differences in the variables villus of intestine, muscle of duodenum, jejunum and villi of jejunum muscle in millimeters and weights of chickens 25 days old, depending on the feed and the dose of butyrate.

CONCLUSION

As for the variables: length of intestine, villus height of duodenum and jejunum, and muscle thickness of duodenum and jejunum, during the phase I trial with 15 days of age, no significant differences in the different treatments studied. Similarly no significant differences in these variables from chickens 25 days with 35 dias de nor age. In general, we can conclude that the conditions in which this research was
carried, although there were few statistically significant responses, we can consider that the use of sodium butyrate added to a mixture of essential amino acids, was slightly beneficial, especially in the Phase I, but also interfered with some variables along phase II. Therefore, we consider very important to follow studying the natural acids, particularly butyric acid and its most appropriate dose, either alone or with other additives.

REFERENCES


