Efficacy of anticoccidial shuttle programs with different withdrawal periods

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Abstract

The current study compares the efficacy of anticoccidial shuttle programs with different withdrawal period (0-, 5- and 10 days) in a 40 days grow out floor pen trial. The following shuttles have been compared with untreated control: nicarbazin/narasin till day 18 followed by narasin till day 40; nicarbazin/narasin till day 28 followed by narasin till day 40; nicarbazin/narasin till day 18 followed by lasalocid till day 35; decoquinate till day 18 - lasalocid till day 35 and decoquinate till day 18 - lasalocid till day 30.

All treated groups showed statistically higher BWG and better FCR in comparison to untreated group, showing that all tested programs provided good coccidiosis control. Moreover, there was no statistically significant difference between the groups with different withdrawal period.

The EPEF was statistically higher in the treated groups. The highest EPEF was provided in the groups where decoquinate or nicarbazin/narasin had been used in the starter feed and lasalocid in the grower feed. Even though lasalocid has been used with 5- or 10 days withdrawal period, while narasin with 0 days, there was no statistically significant difference between them.

Key words

Coccidiosis, program, efficacy, Avatec, Maxiban, Deccox, Monteban

Introduction

Coccidiosis is a parasitic disease caused by protozoa (coccidia) of the genus \textit{Eimeria}. Coccidia can occur in the gastrointestinal tract of all poultry species. Parasites enter in the intestinal epithelial cells and thus damage the intestinal wall or the underlying tissue and cause local inflammation. Damage to the intestinal wall will reduce the capacity to absorb nutrients. This results in a poorer digestion of nutrients. Severe coccidiosis can even increase mortality. Poor digestion and increased mortality of course will have big financial consequences (Williams R.B., 1999). The use of anticoccidial drugs in feed is a widely used method to decrease the consequences of coccidiosis. Anticoccidia can be divided into two groups: synthetic (chemicals) and ionophores. The ionophore group is sub-divided in subfamilies: monovalent, divalent and monovalent glycoside. To prevent (cross-)resistance, it is advised to change regularly between anticoccidials with a different mode of action (belonging to different groups). However, in order to secure the consumer safety, the application of most of the anticoccidial products requires respective withdrawal times (period of time before slaughter, when birds are not supplemented with the product).
In practice, during the starter period, broilers will often be fed a diet supplemented with a chemical or a combination of chemical and ionophore coccidiostat. In the grower period most broilers are fed a diet supplemented with an ionophore coccidiostat. In the finisher period the broilers will be fed a diet without anticoccidial or a diet supplemented with a product without a withdrawal period. Since a high number of coccidiostats are available, several shuttle programs can be used to protect the broilers against coccidiosis.

In this experiment five different shuttle programs with different withdrawal periods were tested in comparison with a non-treated control for the effects on production performance under field coccidiosis pressure.

Materials and methods

The current study was carried out as a floor pen trial involving 2160 male Ross 308 broilers. The trial was designed to mimic field coccidiosis pressure. At eight days of age, six broilers per pen were inoculated with 1 ml of inoculum into the crop. One ml of the inoculum contained *E. acervulina* (150,000 oocysts), *E. tenella* (15,000 oocysts) and *E. maxima* (15,000 oocysts). The inoculation dose was beforehand determined through titration in order to achieve a lesion score of about 3 in the untreated inoculated broilers on the scale of Johnson and Reid (1970). The inoculation was aimed to cause clinical coccidiosis and subsequent oocyst shedding which should naturally infect the uninfected birds in the pen, thus mimic field infection.

The trial took place at the floor pen facility of Schothorst Feed Research B.V. It started on 10/03/2011 and finished on 19/04/2011 with a total duration of the grow-out period of 40 days. Standard management and vaccination program (IB, ND and IBD) was employed.

The test birds were distributed in 6 groups – 5 treatment groups and one infected untreated control group (IUC). Each group consisted of 6 replicates of 60 broilers each. The dose of the anticoccidial products and the withdrawal times in the different groups can be found in table 1.

Table 1. Treatment groups

<table>
<thead>
<tr>
<th>Age</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18</td>
<td>--</td>
<td>narasin 50ppm, nicarbazin 50ppm</td>
<td>narasin 50ppm, nicarbazin 50ppm</td>
<td>decoquinate 30ppm</td>
<td>decoquinate 30ppm</td>
<td>narasin 50ppm, nicarbazin 50ppm</td>
</tr>
<tr>
<td>18-28</td>
<td>--</td>
<td>narasin 50ppm, nicarbazin 50ppm</td>
<td>narasin 70ppm</td>
<td>lasalocid 100 ppm</td>
<td>lasalocid 100 ppm</td>
<td>lasalocid 100 ppm</td>
</tr>
<tr>
<td>28-30</td>
<td>--</td>
<td>narasin 70ppm</td>
<td>narasin 70ppm</td>
<td>lasalocid 100 ppm</td>
<td>lasalocid 100 ppm</td>
<td>lasalocid 100 ppm</td>
</tr>
<tr>
<td>30-35</td>
<td>--</td>
<td>narasin 70ppm</td>
<td>narasin 70ppm</td>
<td>--</td>
<td>lasalocid 100 ppm</td>
<td>--</td>
</tr>
<tr>
<td>35-40</td>
<td>--</td>
<td>narasin 70ppm</td>
<td>narasin 70ppm</td>
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</tr>
</tbody>
</table>
Measurements

The following parameters have been followed:

- Body weight gain (BWG)
- Feed intake
- Feed conversion ratio (FCR)
  - True
  - Corrected $\text{FCR}_{2500} = \text{FCR}_{\text{day 40}} - (\text{BW}_{\text{day 40}} - 2500)/10000*4$
- Mortality
- EPEF (European Production Efficiency Factor)
  - $\text{EPEF} = 10 \times (\text{average daily BWG} \times \text{survival rate})/\text{FCR}$
- Litter quality
  - Litter was scored on 28d of age on a scale of 0-10 in which a score of 0 corresponds with low litter quality (wet) and score 10 corresponds with high litter quality (dry).

Statistical analyses

Raw data were analyzed for outliers. Significant outliers were excluded from the statistical analysis. The experimental data were statistically analyzed by ANOVA using Genstat according to the following model:

$$Y_{ij} = \mu + \text{Block}_i + \text{Treatment}_j + e_{ij}$$

Where:

- $Y$ is Response parameter
- $\mu$ is General mean
- Block is Effect of block ($i=1...6$)
- Treatment is Effect of coccidiostat treatment ($j=1...5$)
- $e$ is Error term

The P-value from the statistical analyses and the LSD (least significant difference at $P = 0.05$) are presented per response parameter. Effects with $P \leq 0.05$ are considered statistically significant, whereas $0.05 < P \leq 0.10$ is considered a near-significant trend. In case the overall ANOVA indicated a significant treatment effect, means were compared by the least significant difference.

Results

The results of the trial are presented in table 2.
Table 2. Production performance and litter quality of the broilers for the total period per treatment

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18</td>
<td>--</td>
<td>nar+nic</td>
<td>nar+nic</td>
<td>dec</td>
<td>dec</td>
<td>nar+nic</td>
</tr>
<tr>
<td>18-28</td>
<td>--</td>
<td>nar+nic</td>
<td>nar</td>
<td>las</td>
<td>las</td>
<td>las</td>
</tr>
<tr>
<td>28-30</td>
<td>--</td>
<td>nar</td>
<td>nar</td>
<td>las</td>
<td>las</td>
<td>las</td>
</tr>
<tr>
<td>30-35</td>
<td>--</td>
<td>nar</td>
<td>nar</td>
<td>--</td>
<td>las</td>
<td>--</td>
</tr>
<tr>
<td>35-40</td>
<td>--</td>
<td>nar</td>
<td>nar</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>LSD</td>
<td></td>
<td>P-value</td>
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</tbody>
</table>

0-40

Body weight gain (g) 2761<sup>b</sup> 2875<sup>A</sup> 2868<sup>A</sup> 2864<sup>AB</sup> 2935<sup>A</sup> 2868<sup>A</sup> 104.6 0.068
Feed intake (g) 4672 4623 4714 4663 4774 4659 156.3 0.439
FCR (g/g) 1.692<sup>c</sup> 1.609<sup>a</sup> 1.644<sup>b</sup> 1.629<sup>a</sup> 1.626<sup>a</sup> 1.625<sup>a</sup> 0.0314 <0.001
FCR 2500 (g/g) 1.570<sup>b</sup> 1.441<sup>a</sup> 1.480<sup>a</sup> 1.466<sup>a</sup> 1.435<sup>a</sup> 1.461<sup>a</sup> 0.062 0.003
Mortality (%) 3.1 5.3 2.3 2.5 2.6 1.8 2.56 0.112
EPEF 392<sup>b</sup> 422<sup>a</sup> 426<sup>a</sup> 429<sup>a</sup> 438<sup>a</sup> 434<sup>a</sup> 22.6 0.006
Litter quality 4.5<sup>b</sup> 7.3<sup>a</sup> 7.0<sup>a</sup> 6.5<sup>a</sup> 6.0<sup>ab</sup> 6.2<sup>a</sup> 1.59 0.02

<sup>abc</sup> values without a common superscript within a row differ significantly

<sup>1</sup> FCR 2500 = FCR corrected to 2500 grams (0.01 per 25 grams)

Discussion and Conclusion

All treated groups showed statistically higher BWG and better FCR in comparison to untreated group, showing that coccidiosis significantly impaired the performance of the untreated control and all tested programs provided good coccidiosis control. Moreover, there was no statistically significant difference between the groups with different withdrawal period.

The EPEF was statistically higher in the treated groups. The highest EPEF was provided in the groups where decoquinate or nicarbazin/narasin had been used in the starter feed and lasalocid in the grower feed.

Even though lasalocid has been used with 5- or 10 days withdrawal period, while narasin with 0 days, there was no statistically significant difference between them.

Summary
Coccidiosis is one of the most economically important diseases in broilers. If not controlled efficiently it might cause huge economical losses. The most widely used prevention tool is the application of in feed anticoccidial drugs. These are different compounds, which are not detrimental for the birds at their recommended dosage, but prevent the parasite to multiply or survive, thus preventing the development of the disease. However, in order to secure the consumer safety, the application of most of the anticoccidial products require respective withdrawal times (period of time before slaughter when birds are not supplemented with the product).

The current paper compares the efficacy of several different anticoccidial shuttle programs with different withdrawal periods (0-, 5- and 10- days). Male 308 Ross birds have been used in a grow-out period of 40 days in a floor pen trial under moderate coccidosis pressure. The following anticoccidial programs have been tested: narasin+nicarbazin till day 18 followed by narasin till day 40; narasin+nicarbazin till day 28 followed by narasin till day 40; narasin+nicarbazin till day 18 followed by lasalocid till day 35; decoquinate till day 18 followed by lasalocid till day 35 and decoquinate till day 18 followed by lasalocid till day 35.

All treated groups showed statistically higher BWG and better FCR in comparison to non-treated group, thus showing that all tested programs provided efficient coccidiosis control. Moreover, there was no statistically significant difference between the groups with 0-, 5- and 10-days withdrawal period.

The EPEF was also statistically higher in the treated groups in comparison to the untreated one. The highest EPEF was provided in the groups where decoquinate or narasin+nicarbazin have been used in the starter feed and lasalocid in the grower feed.

Even though lasalocid has been used with 5- or 10-days withdrawal period while narasin with 0-days there was no statistically significant difference between them.

References
