The Role of Narasin in Poultry Health: A Review

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Abbreviated Title: Narasin in poultry health

Coccidiosis is likely the most costly disease threat to global poultry production and prevention of coccidiosis is essential in order to maintain intestinal integrity and the efficient absorption of nutrients in the chicken. Narasin is an ionophore anticoccidial. Ionophores transport cations such as sodium across the pellicle membrane of sporozoites of coccidia, resulting in a lethal osmotic imbalance and the death of the coccidia. This paper reviews the role of narasin in poultry health and its unique properties that set it apart from other ionophore anticoccidials, thus making narasin an ideal anticoccidial in protecting the intestinal integrity of broiler chickens and assuring optimal growth performance.

Keywords: narasin, coccidia (Eimeria), poultry, ionophores, necrotic enteritis

Introduction

Coccidiosis is a very costly disease on a global basis and continuous prophylactic control of this disease is required in order to maintain intestinal integrity and profitability in poultry production (Chapman, 2009).

Narasin is an ionophore anticoccidial. Sporozoites of coccidia accumulate ionophores in their pellicle membrane, resulting in an influx of sodium into the sporozoites, thus exceeding the parasite’s ability to remove the excess sodium and, in turn, leading to the death of the coccidia through energy depletion and a resultant lethal osmotic imbalance (Smith et al., 1981).

Anticoccidial efficacy

Jeffers et al. (1988a; 1988b) and Ruff, et al. (1980) demonstrated the effectiveness of narasin against all pathogenic species of coccidia of chickens in both battery cage and floor pen trials based upon mortality, weight gain, feed conversion and lesion scores. In these trials, birds medicated with narasin consistently performed as well as, or better than, those medicated with the ionophore monensin. Jeffers et al. (1988c) also compared the production figures under commercial broiler production conditions for birds medicated with narasin or monensin, the results of which are shown in Table 1.
Table 1 A summary of the results of commercial broiler trials comparing 60 and 80 ppm narasin with 100 ppm monensin.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total Number of Broilers</th>
<th>Average Live Weight (kg) at Trial Termination *</th>
<th>Average Feed/Gain at Trial Termination *</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 ppm narasin</td>
<td>100,264</td>
<td>1.758 ab</td>
<td>2.01 a</td>
</tr>
<tr>
<td>80 ppm narasin</td>
<td>99,607</td>
<td>1.766 a</td>
<td>1.97 a</td>
</tr>
<tr>
<td>100 ppm monensin</td>
<td>107,763</td>
<td>1.729 b</td>
<td>1.99 a</td>
</tr>
</tbody>
</table>

* Averages not sharing a letter differ significantly (P < 0.05).

These results showed that average live weights at slaughter were significantly higher for broilers medicated with narasin at 60 or 80 ppm than for those medicated with 100 ppm monensin. There were no other differences when mortality, lesion scores and feed conversion rates were compared.

Synergism of narasin and nicarbazin

When combining different ionophores with the anticoccidial nicarbazin (an equal molar complex of 4,4’-dinitrocarbanalide and 2-hydroxy-4,6-dimethylpyrimidine), Callender and Jeffers (1980) unexpectedly found that combinations of nicarbazin and narasin had synergistic activity. Subsequently, a synergistic 1:1 mixture of narasin and nicarbazin was developed as the anticoccidial Maxiban®, which has become widely adopted as an anticoccidial by broiler producers worldwide.

Additional benefits of narasin in poultry health

In addition to anticoccidial activity, there are a number of other benefits of narasin reported in scientific journal publications.

Necrotic enteritis is caused by the bacterium *Clostridium perfringens* type A, and is a significant disease of broiler chickens worldwide. Control of this condition is dependent on a variety of elements, including reduction of predisposing intestinal infections such as coccidiosis (Al-Sheikhly and Al-Saieg, 1980), and the use of feed additive antibiotics. However, in some countries the use of such antibiotics in feed is prohibited, thus eliminating this practice as a means of preventing necrotic enteritis.

Among the ionophores approved for use in broilers, narasin is apparently the most active against *C. perfringens in vitro* (Watkins et al., 1997), as well as in challenge studies in broilers (Brennan et al., 2001; 2003).

These results were confirmed by Collier et al. (2008) and Lanckriet et al. (2010), with respect to the activity of narasin against combined challenges with coccidian species and *Clostridium perfringens* in broilers (*Table 2*).
Table 2. The effect of several ionophores in reducing the incidence of macroscopic necrotic lesions (lesion score = or > 2) in broiler chickens challenged with coccidian protozoa and Clostridium perfringens. *

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Percentage of Birds With Lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 ppm Lasalocid</td>
<td>14.3</td>
</tr>
<tr>
<td>70 ppm Salinomycin</td>
<td>19.2</td>
</tr>
<tr>
<td>5 ppm Maduramicin</td>
<td>23.1</td>
</tr>
<tr>
<td>70 ppm Narasin</td>
<td>7.4</td>
</tr>
<tr>
<td>Non-medicated, infected control</td>
<td>60.7</td>
</tr>
<tr>
<td>Non-medicated, uninfected control</td>
<td>0.0</td>
</tr>
</tbody>
</table>

* Adapted from Lanckriet, A., et al. (2010).

This property of narasin is especially valuable to broiler producers in global areas where the use of conventional antibiotics in feed is banned.

Gizzard erosion and the presence of C. perfringens in the ceca of broilers were reported by Novoa-Garrido et al., (2006). They found significantly increased C. perfringens counts with increasing severity of gizzard lesions. Kaldhusdal et al., (2012) demonstrated that the severity of gizzard erosion could be reduced by including narasin in the ration, a phenomenon that is likely due to the well documented effect of narasin against coccidian species with combined C. perfringens challenges.

Lastly, narasin produces no deleterious side effects when included in the ration of broilers either on its own, or in combination with nicarbazin. Likewise, the rapid elimination of narasin alone or the synergistic combination Maxiban® from the tissues of medicated broilers has resulted in no regulatory requirement for withdrawal of either product from the ration prior to slaughter in several major broiler producing areas. This has been a great help to poultry producers in protecting the intestinal integrity of their birds right up to slaughter, as well as in managing the practice of “thinning”; the logistics of feed storage and delivery; and the scheduling of flocks going to the slaughter plant.

Conclusions

Aside from outstanding anticoccidial efficacy when used alone, or in combination with nicarbazin as the anticoccidial Maxiban®, narasin has several other proven advantages that make it the ideal anticoccidial in protecting intestinal integrity and in turn, assuring optimal broiler growth performance and profitability in broiler production. These advantages include superior growth performance; activity against concomitant coccidian infection with Clostridium perfringens; effectiveness in reducing the severity of gizzard erosion; and freedom from deleterious side effects.

References


