Food poisoning bacteria **Campylobacter** and *Salmonella* reduced in broilers fed diets supplemented with enzyme

by Dr Milan Hruby, Technical Services, Manager, Danisco Animal Nutrition

Two enzyme products used widely in the poultry industry to improve the digestibility of wheat- and corn-based diets have been found to have additional effects on the numbers of bacteria in the gut of broilers that cause food poisoning in humans. These additional enzyme effects are brought about through an increase in the rate of diet digestibility, which significantly changes both the substrate quality and quantity available to the bacteria in the bird’s gut.

The products are Avizyme* 1300 (which contains the enzymes xylanase and protease and is recommended for wheat-based diets) and Avizyme 1500 (which contains amylase, xylanase and protease and is recommended for corn-based diets). Both are widely used by poultry integrators and feed manufacturers to improve feed efficiency.

However, trials at an internationally acknowledged centre of excellence for veterinary research have shown that when these products are used at recommended commercial rates, they also promote an environment in the intestine that is unfavourable for the food poisoning bacteria *Campylobacter* and *Salmonella*.

This is good news for poultry producers who are looking to incorporate additional practical measures into existing management programs to minimize the occurrence of *Campylobacter* and *Salmonella* in production systems.

The need for such integrated programs has been highlighted by the results of tests carried out by health experts in many countries that show that poultry carcasses often test positive for these harmful bacteria. For example, an investigation in Canada during 1998/1999, where 57 broiler production units were tested for the presence of *Campylobacter*, found that 67 per cent of the units tested positive for *Campylobacter**.

The trials with the Avizyme products were carried out as part of a joint research project between the acknowledged centre of excellence for veterinary research and the manufacturers of Avizyme — Danisco Animal Nutrition (formerly Finnfeeds).

The Ross birds used in the project were fed on commercial diets based on either wheat or corn, plus the standard commercial rates, they were fed on commercial diets based on either wheat or corn, plus the standard calculated analysis

<table>
<thead>
<tr>
<th>Ingredients (kg/tonne)</th>
<th>Wheat diet</th>
<th>Corn Diet</th>
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<tbody>
<tr>
<td>Wheat</td>
<td>546.3 - 547.3</td>
<td>-</td>
</tr>
<tr>
<td>Corn</td>
<td>-</td>
<td>541.5 - 542.5</td>
</tr>
<tr>
<td>Soybean meal 48%</td>
<td>348.9</td>
<td>376.7</td>
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<tr>
<td>Soy oil</td>
<td>42.6</td>
<td>17.5</td>
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<tr>
<td>Tallow</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Salt</td>
<td>3.8</td>
<td>4.1</td>
</tr>
<tr>
<td>DL Methionine</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Limestone</td>
<td>12.2</td>
<td>12.2</td>
</tr>
<tr>
<td>Dical Phosphate</td>
<td>13.5</td>
<td>15.5</td>
</tr>
<tr>
<td>Vit/Min premix</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Avizyme 1300 (wheat) or 1500 (corn)</td>
<td>+/- 1</td>
<td>+/- 1</td>
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*P<0.05; ND = not detected

<table>
<thead>
<tr>
<th>Data for birds inoculated with $10^{7}$ colony forming units (cfus)</th>
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<tbody>
<tr>
<td>Trial</td>
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<tr>
<td>-------</td>
</tr>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
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<td>10</td>
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<td>11</td>
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*Figure 1: The results of an Avizyme and Campylobacter trial Campylobacter jejuni levels in the caecum of broilers - Avizyme treatment compared to the control (%)**

*Table 1: Trial diets

1. Department of Clinical Veterinary Science at the University of Bristol, UK
2. The trials investigating *Salmonella* the broiler chicks were challenged orally with the bacteria at one day of age, and population numbers in different parts of the intestinal tract were measured between 14 and 17 days of age.

In the three corn-based trials, there was, on average, a two-thirds reduction in the number of *Campylobacter* found in birds fed the Avizyme 1300 supplemented diet, and in the four corn-based trials there was a reduction of over a third in birds fed the Avizyme 1500 treated diet, compared with the control (see Figure 1).

In the trials investigating *Salmonella* the broiler chicks were challenged orally with the bacteria at one day of age, and population numbers in different parts of the intestinal tract were measured between 14 and 17 days of age.

In the three corn-based trials, there was, on average, a reduction of almost 60 per cent in the number of *Salmonella* found in birds fed the Avizyme 1500 treated diet and a significant reduction in the number of *Salmonella* found in birds fed the Avizyme 1300 treated wheat-based diet (see Figure 2).

What this means in commercial practice is that fewer birds are likely to test positive for *Salmonella*. These studies found that significantly fewer birds fed the Avizyme treated corn-based diet were positive for Campylobacter and salmonella.
Salmonella enteritidis levels in the caecum of broilers
Avizyme treatment as compared to that of the control (%)

<table>
<thead>
<tr>
<th>Wheat-based diets</th>
<th>Corn-based diets</th>
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<tbody>
<tr>
<td>Trial 12</td>
<td>0.9*</td>
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<tr>
<td>Trial 13</td>
<td>25</td>
</tr>
<tr>
<td>Trial 14</td>
<td>ND</td>
</tr>
<tr>
<td>Trial 15</td>
<td>ND</td>
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<tr>
<td>Average reduction in corn-based diets = 59% (n=7)</td>
<td></td>
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</tbody>
</table>

*P<0.05; ND = not detected

Data for birds inoculated with $=10^6$ colony forming units (cfus)

Figure 2: The results of an Avizyme and Salmonella trial

*Avizyme is a registered trademark of Danisco Animal Nutrition

Keywords: Avizyme 1300, Avizyme 1500, Broiler, Corn, Digesta viscosity, Digestibility, Gut microflora, Microflora, Passage rate, Wheat, AGP, Zoonosis, Food safety, xylanase, amylase, protease, Salmonella, Campylobacter