Introduction
Chronic respiratory disease (CRD) caused by Mycoplasma gallisepticum (MG) and frequently complicated with Escherichia coli (E. coli) are major diseases that can adversely affect the growth and productive performance of broiler breeders, MG can be transmitted vertically via the egg to the next generation of brooding, breeding and rearing birds, and MG also can be transmitted horizontally between birds in the same flock. The major methods of control are routine preventative medication programmes during the rearing stage and sometimes during laying, to achieve better egg production, fertility and hatchability and reduce the transmission to the next generation of chicks. Tiamulin has been shown to be very effective in this (Stipkovits and others, 1993).

The purpose of the study was to compare the efficacy of Cosumix Plus (Novartis Animal Health, Shanghai, China) for MG control, plus Tiamutin (Novartis Animal Health, Basel, Switzerland) for MG control, given in the drinking water with doxycycline and tylosin as positive controls and an untreated control in the prevention of naturally occurring CRD.

Materials and Method
Two thousand broiler breeder Arbor Acre chicks were used in the study and arranged in 5 groups of 500 birds.

Treatment groups
Group 1: Cosumix 120ppm and Tiamutin 125ppm.
Group 2: Cosumix 120ppm and Tylosin 500ppm.
Group 3: Doxycycline 500ppm.
Group 4: Tiamutin 500ppm.
Group 5: Untreated control.

Cosumix was given in the drinking water at 125ppm to chicks on days 1-5, 9-14, 17-23 and every 28 days for 3 days until week 32 as well as Groups 1 & 2. Tiamutin was given in the drinking water at 125 ppm and 250 ppm (Groups 1 & 2). One group was left untreated (Group 5). The growth, mortality rate ... (egg production, laying %, fertility, hatchability and % healthy chicks) was also monitored from 25-44 weeks.

Results
The results are summarized in Table 1. There was not much difference in growth performance between the different treatment groups during the brooding and rearing phases, but both total mortality as well as mortality due to CCRD was lower in the Cosumix Plus/Tiamutin treated groups in comparison with the doxycycline and tiamulin treated controls (See Graph 1 and 2).

There were only minor improvements with the higher Tiamutin 250ppm level than the Tiamutin 125ppm level. In the breeder groups, mortality due to other causes than CCRD was mainly death following birds, dropping and an unusual response to Newcastle disease vaccination. Other deaths in the rearing phase in Groups 1 & 2 were mainly due to metabolic disease or die-offs due to leg problems and 13 birds were killed in Group 5 for being eviscerated in blood-bath. E. coli were isolated from all groups but mycoplasma were only isolated from Groups 1, 3 & 4.

The difference in the laying performance was less marked in the treated Groups 1-4, than Group 5. The effect of lay was similar but Groups 1 & 2 had an earlier peak and higher laying percentage of 8% at 32 weeks of age in comparison with 8% at 34 weeks of age in comparison with 8% at 30 weeks of age. The mortality in all of the groups was similar between 90-95% at peak but the hatchability at peak was much lower in the untreated group in comparison with Groups 1 & 2.

The overall hatching percentage was similar in the treated Groups 1-4 but much lower in Group 5 by 5-6%. The average age of healthy sellable chicks hatched from the Cosumix Plus/Tiamutin treatment in Group 2 was at 77.8. This was 12 days more than Group 1, the lower Tiamutin level of 125ppm, 6 days more than the doxycycline, 5 days more than the tylosin treated group and 18 days more than the untreated control. (See Graph 4).

Conclusions
Using Cosumix 120ppm for controlling E. coli was very effective in the brooding and rearing stages, substantially reducing mortality rates. The additional use of Tiamutin at 125 and 250ppm to control mycoplasma infections was also very effective in both stages and mycoplasma could not be isolated in Groups 1 and 2. Tiamutin at 500ppm and tylosin 500ppm were beneficial but did not control mycoplasma and E. coli as well as Cosumix and Tiamutin. The untreated controls were valuable in highlighting the adverse effects of a chronic mycoplasma and E. coli infection (CCRD) has on breeding and rearing mortality (8.8% and 7% respectively), slower onset of lay and peak laying (2 weeks), lower peak laying percentage (4%), lower average laying percentage of 4.6% and overall a reduction in the number of healthy chicks produced of 18 chicks.

The programs of Cosumix and Tiamutin use were very effective and economic when compared with the losses of 18 chicks in the untreated control and is more effective than doxycycline and tylosin given individually.

Table 1. Comparative treatment performance in brooder, rearing and laying phases

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cosumix 120 Tiamutin 125</th>
<th>Cosumix 120 Tiamutin 250</th>
<th>Doxycycline 500</th>
<th>Tylosin 500</th>
<th>Untreated control</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of birds</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Chick weight wk 1 (g)</td>
<td>37</td>
<td>37</td>
<td>35</td>
<td>38</td>
<td>37</td>
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<tr>
<td>Brooder Mort (%)</td>
<td>1.6</td>
<td>1.2</td>
<td>5.6</td>
<td>4.4</td>
<td>10.0</td>
</tr>
<tr>
<td>Due to CCRD (%)</td>
<td>0</td>
<td>0</td>
<td>4.8</td>
<td>4.0</td>
<td>9.2</td>
</tr>
<tr>
<td>Rearing Mort (%)</td>
<td>5.8</td>
<td>4.4</td>
<td>10.0</td>
<td>9.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Rearing rate (%)</td>
<td>5.4</td>
<td>5.5</td>
<td>10.4</td>
<td>9.3</td>
<td>10.6</td>
</tr>
<tr>
<td>Bodyweight wk 25 (g)</td>
<td>2839</td>
<td>2838</td>
<td>2936</td>
<td>2817</td>
<td>2803</td>
</tr>
<tr>
<td>Dead birds in brooding and rearing</td>
<td>32</td>
<td>32</td>
<td>33</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>Peak laying (wk)</td>
<td>34</td>
<td>35</td>
<td>34</td>
<td>34</td>
<td>34</td>
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<tr>
<td>Peak laying (%)</td>
<td>86</td>
<td>86</td>
<td>84</td>
<td>85</td>
<td>82</td>
</tr>
<tr>
<td>Fertility at peak (%)</td>
<td>95</td>
<td>92</td>
<td>91</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Hatchability at peak (%)</td>
<td>90</td>
<td>90</td>
<td>88</td>
<td>89</td>
<td>85</td>
</tr>
<tr>
<td>Healthy chicks (%)</td>
<td>97</td>
<td>98</td>
<td>95</td>
<td>95</td>
<td>97</td>
</tr>
<tr>
<td>Average laying (%) 25-44wks</td>
<td>79.7</td>
<td>79.7</td>
<td>79.7</td>
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<td>79.7</td>
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<td>Healthy chicks/hen produced</td>
<td>76.5</td>
<td>77.8</td>
<td>71.2</td>
<td>72.7</td>
<td>59.8</td>
</tr>
</tbody>
</table>

References

Diao Youxiang1, Qin Yishun1, Danny Yu2, Martin Valks3 and David Burch4
1Shandong Agricultural University, Jinan, China. 2Novartis Animal Health, Shanghai, China. 3Novartis Animal Health, Basel, Switzerland. 4Octagon Services Ltd, Old Windsor, United Kingdom.

Tiamutin® and Cosumix Plus® in comparison with other antimicrobials for the control of CRD and E.coli infections in broiler breeders

Graph 1. Brooder mortality (%) weeks 0-3

Graph 2. Rearing mortality (%) weeks 4-25

Graph 3. Group laying % week 25-44

Graph 4. Healthy chicks/hen produced
Introduction

Mycoplasma gallisepticum (MG) the cause of chronic respiratory disease (CRD) can have a major effect on a broiler breeder flock’s performance especially if it strikes at the major stress times at point of lay or approaching the peak laying period. Eradication has been the preferred method of control in N. America and N. Europe but in many parts of the world routine preventative medication has been widely used as an alternative to control the infection. More recently, in endemically infected areas, for cost and containment reasons the use of live vaccine with attenuated isolates of MG, such as ts-11 (VacSafe – Novartis) Ltd has been introduced to prevent the development of clinical disease even though breakdown of the vaccine can be induced under challenge conditions (Abd-Al-Motelib and Eleven, 1993) as well as killed bacterin. Stipkovich and others (1993) described the use of ts-11 in breeder layers demonstrating its efficacy in comparison with an MG killed bacterin.

The purpose of this trial was to compare the efficacy of ts-11 vaccination in young birds in comparison with a tiamulin preventive program.

Materials and method

A comparison was made between one house of 2200 Arbor Acre birds given ts-11 vaccine at 6 weeks of age, with a similar house given a routine tiamulin (Tiamulin 45% - Novartis AH) preventive medication program, on a multi-age, open-house system, breeder layer site. Tiamulin was given in the drinking water for 1 day/week at 12.5mg/kg bodyweight in weeks 6, 8, 9, 10, 13, 14 and 2 days/week in weeks 15, 17, 19, 22, 23 (point of lay) and 30 (peak laying). It was also given in the feed at 30ppm for 10 days in week 32 and 60ppm for 28 days starting in week 42. Blood samples were taken from 40 birds/flock on weeks 22, 29, 32, 38, 44 and 50 and analysed for MG antibodies using the KPL Elisa test. The clinical appearance of the flock was monitored on a regular basis and the egg production performance and mortality and cull rates were recorded on a weekly basis.

Results

Both groups of birds grew well in the rearing period but at week 22, as they were approaching point of lay, the ts-11 vaccinated birds showed increasing signs of respiratory disease, attributed at the time to an MG infection. The vaccinated birds were then included into the tiamulin medication program as described above. Less than 5% of either of the flocks was MG positive at week 22, after 29 weeks (peak laying) it started to increase and by week 38 the ts-11 vaccinated group had soared to 63% seropositive and 95% by week 44, while the tiamulin control flock still remained ≤5%.

From week 36 there was a spike in mortality in the vaccinated group (1.5%) due to CRD, whereas the tiamulin group’s was 0.37%, i.e. near target of 0.25%. At week 43 there was a further spike of mortality in both groups associated with heat stress. (See Graph 2.)

The average weekly mortality rate was 0.43% and 0.47% in the tiamulin treated group and the ts-11 (plus tiamulin in the laying period) group respectively and overall mortality for the 44 week laying period was 18.78%, 20.87% and 11% for the tiamulin, ts-11 groups and target production respectively. Hen mortality therefore was 2.1% less in the tiamulin-treated flock than the ts-11 flock, but both were higher than target, presumably due to the weather conditions.

Onset of lay and peak laying was earlier by 3 weeks than target in the ts-11 vaccinated group and 3.5 weeks in the vaccinated flock (189.4), during the 44-week laying period, due to the earlier onset of lay and peak laying.

Conclusions and discussion

Vaccination with ts-11, even given at 6 weeks of age, did not appear to prevent a clinical MG infection developing in this flock. Noormohammadi and others (2002) showed it was not associated with susceptibility to challenge. Serological responses are relatively poor to vaccination with ts-11 and are not good indicators of protection hence the low serological figures at 22 weeks of age. In severe challenge situations such as described in the above trial, with a multi-age site of several open-sided houses, which allow the horizontal spread of infection quite easily, and a stressful situation such as high ambient temperatures and the normal physiological and productive stresses at point of lay and peak laying, it appears that the challenge was too great, resulting in serological conversion after from 29 weeks of age and a clinical outbreak with mortality from 36 weeks of age. The tiamulin prevention program initiated early on at 6 weeks of age did prevent the development of CRD clinically and serologically in the breeder flock although it did not control it sufficiently when the to 11 group was put onto the program, following an upsurge of clinical respiratory disease at the end of rearing thought to be due to CRD. Seroversion was not picked up until later however. The performance of the vaccinated plus tiamulin and tiamulin only-medicated groups were similar, with slight improvements for the tiamulin groups in egg production and reduced mortality, but both groups had a higher mortality than the target production for Arbor Acre birds probably due to the high ambient temperatures found in Thailand.

Overall the tiamulin prevention program through rearing and production appeared to be very effective in preventing CRD in breeder breeders.

Comparison of a tiamulin medication program with ts-11 mycoplasma vaccine on the control of M. gallisepticum in broiler breeders

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References


Graph 1. MG Serology – KPL Elisa test

Graph 2. Mortality/cull (%) vs Heat stress

Graph 3. Egg laying (%) vs TS-11
Evaluation of tiamulin and chlortetracycline in feed in the control of CRD in broilers

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Introduction
Mycoplasma gallisepticum (MG) the cause of chronic respiratory disease (CRD) in chickens is still very common in China. CRD is frequently complicated with secondary Escherichia coli infections to cause complicated CRD (CCRD), which has a major adverse effect on growth rate, feed conversion efficiency (FCE) and mortality rate in broilers.

Tiamulin has been shown to be very effective in controlling mycoplasma infections in broilers but due to the widespread use of incompatible ionophore anticoccidials such as salinomycin and monensin, it has made it impossible to use tiamulin because of the risk of interaction between the two product groups.

Burch and others (1993) showed that tiamulin and the tetracyclines had a synergistic activity against MG and that low levels of tiamulin given in feed at 30ppm did not cause any signs of interaction with salinomycin, monensin and narasin (Burch and Stipkovits, 1991, Stipkovits and others, 1992; Stipkovits and others, 1999). Further trial work showed in artificial infection studies that combinations of tiamulin and chlortetracycline in feed (Burch and Stipkovits, 1984; Burch and Stipkovits, 1996) reduced air sac lesions and mortality from CRD and improved the performance of the birds substantially without inducing any signs of interaction with salinomycin in the feed.

It was the purpose of this study to test the efficacy of a combination of tiamulin and chlortetracycline, given for different durations, in the presence of salinomycin and monensin, for the prevention of a naturally occurring CRD and CCRD infection.

Materials and Method
A combination of tiamulin (T) (Tiamulin 10% Premix – Novartis AHI) at 30ppm and chlortetracycline (CTC) at 100ppm in feed was tested in a floor pen trial with 250 naturally infected birdsgroup given T-CTC between days 1-14, 21-34, 1-40 or not at all (untreated control) or tylosin 40ppm between days 1-40 and T-CTC for days 1-40 gave overall the best performance results with 10% improvement in bodyweight and 11% improvement in FCE. Interestingly all of the monensin groups gave better performance results than their equivalent salinomycin groups, (See Graphs 1 and 2).

- Overall mortality and mortality due to CCRD was lower in the T+CTC groups in comparison with the tylosin and the untreated controls. T+CTC given for days 1-40 had the lowest overall mortality results down from an average of 21.6% in the untreated controls to 5.2%. When mortality due to CCRD is considered it fell from an average of 16% in the untreated controls to 1.4%, a substantial 91% reduction. (See Graph 3 and 4). Medication with T+CTC in the days 21-34 gave a slightly better reduction in CCRD mortality than T+CTC between days 1-14 down from 4.2 to 3.4% but again much improved over the untreated controls and also the tylosin group which was on average 7.8%.

Necropsies of the dead birds showed a severe atelectasis with cloudy and cheesy exudation. In severely affected birds there was pericarditis and pericardio-myocarditis. E. coli and MG were frequently isolated especially from the untreated birds but markedly less from the T+CTC birds treated for 1-40 days. The T+CTC 1-40 day groups gave the best overall economic return, resulting in a 7 times return on investment in local currency.

Conclusions and Discussion
There was no adverse interaction between tiamulin at 30ppm and the ionophores confirming previous work (Burch and Stipkovits, 1991). All of the groups treated with T+CTC gave better results than the untreated control and the tylosin 40ppm positive control. There were minor differences between the T+CTC groups given either days 1-14 or 1-40 of days 21-34, the performance data was slightly better for the earlier treatment but the mortality figures were slightly worse. The T+CTC given for days 1-40 gave the best overall results for performance and mortality and particularly for the reduced mortality due to CCRD, demonstrating an excellent pre-erative effect in the face of a severe field challenge.

Results
The overall results are summarised in table 1.

Improvements in bodyweight gain and FCE were seen in all of the treatment groups in comparison with the untreated controls. T+CTC for days 1-14, 21-34 and 1-40 were better than tylosin 40ppm given for days 1-40 and T+CTC for days 1-40 gave overall the best performance results with 10% improvement in bodyweight and 11% improvement in FCE. Interestingly all of the monensin groups gave better performance results than their equivalent salinomycin groups, (See Graphs 1 and 2).

- Overall mortality and mortality due to CCRD was lower in the T+CTC groups in comparison with the tylosin and the untreated controls. T+CTC given for days 1-40 had the lowest overall mortality results down from an average of 21.6% in the untreated controls to 5.2%. When mortality due to CCRD is considered it fell from an average of 16% in the untreated controls to 1.4%, a substantial 91% reduction. (See Graph 3 and 4). Medication with T+CTC in the days 21-34 gave a slightly better reduction in CCRD mortality than T+CTC between days 1-14 down from 4.2 to 3.4% but again much improved over the untreated controls and also the tylosin group which was on average 7.8%.

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Table 1. Trial results summary

<table>
<thead>
<tr>
<th>Treatment group</th>
<th>Anticoccidial</th>
<th>Bodyweight (kg) day 49 Improve (%)</th>
<th>FCE Improve (%)</th>
<th>Overall mortality (%)</th>
<th>Mortality due to CRD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated control</td>
<td>Monensin</td>
<td>2.16 (1)</td>
<td>2.32 (1)</td>
<td>20.4</td>
<td>15.2</td>
</tr>
<tr>
<td>T30+CTC100 day 1-14</td>
<td>Monensin</td>
<td>2.63 (2)</td>
<td>2.15 (7)</td>
<td>9.8</td>
<td>4.4</td>
</tr>
<tr>
<td>T30+CTC100 day 21-34</td>
<td>Monensin</td>
<td>2.55 (8)</td>
<td>2.21 (5)</td>
<td>8.0</td>
<td>3.2</td>
</tr>
<tr>
<td>T30+CTC100 day 1-40</td>
<td>Monensin</td>
<td>2.82 (31)</td>
<td>2.04 (12)</td>
<td>4.8</td>
<td>1.2</td>
</tr>
<tr>
<td>Tylosin 44 day 1-40</td>
<td>Monensin</td>
<td>2.33 (8)</td>
<td>2.26 (3)</td>
<td>13.0</td>
<td>7.6</td>
</tr>
<tr>
<td>Untreated control</td>
<td>Salinomycin</td>
<td>2.04 (1)</td>
<td>2.34 (1)</td>
<td>22.8</td>
<td>16.8</td>
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<tr>
<td>T30+CTC100 day 1-14</td>
<td>Salinomycin</td>
<td>2.52 (24)</td>
<td>2.20 (6)</td>
<td>9.2</td>
<td>4.0</td>
</tr>
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<td>T30+CTC100 day 21-34</td>
<td>Salinomycin</td>
<td>2.41 (8)</td>
<td>2.23 (5)</td>
<td>8.8</td>
<td>3.6</td>
</tr>
<tr>
<td>T30+CTC100 day 1-40</td>
<td>Salinomycin</td>
<td>2.63 (29)</td>
<td>2.11 (12)</td>
<td>5.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Tylosin 44 day 1-40</td>
<td>Salinomycin</td>
<td>2.14 (5)</td>
<td>2.27 (3)</td>
<td>14.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Graph 1. Bodyweight day 49 (kg)

Graph 2. FCE results day 0-49

Graph 3. Overall mortality (all causes) (%)

Graph 4. Mortality due to CCRD (%)