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

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Introduction

Chronic respiratory disease (CRD) caused by *Mycoplasma gallisepticum* (MG) and frequently complicated with *Escherichia coli* (CCRD) 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 breeding chicken and broiler chick hence the disease continues to be a major problem in many parts of the world. Programs of eradication have been successful in N. America and N. Europe but without strict biosecurity and flock monitoring to keep the disease out or where there is still a lot of local household production of chickens, it is almost impossible to prevent either vertical or horizontal transmission and subsequent infection.

The major methods of control are routine preventive medication programmes during the rearing stage and sometimes during laying, to achieve better egg production, fertility and hatchability and reduce layer mortality 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 (trimethoprim / sulphachloropyridazine (TMP/S) ratio 1:5 – Novartis AH), a broad-spectrum antimicrobial specifically for *E. coli* control, plus Tiamutin (tiamulin – Novartis AH) 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 CCRD.

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 Tiamulin 125ppm
Group 2. Cosumix 120ppm and Tiamulin 250ppm
Group 3. Doxycycline 500ppm
Group 4. Tylosin 500ppm
Group 5. Untreated control

Cosumix was given in the drinking water at 120ppm to chicks on days 1-3, 6-8 and every 28 days for 3 days until point of lay at 24 weeks of age in Groups 1 & 2. Tiamutin was given in the drinking water at 125 ppm and 250ppm (Groups 1 & 2 respectively) on days 29-32 and then 3 days / month until 32 weeks of age (peak laying). Doxycycline 500ppm (Group 3) and tylosin 500ppm (Group 4) was given on days 1-3 and 3 days / month until week 32 as well. One group was left untreated (Group 5). The growth, mortality rate and cause of mortality in the brooding and rearing stage to point of lay were recorded and the subsequent laying performance (egg production, laying %, fertility, hatchability and % healthy chicks) was also monitored from 25-44 weeks.

Dead birds in the brooding and rearing phases were necropsied and the liver and spleen cultured for *E. coli* and the air sacs were cultured for mycoplasma and identified by colony appearance.

Results

The results are summarised in Table 1.

There was not much difference in growth performance between the different treatment groups during the brooding and rearing phase, 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 tylosin treated controls and the untreated controls. (See Graphs 1 and 2).

There were only minor improvements with the higher Tiamutin 250ppm level than the Tiamutin 125ppm level. In the brooder groups, mortality due to other causes than CCRD was mainly deaths following beak clipping 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 culls due to leg problems and 11 birds were culled in Group 5 for being sub-standard in bodyweight. *E. coli* were isolated from all groups but mycoplasma were only isolated from Groups 3, 4 (50%) & 5 (90%).

The difference in the laying performance was less marked in the treated Groups 1-4. (See Graph 3). The onset of lay was similar but Groups 1 & 2 had an earlier peak and higher laying percentage of 86% at 32 weeks of age in comparison with 84% and 85% for Groups 3 & 4 at 33 weeks of age. The untreated controls peaked at only 82%, two weeks later at 34 weeks of age. The fertility in all of the groups was similar between 90-92% 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 5.2-6.6%. The average number of healthy saleable chicks/hen hatched from the Cosumix Plus/Tiamutin was highest in Group 2 at 77.8. This was 1.3chicks more than Group 1 the lower Tiamutin level of 125ppm, 6.6 chicks more than the doxycycline, 5.1 chicks more than the tylosin-treated group and 18 chicks more than the untreated controls. (See Graph 4).

Conclusions

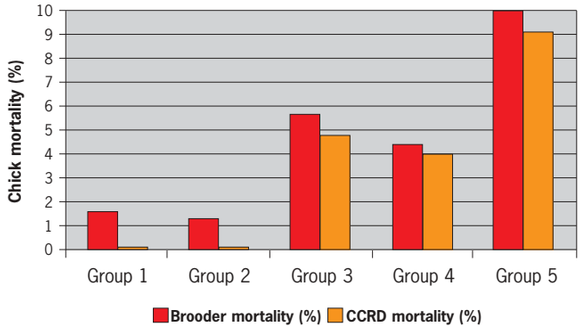
Using Cosumix 120ppm for controlling *E. coli* was very effective in the brooding and rearing stages, substantially reducing mortality rates. The additional use of Tiamutin at 125 and 250ppm to control mycoplasma infections was also very effective in both stages and mycoplasma could not be isolated in Groups 1 and 2. Doxycycline 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 brooding 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 6.6% and overall a reduction in the number of healthy chicks produced/hen of 18 chicks.

The program of Cosumix and Tiamutin use was very effective and economic when compared with the losses of 18 chicks/hen in the untreated controls and is more effective than doxycycline and tylosin given individually.

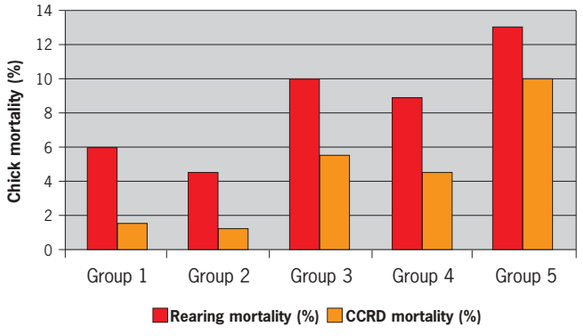
Table 1. **Comparative treatment performance in brooder, rearing and laying phases**

Parameter	Cosumix 120 Tiamulin 125	Cosumix 120 Tiamulin 250	Doxycycline 500	Tylosin 500	Untreated control
Brooder phase 0-3 wk					
No of birds	500	500	500	500	500
Chick weight wk 1 (g)	37	37	35	38	37
Brooder Mort (%)	1.6	1.2	5.6	4.4	10.0
Due to CCRD (%)	0	0	4.8	4.0	9.2
Rearing phase 4-25wk					
Bodyweight wk 4 (g)	411	410	408	409	407
Rearing cull/mort (%)	5.8	4.4	10.0	9.0	13.0
Due to CCRD (%)	1.4	1.0	9.0	8.4	10.8
Rearing rate (%)	94	95.5	89.4	90.5	85.6
Bodyweight wk 25 (g)	2839	2838	2836	2837	2830
Laying performance					
Peak laying (week)	32	32	33	33	34
Peak laying (%)	86	86	84	85	82
Fertility at peak (%)	91	92	91	91	90
Hatchability at peak (%)	90	90	88	89	85
Healthy chicks (%)	97	98	95	95	92
Average laying (%) 25-44wks	71.2	71.5	70.1	70.9	64.9
Healthy chicks/hen	76.5	77.8	71.2	72.7	59.8

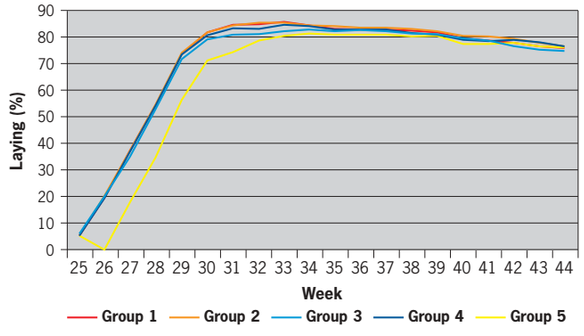
Graph 1. Brooder mortality (%) weeks 0-3



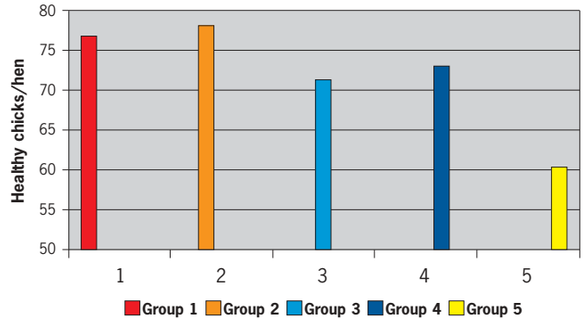
Graph 2. Rearing mortality (%) weeks 4-25



Graph 3. Group laying % week 25-44



Graph 4. Healthy chicks/hen produced



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

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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 preventive medication has been widely used as an alternative to control the infection. More recently, in endemically infected areas, for cost and convenience reasons the use of live vaccination with attenuated isolates of MG, such as ts-11 (VaxSafe – Bioproperties Ltd) has been introduced to prevent the development of clinical disease even though breakdown of the vaccine can be induced under challenge conditions (Abd-El-Motelib and Kleven, 1993) as well as killed bacterins. Stipkovits and others (1993) described the use of tiamulin 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 (Tiamutin 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 50ppm 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%. (See Graph 1.)

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 tiamulin and ts-11 treated birds but this is normal in tropical climates like Thailand. The peak laying percentage was on target for both groups. (See Graph 3.)

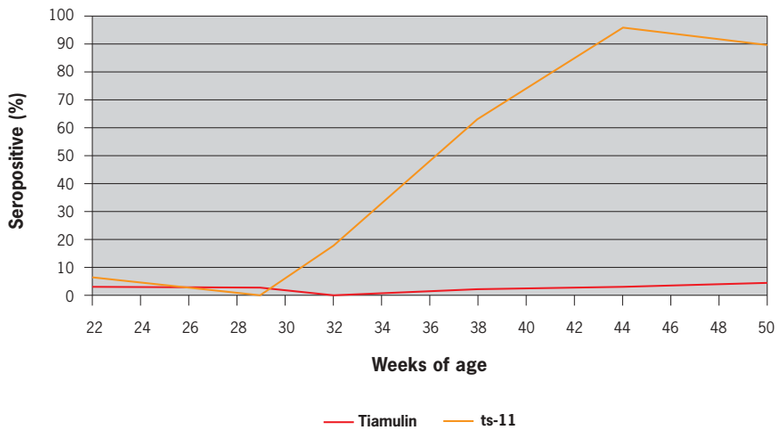
Overall, the tiamulin treated birds and ts-11 group produced 5.5 & 4.6 eggs/hen respectively more than target (189.4), during the 44-week laying period, due to the earlier onset of lay and peak laying.

Conclusions and discussion

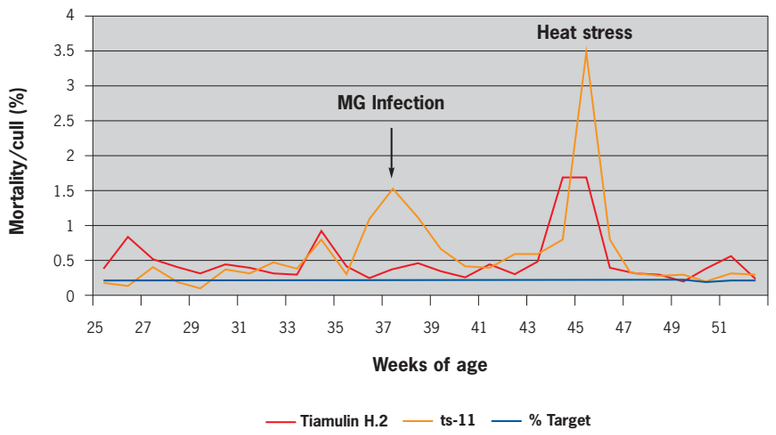
Vaccination with ts-11, even given at 6 weeks of age, did not appear to prevent a clinical MG infection developing in this flock. Noormohammadi and others (2002) showed it was not protective when given at 3 weeks of age, as judged by air sac lesion scores, but at 6 weeks it generally was effective, when challenged 11 weeks after vaccination. 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 from after 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 subsequently when the ts-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. Seroconversion 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 broiler breeders.

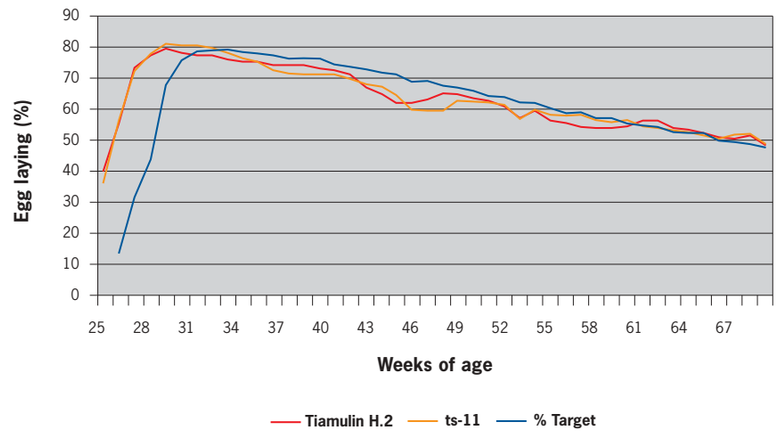
Graph 1. MG Serology – KPL Elisa test



Graph 2. Mortality/cull (%)



Graph 3. Egg laying (%)



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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, 1994; 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) (Tiamutin 10% Premix – Novartis AH) at 30ppm and chlortetracycline (CTC) at 100ppm in feed was tested in a floor pen trial with 250 naturally infected birds/group given T+CTC between days 1-14, 21-34, 1-40 or not at all (untreated control) or tylosin 44 ppm between days 1-40 as a positive control. There were two subsets given the anticoccidials monensin at 90ppm continuously or salinomycin at 60ppm. The trial was terminated on day 49. The cause of mortality was determined by necropsy and bacterial and mycoplasmal cultural examination.

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 30% 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 airsacculitis with cloudiness and cheesy exudation. In severely affected birds there was pericarditis and perihepatitis. *E. coli* and mycoplasma were frequently isolated especially from the untreated birds but markedly less from the T+CTC birds treated for 1-40days. The T+CTC 1-40 day groups gave the best overall economic return, resulting in a 7 times return on investment in local currency.

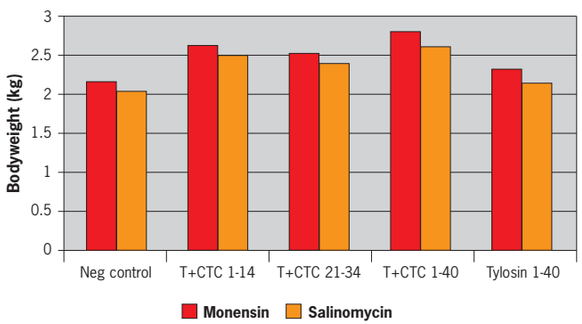
Conclusions and Discussion

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 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 preventive effect in the face of a severe field challenge.

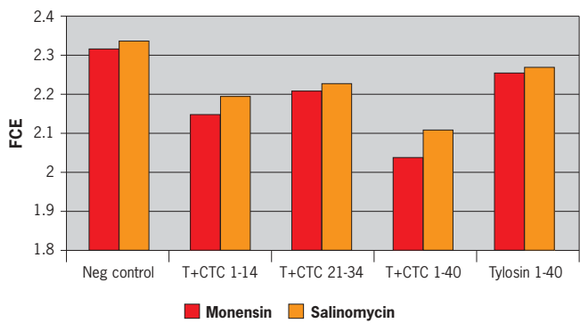
Table 1. **Trial results summary**

Treatment group	Anticoccidial	Bodyweight (kg) day 49 Improve (%)	FCE Improve (%)	Overall mortality (%)	Mortality due to CRD (%)
Untreated control	Monensin	2.16 (-)	2.32 (-)	20.4	15.2
T30+CTC100 day 1-14	Monensin	2.63 (22)	2.15 (7)	9.8	4.4
T30+CTC100 day 21-34	Monensin	2.55 (18)	2.21 (5)	8.0	3.2
T30+CTC100 day 1-40	Monensin	2.82 (31)	2.04 (12)	4.8	1.2
Tylosin 44 day 1-40	Monensin	2.33 (8)	2.26 (3)	13.0	7.6
Untreated control	Salinomycin	2.04 (-)	2.34 (-)	22.8	16.8
T30+CTC100 day 1-14	Salinomycin	2.52 (24)	2.20 (6)	9.2	4.0
T30+CTC100 day 21-34	Salinomycin	2.41 (18)	2.23 (5)	8.8	3.6
T30+CTC100 day 1-40	Salinomycin	2.63 (29)	2.11 (10)	5.6	1.6
Tylosin 44 day 1-40	Salinomycin	2.14 (5)	2.27 (3)	14.0	8.0

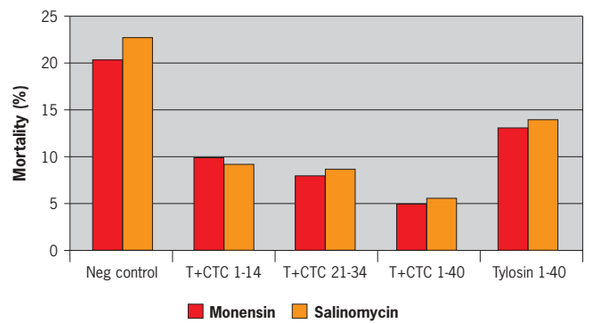
Graph 1. Bodyweight day 49 (kg)



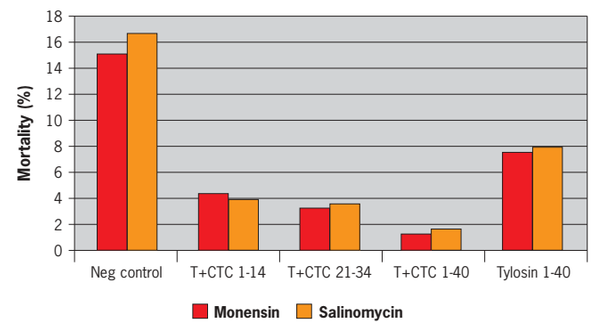
Graph 2. FCE results day 0-49



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



Graph 4. Mortality due to CCRD (%)



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