Impact of synergism of calcium phosphomycin/tylosin tartarate supplements on the performance of broilers in the Lebanon

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Summary

The authors evaluate the impact of a synergistic preparation (SP) of supplements (a combination of calcium phosphomycin and tylosine tartarate) on the performance of broilers with a history of carcass condemnation at slaughter. The experiment included 120-day old broilers (Ross 308), divided equally into two treatment groups, with three replicates per treatment and 20 birds per replicate. The two groups included controls that did not receive SP and those that were treated with SP. The SP group received treatment at three intervals (at 1-5 days of age: 160 mg/kg body weight; at 21-25 days of age: 80 mg/kg; and at 29-33 days of age: 80 mg/kg body weight). The administration of SP at a low level improved performance in SP birds compared to controls and also resulted in the lowest cumulative mortality (1.67% vs 6.67%, respectively), the lowest feed conversion of 1.91 between 1 and 43 days of age and the highest live body weight (2 544.75 g vs 2 390.18 g). The administration of SP at a low level improved performance and reduced the frequency of specific gross lesions at market age (tracheitis, lung congestion, breast blisters and bursal congestion).

Keywords

Broiler, Calcium, Lebanon, Performance, Phosphomycin, Supplement, Tartrate, Tylosin.

Impatto di una somministrazione sinergica degli integratori fosfomicina calcica e tilosina tartrato sulle prestazioni di pulcini di broiler in Libano

Riassunto

Gli autori hanno valutato l'impatto di una preparazione sinergica (PS) di integratori (combinazione di fosfomicina calcica e tilosina tartrato) sulle prestazioni di broiler con storia di distruzione delle carcasse in sede di macellazione. L'esperimento è stato svolto su pulcini (Ross 308), suddivisi equamente in due gruppi di trattamento, con 3 repliche per trattamento e 20 esemplari per replica. I due gruppi hanno compreso gli esemplari di controllo che non hanno ricevuto PS e quelli soggetti a PS. Il gruppo PS è stato trattato in tre intervalli (1-5 giorni di vita: 160 mg/kg di peso corporeo; 21-25 giorni di vita: 80 mg/kg; e 29-33 giorni di vita: 80 mg/kg di peso corporeo). La somministrazione a basso livello di PS ha migliorato le prestazioni di questo gruppo rispetto a quello di

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controllo con più bassa percentuale di mortalità complessiva (rispettivamente 1,67% vs. 6,67%), favorevole indice di conversione alimentare (1,91 da 1 a 43 giorni di vita) e peso vivo massimo (2 544,75 g rispetto a 2 390,18 g). La somministra-zione a basso livello di PS ha migliorato le prestazioni e ridotto la frequenza di lesioni specifiche relative all'età di vendita (tracheite, congestione polmonare, vescicole nell'area del petto e borsite).

Parole chiave
Broiler, Calcio, Fosfomicina, Integratore, Libano, Prestazioni, Tartrato, Tilosina.

Introduction

The most common subclinical infections in Lebanon and in other countries of the Middle East involve a major primary bacterium namely, *Mycoplasma gallisepticum* (5, 6) and another bacterium (*Escherichia coli*) or a virus, such as the H9N2 subtype of the avian influenza virus (7). Subclinical infections result in economic losses due to high mortality, poor feed conversion and carcass condemnation at slaughter (8).

Many bacterial isolates recovered from subclinical infections in poultry in the Lebanon and their marketed products revealed strong resistance to the most commonly used drugs in this country, namely, amoxicillin, ampicillin, colistin, enrofloxacin, flumequine, gentamycin, and sulpha-methoxazole-trimethroprim (3, 4, 9, 14). The search for novel antimicrobial agents to reduce the incidence of subclinical infections continues. A new synergistic preparation (SP), Fosbac Plus T, with total active ingredients amounting to 43% (20% calcium phosphomycin, 5% tylosin tartarate, fructose 1,6-diphosphate and a combination of electrolytes provided by sodium phosphate, sodium chlorate and hepatohydrate magnesium sulfate) has been claimed to reduce significantly such subclinical infections and to target improved performance (Bedson S.A., La Lonja, Argentina). Combining phosphomycin and fructose 1,6-diphosphate is thought to create a synergism due to the high uptake ability by bacteria of the fructose molecule as a nutrient (11), thus pulling effectively with it the bound phosphomycin. The mechanism of phosphomycin interference with the enzyme system of the cell wall of the bacteria, inhibiting the synthesis of the peptidoglycan layer has been described clearly by Kahan *et al.* (10). Due to the lack of cell walls in mycoplasmas, the tylosin bacteriostat is added to the SP, thus assisting directly in the inhibition of the 50s ribosome present in such organisms and indirectly inhibiting the synthesis of internal proteins. The electrolytes added to the SP help to create mineral balances, leading to homeostasis in the volume of extracellular, intracellular and interstitial fluids of the host (1).

Last but not least, the addition of electrolytes to the formula is designed to maintain the electrolyte homeostasis in birds that manifest fever during outbreaks of serious diseases, especially those under the stress of heat in open-system farms that are common in the hot climate of the Middle East (2, 3).

The Bedson Company has performed several research projects in countries such as South Africa, Romania and the United States. The data obtained from these studies show that Fosbac Plus T®, a synergistic preparation, has high antimicrobial activity against a wide spectrum of organisms.

The objective of this study was to evaluate the impact of synergism of supplements to calcium phosphomycin/tylosine tartarate on performance and on the frequency of gross lesions at market age.

Materials and methods

Birds and design

A total of 120-day old broilers, of the Ross 308 breed, hatched from eggs laid by the same parent stock, were divided evenly into two groups, labelled as C and SP. The production of broilers from the same parents and hatchery had a history of fluctuation in performance associated with a high frequency of condemnation due to the presence of gross lesions at the market age of 43 days due to common viral and/or bacterial infections. Each group of 60 birds was divided into three replicates or pens, with 20 birds per pen. Group C included the control birds deprived

of SP treatment, while the birds in the second group were treated with SP at different ages. The SP treatment was administered in drinking water at three age intervals, as follows:

- 1-5 days: an amount of 160 mg/kg body weight
- 21-25 days of age: 80 mg/kg body weight
- 29-33 days of age: 80 mg/kg body weight.

Vaccination

All birds in the two treatment groups were vaccinated in accordance with a programme that is commonly used on broiler farms of the Middle East for the control of Newcastle disease virus (NDV), infectious bronchitis virus (IBV) and infectious bursal disease virus (IBDV). To protect birds NDV, the B1 strain was administered in the eye at 8 days of age (Nobilis® ND Hitchner, Intervet International, Boxmeer), while the LaSota strain was administered in the eye at 17 days of age (Nobilis® ND Lasota, Intervet). To confer protection against the IBV, IB Ma5 was administered in the eye at 8 days of age (Nobilis® IB Ma5, Intervet), while IBV 4/91 was administered in the eye at 15 days of age (Nobilis® IB 4/91, Intervet). Protection against IBDV involved the administration of IBDV (L strain) in drinking water at 12 and 19 days of age (Nobilis® Gumboro D78, Intervet).

Feed, water and bird densities

Feed and water were administered *ad libitum* and, in accordance with the guidelines of the National Research Council (NRC), the birds were reared on the floor, with a density of 10 birds per m^2 (12).

Production performance

The mortality rate was recorded on a daily basis in each pen and the weight of each bird was recorded once a week. The feed conversion was determined in each pen and the average feed conversions of the birds were compared statistically at different ages for both treatments.

Gross lesions

At the market age of 43 days, the frequency of gross lesions was calculated. This included breast blisters, congestion in the bursa, lung congestion, pericarditis and tracheitis.

Statistics

This complete randomised design (CRD) enabled a comparison to be made of the means of all parameters using the analysis of variance (ANOVA). The significance in differences of mean parameters between the two treatments was set at a 95% confidence limit ($p<0.05$).

Results and discussion

Production

The production parameters assessed in the two treatments included the percentage of cumulative mortality up to 43 days of age (Table I), cumulative feed conversion up to 9, 16, 23, 30, 37 and 43 days of age (Table II) and weekly average live body weight effective on day 9 (Table III).

Table I
Cumulative mortality percentage among birds receiving different treatments at different ages (before and after the administration of *Escherichia coli* challenge)

Treatment	Cumulative mean mortality percentage up to 43 days of age
Control group	6.67
Synergistic preparation	1.67

Percent mortality

The birds in the SP treatment group showed the lowest mortality percentage (1.67% up to market age of 43 days), a percentage that was lower than that of the control birds (Table I). This pointed to the safety of SP treatment which did not affect the livability of birds and to a possible reduction of bacterial infections (7, 8). The cumulative mortality in control birds was 6.67% which is considered higher than the internationally accepted percentage mortality among broilers (13); this is mainly due to the long history of *Mycoplasma gallisepticum* infection on the breeder farms.

Feed conversion

The average feed conversion in the two treatments at 9, 16, 23, 30, 37 and 43 days of

age is given in Table II. In the period up to 30, 37 and 43 days of age, the SP group had the lower feed conversion rate in comparison to the controls. However, significant differences were observed only at 43 days of age. This improvement in feed conversion coincided with the end of treatment of the SP birds. The regulation of SP administration at different intervals could be further optimised in the future.

Average live body weight

The data on average live body weight recorded on a weekly basis and effective on day 9 of age and up to market age for the different treatments are shown in Table III. The SP birds consistently weighed more than the birds in group C at 16, 23, 30, 37 and 43 days of age. However, the significance in differences appeared from 30 days of age onwards. It is worth noting that the SP treatment had an average increase of 154.57 g in the weight of the bird compared to that of the control birds at the market age. This is most likely the result of a reduction in bacterial infections among these birds due to the antimicrobials that were administered.

Gross lesions at market age

The incidence frequency of the five pathological lesions most often observed at the 43-day market age used by the world poultry industry in different combinations to condemn carcasses in slaughterhouses (8) are shown in Table IV.

There was a tendency among SP birds to manifest lower frequencies of four of the five lesions in comparison to those recorded in the controls, namely: tracheitis, lung congestion, breast blisters and bursal congestion. This confirms that the SP reduced bacterial infections to a level that reduced the frequency of gross lesions associated with such infections (8).

Table II
Mean feed conversion ratios of the birds receiving the different treatments at different ages

Treatment	Mean cumulative feed conversion ratios up to age specified					
	9 days	16 days	23 days	30 days	37 days	43 days
Control group	2.09[a]	1.80[a]	1.38[a]	1.42[a]	1.70[a]	2.13[a]
Synergistic preparation	2.28[a]	1.75[a]	1.43[a]	1.39[a]	1.59[a]	1.91[b]

(a) and (b) mean totals in a column followed by different superscripts are significantly different ($p<0.05$)

Table III
Weekly average live body weight of birds receiving different treatment

Treatment	Mean live body weight (g)					
	9 days	16 days	23 days	30 days	37 days	43 days
Control group	184.35[a]	471.81[a]	840.17[a]	1 338.68[a]	1 897.95[a]	2 390.18[a]
Synergistic preparation	170.40[b]	482.82[a]	843.90[a]	1 428.05[b]	2 080.42[b]	2 544.75[b]

(a) and (b) mean totals in a column followed by different alphabet superscripts are significantly different ($p<0.05$)

Table IV
Mean frequencies of birds subjected to the two different treatments showing specific gross lesions at market age (43 days of age)

Treatment	Mean percentage of birds showing a specific lesion[a]				
	Tracheitis	Lung congestion	Breast blister	Pericarditis	Congested bursa
Control group	70.00	43.33	3.33	6.67	40.00
Synergistic preparation	53.33	26.67	0	6.67	26.67

(a) means in a column did not differ significantly ($p>0.05$)

Conclusion

The obtained in this study revealed that the administration of SP at low levels clearly improved the performance of the birds (low mortality, low feed conversion, highest live body weight and lowest condemnation due to gross lesions of the carcass).

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