

THE EFFECT OF A MACROLID ANTIBIOTIC ON THE CONTROL OF MYCOPLASMAS AND PRODUCTION EFFICIENCY IN BROILERS

J. Mavromati¹, E. Mavromati², Z. Gjeta³

¹Veterinary Medicine Faculty, Agricultural University of Tirana, Albania

²Faculty of Economy, Logos University, Tirana, Albania.

³Faculty of Agriculture and Environment, Agricultural University of Tirana, Albania

Corresponding author: j.mavromati@hotmail.com

Original scientific paper

Abstract: Various antibiotics are used in Albania for controlling of Mycoplasmas. The main groups of antibiotics with broad spectrum are the tetracycline group (Oxitetracycline, Chlortetracycline, Doxycycline), kinolone group (Enrofloxacin, Norfloxacin, Flumequin) and macrolide group (Tylosin, Erythromycin and Rovomycin). Tilmicosin is a macrolide antibiotic which has not been used in Albania before. Tilmicosin is not being used in human medicine and it acts very well against Mycoplasmas with good results in the performance of birds. Considering that Tilmicosin is a specific antibiotic against some bacteria, particularly against Mycoplasmas, its use presents a great treatment possibility and it's the right time to introduce it also in Albania. The aim of the study was to investigate the effect of the Tilmicosin use on mycoplasmas control in broilers and the impact on the production efficiency. Both, control and experimental flock were Mg and Ms positive (ELISA's test and Cultural control). The experimental results showed that the flock treated with Tilmicosin had a better control on mycoplasmas and better technical and economical results than the control flock. The antibiotic use resulted in a lower mortality rate in broilers compared to the untreated ones. Based on the results of the study some practical recommendations on the use of antibiotic Tilmicosin are also given.

Key words: antibiotic tilmicosin, broiler, mycoplasma

Introduction

The way of use of antibiotics in veterinary medicine is very important for the animal health security. But, it is important for the food safety and the public health as well (*Gary Butcher, 2006*). Many times the use of antibiotics is out of control, which can cause some residues at the meat and problems to public health.

Antibiotics in the control of *Mycoplasma* remain a powerful tool in veterinary medicine as the prevention through vaccines is costly and it has not yet very good results in broilers (*Nascimento et al., 1993*).

Mycoplasma can create inconvenience and economic damage that should be taken into consideration in the poultry industry, which is often not apparent and it silently damages the effectiveness of investment (*Mohammed et al., 1987; Nascimento, 2005*). At the poultry industry *Mycoplasma gallisepticum* (*Mg*) and *Mycoplasma synoviae* (*Ms*) are of the greatest importance (*Kleven et al., 1997; Mohammed et al., 1987*).

The control of *Mycoplasmas* in veterinary practice requires careful selection of the antibiotic as well as good management of the herd.

Some broad spectrum antibiotics such as Oxitetracikline, Doxycycline, Enrofloxacin, Norfloxacin, Tylosine, Eritromycine, Rovamycine etc, are used to prevent and control *Mycoplasmas* in veterinary practice.

Tilmicosine is an antibiotic of macrolid group that has not been used before in Albania which acts against gram positive microorganisms and to *Mycoplasmas*. It has a considerable concentration in macrophages, heterophiles, monocytes of the respiratory system in comparison with other wide specter antibiotics (*Scorneaux, 1998; Warren et al., 1997*).

Tilmicosine is not being used as a human medicine and it has a very good action against *Mycoplasmas*, impacting positively on the economic indicators of production.

In our experiment we used Tilmicosine antibiotic to control the *Mycoplasmas* and see the impact on the economic indicators of the production. Aiming to have a view of the effects of Tilmicosine on both *Mycoplasmas* and production indicators, we conducted an experiment in a broiler flock in central Albania in Myzeqe.

Materials and Methods

In a herd of 10.000 broilers we created two groups with 5.000 birds in each group. The experiment was conducted during September-October 2010 in a contemporary industrial broiler farm in Myzeqe. Each group had equal conditions breeding, feeding, the same vaccination program, disinfection, the same coccidiostats, the same correlation female male race "Cobb 500", the same density (13.9 birds/m²) etc. In the first group of birds we did not use any antibiotic which was used as control group.

In the second group was used antibiotic macrolid Tilmicosine with the following Scheme:

The first 3 days of birds life on the doses just 60 ml 25% solution of Tilmicosine on 200L of fresh water. It reiterates Tilmicosine antibiotic (25%

solution) in the 23-day for 2 days in 60 ml 25% solution of Tilmicosine on 200 L of drinking water.

Before the use of antibiotic we take blood samples from 20 birds from each group and we checked for the presence of antibodies of *Mycoplasma*'s with Elisa test (Flock check MG-IDEEX). Also planting was made in the respective cultures. Planting took place in the microbiology laboratory at the Faculty of Medicine of Ioannina Greece. PPLO agar and bujon medium terrain were used from Difco company. We added mycoplasma supplements: Extract of ferment, horse serum, penicillin and thallium acetate.

From laboratory tests, clinic and anatomopathology, we had no other microbial factors that can influence on the results of the experiment. But anyhow, it is important to mention that the conditions in the two groups of experiment were the same.

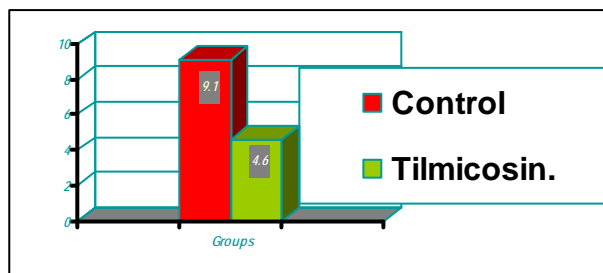
The laboratory results were positive, that means we had the presence of *Mycoplasma* (Mg) in flocks of birds introduced into the experiment. Throughout the growth period of the birds were marked for each day carefully all information on technical and economical indicators of birds such as mortality, morbidity, clinics, anatomopathology, food conversion ratio (FCR), weight, food consumption, weight at the slaughterhouse, age at slaughter, etc.

Results and Discussion

In the Table 1 and the Graph 1, there are some percentages shown of mortality for the two groups of broiler flocks. As it can easily be mentioned, higher mortality was shown at the group in which there was no antibiotic used. These results coincide with some authors (*Nascimento et al., 2005; Stipkovits et al., 1994*).

Table 1. Details for the mortality

Details	Control group	Tilmicosin group
Number of birds	5000	5000
Mortality of birds in numbers	455	230
Mortality in %	9.1%	4.6%



Graph 1. Mortality of broiler in two flocks

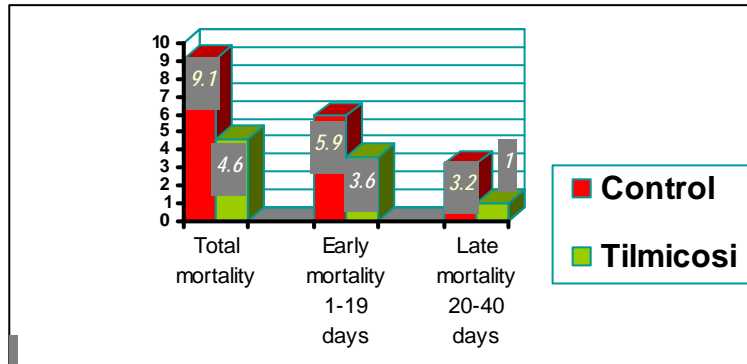
The better effectiveness of macrolid antibiotic Tilmicosin according to some authors has to do with their mode of action (*Nascimento et al., 2005; Stipkovits et al., 1994*).

Tilmicosin is a bacteriostatic antibiotic with high concentrations in macrophages, heterophiles and monocites of respiratory system. Macrophages heterophiles and monocites are cells which participate in the cellular immune system of the organism that when carrying Tilmicosin in their ribosome's, they add their enzymatic activity and their contact with pathogen microbe and it results in phagocytosis of Mycoplasmas in the point of infection. During the process of phagocytosis Tilmicosin hits and eliminates pathogenic microbe. In this way Tilmicosine helps the macrophages to eliminate safely and faster cells of microbial pathogens. Tilmicosin is also being helped this way by the body's immune system cell.

In deep cytological studies, some authors (*Xing-Yuan et al., 2006*) conclude that macrolide antibiotics appear to increase the anti-inflammatory effect of cells that participate in cellular immune system of the body. These results support the view that macrolids drugs stimulate a better anti-inflammatory effect being implicated in the synthesis of several mediators and cytokines participating in the inflammatory process.

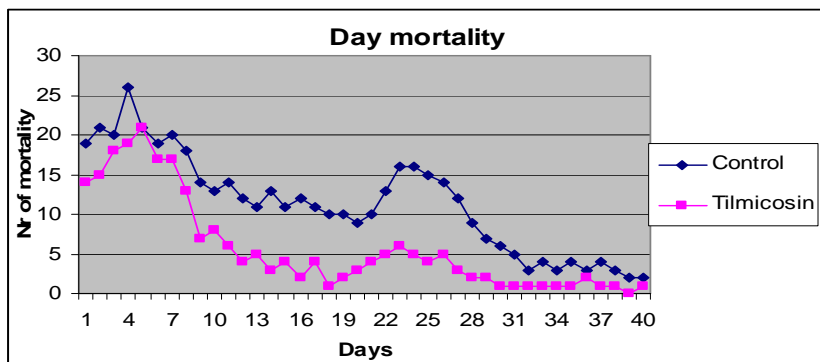
The use of antibiotics in the first days of life of birds decreased microbial load of Mycoplasma income from eggs vertically and horizontally from the incubator, transportation etc. Then the number of Mycoplasma begins to grow again.

After day 20 of life of birds seems that the number of Mycoplasma is added leading to the danger that in conditions of stress of vaccination, density stress (*Škrbić et al., 2011*), nutritional stress etc, can be possible overwhelming and give us signs of clinical disease (*Calnek et al., 1991; Leeson, 2000*).



Graph 2. Early and late mortality

In Graph 2, mortality appears divided in the first phase up to 19 days called early mortality and the second phase called the late phase of the 20-day up to slaughter. In practice it is important to control mortality in general and in particular late stage, because at this stage of economic damage is greater. Tilmicosin in our experiment has a low mortality in the second phase that makes it quite interesting for use in veterinary practice. Experiment results match other authors in terms of results in reducing overall mortality and mortality in the second phase (*Warren et al., 1997; Kleven et al., 1997*).



Graph 3. The daily mortality

At the above chart it appears that both groups have high mortality in the early days of the arrival of the birds in the stable. This is a fact that happens in practice because of newly arrived birds want to be adopted careful. The first stress removes the weak ones.

The percentage of late mortality (from 20 to 40 days) seems to be lower in the group that we used Tilmicosin than the control group.

The second use of antibiotic in the 23-day of bird's life allows us to reduce again the microbial load of Mycoplasmas and the risk of giving us the greatest economical damage (*Stipkovits, 1994; Warren et al., 1997*).

In general, in the second use of antibiotics in the age 22-28 day of broilers, period which coincides with the second vaccination against Newcastle diseases, Gambaro's, infectious bronchitis, etc.

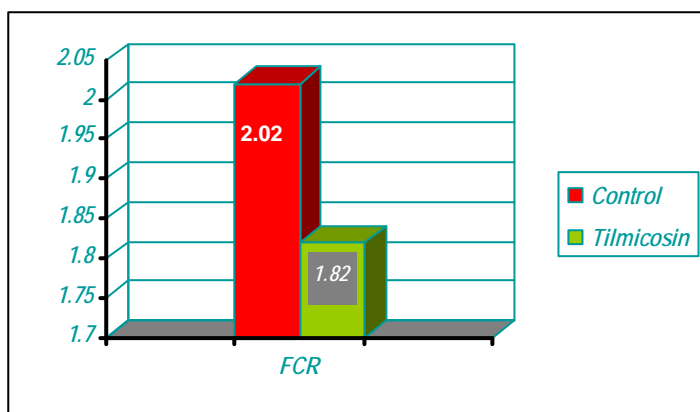
Vaccination with live vaccine virus to the above diseases, creates a significant stress to the birds who should consider having them responding to the use of antibiotics 2-3 days after vaccinating. Vaccination stress allows the rapid growth of the number of Mycoplasma which can aggravate the situation with other stressful factors of the environment and can provide the greatest damage (*Butcher, 2002*).

This is why many researchers today recommend the use of antibiotics in these stages without shown the clinical signs of the disease but in order to prevent the situation. This approach is called metaphylactic use of antibiotics (*Butcher, 2006*).

The use of antibiotics before the clinical signs is important, exactly at the incubation time of microbes. It is recommended to use antibiotics before and/or during a possible stress period.

Table 2. Details for feed conversion ration (FCR)

Details	Control group	Tilmicosin group
Number of birds in slaughter house	4545	4770
Kg live weight in slaughter house	8999	10398
Total Feed consumption in kg	18178 kg	18924 kg
Feed Conversion Ration (FCR).	2.02	1.82



Graph 4. Feed conversion ratio (FCR)

In Graph 4 it is presented a feed conversion ratio, how many kg of feed are consumed by birds to add 1 kg of live weight meat.

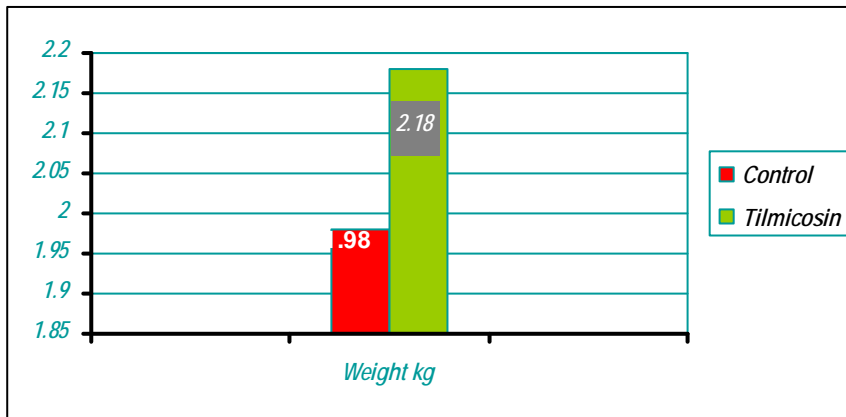
It is clear that the best result was that of the group in which we used the Tilmicosin.

Control group of birds in which there was not used any antibiotic, has a low score, then this group has consumed more feed (2.02 kg) for 1 kg live weight meat which obviously increases significantly the cost of production. Our results correspond to other researchers' (*Barbour et al., 1998; Mohammed et al., 1987*) who mention the importance of the additional weight getting higher in herds that used antibiotics.

Birds were sent to slaughter at the same time (40 days age), but their weight was different.

Table 3. Live weight of birds in slaughter house

Details	Control group	Tilmicosin group
Number of birds in slaughter house	4545	4770
Kg live weight in slaughter house	8999	10398
Average of live weight for one bird in kg	1.98 kg	2.18 kg
Average daily gain for birds in gr	48 gr	53 gr



Graph 5. Weight of two flocks in slaughter house

In Graph 5 appears the slaughter weight of birds for the two groups of the experiment. Control group reached an average weight slaughter of birds relatively

low (1.98 kg), compared to the group of birds in which is used Tilmicosin antibiotic that has reached a average slaughter weight 2.18 kg.

Many authors recommended the use of antibiotics in the first stage of life (1 to 5 days of life) and a repetition during 22 to 26 day of bird's life. The second use of antibiotic has a relatively high cost, because the birds in this stage consume more water and feed, which means more antibiotics and as a result bigger costs. The authors also indicated that for some antibiotic this investment is profitable, because it will increase the economical indicators. Even in our experiment using Tilmicosin in the second phase at days 23-24 of birds gave it's contribution in making the best economical indicators.

Enough authors recommend to be careful in the use of particular antibiotics by using them for particular causes and not in a wider range, because it results in antibiotic resistance (*Warren et al,1997; Kleven et al., 1997*).

European production Index is a significant parameters for the broiler flocks in which are related the most important parameters like: Body mass, vitality, duration of fattening period in days and feed conversion. Production index was calculated according to formula (*Petričević et al., 2011*):

$$\text{Production index} = \frac{\text{Body mass (kg)} \times \text{vitality(\%)} \times 100}{\text{Duration of fattening (days)} \times \text{feed conversion}}$$

(kg/kg)

For the control group the Production index will be: Index = $\frac{1.98 \times 90.9 \times 100}{40 \times 2.02} = 222.6$

For the Tilmicosin group the Production index will be: Index = $\frac{2.18 \times 95.4 \times 100}{40 \times 1.88} = 288.8$

We have significant difference between Tilmicosin group in which the production index is 288.8 than control group in which the production index is 222.6. As higher as can the production index is better for the economic profitability of broiler flocks.

In Table 4, we have all technical and economical figures for the both flocks during the 40 days of fattening period. Finally we can see that the benefit from both flocks are not the same, but with significant differences, more than 1400 Euro in the flock in which we used Tilmicosin than in control group in which we don't use any antibiotic.

Table 4 Economic figures and benefit in Euro for 2 groups of birds

Details	Control group	Tilmicosin group
Number of day old chickens	5000	5000
Mortality number of birds	455	230
Mortality %	9.1	4.6
Live birds in Slaughter house	4545	4770
Live weight in slaughter house	8999	10398
Average weight in kg of one birds in Slaughter house	1.98	2.18
Total feed consumption in kg from flocks	18178	18925
Feed Consumption Ration-FCR	2.02	1.82
Production Index	222.6	288.8
Cost of 1 kg feed (average for first and second period)	0.44	0.44
Total feed cost in euro	7998	8327
Cost of vaccines, coccidiostatics, disinfectants etc.	200	200
Cost of antibiotic treatment	0	300
Cost of buying day old birds (1 birds=0.47 Euro)	2350	2350
Cost of labor, Bank, energy etc	750	750
Total expenditures	11298	11927
Cost of 1 kg live meat weight	1.255	1.147
Sales price of 1 kg live meat	1.45	1.45
Total income from selling live meat	13049	15078
Benefit	1750.3	3150.7

Conclusion

From the data of the above experiment we came to the conclusion that:

- Tilmicosin antibiotic which was used for the first time in our country, has contributed in reducing of the mortality (4.6% in Tilmicosin group from 9.1% in control group).

- Antibiotic Tilmicosin have a positive impact and increasing output indicators compared to the control group in which there was no antibiotic used. The Production index, which is a significant index, it was respectively 222.6 in the control group and 288.8 in the group which used Tilmicosin.

- The final benefit in Euros it was different in 2 groups and exactly 3150.7 Euros benefit in Tilmicosin group compare of control group in which the benefit it was 1750.3 Euros. That means 1400 more Euros in the flock in which we used Tilmicosin than in control group in which we don't use any antibiotic.

- The time of antibiotic use in just born birds is very important (1-3 days) and provides the opportunity to hit and reduce the Mycoplasma's load that comes from the vertical transmission through eggs from infected parent flocks in day old chicks or horizontal infection in the incubator, transport etc.

- The use of antibiotic in the second phase is important, at the age of 22-26 days (in our experiment was used at the age of 23-24 days), because they can prevent the propagation of mycoplasmas by horizontal infection which can be increased further by the different stresses and in particular by stress of post second vaccination of the vaccine against Newcastle disease, infectious bronchitis and Gambaro's which usually ends the immunization program in broiler flocks at the age of 18-22 days (In our experiment and control group the second vaccination against Newcastle was on the 20th day).

Efekat makrolid antibiotika na kontrolu mikoplazmi i proizvodnu efikasnost kod brojlera

J. Mavromati, E. Mavromati, Z. Gjeta

Rezime

Različiti antibiotici se koriste za kontrolu mikoplazmi u Albaniji. Glavna grupa antibiotika sa širokim spektrom dejstva su tetraciklini (Oxitetracycline, Chlortetracycline, Doxycycline), grupa kinolona (Enrofloxacin, Norfloxacin, Flumequine) i makrolida (Tylosine, Erythromycin and Rovomycin). Tilmikozin je makrolidni antibiotik koji ranije nije bio korišćen u Albaniji. Tilmikozin nije korišćen u humanoj medicini dobro deluje protiv mikoplazmi sa dobrim rezultatima na performanse pilića. S obzirom da se pokazao kao veoma dobar u terapiji mikoplazmi, pravo je vreme za njegovu primenu i u Albaniji.

Cilj ovog rada je da se ispita uticaj upotrebe Tilmikozina na kontrolu mikoplazmi kod brojlera i njegov uticaj na proizvodnu efikasnost. Oba, kontrolno i eksperimentalno jato su bili Mg i Ms pozitivni (ELISA test i kontrola kulture). Rezultati eksperimenta su pokazali bolju kontrolu mikoplazme kod jata tretiranog sa Tilmikozinom i bolje proizvodne i ekonomske rezultate u odnosu na kontrolno jato. Upotreba antibiotika rezultirala je smanjenim mortalitetom brojlera u poređenju sa netretiranim. Na osnovu rezultata istraživanja date su praktične preporuke za upotrebu antibiotika Tilmikozina.

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