

Research Article

Effect of Compound Sulfadiazine Suspension on Growth Performance of Broiler in Clinical Efficacy Trial

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Abstract: Compound Sulfadiazine suspension is used mainly to prevent and cure *E. coli*, Salmonella infection of chicken in veterinary clinical application. Effect of compound Sulfadiazine suspension on growth performance of broiler in clinical efficacy trial was studied in the study. One hundred eighty 15-day-old broilers were divided randomly into six groups, blank control group, negative control group, Trisulmixos gavage group, Trisulmixos drinking group, Sufuning gavage group and Sufuning drinking group, respectively. There were three repeating treatments in each group and ten broilers in each treatment. Results showed that compound Sulfadiazine suspension can promote the feed conversion rate of broiler when curing *E. coli*, Salmonella infection of chicken. Both from the perspective of efficacy and from the perspective of growth performance, giving drug by gavage were more effective than giving by drinking. When two products of Compound Sulfadiazine suspension were compared, the indicators of Sufuning were a little better Trisulmixos.

Keywords: Broiler, *Escherichia coli*, salmonella, sufuning, trimethoprim, trisulmixos

INTRODUCTION

Sulfadiazine (SD), a sulfa antibiotic with broad antibacterial spectrum, was used to cure the infections of Gram-positive bacteria, Gram-negative bacteria and many prokaryotes. Trimethoprim (TMP) is an antibacterial synergist and its antibacterial spectrum is broad and is stronger in effectiveness than SD (Chretien *et al.*, 2007; Kongsangdao *et al.*, 2008; Agunos *et al.*, 2012). Compound preparation composed by SD and TMP has excellent antibacterial effect, even kill bacteria. The compound preparation can not only enhance efficacy and shorten treatment, but also decrease the production of resistant strains (Mathlouthi *et al.*, 2012; Skjot-Rasmussen *et al.*, 2013). Compound Sulfadiazine suspension was made up of SD and TMP in the ratio of 4:1 and was used to prevent and cure *E. coli*, Salmonella infection of broiler in veterinary clinical (Ghosh *et al.*, 2012; Salim *et al.*, 2013). Enterprises and researchers in the world paid much attention to the research and development of compound Sulfadiazine suspension (Ali and Zahran, 2010; Ajay and Kaushik, 2011; Chaudhari and Lee, 2013; Giombelli *et al.*, 2013) and several products of compound Sulfadiazine suspension were produced by different enterprises. However most researchers focused on the efficacy of the compound preparation and seldom researchers paid attention to effect of compound Sulfadiazine suspension on growth performance of

broiler in clinical efficacy trial. In this study, Trisulmixos, a kind of compound Sulfadiazine suspension product produced by French Vic pharmaceutical group and Sufuning, another kind of compound Sulfadiazine suspension product produced by Qingdao KDN Animal Pharmaceutical Co. were selected as drug candidate to cure bacteria infection. By different methods of giving drug, effect of compound Sulfadiazine suspension on growth performance of broiler in clinical efficacy trial was studied.

MATERIALS AND METHODS

Reagents: Sufuning, a kind of compound sulfadiazine suspension product, was provided by Qingdao KDN Pharmaceutical Co., Ltd. Trisulmixos, another kind of compound sulfadiazine suspension product, was gotten from France Vic Co. Ltd. MacConkey, LB agar and nutrient broth medium were bought from Beijing Luqiao Technology Co., Ltd. Bacterial strain used in this experiment were *Escherichia coli* and salmonella that were reserved previously in our laboratory.

Experimental animals: One-day-old broilers were purchased from Chia Tai avian field. All of these broilers were fed conventionally before experiment. Complete feed without any drugs was used in the experiment. The broilers were fed ad libitum and free access to water. The broilers were immunized

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Table 1: The treatment processes of the six groups

No	Groups	Samples	Different processes
1	Blank control	30	Each broiler was given 1 mL normal saline by gavage every day for 5 days
2	Negative control	30	Each broiler was given 1 mL normal saline by gavage every day for 5 days
3	Trisulmixos gavage	30	0.08 mL/kg trisulmixos was send into each broiler by gavage every day for 5 days
4	Trisulmixos drinking	30	0.4 mL/L trisulmixos was send into each broiler by centralized watering 3 h every day for 5 days
5	Sufuning gavage	30	0.08 mL/kg sufuning was send into each broiler by gavage every day for 5 days
6	Sufuning drinking	30	0.4 mL/L sufuning was send into each broiler by centralized watering 3 h every day for 5 days

Newcastle disease using LaSota vaccine by intranasalling. When these broilers grew till 15 day old, they can be used in this experiment.

Methods:

Preparation of bacterial liquid used in experiment:

Firstly, we inoculated *Escherichia coli* and *Salmonella* bacteria on LB agar and MacConkey agar. After these bacteria were cultivated at 37°C about 24 h, some typical colonies were chosen to inoculate on 100 mL Broth medium. Then, they were cultivated in desktop bath oscillator at 37°C for 6 to 8 h. After that, 0.1 mL bacteria liquid was 10-fold diluted gradually by nutrient broth. Then part of the bacteria liquid being diluted was coated on a normal flat medium. Finally, Colony Forming Units (CFU) were counted at 37°C after the bacteria was cultivated for 24 h. The ratio of *E. coli* and *Salmonella* in the liquid was 3:1.

Pre-experiment for screening dosage: Forty ten-day-old broilers were divided randomly into four groups. Each group were injected bacteria liquid in different dilution factor, that is, 1, 1×10^{-1} , 1×10^{-2} , 1×10^{-3} , respectively. One ml corresponding bacteria liquid was injected into broilers in corresponding group through pectoral. Then, observe the broilers for 5 days and count the number of dead chickens so as to gain LD₅₀ using Karber method. At last, suitable dosage strength can be obtained.

Clinical cure experiment: One hundred and eighty healthy fifteen-day-old broilers were divided randomly into six groups after being weighed individually. Every group contained three repeat treatments and each treatment contained ten broilers. The broilers in blank control group were fed normally and not injected bacteria liquid. And every broiler in other groups was injected, respectively 1 mL bacteria liquid through pectoral. After typical clinical symptoms appeared, the other treatment processes of the six groups were shown in Table 1. The chickens were observed twice every day and the number of the sick and the number of the dead in every group was counted. We weighed the dead broilers one by one. And then the dead broilers were dissected in order to observe pathological changes. After observation period, the broilers still living were weighed individually. Finally, cure rate, average day gain and feed conversion ratio of every group were obtained.

Evaluation indicators of efficacy: The indicators of efficacy involved in this experiment, including morbidity rates, mortality rates, effective rate and cure rate, were consistent with that in reference (Zhihui *et al.*, 2009).

Evaluation indicators of growth performance:

Average Day Gain (ADG): The broilers were weighed one by one at 14 and 24 day old, respectively, obtaining ADG₁₄ and ADG₂₄, respectively. Then average day gain can be calculated:

$$ADG = (ADG_{24} - ADG_{14}) / \text{Feeding Days}$$

Average Daily Feed Intake (ADFI): Total Feed Intake (TFI) from 14 to 24 day old was recorded to calculate ADFI:

$$ADFI = TFI / \text{Feeding Days} \cdot \text{Broiler number}$$

Feed Conversion Rate (FCR): Total Feed Intake of whole test period (TFI_w) and Total Weight Gain (TWG) were recorded to calculate FCR:

$$FCR = TFI_w / TWG$$

RESULTS AND DISCUSSION

Clinical symptoms and necropsy lesions: The broilers in later five groups were injected 1 mL bacteria with dosage strength of 5.6×10^7 CFU/mL. After that, many typical clinical symptoms appeared, such as lassitude, loose feathers, severe diarrhea. All dead broilers were dissected to observe visceral. It smelled stench while they were dissected. And there were perihepatitis or pericarditis on their hearts and livers in different extents, shown as Fig. 1.

Experiment results on growth performance: On the one hand, the broilers of negative control group were all sick and the mortality rate of this group was 23.3% after being infected by bacteria liquid. On the other hand, there was no dead or sick broiler in blank control group. These results showed that the injection of bacteria liquid can infected successfully these broilers with *E. coli* and *Salmonella*. The cure rates of later four groups were shown in Fig. 2. The cure rates of Sufuning gavage group and Trisulmixos gavage group were higher than other two groups, which meant that when drug was given, the method of gavage was better than the method of drinking. The method of gavage was



Fig. 1: Photograph of heart and liver of boiler after being infected by bacteria

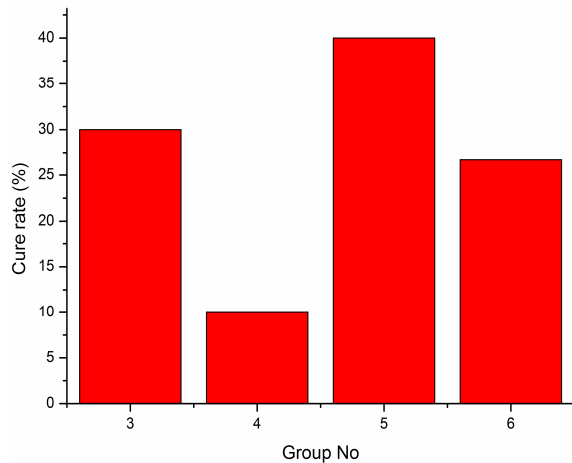


Fig. 2: The cure rate of later four groups

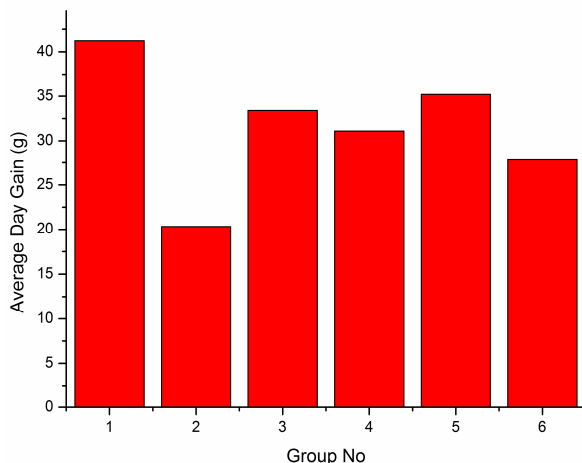


Fig. 3: The average day gain of different groups

conducive to promote the efficacy of compound sulfadiazine on curing the infection of *E. coli* and *Salmonella*.

The average day gains of different groups were shown in Fig. 3. The ADG of blank control group was the highest and the ADG of negative control group was lowest, which indicated that the infection of *E. coli* and *Salmonella* can influence the growth of broiler greatly. From the ADGs of the four-administered groups, it can be seen that the effect of giving-drug method on growth

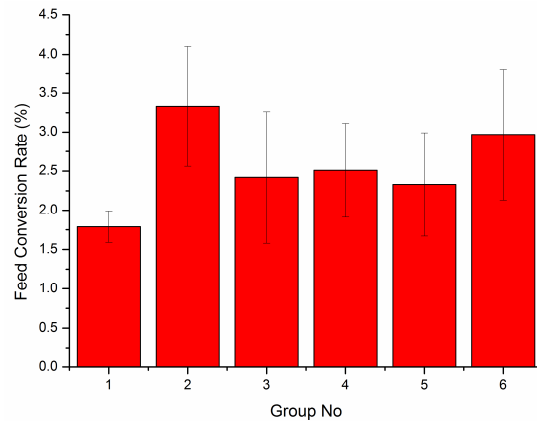


Fig. 4: The feed conversion rates of different groups

of broiler was lower in Sufuning gavage group and Trisulmixos gavage group than in Sufuning drinking group and Trisulmixos drinking group. And the ADG of Sufuning gavage group was a little higher than that of Trisulmixos gavage group. All above-mentioned indicated that giving drug by gavage affected less on the broiler growth than drinking. This trend was similar to the trend of cure rate in these groups.

The feed conversion rates of different groups were shown in Fig. 4. From the experimental results, it can be seen that the feed intakes of different groups were similar, whereas the difference of FCR was huge and the trend of FCR was Inverse to the ADG. The FCRs of administered groups were lower than that of blank control group and higher than that of negative control group. These results indicated that infection of *E. coli* and *Salmonella* affected a little on the broiler feeding process, but affected much on digestion and absorption function of broiler. The infection inhibited *in vivo* nutrient conversion of broilers. However, compound sulfadiazine suspension can change this condition and improve the FCR of broiler.

CONCLUSION

Through observing the growth performance of broiler in efficacy trial, it was concluded that compound sulfadiazine suspension can effectively cure the infection of *E. coli* and *Salmonella* for broilers and can reduce FCR and decrease the loss of infection. Moreover, the efficacy and growth performance of compound sulfadiazine suspension given by gavage was better than given by drinking. When two products of Compound Sulfadiazine suspension were compared, the indicators of Sufuning were a little better Trisulmixos. This study provided scientific basis and trial data for rational use of compound sulfadiazine suspension and provided important references for the cure of *E. coli* and *Salmonella* in the course of broiler breeding. However, the action mechanism of compound sulfadiazine against *E. coli* and *salmonella* and the

mechanism of compound sulfadiazine promoting growth still need to be further study.

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