Influence of Tiamulin Therapy on Weight Gain in *Brachyspira* Dysentery in Piglets

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Abstract
The aim of research was to evaluate the therapeutic and economic efficiency (daily individual weight gain / observation period) of two available tiamulin fumarate antibiotic conditionings (one oral and one injectable) in a farm environment, were *Brachyspira* evolution was suspicioned and confirmed. The experiment was conducted in a pig growing and fattening unit from Timis County, constituted as an intensive system. The sick piglets manifested acute clinical signs, mainly: drowsiness, enophtalmia, kyphosis and the sanguinolent diarrhoea in all cases. Clinical and morphopathologic suspicion was confirmed by the laboratory and bacterioscopic examination, which ascertained the presence of *Brachyspira hyodysenteriae*. Consequently, were chosen 48 ill piglets from the age group of 35 to 45 days and three experimental therapeutic (T) and one Control (C) groups were constituted as follows: group T1 - oral way treatment for five consecutive days with Tiamutin 45% soluble granules (*Ceva*), at doses of 6 and 8 mg.kg.bw., (for group T2) and respectively Tiamutin 10% injectable (*Dopharma*) (T3), 8mg.kg.bw^{-1} I.M., four consecutive days. Study duration was 21 days, revealing the economic superiority of the oral conditionings vs. injectable of tiamulin fumarate and also the therapeutic efficiency of this form as primal choice in the enteric disease outbreaks.

Keywords: *Brachyspira,* dysentery, economic efficacy, pig, tiamulin

1. Introduction

Among the diseases that can cause great damage in swine farms, treponemic dysentery (currently *Brachyspira*) has a special importance, because it involves great economic losses, both by growth failure and high mortality, as well as significant costs of the outbreaks prevention and control [1].
Brachyspira hyodysenteriae, the etiologic agent of treponemic dysentery, can be recognized easily being a big representative *Spirochetae,* presenting up to four large undulations. Culturally it is an anaerobic germ that produces beta type hemolysis on the growing blood mediums [1-3].
The main source of infection is represented by the sick pigs which eliminates great amount of treponemas with faeces. Their excretion begins generally after 24 to 48 hours from the infection and can persist throughout the disease and even another 5-7 weeks after the animals' clinical recovery [2-4].

2. Materials and methods

The unit & Animals
The experiment was conducted in a swine growing and fattening facility from Timiş County. The unit was set up as an intensive farm system, with an effective of 6500 heads, at the time of the testing, structured accordingly to age and weight category. Highest incidence of disease was found especially in the young categories, aged between 35-45 days, but cases have been reported in other categories too.
The study duration was 21 days and started with the individual weighting of the piglets and the

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drug administration and finished at day 21 when efficiency and economic outcome (weight gain) was analyzed. The research was conducted only on sick piglets, with acute clinical signs, manifested by drowsiness state, enophtalmia, kyphosis, sanguinolent diarrhoea.
Three experimental and one Control group were chosen from 35-45 days age category, and were constituted by 12 individuals / group as follows: groups T1 and T2, treated orally with soluble tiamulin fumarate; group T3, treated with oily suspension of tiamulin fumarate and a Control group (untreated until day 7 of the study).

Diagnostic & Confirmation
The diagnosis was made by morpho-pathological examination after the necropsy done in the farm; the main modifications found being diffuse hemorrhagic enteritis and gastritis (fig. 1)

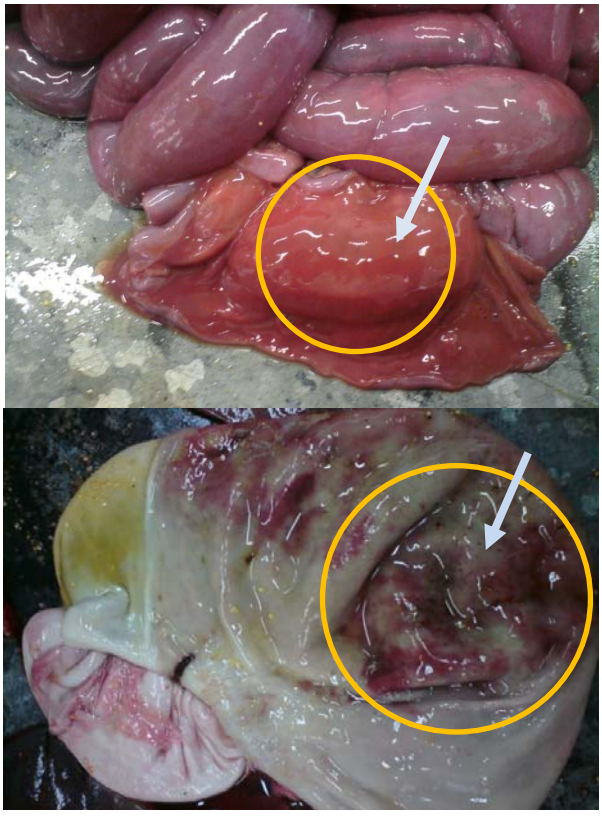

Figure 1. Diffuse hemorrhagic enteritis (upper image) and gastritis (lower image) (original Doma AO)

Also laboratory examinations, based on certain elements of bacterioscopic diagnostic were accomplished at the Sanitary Veterinary Directorate of Timiş County (DSVSA).

Antibiogram revealed that *Brachyspira* samples were sensitive to: dimetridazole, metronidazole, imidazole, ronidazole, tiamulin and carbadox, which are generally used to prevent and combat this enteric disease [1, 5, 6].

Drug formulations used
The drugs used in the study respected the manufacturer's administration indications and were: Tiamutin 45% soluble granules (*Ceva*), containing tiamulin fumarate 450.0 g and soluble excipient to 1000,0 g, administered in the water system of the experimental groups for five days consecutive in the concentrations of 0.006% (meaning dose of: 6 mg/kg.bw.) for T1 group and 0.008% (dose of: 8 mg/kg.bw.), for T2 group.
Tiamutin 10% oily injectable solution (1ml of solution containing 100 mg of tiamulin fumarate) (*Dopharma*), was administered profoundly I.M., at the dose of 8 mg/kg.bw (0.8 ml/10 kg.bw.), for four days.

3. Results and discussion

Group T1
During the experiment, within this lot there has been registered only a single mortality (Fig. 1) representing 8.33%. Initial total weight of the group was of 92.9 kg and after 21 days of experiment, it reached to 98.9 kg, corresponding to an average daily gain of 101.5 g / head / day (fig. 5).

Group T2
In the case of this lot there weren't been registered any mortality cases all 12 piglets healing within 10 days (100% cure rate) (fig. 2). The final total weight of the group was of 117.6 kg (meaning an additional 24.9 kg), the recorded average daily gain being of 172.8 g/head/day (fig. 5).

Group III
The registered in this case losses were 2 piglets, the remaining 10 piglets healing within 10 to14 days (fig. 3). In the case of this lot, due to the recorded mortality (average weight daily gain 79.1 g / head / day), we cannot speak about economic efficiency (Fig. 5).
Group IV
The control group did not receive any treatment during the first 7 days of the experiment. As a consequence of disease evolution, during this time

four piglets died (all with forms of hemorrhagic enteritis) (fig. 4), representing a proportion of 33.3% of the lot.

After the 7 days, to reduce unnecessary losses, the remaining piglets from this group were treated with soluble tiamulin fumarate at a dose of 8 mg /kg.bw, for 5 consecutive days. At the end of experiment in this group, there had been registered a 26 kg deficit and four dead piglets in. (fig. 5).

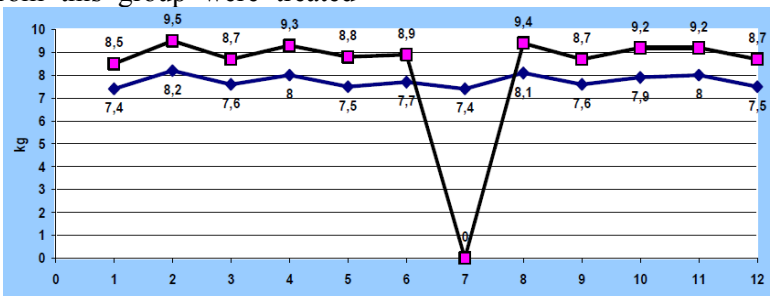

Figure 2. Presentation of individual weight evolutions for the T1 group (dose: 6 mg.kg.bw.$^{-1}$)

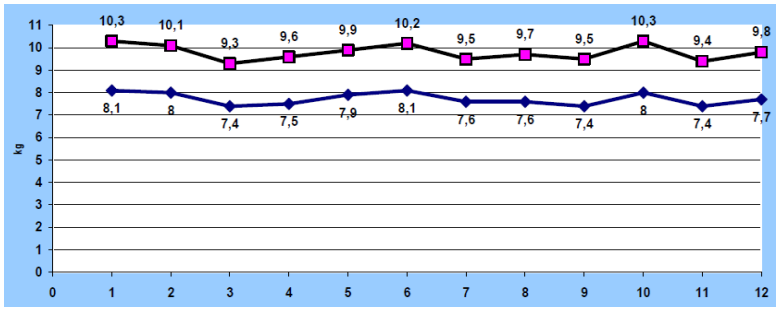

Figure 3. Presentation of individual weight evolutions for T2 group (dose: 8 mg.kg.bw.$^{-1}$).

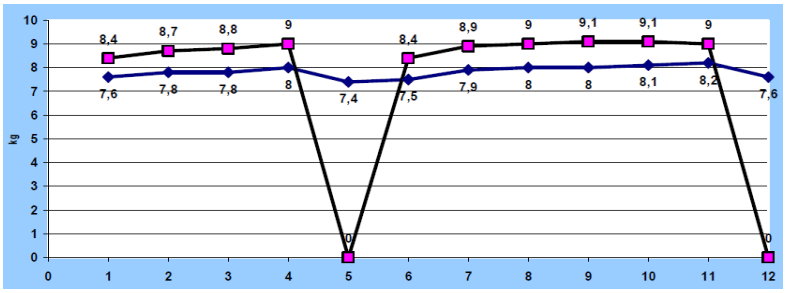

Figure 4. Presentation of individual weight evolutions of T3 group (dose: 8 mg.kg.bw.$^{-1}$)

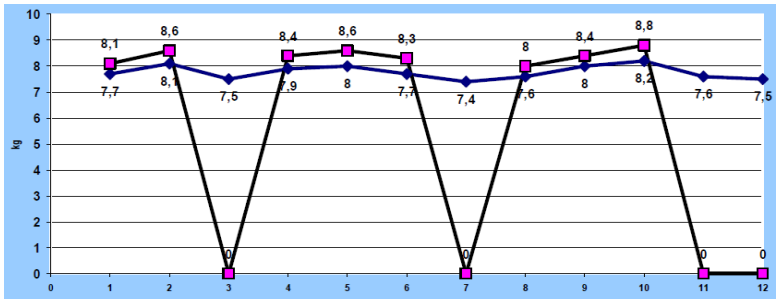

Figure 5. Presentation of individual weight evolutions for Control group

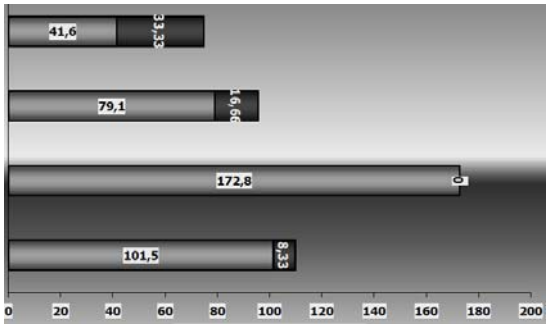

Figure 6. Comparative economic developments (individual weight gain) and mortality on studied groups: 101.5g/day/T1; 172.8 g/day/T2; 79.1 g/day/T3; 41.6 g/day/C

Swine dysentery caused by *Brachyspira hyodysenteriae* is a constant in swine rearing units in the recent years. In the studied unit, this disease was found for several years, its appearance having more explanations: poor feeding conditions, both quantitatively and qualitatively, some deficient microclimate conditions (in part due to an imperfect "intensive" system) had determined losses through mortality (especially in newly weaned young category) and morbidity (to other categories). Under these growth conditions, ideal would be we believe, to use especially preventive medication in the form of feed additives (accompanied or not, as the case may require, also by preventive medication in drinking water), thus ensuring on one hand, control of the disease, and, on the other hand, a good weight gain and a superior feed conversion.

Use in therapy of soluble Tiamutin and injectable Tiamutin should be done with judgment. Injectable form administrations in treponemal swine dysentery are, obviously, more reduced, in comparison with orally administered soluble formulations. This is confirmed, otherwise, also in the specialty literature which shows the use of soluble forms of Tiamulin in drinking water, eventually, in combination with other types of administration (either by injection or in feed) [6-10].

In our study tiamulin fumarate as oral administration proved to be the most effective. Our results confirm other studies on therapy of *Brachyspira hyodysenteriae*. For example Taylor showed that 12 strains of *B. hyodysenteriae* isolated from sick pigs submitted studies sensitivity "*in vitro*" as compared to many antibiotics, the smallest inhibitory doses (mg / mL) were ascertained to tiamulin followed by salinomicin [11, 12].

4. Conclusions

Comparative curative therapy with soluble Tiamulin for 5 days the different doses and the injectable (for 3 days) showed an unquestionable efficacy of the soluble forms.

The best results were recorded at a concentration of 0.06 mg/ml of drinking water administered for 5 days consecutively.

In the therapy of treponemic dysentery single injectable forms are not recommendable; their effectiveness was considered poor average.

Economic efficiency (direct expenses related to treatments) in the case of this condition is justified even in situations in which incur losses, is preferable to "bankruptcy" which can be caused by the lack of treatment in these situations.

It is recommended to extend the study for the case of preventively administered Tiamutin, as feed supplement in various concentrations.

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