

Use of Cymelarsan in Goats Chronically Infected with *Trypanosoma evansi*

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Toxicity and therapeutic trials using Cymelarsan (an arsenical compound) against *Trypanosoma evansi* infection were carried out using chronically infected goats. For the toxicity trial, 40 goats were divided into four groups of 10 animals each; the first three groups received s.c. injections of 5, 10, and 15 mg/kg bw of Cymelarsan, respectively, and the last one served as control. No systemic reaction was observed in any goat throughout the experiment. For the therapeutic trial, 15 adult female goats were inoculated intravenously with at least 1×10^5 *T. evansi* isolated in the Canary Islands. Six months after inoculation, the animals were treated with Cymelarsan at single dose of 0.3 mg/kg (5 animals), 0.5 mg/kg (5 animals), and 0.625 mg/kg (5 animals). At 4 and 6 weeks after treatment, two goats belonging to 0.3 mg/kg group showed recurrence of trypanosomes. Parasitemia, however, was negative in all animals belonging to 0.5 and 0.625 mg/kg groups until the end of the experiment (6 months after treatment). Thus, it can be concluded that Cymelarsan is a safe trypanocidal drug for goats and that the curative dose is 0.5 mg/kg or above.

Key words: *Trypanosoma evansi*; goats; Cymelarsan; arsenical compound

Introduction

Since its introduction in 1921, suramin (Naganol[®]; Bayer, Leverkusen, Germany) was the main therapeutic drug for *Trypanosoma evansi* infection (surra) in susceptible animal hosts. However, massive use led to the emergence of suramin-resistant *T. evansi* populations in many parts of the world. Cymelarsan[®], an arsenical compound (Merial, Lyon, France), is the newest trypanocidal drug marketed and it has proved to be effective in mice against *T. evansi* strains resistant to suramin or quinapiramin sulfate.¹ Cymelarsan is currently used against *T. evansi* infection in camels,² cattle,³ and horses.⁴ However, there is only little information about the use of Cymelarsan in other susceptible animal species, like pigs or small ruminants. With re-

spect to small ruminants, there is only one report of the use of Cymelarsan in inoculated goats using *T. evansi* CP 582 strain isolated in Kenya in 1981.⁵ On the other hand, toxicity profiles of Cymelarsan in goats have not been performed until now; thus, possible toxic consequences of the use of Cymelarsan in goats are unknown.

Goats could play an important role in the dissemination of *T. evansi* infection in tropical and subtropical areas. Consequently, toxicity and therapeutic profiles were carried out in this work using goats chronically infected by *T. evansi*.

Materials and Methods

Toxicity Profiles

Forty female Ethiopian goats were used for this experiment. Thirty goats were divided into

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three groups of 10 animals each. Cymelarsan was administered subcutaneously in each group at a dose of 5, 10 and 15 mg/kg bw, respectively. The other 10 animals served as control.

Experimental Infection

Fifteen adult female goats were inoculated intravenously with at least 1×10^5 *T. evansi* isolated from a dromedary camel in the Canary Islands. The animals were housed in fly-proofs pens in the experimental inoculation area at the University of Las Palmas. Six months after inoculation the goats were treated intramuscularly with Cymelarsan at a single dose of 0.3 mg/kg (5 animals), 0.5 mg/kg (5 animals), and 0.625 mg/kg (5 animals). The animals were examined every 2 weeks by parasitologic (Woo technique; two tubes per animal)⁶ and serologic (CATT/*T. evansi*; Institute of Tropical Medicine, Antwerp, Belgium) procedures for 6 months.

Results

Toxicity Profiles

No systemic reaction was observed in any goat injected with Cymelarsan at different doses. However, a local swelling at the inoculation point was detected in the animals. This reaction disappeared within a few days after inoculation.

Experimental Infection

The animals showed a subclinical course of infection and parasitemia remained low but persistent throughout the experiment. Only carpal arthritis was observed in one goat at 5 months post inoculation. After treatment, all animals were negative from the first check-up (at 24 h post treatment). At 4 and 6 weeks after treatment, two goats belonging to the 0.3 mg/kg group showed recurrence of trypanosomes. However, all animals belonging to

the 0.5 and 0.625 mg/kg groups were negative for parasitemia to the end of the experiment (6 months after treatment). Serologically, however, all animals remained positive until the end of the experiment, although agglutinations were weaker from 5 months after treatment in some goats belonging to 0.5 and 0.625 mg/kg groups.

Discussion

The toxicity trial showed no signs of acute toxicity in any goat at dose of 10, 20 and 30 times the medium dose used in this study (0.5 mg/kg). This would demonstrate that Cymelarsan can be considered safe for goats.

On the other hand, the results obtained in this study seem to confirm the efficacy of Cymelarsan for the treatment of *T. evansi* in goats. At 24 h post treatment, the parasites were eliminated from the bloodstream, and relapses were only detected in animals belonging to the 0.3 mg/kg group. Cymelarsan is recommended in camels and horses to treat *T. evansi* infection at 0.25 mg/kg of body weight. However, that dose has not been curative for goats. In a previous trial using goats experimentally infected with *T. evansi* CP 582 strain, curative dose were 0.3 mg/kg and 0.625 mg/kg for acutely and chronically infected animals, respectively.⁵ However, trypanosomes were demonstrated in cerebrospinal fluid (CSF) in two chronically inoculated goats. Relapses are common in late treatment with trypanocidal drugs, and are usually due to extravascular trypanosomes beyond the reach of the drug. These trypanosomes invade the blood once the circulating drugs fall below effective levels.⁷ CSF was not investigated in our experiment, but all animals were negative for parasitemia for almost 1 year after treatment. On the basis of our results, a dose of 0.5 mg/kg could also be curative for chronically infected goats, although further studies are necessary using a larger number of animals and different *T. evansi* strains. This finding can be important because goats normally show a subclinical picture of the disease, and the chronic

infection is the most likely form seen in field conditions.⁸

Conflicts of Interest

The authors declare no conflicts of interest.

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