PENTAMIDINE\textsuperscript{1} IN CHEMOIMMUNISATION OF CATTLE AGAINST BABESIA BIGEMINA INFECTION\textsuperscript{2}

E. Pipano, I. Jeruham and Meira Frank
The Kibron Veterinary Institute, Beit Dagan, Israel

SUMMARY

A single dose of 0.5 to 1 mg/kg of Pentamidine led to clinical recovery of splenectomised calves infected with Babesia bigemina. On the other hand, as much as 5 mg/kg administered during patency did not destroy the carrier state in intact calves. The fact that the sterilising dose was at least five times as great as that needed for clinical recovery makes Pentamidine a promising agent for chemoimmunisation against B. bigemina infection.

INTRODUCTION

Immunisation against Babesia bigemina infection is performed by inoculating susceptible cattle with infected blood. Intact (non-splenectomised) animals with blood-transmitted infections generally suffer only mild symptoms before entering the carrier state, in which they are highly resistant to tick-transmitted infection. Nevertheless, in some instances severe clinical reaction and death can result from attempts to immunise by this means. In order to minimise this contingency, babesicidal drugs are used to suppress multiplication of the parasites. However, a problem arises from the fact that drugs capable of sterilising B. bigemina infections at dosages only slightly above the therapeutic level (Callow, 1967; Callow and McGregor, 1970; Hashemifesharki, 1975), are difficult to use in immunisation programmes. If administered in a slight over-dose at the onset of parasitaemia, they may inhibit the development of immunity (Pipano, Weisman, Raz and Klinger, 1972; Löhr, 1972). It follows then that a drug of choice for chemoimmunisation against B. bigemina should block multiplication of the parasites at a considerably lower dosage than that needed to eliminate the infection totally.

The present report describes our encouraging findings with Pentamidine in chemoimmunisation trials on calves against B. bigemina infection.

MATERIALS AND METHODS

Cattle

Sixty-two Israeli-Frisian female and male calves, 2 to 9 months old, were obtained from Babesia-free farms. All were negative in serological tests for B. bigemina using an immunofluorescence procedure (Goldman, Pipano and Rosenberg, 1972). The calves were splenectomised before or after inoculation as described in the experiments.

Infection, treatment and examination

Five millilitres of blood containing a strain of B. bigemina used for immunisation in the field was given subcutaneously in order to infect the calves. Pentamidine was administered subcutaneously at dosages from 0.5 mg/kg to 10 mg/kg, according to the schedules described below.

\footnote{1 Lomidine-Specia, 21, Rue-Jean-Goujon 75008, Paris.}
\footnote{2 Supported by the Sturman Memorial Fund for Research in Tick Fever.}
Temperatures of the calves were checked, and blood smears were made from capillary blood daily throughout the experimental period. The smears were stained with Giemsa and examined for parasites.

EXPERIMENTS AND RESULTS

Two types of experiments were performed: (a) to determine the minimal dose of Pentamidine effective during the acute stage of B. bigemina infection in splenectomised calves, and (b) to assess the effects of Pentamidine on the carrier state of intact calves receiving the drug in the early stages of the infection.

A. Treatment with Pentamidine of splenectomised calves during the acute stage of B. bigemina infection (Table I)

Twenty-eight splenectomised calves were treated with Pentamidine at dosages of 0.5 to 10 mg/kg during the acute stage of B. bigemina infection. On the day of treatment all animals had fever and showed 1 to 14 per cent parasitaemia.

<table>
<thead>
<tr>
<th>Number of calves</th>
<th>Dosage (mg/kg body weight)</th>
<th>Recovered/ died</th>
<th>Relapsed/ treated second time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2.5-10</td>
<td>5/0</td>
<td>3/0</td>
</tr>
<tr>
<td>4</td>
<td>1.5-2</td>
<td>3/1</td>
<td>2/0</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>15/1</td>
<td>5/2</td>
</tr>
<tr>
<td>3</td>
<td>0.5</td>
<td>3/0</td>
<td>2/2</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>0/0</td>
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</tr>
</tbody>
</table>

Twenty-six of the animals recovered, including 18 out of 19 that received 0.5 to 1.0 mg/kg. Two calves treated with 1.0 and 2.0 mg/kg, respectively died despite treatment. Parasites were not detected in blood smears for 24 to 48 h after treatment in all animals that recovered. In 12 calves parasites reappeared in the peripheral blood 8 to 34 days after the administration of the drug; in 6 of them a second treatment was indicated and they were given a curative dose (10 mg/kg) of Amicarbalide Isethionate (Pipano, Weisman, Raz and Klinger, 1972). Eight splenectomised control calves inoculated with the same dose (5 ml) of infected blood but not treated, died of acute babesiosis.

B. Treatment of intact calves during the prepatent and patent period of B. bigemina infection (Table II)

In 2 calves inoculated with B. bigemina and simultaneously treated with 1 mg/kg of Pentamidine, parasites were not detected in peripheral blood before or after splenectomy. Four calves received 1 mg/kg Pentamidine 4 days after the inoculation of the parasites but before patenty. Three of them developed parasitaemia before splenectomy and one after. Out of 5 calves treated with 5 mg/kg on day 4, 2 developed parasitaemia after splenectomy while 3 animals were apparently sterilised of their infection.