The Level of IgE and IgA Isotypes in Leishmania Infantum Resistant and Susceptible Mice

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ABSTRACT

IgE and IgA isotypes in serum were considered in susceptible BALB/C and resistant C57BL/6 mice during 36 weeks leishmania infection. Association of the IgA level in both mice with early phase of the disease may discriminate the acute and chronic infection. And correlation of IgE level with intensity of the disease may be used as a tool to estimate the effects of the drug in the treatment.

Key words: leishmania, IgA, IgE, C57BL/6, BALB/C.

Introduction

Leishmaniases refers to a number of diseases caused by the intracellular parasite Leishmania [1]. Leishmania presents different clinical expressions depending on both species of parasite and host immune responses [2,3].

BALB/c mice are susceptible to parasite and develop large and non healing lesions in the case of infection, other mouse strains, such as C3H, CBA/J, and C57BL/6 are resistant and develop small lesions that heal easily. Resistivity is related to Th1-type immune responses and Th1 derived cytokines. Susceptibility on the other hand depends on the Th2 immune response and its characteristic mediators [4,5]. Depressed cell mediated immunity and elevated humoral immune responses are associated with the pathogenesis of visceral leishmaniases. The major role for IgE and IgA antibodies has been demonstrated [6,7,8,910] on gastrointestinal dwelling parasites. Therefore studying the IgE during visceral leishmaniasis was of great interest.

Material and method

A total of 210 female BALB/C and C57BL/6, 8 to 10 weeks old mice were infected with L infantum, by injecting of 2 X 106 promastigotes into the peritoneum. Four infected & two control BALB/C and C57BL/6 mice were anesthetized each every ten days and blood was obtained through their heart and Serum was frozen until examined for Ab detection. Leishmania antigen isolated from promastigote of L. infantum which was grown in culture medium [11]. The amount of protein of antigen was tested by the method of Lowry [12]. The amount of IgE and IgA antibodies was measured by the Enzyme-linked immunosorbent assay (ELISA) method, which has been described already [13,14,15].

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Immunosorbent assay-standard micro-well and Peroxidase conjugated antibodies specific to mice IgA, IgE and ELISA reader was employed. The results of the reaction were read at 492 nm and expressed as optical density (O.D.). Serums were examined throughout 36 weeks of infection.

Results:

- Infected serum was diluted 1:10, 1:50, 1:100 and 1:200. The best response was observed with the 50 fold dilution in preliminary examination; therefore all the tests were carried on with 1:50 dilution during the experiments. Concentration of anti-leishmanial IgE and IgA was explained by means of optical density reading. An increase in the IgA level was observed in infected BALB/C mice after 10 days of infection and reached a maximum at 21 weeks and gradually decreased later (Fig. 1).

- The IgE level in infected BALB/C mice was increased 10 days after infection and stayed increasing until the end of the experiments (Fig. 2).

- The IgE level in infected C57BL/6 mice was increased 20 days after infection and reached a maximum at 20 weeks and was gradually reduced until the end of the experiments (Fig. 3).

- The IgA level in infected C57BL/6 mice was increased 40 days after infection and reached a maximum at 24 weeks and was reduced sharply by week 27 post infection (Fig. 4).

- At the beginning the level of IgE in infected BALB/C and C57BL/6 mice was gradually increased and reached a maximum at week 20. In comparison to infected BALB/C the level of IgE in infected C57BL/6 mice gradually decreased by week 22 post infections (Fig. 5).

- The level of IgA in infected BALB/C and C57BL/6 mice was increased and reached a maximum at week 22 post infection. The level of IgA in infected BALB/C was always higher. After week 22 the level of IgA in both strains decreased gradually and was reduced to the same level as the control animals at 28 weeks post infection (Fig. 6).

![Fig. 1: Mean IgA level in Leishmania infantum infected and control BALB/C mice.](image1)

![Fig. 2: Mean IgE level in leishmania infantum infected & controls BALB/C mice.](image2)
Fig. 3: Mean IgE level in Leishmania infantum infected and controls C57BL/6 mice.

Fig. 4: Mean IgA Level in Leishmania infantum infected and controls C57 BL/6 mice.

Fig. 5: Mean IgE level in Leishmania infantum infected BALBE/C & C57 BL/6 mice.

Fig. 6: Mean IgA level in Leishmania infantum infected BALBC& C57 BL/6 mice.
Discussion:

Successful host defence and pathogenicity in leishmaniasis depends on T-cell polarization. Resistance to the Leishmania infection in the murine model is based on the activation of the cellular immune responses organized by the Th1 cells, making specific cytokins including IFN-γ that recruits CMI. Leishmania resistant strain of mice such as C57Bl/6 genetically produces Th1 immune responses and shows only a local reaction that heals easily [16,17]. On the other hand infected BALB/C mice generally activate Th2 cells and regulate humoral immune responses which are associated with severe systemic diseases [18]. The effect of humoral response in acute and chronic phase of parasitic diseases have been studied [19,20]. Systemic parasitic infections are associated with high level antigen-specific antibodies [21,22]. IgE production is dependent on IL-4, a cytokine involved in differentiation of CD4+ Th2 cells [23]. Th2 cells may also increase IgA production, but it is not fully investigated in the Leishmaniasis. IgE can be used to detect the occurrence of some Th2 dependent pathological conditions such as autoimmune diseases, parasitic, and viral infections [24,25,26]. IgE is also associated with allergic reactions [27] and has been used in diagnosis of parasitic diseases [28]. A high level of IgA has been found in schistosomiasis against schistosoma antigen at acute phase of infection [29,30]. IgA might protect patients against schistosomiasis [32,33].

In this experiment we assayed specific IgE and IgA antibodies to L.infantum antigens by ELISA method during 36 weeks. In comparison to control animals we observed high levels of IgE and IgA isotypes in the leishmania-infected BALB/C and C57BL/6 mice Fig.1, 2, 3, 4. Continuously increasing the level of IgE in leishmania infected BALB/C mice explains the susceptibility of the animals to infection and the fact that parasites still exist in the body. Decreasing the level of IgE in C57BL/6 mice after week 21 may be an evidence for improving the CMI in these mice and clearance or reducing of the parasites in the body. Increasing the level of IgA until week 28 and reducing the antibody to a very low level later on in both BALB/C and C57BL/6 mice may explain a role for IgA in early phase of the infection. The same role that has been found in schistosomiasis [29,30]. During the experience the level of IgA in BALB/C mice was always higher than C57BL/6. This makes it hard to speculate any protective role for IgA antibody during the leishmaniasis. The following ideas can be hypothesized from the results of this experiment:

1. A high level of IgA against leishmania antigen may be useful to differentiation of acute and chronic phase of leishmaniasis infection.

2. A sufficient quantity of IgA in acute phase of leishmaniasis may play a preliminary supportive role in providing the protection against the parasite.

3. Detection of high level of IgM against leishmania antigens may be considered as a serum marker for evaluation of the disease activity and proper treatments.

References


