Immuno-biochemical variation in susceptible BALB/c and resistant C57BL/6 mice infected with Iranian strain of cutaneous leishmaniasis; Leishmania major MRHO/IR/75/ER

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Citation

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Abstract

Background: Cutaneous infection caused by Leishmania is a major worldwide health problem, with high endemicity in developing countries.
Methods: In the current study, we compared production of nitric oxide (NO) and reactive nitrogen intermediates (RNI) in two different hosts (susceptible BALB/c and resistant C57BL mice) infected with L. major. Exprimental leishmaniasis was initiated by subcutaneous (s.c.) injection of promastigotes into the basal tail test groups. The development of lesions was determined weekly by measuring the two diameters. After 10 weeks, all mice were killed humanly by terminal anesthesia and target tissues including lymph node, spleen and liver from each mouse were removed, weighted and their impression smears were also prepared.
Results: Disease period, macroscopic features, lesion sizes, RNI levels in plasma and also in liver and spleen suspensions, proliferation of amastigotes inside macrophages, visceralization of parasite and hepatosplenomegaly in both susceptible and resistant mice infected with L. major was compared. Results from this investigation clear that differences between susceptible BALB/c and resistant C57BL mice were correlated with immuno-biochemical factors and clearly point to a partial involvement of NO in the cytotoxic activity of macrophages against this parasite.
Conclusions: Analysis of data resulted from this study revealed an association between RNI levels with the evolution of disease, which had effects on pathological sign of L. major infected mice. The modulation of NO was able to modify these clinical signs and could affect the proliferation of amastigotes inside macrophages, lesion sizes, survival rates, degree of splenomegaly / hepatomegaly and presence of amastigotes in lesion smears of liver, spleen and lymph node.

INTRODUCTION

Leishmaniasis is one of the most important infectious diseases worldwide. Leishmania are protozoa parasites that cause cutaneous, mucocutaneous or visceral clinical manifestations in host, depending on the parasite species, the host's immune response and genetics [1]. Healing in cutaneous leishmaniasis (CL) is thus dependent on the host immunity [2] and the development of a protection is dependent on the generation of cytokines and mediators [3,4]. In addition, in L. major infections, M? was also responsible for the parasite clearance [2]. Host genetic factors play an important role in resistance or susceptibility to infection with Leishmania [5]. This is a novel idea to evaluate pathophysiological differences and parasitological assays in Balb/c (as susceptible strain) and C57bl/6 (as resistant strain) infected with L. major MRHO/IR/75/ER (IR/75); as a prevalent strain of CL in Iran. This study has been carried out to compare production of nitric oxide, essential trace elements including Zn and Cu and also the serum concentration of liver enzymes including Serum Glutamic Oxaloacetic Transaminase (SGOT), Serum Glutamic Pyruvic Transaminase (SGPT) and Alkaline Phosphatase (ALP) in two infected BALB/c and C57BL/6 mice. This is a novel idea to test endemic Iranian strain of CL in two genetically different inbred mice by evaluation of pathophysiological parameters in a single study [6].

MATERIALS AND METHODS

To carry out this study, mice were assigned to 4 groups (n = 5) as BALB/c infected with L. major, control BALB/c, C57BL/6 infected with L. major and its control. Experimental leishmaniasis was initiated by subcutaneous (s.c.) injection of the 2×106 promastigotes into the basal tail of two groups (Figure 1). The development of lesions was determined weekly by measuring in two diameters. After 10 weeks, all mice were killed humanly and target tissues including lymph node, spleen, liver and brain from each mouse were removed, weighted and their impression smears were also prepared. Disease period, macroscopic features, lesion size, proliferation of amastigotes inside macrophages, visceralization of parasite and hepato / splenomegaly in both control and test groups was compared. Griess micro assay (GMA) applied for measurement of NO concentration in plasma, liver and spleen suspensions [$_6$]. Serum Zn and Cu were determined by direct ambition of 1:10 dilution of serum in deionized water into the Atomic Absorption Spectrophotometer. Serum SGOT, SGPT and ALP were determined by Auto Analyzer RA1000.

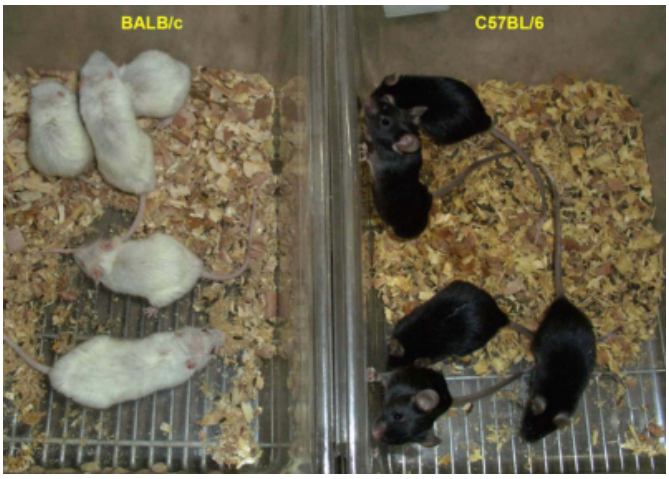
RESULT AND CONCLUSIONS

The results showed, NO concentration in plasma and in tissues, progress of lesion sizes, proliferation of amastigotes inside macrophages, pathophysiological signs and biochemical factors such as plasma levels of Zn, Cu, Cu / Zn ratios, SGOT, SGPT, ALP in two susceptible and resistant host are varied and these variations are depended on mice strain and genetic variability.

Results from this investigation clear that differences between susceptible BALB/c and resistant C57BL/6 mice were correlated with immuno-biochemical factors and clearly point to a partial involvement of NO in the cytotoxic activity of macrophages against this parasite. The modulation of NO was able to modify clinical signs and could affect the proliferation of amastigotes inside macrophages, lesion sizes, survival rates, degree of splenomegaly / hepatomegaly and presence of amastigotes in lesion smears of liver, spleen and lymph node. Variation of parasite load in liver, spleen and lymph node has clarified a strain-specific difference of leishmania localization. The continuous presence of free and living L. major in BALB/c mice makes possible spreading of the parasites to the lymph nodes and finally to visceral organs. Also we concluded that serum essential trace elements Zn and Cu concentrations were probably altered by the some immunocytokines as a host-defense strategy of organism during CL infection. In addition a different pattern of induction was observed between these two hosts. Alteration of liver enzymes concentration is a consequence of leishmaniasis among BALB/c and C57BL/6 mice. It is indicated microelements and liver enzymes may involve in susceptibility and resistance of murine hosts against L. major infection.

Figure 1

Figure 1: Experimental leishmaniasis in BALB/c and C57BL/6 infected with



Experimental leishmaniasis was initiated by subcutaneous injection of the L. major promastigotes into the basal tail of BALB/c and C57BL/6 mice.

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