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Th1-biased immunomodulation and therapeutic potential of *Artemisia annua* in murine visceral leishmaniasis

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In the absence of vaccines and limitations of currently available chemotherapy, development of safe and efficacious drugs is urgently needed for visceral leishmaniasis (VL) that is fatal, if left untreated. In the present study, we investigated the immunostimulatory and therapeutic efficacy of n-hexane fractions of *Artemisia annua* leaves (AAL) and seeds (AAS) against *Leishmania donovani*. Ten-weeks post infection, BALB/c mice were orally administered AAL and AAS for 10 consecutive days. Significant reduction in hepatic (86.67% and 89.12%) and splenic (95.45% and 95.84%) parasite burden with decrease in spleen weight was observed. AAL and AAS induced the strongest DTH response as well as three-fold decline in IgG1 and two-fold increase in IgG2a levels as compared to infected controls. Cytometric bead array further affirmed the elicitation of Th1 immune response as indicated by elevated levels of IFN-γ and reduction in Th2 cytokines (IL-4 and IL-10) in treated mice. Lymphoproliferative response, IFN-γ producing $CD4^+$ and $CD8^+$ T lymphocytes and nitrite levels were significantly enhanced upon antigen recall *in vitro* coupled with augmentation of CD80 and CD86 co-expression on macrophages. $CD8^+$ T cells exhibited $CD62L^{low}$ and $CD44^{hi}$ phenotype, signifying induction of immunological memory upon AAL and AAS treatment. Normal range of serum enzyme markers depicted inertness against nephro- and hepato-toxicity. Our results establish the two-prong antileishmanial efficacy of AAL and AAS that is dependent on both direct leishmanicidal action as well as switching-on of Th1-biased protective cell-mediated immunity with generation of memory. AAL and AAS could represent adjunct therapies for the treatment of leishmaniasis.

Biography

Farhat Afrin has received her PhD from Indian Institute of Chemical Biology, Kolkata, India. She has served at the Department of Biotechnology, Hamdard University, India for 16 years. She has also worked at National Institutes of Health, Bethesda, MD, USA and Centre for Immunology and Infection, University of York, UK. She is a recipient of several honors including American Association of Immunologists Young Faculty Travel Grant, Commonwealth Academic Staff Fellowship. Her research interest is parasite immunology with emphasis on Leishmania immunotherapeutics. She has published over 55 papers in journals of international repute and is an Academic Editor, Editorial Board Member and Reviewer of several journals.

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