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ORIGINAL ARTICLE

Ascaris lumbricoides infection in urban schoolchildren: Specific IgE and IL-10 production☆,☆☆

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Abstract
Background: Helminth infections and allergies are diseases with intense Th2 lymphocytes participation and characterised by a high IgE and Interleukin-(IL) IL-4, IL-5 production and eosinophilia. However, helminths also induce IL-10 production, which may alter the outcome of allergic diseases in infected patients.
Objective: This experimental study analyses the relationship between IL-10 production by cell culture from geohelminth infected and non-infected children and specific IgE to *Ascaris lumbricoides* (Asc) or *Blomia tropicalis* (BT).
Methods: IL-10 content in supernatant from peripheral blood mononuclear cell culture from nine helminth infected and eleven non-infected patients was determined by ELISA after in vitro stimulation with Asc or BT extracts.
Results: A positive association was observed between total IgE levels and anti-*Ascaris* and anti-*Blomia tropicalis* specific IgE, independent of infection status. For both helminth-infected and non-infected groups, there was no difference in IL-10 production in response to Asc extract, even though anti-*Ascaris* IgE levels were higher in the latter group. In response to BT stimulus, a lower production of IL-10 by the geohelminth-infected group was observed, but with no relationship between IL-10 production and specific IgE to BT.
Conclusion: The results suggest that anti-*Ascaris* IgE in non-infected patients may be associated to a resistance to parasites. Levels of specific IgE to parasite antigens or *B. tropicalis* allergen

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☆☆ The authors declare that the procedures of the study were approved by the Health Sciences Research Ethics Committee at UFPE (CEP/CCS/UFPE) and applicable local regulations; assent and written informed consent were obtained from each parent or legal guardian before study procedure was initiated. The author for correspondence is in possession of this document. The authors declare that they have followed the protocols of their work centre on the publication of patient data.
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were not impaired by IL-10 production in children from an urban area in which geohelminthiasis is endemic.

Introduction

Allergic diseases are mediated by type Th2 immune response (IL-4, IL-5, IL-13, eosinophilia and high IgE levels) as a consequence of the complex interaction between genetic predisposition and the constant contact with environmental allergic proteins.[1–3] Proteins derived from helminths, e.g. *Ascaris lumbricoides*, also share the property of stimulating a Th2 response in the host, accompanied by a significant IgE production. During helminth infection, a large quantity of IgE is produced against parasitic antigens that together with a polyclonal stimulation leads to an increase in total IgE levels, including anti-allergens IgE.[4] Similarly, it has been observed that atopic patients are more likely to produce IgE against helminth proteins and present a degree of resistance, especially to a high parasitic load.[5] Moreover, it has also been demonstrated that allergic and parasite proteins share many analogies.[6]

Although they share immunological reactions such as total IgE hyperproduction, helminthiasis and allergic diseases differ in their capacity to modulate the immune response of the host. Throughout the acute phase of helminth infection there is an IgE-mediated inflammation and symptoms similar to those of allergy (urticarial reactions, bronchospasms caused by larval migration and eosinophil tissue recruitment) may also happen.[2] After a period of parasitic aggression there is a host adaptation. During this chronic phase, parasites may stimulate regulatory T cells with a significant production of IL-10 which contribute to the suppression of the Th2 response against parasites[7] and may also alter the response to environmental allergens.

Helminth immunomodulation has been the basis of several studies that showed an inverse relationship between parasites and allergies.[8] These studies indicate an increase in allergic diseases in urban centres, where the prevalence of parasitic infections are very low, in contrast to rural or urban areas with poor sanitation conditions, where parasitic diseases are highly prevalent.[9]Focusing on allergic diseases in patients with intestinal parasites, studies have demonstrated an increase in total IgE levels, accompanied by the presence of anti-*Ascaris* IgE, and an inverse relationship between total IgE and positive cutaneous hypersensitivity test in patients with high parasitic loads.[10,11] According to several authors, rather than being considered as a response marker to geohelminth and parasitic symptomatology, anti-*Ascaris* IgE has been regarded as a risk factor for atopic disease and as a possible marker for or propensity to allergic disease.[12–14]

The immunomodulatory role of IL-10 in the IgE-dependent immune response has been demonstrated, not only in the induction phase (B lymphocytes IgE production),[15] but also in the effector phase (mast cell and eosinophil activation).[16] However, very few studies have examined the role of this cytokine during geohelminth infections and its relationship with allergies and IgE levels.[17,18] Therefore, the aim of this experimental study was to evaluate the IL-10 production capacity of peripheral blood mononuclear cells from allergic parasitised and non-parasitised children living in an urban area of Northeast Brazil and to evaluate the relationship between parasitic infection, total and specific anti-*Ascaris* and anti-*Blomia* IgE levels.

Materials and methods

Study design and population

From a clinical study involving 123 children, a convenience sample of 20 children (9 parasited and 11 non-parasited by geohelminths) was selected for an exploratory study of cellular culture to evaluate IL-10 production. All included children had respiratory allergic manifestations (rhinitis and/or asthma) and a positive prick test to *B. tropicalis* or *D. pteronyssinus* antigens.

Children's age varied between 9 and 12 years (median 10 years) and there were nine females. For the nine parasitised individuals, in which only *A. lumbricoides* were found in stools were with a low parasitic load (<500 eggs/gram faeces). No parasites were found in three stool samples of 11 children (non-parasitised group) (Table 1).

IL-10 content in supernatant from peripheral blood mononuclear cell culture from patients after in vitro stimulation with *B. tropicalis* and *Ascaris* extract was determined by ELISA. Each patient had samples cultured in duplicate and for ELISA, each supernatant obtained was also measured in duplicate.

In order to assess the humoral allergic responses, total IgE, *B. tropicalis*-specific IgE (the most important aeroallergen in clinical study) and anti-*Ascaris* IgE plasma levels were measured.

Table 1 Demographic data from asthmatic individuals infected with *Ascaris lumbricoides* or non-infected.

A. lumbricoides (egg/g faeces)	–	130.7 ± 40.9
Median age (years)	10 (8–12)	9 (8–12)
Gender		
(*n*) % of male	(5) 45%	(6) 66%
Clinical diagnosis (n) %		
Mild asthma	(7) 63%	(6) 67%
Severe asthma	(1) 10%	–
Mild allergic rhinitis	(3) 27%	(3) 33%
Skin Prick Tests (n) %		
B. tropicalis	(1) 10%	(5) 56%
B. tropicalis + *D. pteronyssinus*	(6) 54%	(1) 11%
B. tropicalis + *D. pteronyssinus* + others	(4) 36%	–
D. pteronyssinus	–	(3) 33%