



Inhibition of allergen-induced airway inflammation and hyperreactivity by recombinant lactic-acid bacteria

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Received 11 January 2005; received in revised form 9 May 2005; accepted 12 July 2005

Available online 7 September 2005

Abstract

Recombinant lactic-acid bacteria (LAB) are able to inhibit allergen-specific T-cell responses. In this study, we examined whether oral feeding of recombinant LAB was able to suppress allergen-induced airway inflammation and hyperreactivity (AHR) in a murine model. Animals were intraperitoneally sensitized with *Dermatophagoides pteronyssinus* group-5 allergen (Der p 5) and orally treated with recombinant LAB containing a plasmid-encoded Der p 5 gene or placebo on day 7 and day 14 for three days consecutively. Twenty-one days after sensitization, mice underwent inhalational challenging. Der p 5-specific immunological responses including changes to specific immunoglobulin G and E (IgE) levels, the presence of cells in the bronchoalveolar lavage fluid (BALF), and AHR were assessed following this inhalational challenge. We demonstrated that oral feeding of recombinant LAB could significantly decrease the synthesis of Der p 5-specific IgE, and AHR. Furthermore, following such treatment, we also noted that both neutrophils and eosinophils had infiltrated the BALF to a significantly lower extent, when compared to the vehicle-treated group. Neither recombinant allergen nor LAB alone was able to suppress allergen-induced immune responses. Our findings suggest that treatment with recombinant LAB at a low dose can suppress allergen-induced airway allergic inflammation, this providing a basis for developing a novel therapeutic method for allergic airway diseases.

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Keywords: Allergy; Airway hyperreactivity; Immunotherapy; Lactic-acid bacteria

1. Introduction

Asthma is a chronic inflammatory disease of the airways, currently affecting over 155 million people worldwide and ever increasing in such frequency [1,2]. To the best of our knowledge, allergen immunotherapy is the only currently available treatment that deals with the main cause of allergic disease by modifying or down-regulating the immune response, such a therapeutic modality possibly also altering the natural course of allergic disorders [3,4]. In the past, allergen immunotherapy has been administered mainly by the parenteral injection of allergens but, in recent years, other routes of administration including oral, sublingual, nasal

and bronchial routes have been attempted [5]. Sublingual immunotherapy has been shown to reduce allergic symptoms and/or mediation needs for allergy sufferers in several studies [6–8]. The efficacy of sublingual immunotherapy appears to be similar to that of subcutaneous injection immunotherapy performed upon children, and such success has been ascribed to the use of a higher dosage of allergen and the development of one or more partial “oral tolerance” mechanisms [9,10]. Therefore, the sublingual swallowing method seems to provide the best compromise in terms of efficacy, safety, and patient acceptability [11], although the relatively high cost of such therapy can constitute a serious concern as regards many human therapeutic proteins including crude mite extract [12].

Recombinant allergens featuring an authentic tertiary structure may exhibit the potential to display efficacy and safety profiles similar to those of natural allergens [13–15]. A

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