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Short Communication
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Importance of Probiotics in Management of Allergic Diseases – Current Scenario and Future Directions

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Abstract

Microbiota (microbiome and virome) is a community of microorganisms that harbour human digestive system and exhibit beneficial effects on human health. Dysbiosis in microbiota is associated with the occurrence of allergic diseases. Antibacterial therapy by administration of probiotics is emerging for allergy management. However, due to lack of substantial evidence, the importance of probiotics in prevention of allergic diseases has not been fully established. It is necessary to carry out detailed investigations using standardized dose and type of probiotic bacterial strain for establishing effective treatment of allergic diseases by administering probiotics.

Keywords: Allergy; Microbial hypothesis; Microbiota; Probiotics; T cell response

Short Communication

Balanced composition of microbiota regulates the health and normal functioning of human body. The community of microorganisms that form the microbiota plays important role in immunity by maintaining a balance between immunological defence of mucous membranes and systemic tolerance. Any dysbiosis in microbial flora tends to disturb the immune system and may contribute to allergic diseases through its substantial effect on mucosal immunity [1]. In this regard, the 'hygiene hypothesis' has been expanded to encompass the 'microbial hypothesis' laying emphasis on alteration of commensal microbiota during infancy as a potential factor of immune dysregulation and development of allergic diseases. This is evident from incidences of natural exposure to maternal microbial flora through vaginal delivery and breastfeeding that have shown reduced risks of developing allergic diseases. Exposure to microbial flora early in life through farming, older siblings, pets and toddlers playing on floor have shown lower risk of developing asthma, atopic dermatitis and rhinoconjunctivitis [2]. Since exposure to microbial flora early in life can change the balance of immune development; antibacterial therapy with probiotics has recently come up as an active area of clinical research for the management of allergic diseases.

Probiotics are live strains of certain microorganisms which confer a positive effect on human health, if administered in adequate amounts. Probiotics tested in clinical trials for allergy prevention or treatment primarily include strains of *Lactobacillus* and *Bifidobacterium* [3]. So far, probiotic supplementation has shown more promise for primary prevention than treatment of an established allergic disease. Prenatal supplementation of probiotics has shown more effective results than postnatal use. Combined strategies involving probiotic supplementation during pregnancy as well as motherhood (postnatal) have shown highest impact on allergy management [4]. Significant clinical improvement in atopic dermatitis with the use of probiotics by women during the last trimester of pregnancy, lactating mothers, or when administered to infants has been demonstrated in many studies [2]. However, evidence is lacking to support the precise effect of probiotics on other allergic diseases including asthma, allergic rhinitis, and food allergy. Based on the modest evidences, the World Allergy Organization has recommended potential benefits of the use of probiotics by (1) pregnant women at high risk of having a child with allergy, (2) lactating women with high-risk infant, and (3) infants at high risk of developing allergy [2]. No recommendation is made regarding the type of probiotic bacterial strain or dose to be used. This is because of inconsistent findings of different studies on the usefulness of probiotics in allergic diseases. The heterogeneity in results possibly occur due to variations in implementation pattern such as use of different first supplementation period, probiotic strains, dose, duration, outcome measurements, study design, short follow-up period and host factors *viz*, host immunity and existing microbiota. Insights into the mechanism of action shows that probiotics inhibit allergic diseases by suppressing the Th2 response characterized by reduced secretion of cytokines *viz*, IL-4, IL-5, and IL-13. Recently, it

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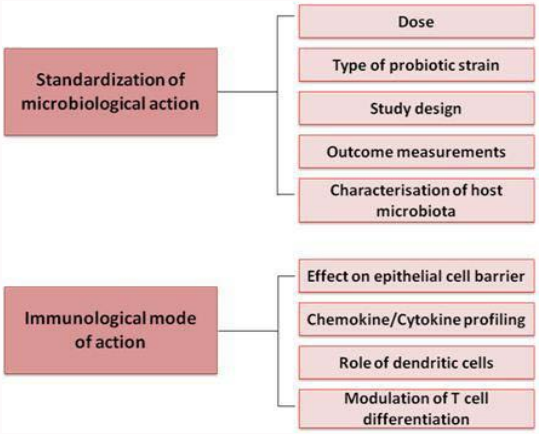

Figure 1: Proposed future directions, for understanding the beneficial effects of probiotics in the treatment of allergic disease.

is shown that probiotics act by suppressing inflammatory response caused by Th17 cells, IFN-γ and IL-4, and increases the level of immunoregulatory cytokines IL-10 and TGF-β by inducing Tregs cells in allergic diseases [1,4,5]. The influence of probiotics on T cell differentiation has also pointed out a significant role of dendritic cells in regulating the mechanism of action of probiotics in allergic diseases. Probiotics have shown to inhibit the differentiation of mature DCs *in vitro* [1,4]. However, the confirmation for association of mature DCs with probiotics in management of allergic diseases needs additional investigations. Future directions therefore, should focus on more extensive research involving clinical trials and further studies on animal models to clearly understand the mechanisms of action of probiotics in management of allergic diseases (Figure 1). This includes effect of probiotics on functioning of epithelial cell barrier, chemokine and cytokine profiling, activation of dendritic cells and consequent functioning on T cell immune responses. It is necessary to design and carry out thorough and detailed research to confirm significance of treatment by using most effective probiotic strains, optimized dose, standardized protocol and optimum timing of administration.

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