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CD155 mediates a costimulatory signal for Th1 development and is involved in the development of allergic diseases

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ABSTRACT

Allergy is one of the most common disorders, affecting no less than 25% of all individuals in the world. Allergic reactions involve helper T cells *in vivo*. For example, contact dermatitis is mediated by T helper 1 (Th1) cells. In contrast, asthma is mediated by T helper 2 (Th2) cells. Because therapy for allergy is limited to symptomatic treatment, a new therapy based on the molecular mechanisms of allergic reactions should be desired. CD155 (poliovirus receptor; PVR/Necl-5) is a member of immunoglobulin superfamily and ubiquitously expressed on both hematopoietic and nonhematopoietic cells. Although CD155 is known to be involved in cell adhesion of epithelial and endothelial cells, the role of CD155 expressed on immune cells in immune responses has been undetermined. Here, we report that CD155 on CD4⁺ T cells plays an important role in helper T cell differentiation and involved in the development of allergic diseases. CD155-deficient mice exhibit milder symptoms of contact dermatitis, than did WT mice. In contrast, eosinophilic airway inflammation, an asthma model in mice, was exacerbated in CD155-deficient mice compared to WT mice. To explore how CD155 is involved in the pathogenesis of allergic diseases, we investigated the functions of CD155 on CD4⁺ T cells.

Stimulation of

CD155 together with TCR on CD4⁺ T cells with antibodies enhanced activation and proliferation of naive CD4⁺ T cells and increased IL-2 production from CD4⁺ T cells significantly more than that of TCR alone, suggesting that CD155 is a co-stimulatory molecule in helper T cells. Furthermore, CD155-mediated co-stimulatory signal in helper T cells up-regulated the expression of T-bet, the degradation of I κ B α , nuclear translocation of NF κ B, phosphorylation of STAT1, and the production of IFN- γ . These results indicated that CD155-mediated signal promoted IFN- γ -dependent Th1 development, thus suppressing Th2 development. CD155 may be a good candidate for molecular target therapy for allergic diseases.