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The role of the dendritic cells in allergy and immunotherapy

Dendritic cells (DCs) are located at the body border zones to the environment and represent an important link between the innate and the adaptive immune system. Depending on their localisation and subtype, they are equipped with the high affinity receptor for IgE (FcεRI), which enables them to take up IgE and allergens. Furthermore, they express different pattern recognition receptors such as toll-like receptors (TLRs) in order to be able to sense the environment for danger signals.

The number and subtype of DCs in the skin and the oral mucosa varies depending on their location, the cells in the microenvironment, the state of inflammation and allergic symptoms of the individuals.

Allergen specific immunotherapy (SIT) represents a well established long-term treatment of allergic rhinitis and mild asthma, which is currently applied primarily via the skin and the oral mucosa. A shift of an immune response of the Th2 type into a modified Th1 immune response, increase of IgG4 instead of IgE production as well as induction and activation of regulatory T-cell subtypes are modifications of the immune system which have been demonstrated to go along with the clinical effect of SIT.

Obviously, DCs are important target cells of allergen immunotherapy, since they are capable of taking up allergens, prime T-cells of any type and efficiently induce allergen specific tolerance. However, most of the hypotheses on the function of DCs as facilitators of allergen specific tolerance in allergen immunotherapy remain speculative. In order to close the gap of knowledge on the role of DCs in SIT, studies in human and mice models have been conducted during recent years. The number and subtype of DCs as well as expression of FcεRI varies depending on the location in the oral mucosa and skin. The quantity of mast cells and other cell types such as regulatory T-cells as well as macrophages varies and might play an additional role in this context. Whereas the target DC population in subcutaneous SIT remains largely unknown, it has recently been shown in a human *ex vivo* model that resident DCs within the oral mucosa bind allergen during absorption in a dose and time dependent manner leading to an induction of T-cells producing immunosuppressive cytokines. Similar results have been demonstrated in mouse models. Furthermore, activation of TLRs on oral mucosal DCs enforced their tolerogenic properties so that in particular DCs of the oral mucosa seem to be quite potent inducers of allergen specific tolerance and ideal targets for adjuvants.

Key message
DCs are important targets of SIT.

Conclusion
Knowledge about the mechanisms of allergen uptake by DC subtypes and their interaction with T-cells and other cells in the cellular microenvironment will help improve therapeutic strategies of SIT in future.