Immunhistochemical analysis of the eczematous reaction to native pollen grains

Huss-Marp J[a], Eyerich K[a], Darsow U[a,b], Wollenberg A[c], Ring J[b], Behrendt H[a], Traidl-Hoffmann C[a]

[a]Div. of Environmental Dermatology and Allergy, GSF / TU Munich, ZAUM – Center for Allergy and Environment, [b]Dep. of Dermatology and Allergy Biederstein, TU Munich, [c]Dep. of Dermatology and Allergy, LMU Munich

Eczematous reactions to epicutaneous application of aeroallergens (Atopy patch test, APT) are well documented in a subgroup of patients with atopic eczema (AE). The role of IgE-mediated hypersensitivity in the elicitation and maintenance of eczematous skin lesions in AE is still controversial. The aim of this study was to delineate the mechanisms underlying the cutaneous reaction to pollen grains in comparison to a classical delayed type hypersensitivity (DTH) response tested by epicutaneous test to nickel (ECT). Patients with history of AE, sensitisation to grass and/or birch pollen and positive APT reactions (n=4), AE patients with negative APT reactions (n=2), patients with a positive nickel patch test (n=2) and healthy controls (n=2) were included in the study. Grass or birch pollen grains resp. nickel sulfate were applied in Finn chambers with petrolatum as carrier. Biopsies were taken from positive and negative APT and ECT reactions 6, 24, 48, 72 and 96 h after application. Cryosections were investigated by alkaline anti-alkaline phosphatase (APAAP)-immunohistochemistry. Quantification was performed automatically in a blinded manner with the KS 300 Zeiss programm.

Histology of both positive pollen and nickel patch tests showed a strong influx of lymphocytes with epidermotropism. By immunohistochemistry, the majority of these T lymphocytes were characterised as CD3+, CD4+, CD45RO+. Only a small amount were CD8+. A quotient of CD25/CD4 positivity revealed a biphasic course of occurence of CD25 positive cells: in ATP-lesions a rapid influx of CD25+ T-cells (6 h) was observed with a second late peak (96 h) whereas in ECT-lesion a maximum after 24 and 96 h was observed. High amounts of IgE positive cells were found only in APT biopsies. In ECT lesion the cytokine pattern of the cellular infiltrate was clearly IFN-γ dominated as shown by a quotient of IFN-γ/ IL-5 > 1. In contrast, the APT reaction showed a biphasic pattern with a dominating IL-5 production in the early phase of the reaction and a more IFN-γ driven response 96 h after pollen application. Concerning FcεRI there was an increase in positve cells with time in the positive APT compared to the negative controls. CD1a positive cells (IDEC) were more prominent in APT compared to ECT-lesions. CD64 and CD68 were maximally expressed after 72 h in both the APT- and ECT-reactions. Negative pollen patch test reactions showed only a scarce cellular infiltrate, dominated by CD25+ T-cells and IFN-γ. In this study we demonstrate that pollen induce acute eczematous reactions which show immunohistochemical similarities to DTH reactions, but follow a faster kinetic and a biphasic cytokine expression pattern – Th2 in the early and Th1 in the late phase.