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Mast cells and γδ T cells in ultraviolet B mediated immunosuppression of experimental autoimmune encephalomyelitis

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With a prevalence of about 1/800 in Europe and North America, multiple sclerosis is among the primary causes of neurological disabilities during young adulthood. Patients suffer from various symptoms including sensitive, motor and cognitive impairments, which are caused by immune-mediated multifocal inflammations leading to demyelination, neuronal degeneration and gliosis in the central nervous system.

Concerning the pathogenesis of multiple sclerosis a correlation of increased sunlight/UV exposure and reduced incidence is known and thought to be vitamin D-mediated. However a vitamin D-independent decrease of autoimmunity upon ultraviolet (UV) B irradiation has been discovered using the murine model of multiple sclerosis, called experimental autoimmune encephalomyelitis (EAE). Additionally, findings of the CCU Neuroimmunology and Brain Tumor Immunology Group (DKFZ Heidelberg) revealed an AhR-dependency of UVB-induced immunosuppression in the model of EAE.

The AhR is expressed on immune cells residing in the skin and can be activated by 6-formylindolo[3,2-b]carbazole (FICZ), a UVB-induced photoproduct of tryptophan. The FICZ-stimulated AhR influences the ratio of pro-inflammatory T helper type 17 cells and anti-inflammatory regulatory T cells (Tregs) and may regulate autoimmunity in EAE.

In this study UVB-mediated systemic immunosuppression focusing on mast cells and γδ T cells as possible mediators of the effect is investigated.
Reasons for the selection of these two cell populations include expression of the AhR and a reported reduction of cell numbers in AhR-deficient mice.
A role for the AhR in γδ T cell- but not mast cell-homeostasis could be confirmed. Moreover, the present findings correlate UVB-induced reduction of autoimmunity with a decrease of T helper type 1 and an increase of Tregs in inflamed-CNS as well as with an expansion of Tregs in peripheral lymphoid tissue. Thereby, mast cells and γδ T cell frequencies in the skin decrease, indicating a potential function in the initiation of the pathway. The importance of mast cells in the investigated effect was further sustained by resistance of mast cell-deficient mice to UVB-mediated immunosuppression.

In essence, this study provides insight into mechanisms of UVB-mediated systemic immunosuppression by underlining the importance of Tregs and mast cells as well as proposing a role for γδ T cells.