AhR expression and its functional consequences on the Th17 effector T cell subset

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The aryl hydrocarbon receptor (AhR) which is widely expressed in the body and fulfils a range of physiological functions not all of which are fully elucidated, has recently been described by us to be selectively expressed on a relatively new CD4 effector T cell subset, the Th17 subset. These cells constitute a separate lineage from the previously known helper T cell subsets Th1 and Th2 that have functions in the defense against intra- or extracellular pathogens respectively. Th17 cells are crucial in protection against fungal infections and certain extracellular bacteria, but their functions may also include orchestration of immune responses carried out by other cells due to the induction of chemokines and cytokines by a wide range of cell types that is induced by their signature cytokine IL-17.
Importantly, Th17 cells were found to be responsible for many autoimmune syndromes, such as multiple sclerosis, rheumatoid arthritis and myocarditis. The expression of AhR endows these cells with the ability to respond to a potentially wide variety of ligands that either constitute exogenous toxins or endogenous factors that may link these cells to other physiological responses in the body. Thus, AhR stimulation by the tryptophan metabolite FICZ strongly increases development of Th17 cells and induces their production of the cytokine IL-22 that plays important roles in mucosal and skin defenses against pathogens. On the other hand in an autoimmune setting FICZ mediated stimulation of AhR on Th17 cells greatly enhances autoimmune pathology. Thus, the linkage of this T cell subset to the AhR system potentially offers mechanistic explanations of how environmental stimuli may exacerbate autoimmune conditions in susceptible individuals.