TAhRget: Dietary Modulation of AhR-mediated Immune Phenotypes in Healthy Individuals

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The aryl hydrocarbon receptor (AhR) is a ligand-activated transcription factor that interacts with environmental contaminants as well as with nutritional ligands. The AhR is known to be involved in several inflammatory processes and immune system dysregulation like chronic kidney disease (CKD) and multiple sclerosis (MS), but a deeper understanding of how nutrition modulates AhR-mediated immune responses is needed.

Plant-based diets, rich in tryptophan, can activate AhR, affecting its role in immune responses.

To better understand the nutritional effect on AhR-related inflammatory responses, 12 healthy volunteers were enrolled to a 3-day contrasting dietary challenge. Six volunteers in each diet group were exposed to a western diet containing pro-inflammatory nutrients (saturated fatty acids, refined grains, sugars) or plant-based diet, containing anti-inflammatory nutrients (omega-3 fatty acids, fiber, polyphenols). Volunteers were kept in a highly controlled inpatient setting (German Aerospace Center) to reduce environmental influences. For immune phenotyping, whole blood samples were analyzed using CyTOF. Three different antibody panels were applied to target T cells, B cells and granulocytes. Overall findings imply that plant-based diet might positively influence AhR-mediated inflammatory responses. Cluster frequencies revealed an increase in $CD33^{+}CD16^{+}$ granulocytic myeloid-derived suppressor cells (GMDSCs) in plant-based diet compared to western diet.

Unravelling the interaction between AhR, diet, microbiome and health could be the fundament for personalized dietary interventions and provide strategies to prevent chronic inflammatory diseases such as CKD or MS.