

An anti-inflammatory diet enriched in omega3 and inulin prevents Type 1 Diabetes by inducing intestinal T_{reg} cell differentiation and restoring gut barrier integrity in NOD mice

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Background: The gut environment plays an important role in modulating the pathogenesis of extra-intestinal autoimmune diseases such as Type 1 Diabetes (T1D). In line with this idea we recently demonstrated that activation of beta cell autoimmunity is due to dysbiosis, breakage of gut barrier integrity and intestinal inflammation (Sorini C. et al. PNAS 2019).

Hypothesis: we tested the hypothesis that restoration of intestinal immune homeostasis, including microbiota composition, and gut barrier integrity by administration of an anti-inflammatory diet prevents beta cell autoimmunity and T1D occurrence in NOD mice.

Methodology: We fed T1D model mice with anti-inflammatory diets (AID) enriched with fibers (inulin) and omega3 fatty acids and we assessed modification of gut microbiota composition (16s rRNA), amelioration of gut barrier integrity (intestinal permeability and mucus structure and composition), restoration of immune homeostasis (T_{eff}/T_{reg} cell ratio) and occurrence of T1D.

Results: Our results show that dietary components significantly modulate the immunological phenotype of adaptive immunity and microbiota composition at the intestinal level, pushing towards induction of a tolerogenic environment and differentiation of regulatory T cells (FoxP3⁺ T_{reg} and IL10⁺ Tr1 cells) and restoration of gut barrier integrity with a beneficial effect on T1D occurrence.

Conclusions: Our data indicate that dietary components modulate the autoimmune pathogenesis of T1D by restoring gut barrier integrity and a tolerogenic intestinal environment. This new concept could pave the way to innovative therapeutic interventions aimed at restoring gut barrier integrity to prevent islet-autoimmunity in genetically at-risk individuals.