Title: Inducing Immune Tolerance in Multiple Sclerosis via CRISPR-Edited Autoreactive CD4+ T Cells

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Abstract:

Multiple Sclerosis (MS) stems from autoreactive T cells targeting myelin antigens (e.g., MBP, MOG), driving demyelination. Current broad immunosuppression risks infections (e.g., PML) and fails to address the root cause. I propose a novel approach: using CRISPR/Cas9 to convert autoreactive CD4+ T cells into regulatory T cells (Tregs) by enhancing regulatory genes. These Tregs could selectively suppress myelin-specific effector T cells (CD8+, memory), preserving pathogen immunity. Unlike modifying myelin-producing cells—which leaves myelin exposed—this targets autoreactive T cells directly, offering a potential paradigm shift in MS therapy. In the EAE model, edited CD4+ T cells may reduce inflammation and protect myelin, with pathogen challenges to ensure safety. Challenges include specificity and pre-existing memory T cells, but preliminary testing could justify investment in this precise, transformative strategy.

Keywords: Multiple Sclerosis, CRISPR, CD4+ T cells, Tregs, immune tolerance, myelin