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Advancing an antigen-specific nanomedicine for the treatment of central nervous system autoimmunity (MS_NANOMED)

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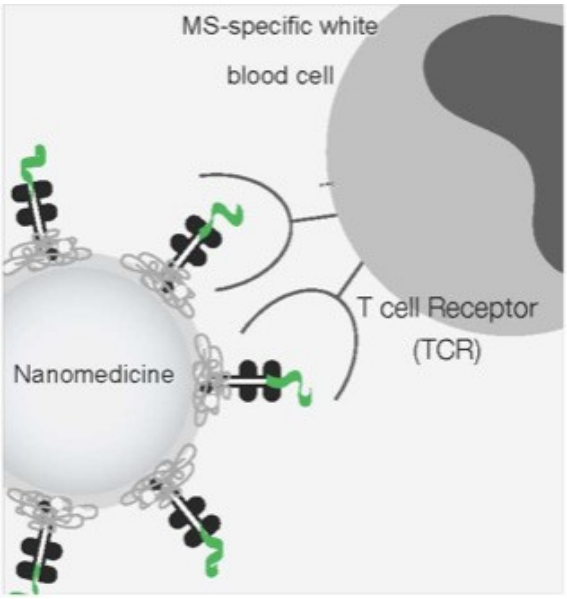
MS_NANOMED is founded on the discovery of a new, potentially groundbreaking, paradigm in the treatment of autoimmune disease. Traditionally, vaccines have been used to expand the number of white blood cells capable of protecting against viruses, bacteria or cancer, or to eradicate white blood cells capable of causing autoimmune diseases, such as multiple sclerosis (MS) and diabetes. We have developed a nanoparticle-based medicine that can blunt anti-self immune responses by selectively expanding what we call 'autoregulatory' white blood cells (T-lymphocytes). These constitute a new type of 'autoreactive' white blood cell, whose function is to thwart disease-causing autoimmune attacks. Our nanomedicines are capable of expanding this population of white blood cells, enhancing their disease-countering capabilities, while blunting autoimmune responses, without causing a general suppression of the immune system.

This project is an effort to advance a nanomedicine developed for the treatment of central nervous system inflammation in MS patients towards clinical trials. Current MS therapies rely on systemic immunosuppression and are not curative. Our research will focus on relapsing-remitting MS patient samples and will test eight different nanomedicines with high population coverage in a novel assay system using mice transplanted with peripheral blood lymphocytes drawn from patients. We will demonstrate that treatment with disease-specific nanomedicines leads to the expansion of the same type of disease-suppressing white blood cells, which resolve neuroinflammation in mouse models of MS. Our work seeks to identify MS-specific nanomedicines which are likely to work in early-stage clinical trials, hence reducing drug development risk and facilitating clinical translation.



A nanoparticle displaying a "bait" for disease-causing white blood cells