Reversing autoimmune disease through multiple epitope presentation

Current therapeutic developments for autoimmune diseases such as type 1 diabetes (T1D) and rheumatoid arthritis are focused on inducing tolerance to epitopes, which were at some point improperly presented and thus elicited an immune response. However, tissue-specific autoimmune diseases are especially challenging, as there can be multiple antigens from the same target tissue. This technology, a DNA construct, solves the problem of multiple antigens through co-expression and optimized presentation of major disease-driving epitopes from different antigens of a single construct. This technology currently has been developed in the context of T1D and has been shown to successfully present antigen-specific T cells when epitopes are introduced to antigen-presenting cells. As such, the technology provides a solution to the challenge of multiple antigens through highly specific and optimized epitope design and could be developed into an effective treatment option for autoimmune diseases such as T1D.

Precise DNA construct design for specific targeting of autoimmunity

This technology achieves the difficult task of presenting multiple epitopes to immune cells to reinstate proper tolerance to “self” cells. While this idea has been pursued as a potential treatment strategy for autoimmune disease, not much progress has been made given the large number of possible antigens from a single target tissue. This technology encodes a string of endosome-targeted CD4 epitopes and mimetopes followed by a series of CD8 epitopes. The CD4 and CD8 peptides are separated by a cleavage site, which allows CD8 to be released into the cytoplasm and CD4 to be targeted to the endosome. This provides a thorough and expansive coverage, which allows for a more effective treatment. In addition, the specificity of the construct ensures only the targeted epitopes are involved, minimizing the risk for off-target effects.

Epitopes from this technology have been shown to be processed and presented to antigen-specific T cells when introduced to antigen-presenting cells, and are likely to function similarly when introduced to tolerogenic cells.

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Applications:

• Antigen-specific immunotherapy for Type 1 diabetes
• Antigen-specific immunotherapy for various autoimmune disorders
• Immune-specific method for targeting and treating cancer
• Research tool for studying immunology and autoimmune disorders
• Research tool to differentially target multiple proteins simultaneously

Advantages:

• Highly specific targeting
• Efficient DNA construct design
• Effective antigen presentation
• Minimal off-target effects
• Improves R&D for immunology field
• Research tool to identify and understand autoimmune triggering epitopes

Patent Information:

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Related Publications:


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