Therapeutics & Vaccines


# Nanoparticles That Target Dendritic Cells

View U.S. Patent No. 9,107,858 in PDF format.

**WARF: P07026US**

Inventors: Ferencz Denes, Zsuzsanna Fabry, Matyas Sandor

**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing carbon nanoparticles that selectively target dendritic cells and may be used in the development of vaccines.**

## Overview

Dendritic cells play an important role in the process of initiating immune response. They are present in small quantities in tissues, such as skin and lung, that are in contact with the external environment and serve as “border patrols.” Once activated by an antigen, dendritic cells migrate to the lymph tissues where they interact with T and B cells to initiate immune response. As a result, vaccines that stimulate dendritic cells may enhance immunity.

## The Invention

UW-Madison researchers have developed a system for delivering vaccines and other biomolecules to dendritic cells. This system includes carbon nanoparticles that are preferentially taken up by dendritic cells, rather than macrophages.

Antigens, dendritic cell-targeting antibodies and dendritic cell-activating substances may be attached to the nanoparticles. The antigens are capable of inducing a specific T-cell response and can be associated with infectious disease or a tumor. When delivered to dendritic cells, these nanoparticles enhance immune response.

Other biomolecules, including targeting compounds, therapeutic agents and detectable labels, can be attached to the nanoparticles as well. Targeting compounds may be attached to enhance the uptake of the nanoparticles by dendritic cells. To treat autoimmune diseases, a cytotoxic agent could be attached to the nanoparticles to selectively target and kill aberrant dendritic cells. Fluorescent or radioactive labels could be added to make it easier to isolate dendritic cells.

## Applications

- Preventing infectious disease
- Treating cancer
- Treating autoimmune diseases, such as arthritis, multiple sclerosis and autoimmune diabetes
- Monitoring, isolating and manipulating dendritic cells
- Delivering biomolecules to dendritic cells

## Key Benefits

- Capable of initiating a strong immune response
- Carbon-based magnetic nanoparticles are stable over a large temperature range.
- Nanoparticles have a large specific surface area that enables the high density attachment of bio-macromolecules, including proteins.

- Nanoparticles are not toxic or inflammatory.
- Nanoparticles can be directed to a specific site in a patient using a magnetic field.
- May enable targeted, localized delivery of antigen
- A variable magnetic field can be applied to a patient to generate heat in the cells surrounding the nanoparticles.

## Stage of Development

The inventors have shown that the nanoparticles are preferentially taken up by dendritic cells and induce a strong immune response in *in vitro* and *in vivo* environments. They also have demonstrated that the nanoparticles are non-toxic and do not induce inflammation.

## Additional Information

**For More Information About the Inventors**

- Zsuzsanna Fabry
- Matyas Sandor

**Tech Fields**

- Drug Delivery : Other drug delivery technologies
- Therapeutics & Vaccines : Vaccines

For current licensing status, please contact Rafael Diaz at rdiaz@warf.org or 608-960-9847