



Tweaking Immune Cells to Tackle Food Allergy

New research into a unique immunotherapy holds promise for treating food allergy and other immune system disorders by tweaking our own cells.

Primary Researchers

WOJCIECH DAWICKI

Department of Medicine
University of Saskatchewan

JOHN GORDON

Department of Medicine
University of Saskatchewan

Citation

Dawicki W, Li C, Town J, Zhang X, Gordon J. Therapeutic reversal of food allergen sensitivity by mature retinoic acid – differentiated dendritic cells induction of LAG3+ CD49b-Foxp3⁻ regulatory T cells. *The Journal of Allergy and Clinical Immunology*. 2017; 139(5); 1608 – 1620.

Keywords

dendritic cells, anaphylaxis, immune cells, immunotherapy, food allergies, IL-10, IL-27, vitamin A

What is this research about?

Whether flying in an airplane, dining out or eating lunch at school, individuals with food allergies must always be on guard. There is no cure for food allergies and, other than food avoidance, treatment options are limited.

But new research into a unique immunotherapy holds promise for treating food allergy and other immune system disorders by tweaking our own cells.

The researchers developed a therapy that uses a type of immune cell called a dendritic cell to reduce the immune response responsible for an allergic reaction.

Dendritic cells are found in tissues that are in contact with the external environment, such as the skin, the lining of the nose and lungs, and the walls of the intestines. When a foreign particle enters the body, it runs into a web of dendritic cells, which tells the immune system how to respond.

Normally, when dendritic cells encounter a food particle, they send a “do not respond” signal to the immune system. In the case of a food allergy, the immune system becomes inappropriately activated, causing an allergic reaction.

Building on their previous work using dendritic cells to reverse allergic sensitivity in asthma in mice and on human cells in a test tube, the researchers created a new type of dendritic cell that can turn off the allergic response that occurs with a food allergy.

What did the researchers do?

The researchers isolated cells from mice that develop into dendritic cells. The cells were grown in a test tube in conditions that promote their normal maturation. The researchers modified the cells by exposing them to a vitamin A by-product known to help regulate a healthy immune response to food, as well as two common food allergens—peanut protein and egg white protein. These modifications produced an entirely new type of dendritic cell.

Supporters



ResearchSKETCHES is a program of the Allergy, Genes and Environment (AllerGen) Network.

ResearchSKETCHES translates AllerGen-funded research into simple, accessible clear-language summaries, in order to disseminate these findings to a broad lay audience.

Contact Us:



The researchers then evaluated the ability of the new dendritic cells to turn off the allergic response to food. To do this, they injected allergic mice with peanut or egg white protein through a stomach tube until symptoms of anaphylaxis (a severe allergic reaction) developed. Next, they separated the mice into two groups, treating one with the modified dendritic cells and the other with a simple saline (salt) solution.

Four weeks later, the researchers fed the mice the same food allergens and monitored their allergic reactions.

What did the researchers find?

The researchers found that the new dendritic cells turned off the allergic response to peanut and egg white protein. Within four weeks, mice that received the dendritic cell treatment had a 50% to 90% lower anaphylactic response compared to those treated with saline.

To understand how the new dendritic cells worked, the researchers analyzed the compounds these dendritic cells produced. They found that the cells produced the immune protein interleukin-27 (IL-27) in abundance. IL-27 is important for making T cells that turn off or reduce the severity of immune responses.

The researchers then confirmed the key role of IL-27 by demonstrating that when this protein was absent, the new dendritic cells no longer reduced the allergic response.

How can this research be used?

This research outlines a method for producing specialized dendritic cells that can significantly reduce food allergies in mice, and showed that the dendritic cells do this by producing IL-27.

Although a treatment that can help people overcome food allergies is likely years away, this study's findings support the development of new dendritic cell therapies for the treatment of asthma, food allergies and related immune system conditions in humans.