New blood cells fight brain inflammation

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Hyperactivity of our immune system can cause a state of chronic inflammation. If chronic, the inflammation will affect our body and result in disease. In the devastating disease multiple sclerosis, hyperactivity of immune cells called T-cells induce chronic inflammation and degeneration of the brain. Researchers at BRIC, the University of Copenhagen, have identified a new type of regulatory blood cells that can combat such hyperactive T-cells in blood from patients with multiple sclerosis. By stimulating the regulatory blood cells, the researchers significantly decreased the level of brain inflammation and disease in a biological model.

The results are published in the journal *Nature Medicine*.

Molecule activate anti-inflammatory blood cells

The new blood cells belong to the group of our white blood cells called lymphocytes. The cells express a molecule called FoxA1 that the researchers found is responsible for the cells' development and suppressive functions.

"We knew that some unidentified blood cells were able to inhibit multiple sclerosis-like disease in mice and through gene analysis we found out, that these cells are a subset of our lymphocytes expressing the gene FoxA1. Importantly, when inserting FoxA1 into normal lymphocytes with gene therapy, we could change them to actively regulate inflammation and inhibit multiple sclerosis, explains associated professor Yawei Liu leading the experimental studies.

Activating own blood cells for treatment of disease

FoxA1 expressing lymphocytes were not known until now, and this is the first documentation of their importance in controlling multiple sclerosis. The number of people living with this devastating disease around the world has increased by 10 percent in the past five years to 2.3 million. It affects women twice more than men and no curing treatment exists. The research group headed by professor Shohreh Issazadeh-Navikas from BRIC examined blood of patients with multiple sclerosis, before and after two years of treatment with the drug interferon-beta. They found that patients who benefit from the treatment increase the number of this new blood cell type, which fight disease.

"From a therapeutic viewpoint, our findings are really interesting and we hope that they can help finding new treatment options for patients not benefiting from existing drugs, especially more chronic and progressive multiple sclerosis patients. In our model, we could activate lymphocytes by chemical stimulation and gene therapy, and we are curios whether this can be a new treatment strategy", says professor Shohreh Issazadeh-Navikas.

And this is exactly what the research group will focus on at next stage of their research. They have already started to test whether the new FoxA1-lymphocytes can prevent degradation of the nerve cell's myelin layer and brain degeneration in a model of progressive multiple sclerosis. Besides multiple sclerosis, knowledge on how to prevent chronic inflammation will also be valuable for other autoimmune diseases like type 1 diabetes, inflammatory bowel disease and rheumatoid arthritis, where inflammation is a major cause of the disease.

More information: FoxA1 directs the lineage and immunosuppressive properties of a novel regulatory T cell population in EAE and MS, DOI: 10.1038/nm.3485

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