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Towards a revolution in the treatment of multiple sclerosis

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Brilliant researchers at Harvard University have created a strain of intestinal bacteria that produces a molecule capable of blocking the autoimmune reaction in the brain that causes multiple sclerosis.

5 to 10% of the population is affected by one or other of the approximately 80 autoimmune diseases known to date (multiple sclerosis, rheumatoid arthritis, celiac disease, lupus, and psoriatic arthritis, to name a few).

Despite this high prevalence, treatment options are limited for most of these conditions and generally consist of the use of medications that non-specifically block the immune system.

These treatments are generally not curative, cause several side effects and leave patients vulnerable to opportunistic infections and the development of malignancies.

Autoimmune diseases that affect the brain, such as multiple sclerosis, are particularly difficult to treat because many therapeutic agents cannot cross the blood-brain barrier, a protective network of cells that filters substances carried by the blood to protect the brain from toxins and pathogens.

New therapeutic approaches are clearly required if we are to reduce the devastating impact of these diseases on the quality and life expectancy of those affected.

A BIOCHEMICAL BRAKE

To identify these new potential targets, a team of researchers focused on dendritic cells, a type of immune cell abundant in the gastrointestinal tract and in the brain.

These cells are considered sentinels of the immune system, that is to say, they are constantly on the lookout for new dangers and then transmit the information to other immune cells so that they can take action and eliminate the threat.

Since autoimmune diseases are by definition caused by a disruption that causes the immune system to attack normal cells for no reason, it is therefore possible that dysfunction of dendritic cells can contribute to diseases such as multiple sclerosis.

In addition, it seems that this is indeed the case: in a recent publication in the very prestigious journal *NATURE*, researchers have shown that under normal conditions, lactic acid generated by the metabolism of dendritic cells acts as a biochemical brake which prevents the inappropriate triggering of immunity that causes autoimmune disease (1).

This brake is blocked in people with multiple sclerosis, resulting in a dysfunctional activation of the immune system that then attacks brain cells in an abnormal manner.

CURATIVE PROBIOTIC

Since it is not possible to administer large amounts of lactate to correct this defect (which would cause a risk of lactic acidosis), researchers had the brilliant idea of creating a strain of intestinal bacteria that is modified to continually produce this molecule, a kind of probiotic created *de novo*.

When this bacteria was implanted in the intestine of mice suffering from a disease similar to multiple sclerosis, the researchers noted a marked reduction in the degree of brain inflammation as well as a significant reduction in the number of T lymphocytes, indicating suppression of autoimmunity.

These results are very interesting, because they show that bacterial activity in the intestine is capable of influencing the function of the brain and very probably other organs.

In other words, instead of treating an autoimmune disease with non-specific drugs that have a restricted action and are quickly eliminated from the body, one could consider using intestinal bacteria as drug factories, capable of continuously producing active molecules against these diseases.

This is very high-level biochemical science...

(1) Sanmarco LM et al. Lactate limits CNS autoimmunity by stabilizing HIF-1 in dendritic cells. Nature 2023; 620: 881-889.

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