Intestinal barrier damage in multiple sclerosis

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Researchers at Lund University in Sweden have published new research findings on the role of the intestinal barrier in the autoimmune disease multiple sclerosis (MS).

Within medical science, it is not known for certain how MS develops or why the body's immune system attacks cells in the central nervous system. Inflammation develops for an unknown reason, which hinders transport of neural impulses. This can produce various physical and mental symptoms, including a loss of sensation, motor difficulties, blurred vision, dizziness and tiredness.

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"We know that the permeability of the intestines to harmful substances is raised in inflammatory bowel diseases such as Crohn's disease and ulcerous colitis, as well as in some other autoimmune diseases such as

type 1 diabetes. The condition is called 'leaky gut syndrome'. Our studies indicate a leaky gut and increased inflammation in the intestinal mucous membrane and related lymphoid tissue before clinical symptoms of MS are discernible. It also appears that the inflammation increases as the disease develops", said Shahram Lavasani, one of the authors of the study.

Dr Lavasani and his colleagues at Lund University have previously shown that probiotic bacteria could give a certain amount of protection against MS. They therefore wondered whether the intestinal barrier is affected and decided to investigate inflammatory cells and processes in the intestine. The hypothesis was tested in a research project in collaboration with Professor Björn Weström, doctoral student Mehrnaz Nouri and reader Anders Bredberg.

"To our surprise, we saw structural changes in the mucous membrane of the small intestine and an increase in inflammatory T-cells, known as Th1 and Th17. At the same time, we saw a reduction in immunosuppressive cells, known as regulatory T-cells. These changes are often linked to inflammatory bowel diseases, and biologically active molecules produced by Th1 and Th17 are believed to be behind this damage to the intestines."

Neuroinflammatory processes in MS are believed to lead to damage and leakage in the blood-brain barrier that protects the central nervous system and regulates the transport of cells. The researchers have now observed similar damage in the intestinal barrier, especially to the 'tight junctions' that bind the cells together in the mucous membrane of the intestine, and have demonstrated that these are connected to disease-specific T-cells.

"In most cases, we don't know what triggers autoimmune diseases, but we know that pathogenic cells frequent and disrupt the intestines. A

leaky gut enables harmful bacteria and toxic substances in the body to enter the intestine, which creates even more inflammation. Our findings provide support for the idea that a damaged intestinal barrier can prevent the body ending an autoimmune reaction in the normal manner, leading to a chronic disease such as MS", said Dr Lavasani.

Shahram Lavasani and his colleagues believe that future drugs to treat this type of disease should perhaps not only focus on the central nervous system, but also on the intestines by repairing and restoring the intestinal barrier.

"In the long run, we hope that our findings will lead to better understanding of what actually happens in the development of MS. Looking even further to the future, we hope for the development of a better treatment that aims at the intestinal barrier as a new therapeutic target."

The research group is now studying other inflammatory parameters in the gut that could affect the development of MS. Their aim is to draw up treatment methods that can heal the mucous membrane in the intestine in the hope of preventing the development of the disease. Some of this work forms part of Mehrnaz Nouri's thesis, which will be defended later in the year.

More information: "Intestinal Barrier Dysfunction Develops at the Onset of Experimental Autoimmune Encephalomyelitis, and Can Be Induced by Adoptive Transfer of Auto-Reactive T Cells," Mehrnaz Nouri, Anders Bredberg, Björn Weström, Shahram Lavasani, Published: September 03, 2014DOI: 10.1371/journal.pone.0106335

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