Scientists Find Single Protein That Blocks MS Relapses, Cures Gum Disease

A protein 'gatekeeper' decides how much inflammation is enough during an immune response. Without the protein, chronic inflammatory conditions like MS and gum disease can wreak havoc.

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In a new study, scientists at the University of Pennsylvania (Penn) have discovered that a protein previously shown to treat gum disease also blocks relapses in mice with a condition similar to multiple sclerosis (MS).

The leap from experimenting on gum disease to investigating the effects of this protein, called Del-1, on MS came when researches realized that it plays a key role in the body's immune response.

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The Leap from Gums to Brain

In their earlier work, the research team, led by George Hajishengallis, a professor of microbiology at Penn's School of Dental Medicine, discovered that Del-1 was missing in mice that were given the mouse model of gum disease, or periodontitis. Why?

The immune system is the body's complex defense mechanism. When a threat is detected — whether it's a virus, bacteria, an insect bite, or even a foreign object like a splinter — the immune system goes into action, sending cells to the site of the injury.

Hajishengallis and his team found that Del-1 regulates how these immune cells circulate and accumulate. When there are low levels of Del-1, as was the case for the mice with gum disease, the immune response can spiral out of control. Without the checks and balances Del-1 provides, the inflammation becomes chronic, resulting in damage to gum tissue and the underlying bone.

When the investigators injected Del-1 into the mice's gum tissue, they found that the infection cleared. This was an illuminating discovery, and the team began to consider the implications for other inflammatory diseases.

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When they screened various human tissues for Del-1 expression, they found that the brain expressed the largest amounts of the protein, explained Hajishengallis in an interview with Healthline. "This suggested that Del-1 might play an important role in the central nervous system," he said.

During their research, the team came across a genetic study by an independent group that had identified Del-1 as a risk factor for MS, though to date there have been no studies linking the protein to the disease.

"Taken together," said Hajishengallis, "these observations prompted us to investigate whether Del-1 could prevent inflammation in the central nervous system just as it did in the gum tissue."

How Does Del-1 Affect MS?

The team examined brain tissue from both healthy people and people with MS. They found far lower

levels of Del-1 in the brain tissue of those who had chronic disease activity at the time of their death compared to healthy tissue or tissue from MS patients who had been in remission when they died. The researchers also noted that mice that were given the MS-like disease experimental autoimmune encephalomyelitis (EAE) had lower levels of Del-1.

To test their theory about Del-1's role in MS, they waited for the mice with EAE to have a relapse, when levels of the protein would be lowest. After injecting the mice with Del-1, the researchers noticed that the relapses stopped and the mice had no further flare-ups.

"This treatment prevented further disease relapse," senior author Dr. Triantafyllos Chavakis of Germany's Technical University Dresden said in a press release. "Thus, administration of soluble Del-1 may provide the platform for developing novel therapeutic approaches for … demyelinating diseases, especially multiple sclerosis."

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In an immune response, there are many players. Certain cells secrete substances called cytokines that can stop production of Del-1. In a healthy immune system combating an acute infection, for example, that's a good thing. It allows immune cells to be deployed quickly to fight the infection.

"However, if this condition persists and becomes chronic," Hajishengallis explained, "it is bad [because] chronically low levels of Del-1 lead to excessive recruitment of inflammatory cells that do more harm than good."

This study suggests that reduced production of Del-1 is part of the MS disease process. Finding a way to replace the needed protein — or trigger the body to produce it — could be a new target for MS drug research.

Hajishengallis said his team's future research will focus on "whether the useful properties of Del-1 can be localized in specific parts of the protein. This may make the protein more 'druggable.' We [will] also investigate novel properties of Del-1 and want to see its role in additional tissues and diseases."

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