In Multiple Sclerosis (MS), the body's immune system attacks the myelin membrane that covers the spinal cord, brain and optic nerve, resulting in a debilitating central nervous system disorder. The exact cause of MS is still being investigated, but consensus agrees that the body's autoimmune process activates T-cells and possibly B-cells, programming them to attack the fatty layer of protective myelin that surrounds nerve fibers.

The autoimmune response that results in the destruction of myelin is called demyelination. The result of this demyelination is a number of symptoms that can make life miserable for those suffering from MS. Demyelination of the cerebrum and cerebellum can result in balance, speech and coordination problems. Demyelination of the motor tract nerves can result in vision loss, bowel and bladder problems, muscle weakness and paralyzing muscle spasms. Demyelination of the sensory nervous tract can result in numbness, burning and tingling as well as strange and altered sensations.

Conventional treatments for MS, diabetes, asthma, and other immune disorders involve the use of immunosuppressive therapies that weaken the immune system, thus preventing the body's attacks on itself. Current immunosuppressive treatments for MS can have side effects that affect other functions of the nervous system, leaving the patient susceptible to other immune disorders like flu and infection. This weakening of the immune system can also detract from the patient's quality of life, trading severe symptoms for new albeit less severe symptoms.

Scientists at Northwestern University have developed a nanopolymer delivery vehicle for targeted immunotherapy that has been proven to stop remission of a common type of MS in its tracks. The nanoparticle delivery vehicle is made of a biodegradable polymer called PLG that delivers the MS antigen to the body's spleen. The spleen thinks the polymer nanoparticle is a dying cell, thus leaving it alone. The presence of the antigen in the spleen creates an immune tolerance to the antigen. The result is the body halts production of the myelin responsive T-cells by creating other types of T-cells that regulate the body's autoimmune response. This therapy specifically targets myelin destroying T-cells without influencing normally functioning parts of the immune system.

Author:

Tai Wallace
Development Stage:

- Engineering [8]

Key Words:

- Immunotherapy [4]
- PGL [9]
- White Blood Cells [10]
- Multiple Sclerosis [2]
- Myelin [3]

Mechanism:

- Molecular Nanosystems [12]

Source:

Microparticles bearing encephalitogenic peptides induce T-cell tolerance and ameliorate experimental autoimmune encephalomyelitis [13]

Summary:


Function:

- Enhanced Drug Delivery [15]

Source:

Breakthrough Nanoparticle Halts Multiple Sclerosis: New nanotechnology can be used for Type 1 diabetes, food allergies and asthma [16]
Source:

Microparticles bearing encephalitogenic peptides induce T-cell tolerance and ameliorate experimental autoimmune encephalomyelitis [13]

Benefit Summary:

This drug delivery [14] platform has the potential to increase the quality of life decrease the costs of treatment [17] and make treatment [17] easier for MS patients and those with other types of pathological immune disorders such as type I diabetes, asthma, and food allergies by inducing t-cell tolerance in patients.

Benefit:

- Health [18]

Risk Summary:

The human health [19] and ecological risks of this drug delivery [14] platform are very low. PLG is an FDA approved biodegradable polymer similar to that used in dissolving stitches and sutures. The material is processed in the spleen and is passed through the body similar to any other dying cell.

Risk Characterization:

- Simple [20]

Risk Assessment:

- Health Risks [21]

Source:

Breakthrough Nanoparticle Halts Multiple Sclerosis: New nanotechnology can be used for Type 1 diabetes, food allergies and asthma [16]
Facility:

- **Medicine** [22]

Substitute:

- **Existing Therapy** [23]

Challenge Area:

- **Health** [24]

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