The Primary Myelin Disorder Theory

The primary myelin disorder theory states that some process first causes damage to the myelin and that the immune system reaction is secondary to this. The cause of the damage to myelin is currently unknown, but virus infections, toxins or other diseases that damage myelin are all possibilities. If it were due to a virus, the immune reaction would be directed against that virus. If due to a toxin or other myelin disease, the immune reaction would be directed at removing damaged tissue.

The hygiene hypothesis is a variation on the primary myelin disorder theory, and is described on another webpage on this site.

There are several observations that support the primary myelin disorder theory.

1. **Geography**: MS is more common at high latitudes (more northern latitudes in the Northern Hemisphere, more southern latitudes in the Southern Hemisphere). This suggests that there is something in the environment related to the cause of MS.

2. **Migration studies**: The risk of MS is determined by where one grows up. In general, this risk is determined before the mid-teens. Those who move after this age, carry the risk of MS with them from childhood. Those who move before this age acquire the risk of their new home.

3. **Clusters of MS**: There have been several clusters of MS suggesting a viral cause of the disease. For example, the outbreak of MS in the Faroe Islands appears to coincide with the arrival of British troops during World War II.

4. **Changes in MS gender over time**: MS is becoming more common in women. This is difficult to explain except through some environmental factor.

5. **Changes in MS race over time**: MS is increasing in racial groups in which it was previously rare. This is difficult to explain except through some environmental factor.

6. **MRI lesions are not synchronized**: On MRI scans, some MS lesions can be improving at the same time that other lesions are having acute inflammation. This suggests that some local factor within the brain must be causing the immune system to be active at those particular spots. This could be a virus, changes in proteins expressed in those locations or other diseases that damage myelin in specific locations.

7. **HLA linkage**: HLA proteins are found on the surface of many of the cells of our bodies. These proteins play a key role in the immune system by binding foreign protein targets and presenting them to lymphocytes. Certain HLA types are more common in people with MS compared to people without MS. HLA types play important roles in our immune reactions to viruses.

8. **Pathology**: A few pathology specimens exist of acute MS attacks very shortly after the onset of symptoms. Some of these have widespread damage to myelin in the absence of an immune component. There are also special MRI techniques that show changes in the brain weeks to a few months before the immune system attacks the brain. These findings
suggest that the earliest phase of an MS attack might not involve the immune system, and that the immune reaction might be secondary to damage done by some other cause.

9. Pathology subtypes: There are four types of pathology seen in acute MS attacks. All of these are compatible with the primary myelin disorder theory. Types III and IV and difficult (but not impossible) to explain with the autoimmune theory.

There are several observations that argue against the primary myelin disorder theory.

1. Absence of virus: Despite decades of searching, a virus has not been found to explain MS, and there have not been virus particles identified on pathology specimens.

2. Pathology: Most pathology specimens have prominent immune system activation, even early during MS attacks.

3. Immune treatments: Current therapies directed against the immune system have been at least partially successful in slowing the disease. The immune system must be playing an important role in contributing to the disease.

4. Migration studies: If MS is due to a virus, why do those who grow up in low risk areas (who have presumably not ever been exposed to the virus) not become acutely ill when they move to a high risk area (where they would be suddenly exposed to the virus)?