Evidence suggests a pathogenic role of brain autoimmunity in central nervous system disease.

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More than 50 million people in the United States suffer from autoimmune diseases due to an abnormal immune reaction called autoimmunity. Autoimmunity is a major cause of many chronic diseases. This number, however, does not include several brain diseases and mental illnesses for which brain autoimmunity has been experimentally demonstrated. For example, a huge population with autism spectrum disorder (ASD), Alzheimer's disease (AD), Tourette's syndrome (TS) and obsessive-compulsive disorder (OCD) has been found to have autoimmunity to the brain. This patient population is never included in epidemiological studies of the autoimmune disease.

If you have an autoimmune disease, your immune system goes haywire and begins to attack healthy cells, tissues, and organs. However, this must happen in a highly selective way. Thus, in the case of NeuroAutoImmunity (NAI), the immune system will elicit autoimmune response that is directed against the brain or nerve tissue. To that end, the term "NeuroAutoImmunity" (NAI) has recently been used to refer to this autoimmune response that is directed against the brain or nerve tissue. Our immune system and nervous system are connected with each other via the so-called neuro-immune circuitry and when this circuitry is disrupted, the most common problem manifested is autoimmunity to brain. Then, people commonly show a wide spectrum of neurological and psychiatric health problems.

What causes autoimmune diseases is not well known. The common brief is that they are triggered by environmental factors, in particular viruses; for example, human herpes virus-6 in multiple sclerosis (MS), measles virus in autism spectrum disorders, and herpes simplex virus in Alzheimer's disease. Virus infection is now known to change the permeability of the bloodbrain barrier, which permits the entry of immune cells and proteins into the brain. Inside the brain, the microglial

cells can also produce immune proteins that are involved in the autoimmune process commonly referred to as brain inflammation or neuroninflammation.

Like all typical autoimmune disease, the autoimmunity to the brain has been found through laboratory studies of specialized proteins of the immune system (for example, antibodies and cytokines), autoimmunity testing, and immunotherapy. Immune activation, which is the first step in the onset of autoimmunity, has been shown in patients with multiple sclerosis, autism spectrum disorders, Alzheimer's disease, Tourette's syndrome, and obsessive-compulsive disorder. Patients with these diseases also harbor elevated levels of autoantibodies that bind specifically to the brain protreins – for example, antibodies to audate nelues of the basal gaglia (a brain region involved in Parkinson's disease) in autism spectrum disorder, Tourette's syndrome, and obsessive-compulsive disorder; antibodies to amyloid protein0beta in Alzheimer's disease; and antibodies to myelin basic protein in autism spectrum disorder and multiple sclerosis. Interferon-gamma and interleukin-12, the two proteins of the immune system that initiate autoimmunity, are also activated in patients with brain diseases. Furthermore, many patients also show improvement when administered with immunotherapy using intravenous immunoglobulin, plasmapheresis, transfer factor, and other immune modulating agents.

Clearly, several lines of scientific evidence suggest a pathogenic role of brain autoimmunity or NeuroAutoImmunity in central nervous system diseases. This patient population must be included in all future epidemiological studies if we are going to realize the overall impact of autoimmune disease. Immunotherapy with immune modulating agents offers a novel promising approach to help those affected with these medical conditions. Autoimmunity in the brain may also cause a shift in brain waves or states, thereby resulting into a functionally "imbalance brain." To that end, a novel approach of Brainwave Optimization with RTB™ (Real Time Balancing) that stems from brain plasticity (brain's ability to re-wire and heal itself) might also be quite important in helping people who suffer from brain diseases and mental illnesses involving autoimmunity.

According to the World Health Organization (W.H.O), the financial burden of all brain diseases and mental illnesses surpasses that of cancer and heart disease. Up to 75-80 percent of patients with brain diseases have autoimmunity, which means that a significant proportion of this population could potentially benefit from interventions directed towards autoimmunity in the brain.