MANTECH Publications

Journal of Research in Microbiology and Immunology
Volume 4, Issue 2, May-August, 2022

Research on Existing and Developing Forms of Autoimmune Illness in Humans

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Abstract

Immune system disorders cause abnormally low activity or over activity of the immune system. In cases of immune system over activity, the body attacks and damages its own tissues (autoimmune diseases). Immune deficiency diseases decrease the body's ability to fight invaders, causing vulnerability to infections. Some of the autoimmune disease are as follows rheumatoid arthritis, systemic lupus erythematosus (lupus), inflammatory bowel disease (IBD),multiple sclerosis (MS),Type 1 diabetes mellitus, Guillain-Barre syndrome, chronic inflammatory demyelinating polyneuropathy, psoriasis.

Keywords: *Autoimmune Diseases, IBD, Lupus, Immune System*

INTRODUCTION

The major role of variety in immune system development is to protect hosts against infectious pathogens. Pathology is caused by this pleiotropic immune system in two basic ways. The first are immune deficiency syndromes, which occur when one or more components of the immune system are unable to respond in a protective fashion to a pathogen, and the second are autoimmune illnesses. Tolerance is the failure to discriminate self from nonself, which is the basis for autoimmune illness and the topic of this article. Historically, autoimmune disorders were thought to be uncommon, but systematic epidemiological studies have revealed that they afflict 3-5% of the population, with autoimmune thyroid disease and type I diabetes (T1D) being the most frequent. However, there are almost 100 unique autoimmune illnesses, some of which are organ specific, such as primary biliary cirrhosis (PBC), and

others of which reflect a range of immunological dysfunction affecting numerous organs, such as systemic lupus erythematosus (SLE). [1] Significant gains in diagnosis and illness classification, as well as prognosis, have been made in recent years, thanks to the development of technology in molecular immunology and evidence-based clinical laboratory testing. To comprehend immunological tolerance, several fundamental ideas should be addressed, including central tolerance, peripheral energy, T regulatory cells (Tregs), and the homeostasis established by cytokines and chemokines and their receptors. Central tolerance in the thymus and bone marrow is important in determining immune system balance. Before maturing and entering the circulation, developing lymphocytes in the thymus undergo positive selection in the cortex. Lymphocytes with potential reactivity to self-peptides are negatively chosen and eliminated in the thymic medulla of a healthy host. Importantly, mature T cells are exposed to secondary selection (peripheral tolerance) after departing the thymus, where the majority of self-reactive T cells are destroyed or rendered anergy. Furthermore, clonal deletion or clonal anergy occurs when immature B lymphocytes produce surface IgM that detects self cell-surface antigens. Through a process known as receptor editing, auto reactive B cells can avoid deletion. Peripheral tolerance regulates mature B cells as well.

The Epidemiology of Autoimmunity:

Autoimmune illnesses are often assumed to be rare, yet their impact on mortality and morbidity is enormous. The general population has an autoimmune prevalence of roughly 3-5%. [2,3] Despite significant progress in the diagnosis and treatment of autoimmune illnesses, there is still a lack of information on the aetiological processes that lead to clinical pathology.

The incidence and frequency of autoimmune disorders vary. When differences in age, gender, ethnicity, and other demographic factors are incorporated, geo epidemiology becomes more complicated. Autoimmune disorders can develop at any age, although each disease has a distinct age of start. The frequency is greater in first-degree relatives and significantly higher in monozygotic twins in practically all cases. [4] Women have a higher prevalence of autoimmune disorders, with a female-to-male ratio ranging from 10: 1 to 1: 1 [the exception being Crohn's disease, which has a ratio of 1: 1.2]. The sex bias of autoimmunity has received a great deal of research, yet it remains unsolved.

The Genetic Basis of Autoimmunity:

The majority of autoimmune disorders are not caused by a single hereditary component, but rather by a combination of several. Although there have been a number of early studies that demonstrate connections with the major histocompatibility complex (MHC) in human autoimmune illnesses, the findings have frequently failed to lead to relationships with sufficient predictive strength for clinicians. The major histocompatibility complex is found on the short arm of chromosome 6 and contains genes that encode molecules involved in antigen presentation, making it important in discriminating self from nonself. Human leucocyte antigens are the gene products of the major histocompatibility complex in humans (HLAs). Several linkage studies have identified genetic variations linked to autoimmune disorders. [5]

The Environmental Influence of Autoimmunity: The identification of specific environmental variables is crucial for understanding individual vulnerability, but there are few agents that clearly have a role, and the identification of generic risk factors is unclear. Nutrition, the microbiota, infectious processes, and xenobiotics, such as cigarette smoke, pharmacological agents, hormones, UV radiation, silica solvents, heavy metals, vaccinations, and collagen/silicone implants, are examples of environmental influences [57-59]. Infectious agents have long been one of the most extensively researched environmental variables. [6] The finest illustration of a link between infection and immunity is acute rheumatic fever, which arises after Streptococcus pyogenes exposure in genetically susceptible hosts. [7] It is assumed that the cause of autoimmunity in acute rheumatic fever is'molecular mimicry' between the bacterial M protein and human lysoganglioside, which leads to immunological tolerance loss and the formation of cardiac reactive T cells. [8]

Damian proposed the phrase "molecular mimicry" in 1964, implying that some antigenic determinants of bacteria may possibly resemble host epitopes and hence induce an autoimmune response. [9,10] In contrast to autoantibodies, relevant (disease-associated) auto reactive T lymphocytes [11] operate on the target tissue and circulate at extremely low precursor levels. In other words, the auto reactive T-cell precursor level in the target tissue is substantially greater than in the peripheral blood, typically more than 100-fold higher. T-cell receptor (TCR)-binding auto reactive cytotoxic T lymphocytes (CTL) identify a target cell by binding to the proper mix of major histocompatibility complex I and auto antigen-derived peptides. Then, a complex of major histocompatibility complex I and auto antigen-derived

peptides directly kills target cells through different mechanisms:(i) secretion of cytotoxic granules (perforin and granzyme B) resulting in disintegration of the cell membrane and induced apoptosis; (ii) activation of Fas-Fas ligand, which induces apoptosis; and (iii) release of cytokines (such as TNF-a and interferon-c), leading to tissue injury. [12] Because of the growing corpus of knowledge on additional CD4 subsets, such as Th17 [13], T regulatory cells, and T follicular helper cells, the paradigm of Th1/Th2 balance has evolved (Tfh). [14,15]

New Approaches to Therapy:

The use of biological therapeutics that modulate particular inflammatory and effector pathways is the new paradigm in the treatment of autoimmune illnesses. Since then, medications that inhibit TNF-a have been developed not just for the treatment of rheumatoid arthritis, but also for systemic lupus erythematosus, psoriasis, psoriatic arthritis, inflammatory bowel disease, multiple sclerosis MS, and many others. The objective of treating people with autoimmunity is clear: find a specific drug that can totally reverse, if not cure, the condition. This does not yet exist for any autoimmune condition. It is envisaged, however, that it will also be feasible to change the host immune system in order to reestablish tolerance. Although this is achievable in certain animal models of autoimmunity, despite several attempts employing immunotherapy, including stem cell treatments, it has yet to be demonstrated beneficial in people.

However, our understanding of human autoimmune illness has grown and continues to grow as a result of a massive number of molecular studies that investigate not just genetic determinants, but also the function of epigenetics, the environment, infection, and the microbiota. Furthermore, laboratory testing procedures have improved, including serology standardisation and the introduction of novel autoantibody assays. Furthermore, a greater grasp of geoepidemiology has resulted in a far better understanding of what happens to specific patients following a breach of tolerance. Autoimmunity is a problem for all doctors; nevertheless, the prognosis for patients with these diseases has improved considerably in the last decade, and we predict additional improvements in the future.

Autoimmune Lymphproliferative Syndrome (ALPS):

Autoimmune lymphoproliferative syndrome (ALPS) is a rare hereditary immune system condition that affects both children and adults that was initially reported by NIH scientists in the mid-1990s. ALPS is characterised by an abnormally high number of white blood cells called lymphocytes accumulating in the lymph nodes, liver, and spleen, which can lead to organ enlargement. ALPS can also induce anaemia (low red blood cell count), thrombocytopenia (low platelet count), and neutropenia (low level of neutrophils, the most common type of white blood cell in humans). These issues can increase the likelihood of infection and bleeding.

Inflammatory Bowel Diseases (IBDs): Inflammatory bowel diseases (IBDs), including Crohn's disease and ulcerative colitis, cause inflammation of the digestive system. Crohn's can affect any area from the mouth to the anus and often affects the lower part of the small intestine called the ileum. Ulcerative colitis leads to sores on the large intestine, or colon.

Crohn's Disease:

Crohn's disease is a chronic, or long lasting, disease that causes inflammation and irritation in your digestive tract. The most common symptoms of Crohn's disease are diarrhea, cramping and pain in your abdomen, and weight loss.

Multiple Sclerosis (MS):

Multiple sclerosis (MS) is a nervous system disease that affects the brain and spinal cord. Multiple sclerosis damages the myelin sheath, the material that surrounds and protects nerve cells. This damage slows down or blocks messages between the brain and other body parts, leading to the symptoms of multiple sclerosis.

Psoriasis:

Psoriasis is a chronic (long-lasting) disease in which the immune system works too much, causing patches of skin to become scaly and inflamed. Most often, psoriasis affects the:

- Scalp.
- Elbows.
- Knees.

The symptoms of psoriasis can sometimes go through cycles, flaring for a few weeks or months followed by times when they subside. Psoriasis, may have a higher risk of getting other serious conditions, including:

- Psoriatic arthritis.
- Heart attack or stroke.
- Mental health problems, such as low self-esteem, anxiety, and depression.

Rheumatoid Arthritis (RA):

Rheumatoid arthritis (RA) is a form of autoimmune inflammation that causes pain, swelling, stiffness and loss of function in your joints. Rheumatoid arthritis can affect any joint but is common in the wrists and fingers.

Systemic Lupus Erythematosus:

In lupus, the immune system mistakenly targets healthy cells and tissues. This can cause joint, skin, blood vessel, and organ damage. Lupus comes in a variety of forms.

The most prevalent kind, systemic lupus erythematosus, affects many organs. Discoid lupus results in a persistent rash. Lupus induces sunburns on the subcutaneous and cutaneous levels. Medication can also induce another kind. Neonatal lupus is an uncommon condition that affects neonates.

Scleroderma:

Scleroderma, which meaning "hard skin," refers to a group of illnesses that produce aberrant connective tissue development. Connective tissue is the substance found within the body that gives tissues structure and allows them to be sturdy. Scleroderma causes the tissue to become overly hard or thick, causing swelling or discomfort in the muscles and joints.

Type 1 Diabetes:

Diabetes means a person’s blood glucose, or blood sugar, levels are too high. In type 1 diabetes, the pancreas does not make insulin. Insulin is a hormone that helps glucose get into cells to provide energy. Without insulin, too much glucose stays in the blood. Over time, high blood glucose can lead to serious problems with the heart, eyes, kidneys, nerves, and gums

and teeth. Type 1 diabetes happens most often in children and young adults but can appear at any age.

CONCLUSION

An autoimmune illness is a disorder in which your immune system assaults your body by mistake. Normally, the immune system protects against pathogens such as bacteria and viruses. When it detects these intruders, it unleashes an army of fighter cells to assault them. However, autoimmune disease therapy is being researched, and new techniques for prognosis are being developed. The major cause of its prevalence is unknown and is not identified by physicians, however research is being conducted.

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