



EVOLVING EXPLANATION OF AUTO IMMUNE DISEASE – A BRIEF REVIEW

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ABSTRACT

Intermittent fasting which includes periods of fasting and nutrition, has been considered a dietary approach for weight loss and metabolic health improvement. However, its potential benefits in autoimmune diseases have not been widely studied. Autoimmune diseases are chronic conditions characterized by an aberrant immune response against the body's own tissues, leading to inflammation, tissue damage, and functional impairment. The global incidence of autoimmune disorders has shown a significant upward trend, affecting millions and contributing to increased morbidity and healthcare burden. This review describes the common epidemiology, clinical manifestation and mechanisms of autoimmune diseases, with a focus on typical autoimmune diseases including multiple sclerosis, type 1 diabetes, rheumatoid arthritis, systemic lupus erythematosus, and Sjogren's syndrome. We discuss the current therapeutics developed in this field.

KEYWORDS: Autoimmune, infection, T-cells, B-cells, Endocrine, diabetes.

BACKGROUND OF AUTOIMMUNE DISEASE

The immune system comprises cellular, chemical, and soluble protein components that together protect the body against foreign substances, including infectious agents and tumor cells, while not responding to molecules that signify "self". Autoimmunity arises when the immune system fails to distinguish self from non-self at the level of specific regions of cell surface molecules, or epitopes, recognized by two of the major effectors of the immune system: B cells, which produce antibodies, and T cells. Autoimmune disease by definition, then, is autoimmunity that results over time in a pathological outcome with self-reactive, or autoreactive, T cells and autoantibodies causing tissue damage (Brent et al., 2007; Johns Hopkins University, 2022; Rose and Bona, 1993; Rosenblum et al., 2015). In 1993, Rose and Bona reevaluated Witebsky's postulates defining autoimmune disease, and proposed three levels of evidence to establish that a human disease is autoimmune in origin, including direct evidence by transfer of disease with

pathogenic autoantibody or autoreactive T cells, indirect evidence based on reproduction of the autoimmune disease in an animal model, and circumstantial evidence from clinical data (Rose and Bona, 1993).

INTRODUCTION

A misdirected immune response that occurs when the immune system goes awry and attacks the body. Autoimmunity is present to some extent in everyone and is usually harmless, however, autoimmunity can cause a broad range of human illnesses, known collectively as autoimmune disease. Autoimmune disease occurs then there is progression from benign autoimmunity to pathogenic autoimmunity this progression is determined by genetic influences as well as environmental triggers. Autoimmune is evidence by the presence of antibodies and T-cells that reactive with host antigens. Auto-immune diseases are conditions in which your immune system mistakenly damages healthy cells in the body.

Causes and Sex Differences in Autoimmune Diseases

The precise cause of autoimmune disease is unknown. However, there are risk factors that may increase a person's chances of getting immune disease including: Some medications-(medication for blood pressure, statins, and antibiotics), Having relatives with autoimmune diseases, Already having one autoimmune disease (high risk of developing another), Smoking, Exposure to toxins. 6.78% of people with autoimmune disease are women(female), Obesity.

Most autoimmune diseases are more prevalent in women than men, with conservative estimates attributing greater than 75 percent of autoimmune disease incidence to women. Among the exceptions are type 1 diabetes mellitus and myocarditis, which occur more often in boys or men. Research suggests that sex and steroid hormones may contribute to these sex-related disparities. Sex hormones, both natural and synthetic, directly interact with cells of the immune system through receptors located on or inside immune cells. Steroid hormones, including estrogens and androgen, affect antibody production and immune cell proliferation and in this way can increase or inhibit immune response.

Endocrine-disrupting chemicals such as phenols, parabens, and phthalates may influence sex differences in autoimmune diseases by altering sex hormone levels and/or ratios. In addition, the X chromosome encodes many immune system genes, and dysregulated X-inactivation may contribute to sex differences in autoimmune diseases. Much of our understanding of sex differences and the immune response during autoimmune disease is based on studies using animal models.

Common symptoms of autoimmune disease in women

Rheumatoid arthritis (a form of arthritis that attacks the joints), Psoriasis, (a condition marked by thick, scaly patches on skin), Psoriatic arthritis (a type of arthritis affecting some people with psoriasis), Lupus (a disease that damages areas of the body including joints, skin and organs), Thyroid diseases, including Graves' disease, where the body makes too much thyroid hormone (hyperthyroidism) and Hashimoto's thyroiditis, where it doesn't make enough (hypothyroidism) of the thyroxine hormone.

Effects of autoimmune diseases and treatment (Figure no 1).

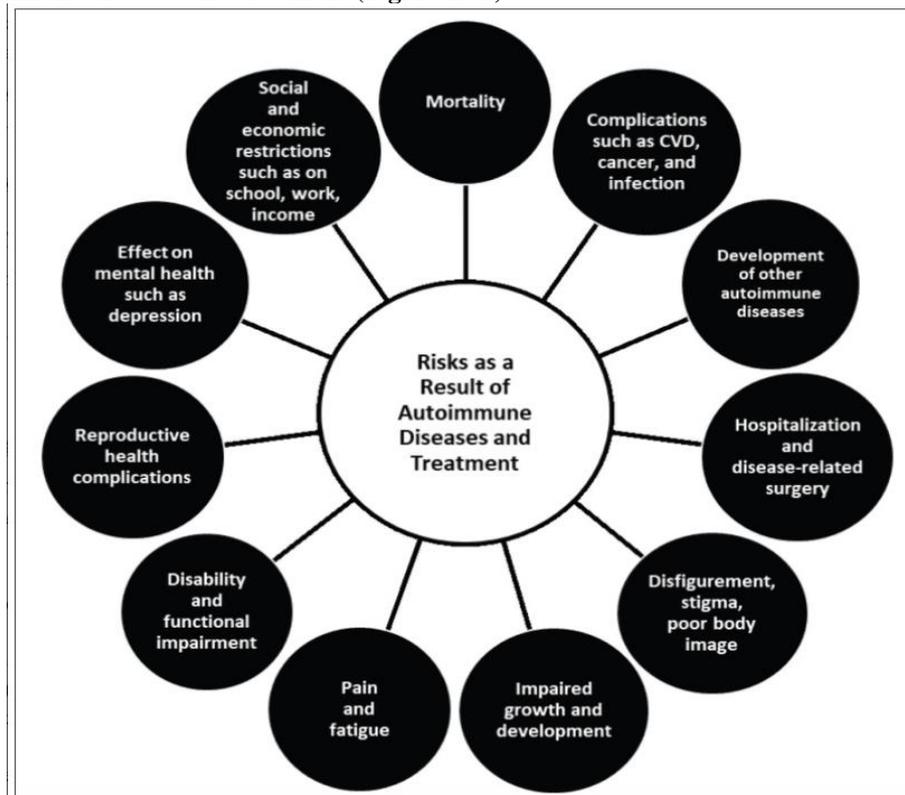


Figure no. 1.

Decrease your risk

In some cases, such as being born female, the inherent level of risk cannot be controlled. On the upside, there are a number of ways to avoid the accumulation of multiple risk factors and help prevent the onset of chronic illness or additional diseases, including; Eating a

nutrient-dense diet and limiting processed foods, Incorporating physical movement into your daily life, Keeping up with the latest information about your medications, Paying attention to environmental toxins and exposure to them, Avoiding cigarettes, Talking to a doctor about specific ways one can reduce your risk.

Common auto immune diseases (Table No:1)

Autoimmune diseases are relatively common. According to some estimates, there are more than 80 trusted Source

autoimmune conditions, and some are more common than others. They are a leading cause Trusted Source of death and disability in the country.

Table No. 1: Common types of auto immune diseases.

S. No	Type	Explanation	Symptoms
1	Type 1 Diabetes	Type 1 diabetes is one of the most prevalent autoimmune diseases that usually starts in childhood. It is characterized by high sugar levels in the blood due to the absence of adequate hormone insulin. We require insulin hormone to metabolize the sugar levels in our blood. But in type 1 diabetes, the pancreas organ does not produce insulin hormone.	Frequent need to pass urine, Increased thirst and hunger, Weight loss, Skin and vaginal infections
2	Rheumatoid Arthritis	Rheumatoid arthritis is a long-term inflammatory disorder of the joints that causes damage and disability. In this condition, your immune system attacks the protective lining around the joints called synovium. It triggers a lot of inflammation in your joints.	joint pain, stiffness and swelling, also involves joint disability, affect organs like heart, kidney, etc.
3	Systemic Lupus Erythematosus	Systemic lupus erythematosus often affects women of reproductive age. It is a long-term autoimmune disorder that causes inflammation affecting multiple body organs. The treatment of lupus aims to suppress the immune system to prevent further organ damage.	Fever, Weight loss, Tiredness, Blood clots, Hair loss, Heartburn, Stomach pain
4	Psoriasis	Psoriasis is a skin problem that appears red, scaly, and erupted. It can occur in any part of the body. Still, elbows, knees, and scalp are primarily affected, which could irritate the skin and cause pain and itchiness	Pain, Redness, Itching, Silvery scales, Irritation, Inflammation
5	Celiac Disease	Celiac disease is an autoimmune genetic disorder in which gluten-containing foods lead to severe damage in the small intestine. Gluten is one of the household ingredients present in wheat and barley that we regularly eat.	Unusual anemia, Tiredness, Diarrhoea, Vomiting, Bone or joint pain, Liver and bile disorders, Depression, Anxiety, Migraines, Seizures, Infertility, Mouth ulcers, Skin inflammation
6	Graves Disease	Contrary to Grave's disease, Hashimoto's is characterized by an underactive thyroid. The term thyroiditis refers to thyroid gland inflammation. As the inflammation of the thyroid gland persists, the gland gradually loses its ability to function normally and produce hormones when required. It affects people irrespective of their age, but it is more common among middle-aged women	Racing heartbeat, Hand tremors, Trouble sleeping, Weight loss, Muscle weakness, Heat intolerance, Inflammation of the eyes, Lumpy reddish thickening of the skin, Bulging of the eyes
8	Multiple Sclerosis	Multiple sclerosis is a long-term central nervous system disorder where an immune response destroys the brain, optic nerve, and spinal cord. It leads to motor dysfunction and cognitive impairment over time	Tiredness, Pain, Bladder and bowel issues, Sexual dysfunction, Movement and coordination problems, Visual problems, Emotional changes
9	Inflammatory Bowel Disease	Inflammatory bowel diseases, include Crohn's and ulcerative colitis that cause prolonged periods of inflammation in the gastric tract. Since our gastric tract is crucial for digesting whatever we eat, inflammation can impair the organs to function properly.	Diarrhoea, stomach pain, Rectal bleeding, Weight loss Tiredness, Loss of appetite, Night sweats
10	Sjogren's Syndrome	Sjogren's syndrome is a disorder where the body attacks the glands responsible for producing moisture in the mouth, skin, eyes, vagina, gastric and respiratory tract. Since moisture is vital for our body systems to function correctly, even a slight delay in seeking treatment can lead to severe complications.	Burning sensation in the eyes, Peeling lips Difficulty talking, chewing or swallowing, Sore or cracked tongue, Burning throat, Changes in taste and smell, Dental problems, Problems in digestion

New therapeutic strategies for autoimmune disorders

1. Antibody therapy-Combination of targeted antibody therapies

It is undeniable that single antibody treatment may have some effect on autoimmune diseases, however, combined treatment may target two or more signaling pathways and achieve synergistic treatment effects.

2. Bispecific antibodies therapies

Bispecific antibodies (BsAbs) are a new class of antibodies that can identify two different antigens or two different epitopes of the same antigen. The successful generating of more than 100 BsAbs formats benefit from the significant advances in antibody engineering and antibody biology. Due to their strong multitargeting, high binding potency, bridging cell action, and cascade amplification effect, they have been applied to the treatment of complex tumors and autoimmune diseases.

3. RNA interference therapy

Hence, in this review, we emphasize the siRNA application for autoimmune diseases. siRNA usually is 15–30 bp in overall length. siRNAs can trigger efficient target gene silence by inhibiting mRNA translation and promoting mRNA degradation. Pharmaceutical companies have been devoted to developing the siRNA therapeutics and major breakthroughs were being made that paved the way to successful clinical translation. Indeed, the rapid development of siRNA is benefit from lipid nanoparticles (LNPs) technology progress and related nucleic acid modification methods. Researchers also use siRNAs for the treatment of autoimmune diseases and achieved some progress.

4. Hematopoietic stem cell transplantation

As previously discussed, the fundamental mechanism of autoimmune diseases is the break of autoimmune tolerance because of the environment and genetic factors. HSCT provides a treatment option to restore immune tolerance by replacing or resetting immune responses. During the immune reconstitution process, NK cells and B cells recovering faster than T cells, with CD4⁺ T cells recovered slowly compared to CD8⁺ T cells based on a study in MS patients after HSCT transplantation. The pre-existing T cells with pathological and autoimmune reactions will be replaced by newly formed T cells.

CONCLUSION

The pathogenesis of autoimmune diseases is multifaceted, involving genetic susceptibility, environmental triggers, and breakdown of immune tolerance. Central tolerance mechanisms in the thymus and bone marrow eliminate autoreactive T and B cells, whereas peripheral tolerance relies on Tregs and the indication of anergy. Future research should focus on identifying biomarkers for early diagnosis and stratifying patients based on molecular subtypes. Multiomics technologies and artificial intelligence may enhance precision medicine by predicting treatment responses.

Additionally, combination therapies, integrating biologics with small-molecule inhibitors or microbiota modulation, could maximize effectiveness while minimizing toxicity. Ultimately, bridging translational gaps between preclinical models and clinical practice will be critical to developing curative strategies for autoimmune diseases.

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