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Acupuncture Regulates Immunity in Autoimmune Disorders: Review and Analysis

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Introduction

Autoimmune disorders represent a group of chronic and often debilitating diseases characterized by an aberrant immune response against the body's own tissues. Conditions such as rheumatoid arthritis, systemic lupus erythematosus, multiple sclerosis, inflammatory bowel disease and type 1 diabetes are examples where the immune system fails to distinguish self from non-self. Current therapies primarily involve immunosuppressive drugs, corticosteroids and biologics, which, while effective to some extent, come with a host of side effects including increased risk of infection, organ damage and reduced quality of life. As a result, there is growing interest in complementary and integrative medical practices that offer more holistic, side-effect–free approaches. Among these, acupuncture, a cornerstone of Traditional Chinese Medicine (TCM), has gained international recognition for its potential role in modulating immune function. This review and analysis aim to explore how acupuncture affects the immune system in the context of autoimmune disorders, focusing on its mechanisms, therapeutic outcomes and integration into modern medical practice.

Description

Acupuncture involves the insertion of fine needles into specific points on the body known as acupoints, which are believed to influence the flow of "Qi" (vital energy) and restore physiological balance. From a biomedical perspective, acupuncture is known to stimulate peripheral nerves, trigger local tissue responses and activate various neural pathways and biochemical mediators. Increasingly, scientific studies have demonstrated that acupuncture can exert significant immunomodulatory effects, making it a promising adjunct therapy for autoimmune diseases.One of the primary ways acupuncture regulates immunity is through its impact on pro-inflammatory and anti-inflammatory cytokines. In autoimmune diseases, an imbalance between Th1 and Th2 helper T cells, or between regulatory T cells (Tregs) and effector T cells, contributes to disease progression. Acupuncture has been shown to restore this balance. For example, electroacupuncture at specific acupoints like ST36 (Zusanli) and LI4 (Hegu) has been observed to reduce levels of inflammatory cytokines such as TNF-α, IL-1β and IL-6, while enhancing anti-inflammatory cytokines like IL-10. This modulation plays a crucial role in reducing tissue inflammation and immune-mediated damage in diseases like rheumatoid arthritis and ulcerative colitis [1].

Neuroendocrine-immune interactions also play a significant role in acupuncture's effects. The hypothalamic-pituitary-adrenal (HPA) axis, a major stress-response system, is closely linked with immune function. Acupuncture stimulates the HPA axis, leading to the release of cortisol, a natural immunosuppressant that helps regulate immune responses. Additionally, the vagus nerve part of the parasympathetic nervous system can be activated through auricular acupuncture or abdominal acupoints, leading to the cholinergic anti-inflammatory pathway that further suppresses overactive immune reactions. These mechanisms are especially relevant in autoimmune disorders where chronic inflammation underlies many clinical symptoms. In the case of Rheumatoid Arthritis (RA), one of the most extensively studied autoimmune diseases in acupuncture research; both animal and clinical studies have reported promising outcomes. Experimental models of collagen-induced arthritis in rodents treated with acupuncture showed reduced paw swelling, less joint destruction and decreased inflammatory markers. Human studies have echoed these findings. Patients receiving acupuncture experienced significant improvements in pain, joint stiffness and functional mobility. While the exact degree of immune modulation in humans is complex to quantify, reductions in Rheumatoid Factor (RF), erythrocyte sedimentation rate (ESR) and C-Reactive Protein (CRP) have been documented in acupuncture-treated groups compared to controls.

Systemic Lupus Erythematosus (SLE), a multi-organ autoimmune disorder, presents additional complexity due to the involvement of both B and T lymphocytes. Preliminary research has indicated that acupuncture may help reduce fatigue, joint pain and mental stress in SLE patients, all of which are exacerbated by immune dysregulation. Animal studies suggest that acupuncture can downregulate autoantibody production and normalize Treg function, thereby reducing the immune system's attack on healthy tissues. While more rigorous clinical trials are needed, the initial findings support acupuncture's potential as a supportive therapy in SLE management. Multiple sclerosis (MS), a neuroinflammatory autoimmune disease, is another area where acupuncture has shown promise. Though it does not reverse the neurodegenerative process, acupuncture can alleviate symptoms such as fatigue, muscle spasms and bladder dysfunction. The neuroimmune interface in MS is crucial and acupuncture appears to reduce central nervous system inflammation through pathways involving endogenous opioids and neuropeptides like substance P and β-endorphin. These compounds not only modulate pain but also influence immune cells in the central and peripheral systems. Additionally, acupuncture-induced changes in brain activity, as demonstrated by fMRI studies, suggest a neuroplasticity component that could indirectly support immune homeostasis [2].

In autoimmune gastrointestinal disorders such as Crohn's disease and ulcerative colitis, acupuncture has demonstrated immunomodulatory effects by improving intestinal barrier function, regulating gut microbiota and suppressing mucosal inflammation. Electroacupuncture has been particularly effective in reducing the expression of inflammatory markers like nuclear factor kappa B (NF-κB) and cyclooxygenase-2 (COX-2) in intestinal tissues. In clinical settings, patients often report improvements in abdominal pain, bowel movement regularity and quality of life when acupuncture is used alongside conventional therapies. Furthermore, acupuncture may influence immune cell activity at the systemic level. Studies have shown that acupuncture can increase the proportion of CD4+ T cells and normalize CD4+/CD8+ ratios in patients with autoimmune thyroiditis and type 1 diabetes. These changes indicate a

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recalibration of the immune system towards a more balanced and less aggressive state. Natural killer (NK) cells, dendritic cells and B cells are also affected, though the exact mechanisms vary depending on the disease context and acupuncture protocol.

Conclusion

In summary, acupuncture emerges as a promising complementary approach in the management of autoimmune disorders through its multifaceted effects on the immune system. By modulating cytokine production, influencing neuroendocrine pathways, restoring immune cell balance and alleviating systemic inflammation, acupuncture addresses the core dysfunctions underlying autoimmunity. It offers a safer, more sustainable option that complements conventional treatments, especially for patients who experience side effects from immunosuppressive drugs or seek holistic care. Though limitations in research design and mechanistic clarity persist, the growing body of preclinical and clinical evidence underscores acupuncture's therapeutic potential. Integration into standard healthcare models, combined with rigorous scientific inquiry and practitioner training, can pave the way for a more inclusive and effective approach to autoimmune disease management. As our understanding of immune regulation deepens, acupuncture's role is likely to expand from supportive therapy to a vital component in the multidimensional treatment landscape for autoimmune disorders.

Acknowledgment

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Conflict of Interest

None.

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