

New Perspectives of Autoimmunity Diseases and Microbiome: Etiology and Treatment

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Abstract

Autoimmunity diseases have increased incidence at global level, and the concept of microbiome has emerged to link microbial infections with autoimmune diseases such as multiple sclerosis. In this study, we reviewed the literature for recent trends in understanding the role of microbiome in inducing autoimmunity diseases. We also showed that the therapeutic approaches implied treating the pathogenesis rather than the etiology of the disease. At the end of this study, we showed our perspectives towards autoimmunity diseases and showed some new treatment options for shingles and psoriasis.

Keywords: Microbiome; Autoimmunity Diseases; Shingles; Psoriasis

Introduction

Autoimmune diseases are characterized by structural or functional damage body systems from cells to organs, or even systems due to the activity of immune system, and accordingly immune cells attack normal constituents of the body [1].

There is a trend implying the existence of increased incidence of both autoimmune and inflammatory diseases at global level [2]. It has been proposed that environmental changes including modern lifestyles, dietary habits, antibiotic use and hygiene to have a significant role in initiating autoimmune diseases [3]. Using animal models for studying germ-free and gnotobiotic gives some ideas on the way by which some microbiome changes impact autoimmunity of host [4]. Microbial infection can induce apoptosis in intestinal epithelial cells which facilitates self-antigen presentation ending with activation of autoreactive cells as well as T-helper cells [5]. A recent study based on three infant cohorts indicated that children from area, that are associated with high prevalence of autoimmune diseases, have been predominated by bacterial species with less immunogenic lipopolysaccharide (LPS) and that varied microbiome-derived LPSs have the ability to show various structures and immunogenic functions [6].

Severancea [7] conducted a review study in the light of the fact that schizophrenia is linked with autoimmunity and gastrointestinal (GI) disorders. According to this review, there is a strong link between schizophrenia and autoimmune disorders such as enteropathic celiac disease. It was also shown that the wheat gluten exposure and casein of bovine milk induce food sensitivity that is not related to celiac among susceptible individuals. Furthermore, the inflammatory processes in gastrointestinal are associated with immunological reactions against food antigens that are encountered at an early stage of schizophrenia and it looks to be independent from antipsychotic-generated motility effects. However, this inflammatory process makes gut bacteria able to enter circulation. From another side, Infection by *Toxoplasma gondii* induces several pathologic processes including innate immunity that ends with activation of complement C1q.

Wang and Kasper [8] conducted a study in which they stated that the relationship between mammals and microorganisms living inside mammals has a nature of evolution. The microbiome implies the existence of these genomes of microorganisms that is determined by host related factors including genetics and nutrients. On the other hand, microbiome has the ability to affect

host pathophysiology. Gut microbiome can exert effects on local and distal areas in the host. The researchers showed that gut microbiome plays an important role in the gut-brain axis that regulates the activities of the gut and central nervous system (CNS). The researchers pointed to the existence of diverse forms of neuro-immune and neuro-psychiatric diseases that can be either correlated with or modulated by the differences of microbiome, microbial products in addition to exogenous antibiotics and probiotics. The researchers also put emphasis on the role of microbiome in controlling immune homeostasis and impacting host susceptibility to CNS autoimmune diseases including multiple sclerosis.

Li., *et al.* [2] conducted a review study in which they pointed to some considerations such as the number of microbial cells in the body is much greater than that in the body. Furthermore, environmental factors play a role in shaping flora at mucosa.

Paget [9] conducted a study about microbiome, autoimmunity, and arthritis in terms of causes and effects. The researcher expressed his views as that the real history of arthritis belongs to writings of Sir William Osler who considered various factors beyond the etiology of arthritis. These factors included the nervous system, infections, age, gender, family history, cold, damp, diet errors, stress, and local injuries. According to the author, recent therapeutic approaches target the pathogenesis rather than the etiology.

Study Objectives

The main objective of this study was to show new perspectives of autoimmunity diseases and microbiome from etiology and treatment points of view in the light of literature and our studies.

Our perspectives towards autoimmunity diseases and microbiome

Autoimmune diseases have become more popular and several diseases have been described as autoimmune diseases such as cancer, diabetes, neurological disorders, dermal diseases including psoriasis, and vitiligo. We think future will witness more and more disease as autoimmune diseases. This reflects the importance of immune system in providing protection for the whole body. The mechanisms included in the immune system are very complicated and it seems that microbes inhabiting the body have evolutionary adapted with immune system, but emerging trends in our life including life styles and environmental conditions have made changes in cellular micro-environment that made changes in the relationship between immune system and normal flora, and hence

the concept of microbiome has emerged. A very large question has come to my mind, does human need centuries to adapt again to emerging condition including environmental and life style changes to minimize the occurrence of autoimmunity diseases?

Methodology

In this section, we put some findings from our experiments in which some has already been published whereas others are not

From my own experience, I would like to put focus in the micro-environmental products on cellular and tissue levels because microbes have the ability to produce and release some molecules similar to that involved in host environment that triggers the immune system to develop immunological responses and by thus develops autoimmunity. We have some trials in treating disease that may have autoimmune disease properties including shingles and psoriasis based on herbal treatments. Shingles is disease caused by Herpes Zoster Virus which affects neurons, and may stay as latent for a long time, but once activated, it produces painful lesions across the path of that nerve. Using the extract of *Alhagi graecorum* in olive oil showed a very simple effective treatment that completely ends the Shingles [10]. The same extract was used to treat other diseases that exhibit autoimmunity disease properties including psoriasis and eczema (to be published). We think that the extract of *Alhagi graecorum* in olive oil may work in different mechanisms to overcome the episodes of autoimmunity diseases including anti-inflammatory, natural antimicrobial activities, and natural anti-oxidant. Deep understanding of these mechanisms expands our understanding of underlying etiology and helps in designing better future therapeutics for autoimmunity diseases.

Conclusion

Although the exact causes of autoimmunity diseases are not well understood, the microbial origin is still important factor in initiating autoimmunity diseases. Autoimmunity diseases are diverse to the degree that no single reason can explain their occurrence. In this study, we would like to look for autoimmunity diseases as a novel with extended episodes. From the evolutionary points of view, to shifting in micro-environmental changes, to changes in life style, and probably others, autoimmunity diseases have increased over time. We have expanded the picture of understanding the autoimmunity diseases through showing the production and releasing of certain molecules by microbes that are similar in their structure to molecules produced by our bodies which triggers autoimmunity.

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