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Helminths and Approach to Treatment of Immune-Mediated Diseases

Mohammad Zibaei[1,2*]

[1]Evidence-based Phytotherapy & Complementary Medicine Research Center, Alborz University of Medical Sciences, Karaj, Iran
[2]Department of Parasitology and Mycology, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran
***Corresponding Author:** Mohammad Zibaei, Email: zibaeim@sums.ac.ir

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Helminth therapy or worm therapy is a type of immunoassay that includes the treatment of autoimmune diseases and immune disorders, using intentional contamination by the parasites in their different stages of development such as eggs, larvae or adult worms.[1]

All parasitic worms cannot be harmful and damage to the body, because due to evidence, people who are regularly infected with worms have low levels of autoimmune diseases. These observations have led to a health hypothesis that states in developing countries, environments with high hygiene levels are responsible for causing chronic allergies and asthma. This theory also indicates that in complete health conditions and in conditions free of any parasitic infections, we develop immune system impairment such as uncontrollable inflammation, which in turn leads to a targeted experimental infection with parasitic worms.[2,3]

In some countries such as Germany, the Food and Drug Administration (FDA) has agreed consumer safety and the relative suitability of parasitic worms as a treatment strategy for a wide range of autoimmune disorders. The FDA believes that such treatments can include the addition of a pill or a drug derived from parasites to foods or drinks. Therefore, the term "worm therapy" is rapidly increasing, although the scientific evidence in support of it is suspicious.

Several studies have shown that the worms can secrete anti-inflammatory proteins. Moreover, investigations have revealed that helminthic infections help the patients with asthma, allergies, type I diabetes, inflammatory bowel disease, obesity, and multiple sclerosis.[4-6]

In a study, the effects of *Heligmosomoides polygyrus*, a parasite nematode, was assessed on rat obesity. Initially, they fed a group of mice with a proper diet, and the other group fed a high-fat diet, then the animals were infected by eggs of *H. polygyrus*. As a result, mice with high fat diet and without exposure to the parasites (therapeutic helminth) showed weight gain compared to the control group. On the other hand, mice that were on a high-fat diet and also been infected with worms, gained less weight. In fact, they were similar to those mice that had a controlled diet. In addition, the adipose tissue of infected mice had greater number of anti-inflammatory cells than that of obese mice. Finally, researchers showed that protection by worm infections can be transmitted from one mouse to another.

The immune cells were isolated from infected and uninfected mice. Then these cells were transplanted into the mice that were on high-fat diet. Mice receiving immune cells from mice infected with helminths did not gain much weight.

Some reports have revealed that helminthic infections can protect us against cancer by:

- Provoking anti-tumor responses that prevent tumor formation and recurrence of cancer
- Reducing the risk of colitis associated with tumor formation
- Changes in inflammatory responses and prevention of gastric atrophy, dysplasia and cancer (by *Helicobacter pylori*)
- The alloptic ability of some helminths-derived molecules may make them a potential candidate for anticancer drugs.
- Infection with some parasites, such as a single-cell toxoplasma gondii, stimulates the body to produce natural lethal cells and cytotoxic T cells, which ultimately imposes a cure for cancer cells.[7]

Gastrointestinal inflammation is one of the most common diseases in the developed countries and unusual in the developing countries. The World Health Organization (WHO) has suggested that recent increases in allergies and autoimmune diseases, lifestyle, and highly modern medical conditions could be due to the common loss of parasitic worms as a result of lifestyle improvements and related factors which has caused an increase in the prevalence of these diseases.

In the experimental studies with animals along with

clinical symptoms including inflammatory bowel disease (IBD), nematodes through multiple mechanisms, such as the inherent and adaptive induction of worms such as *Trichuris suis* or *Necator americanus*, it is suggested that these helminths are safe and may be effective treatments for controlling the intestinal inflammation disease and other immune diseases.[8]

Helminths therapy controls inflammation of the intestines. Inflammation of the intestine is a chronic bowel disease, which often begins at early ages with a recurrent chronic illness. The underlying cause of this disease is unknown. Severe helminthic infections induce immune regulation. Non-infection with worms during childhood is an important cause for an increased incidence of intestinal inflammation.[9] The infection with worms appears to be important to enable the agent to be protected against these disorders. Based on the promising findings from helminthic infections and colitis, helminth therapy has been effective in treating the patients with ulcerative colitis according to the studies on *Trichuris suis*.

Using worm therapy, the effectiveness of human-infecting hook (*N. americanus*) and also *T. suis* has been examined in Crohn disease. Helminths have an intrinsic effect on immune system and can comparatively respond to it and help with new therapeutic outcomes.

Finally, there is sufficient evidence to allow any firm conclusions regarding the efficacy and safety of helminths used for the treatment of immune-mediated diseases. However, further studies are required to assess the efficacy and safety of helminth therapy in autoimmune diseases and immune disorders.

Ethical Approval

Not applicable.

Conflict of Interest Disclosures

The author declares that he has no conflict of interests.

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