

# Bi-directional Regulation of Immune Function of Traditional Chinese Medicine

Ruiheng Ye

Zhuhai Institute of Science and Technology, Zhuhai 519041, China

yrh3383@163.com

## Abstract

In recent years, with the rapid development of cancer immunotherapy, people pay more and more attention to the role of traditional Chinese medicine in anti-tumor immunity. People pay more attention to the activation of traditional Chinese medicine on immunity, but the Bi-directional regulation of traditional Chinese medicine on immunity is rarely reported. This paper reviews the literature on the Bi-directional regulation of traditional Chinese medicine on immune function, in order to provide some reference for the application of traditional Chinese medicine on Bi-directional regulation of immune function.

## Keywords

Traditional Chinese Medicine; Bi-directional Regulation; Immunotherapy.

## 1. Introduction

Traditional Chinese medicine for the treatment of cancer is not rare, it can not only reduce the tumor size, but also improve the quality of patients' life. However, many studies have shown that traditional Chinese medicine plays a dual role in immune regulation, which is immune activation and immunosuppression. Bi-directional immune regulation refers to the positive and negative Bi-directional regulation of immune response by various factors in human body. The results showed that *Astragalus membranaceus* and *Cornus officinalis* had this effect [1,2]. Moderate activation of immune response by traditional Chinese medicine can inhibit tumor, but over activation of immune response is easy to cause inflammatory reaction. Some traditional Chinese medicine can play a Bi-directional regulatory immune function on macrophages, lymphocytes and so on, which can make the human immune response moderately, to maintain the relative stability of human body environment, and then inhibit the development of tumor. Therefore, it is of great significance to explore the Bi-directional regulation function of traditional Chinese medicine on immunity.

## 2. Influence Factors of Traditional Chinese Medicine on Bi-directional Regulation of Immune Function

Modern scientific research shows that the Bi-directional regulating effect of traditional Chinese medicine is different due to its application conditions (such as dosage, composition and compatibility) and objects (functional state of the body).

In vitro experiments showed that TGP could induce splenic lymphocytes of mice to produce antibodies at low dose, but it had inhibitory effect at high dose [3]. Small dose of *Tripterygium wilfordii* can improve the activity of splenocytes, but large dose of *Tripterygium wilfordii* can inhibit it. This dose-dependent relationship shows that only in the appropriate dose range, Chinese medicine can play an effective role in immunoregulation [4].

Glycyrrhiza polysaccharide can inhibit antibody production, but glycyrrhetic acid can improve the activity of phagocytes. Similarly, rhubarb polysaccharide can promote non-specific immunity, but rhubarb anthraquinone derivatives show the opposite effect [5]. At the same time, different components of *Astragalus membranaceus* have different immunomodulatory effects [6].

Licorice has inhibitory effect on red blood cells, but Buzhong Yiqi Decoction composed of *Astragalus membranaceus* can improve the red blood cell immunity of spleen deficiency mice. However, the whole prescription can significantly increase NK activity [7]. This shows that the Chinese herbal medicines with different properties have Bi-directional regulatory effect on immunity after reasonable deployment, which shows the importance of scientific compatibility. Under normal condition, glycyrrhetic acid can enhance the body's non-specific immunity, but when the body's immunity is low, it can promote the production of interferon and specific immunity. *Astragalus polysaccharide* and Buzhong Yiqi Decoction have no significant effect on normal mice, but they can obviously promote the production of interleukin-2 in spleen deficiency mice [8]. Maxing Shigan decoction, which is composed of ephedra, can cause allergic diseases such as asthma and urticaria. However, in the body with low immune function, it can improve the immune function of the body [5].

### 3. Mode of Traditional Chinese Medicine in Regulating Immune Function

In vitro, *Agaricus blazei* Murill polysaccharide from *Grifola frondosa* fruiting body could activate macrophages and enhance antigen presentation of macrophages in vivo [9]. In vitro, aloe polysaccharides and yeast polysaccharides can enhance the endocytosis of macrophages, and intraperitoneal injection of polysaccharides can activate mouse macrophages [10]. *Scutellaria barbata* polysaccharide can promote the proliferation of T lymphocytes in tumor bearing mice as well as the secretion of cytokines by helper T cells, enhancing the cellular immune function of the body [11]. Masson pine pollen polysaccharide can significantly enhance specific immunity [12].

In vivo experiments show that LBP can improve the activity of bone marrow cells and restore the ability of killing cells [13]. Traditional Chinese medicine polysaccharides (such as *Poria cocos* and *Angelica sinensis*) enhance the immune function of red blood cells by enhancing the adhesion of red blood cells [14]. Appropriate *Astragalus polysaccharides* can significantly promote the differentiation and maturation of DC cells and enhance their immune activity [15]. Polysaccharide components of *Porphyra yezoensis* and *Bupleurum chinense* can affect the transcription level of cytokine gene in the cell [16], As an immune activator, brown algae polysaccharide can significantly increase the level of cytokines and improve the immune ability of the body [17].

### 4. Conclusion

Traditional Chinese doctors believes that the body and disease are a dynamic material process. The Bi-directional regulation of immune function of traditional Chinese medicine lies in the selection of appropriate drug composition and dosage, regulating the immune function of the body, so as to treat diseases. Especially in the treatment of COVID-19, Chinese medicine plays an important role. Only by systematically understanding the Chinese medicine can we carry forward the Chinese medicine all over the world.

## References

- [1] Song Baohui, Yu Xinhui. Study The Impact on Macrophage Cell, IL-2 of Milkvetch Root[J]. Journal of Mudanjiang Medical College, 2005, (05): 10-11.
- [2] Du Weifeng, Wang Mingyan, Cai Baochang. Effect of Polysaccharides in Crude and Processed *Cornus Officinalis* on the Immunologic Function of Mice with Immunosuppression Induced[J]. Journal of Chinese Medicinal Materials, 2008, (05): 715-717.
- [3] Wang Xingwang, Chen Minzhu, Xu Shuyun. Effect of Total Glucosides of Paeony on Immune System [J]. Chinese Journal of Pathophysiology, 1991, (06): 609-611.
- [4] Luo Dan, Xu Wenyan. Tripterygium Wilfordii T-Immunomodulatory Effect of Tetramer I. T<sub>H</sub> Regulation of NK Activity in Mouse Splenocytes by CCl<sub>4</sub> [J]. Chinese Medical Sciences Journal, 1990, (02): 115-120.
- [5] Shi Qi, Zhang Yuping. Application and Research Department of Modern Chinese Medicine [M]. Shanghai University of Traditional Chinese Medicine Press, 1997.
- [6] Chu Datong, Sun Yan, Lin Juanru etc. Effect of Astragalus Extract on the Recovery of Lymphocyte Immune Function in Cancer Patients and the Reversal of Immunosuppression in Rats [J]. Journal of Integrative Medicine, 1989, (06): 351-354.
- [7] Mi Na, Wu Minshu, Sun Weimin. Study on the Immunoregulation of Radix Astragali and Radix Glycyrrhizae in Buzhong Yiqi Decoction [J]. Editorial Board of Acta Academic Medicine Wannan, 2002, (01): 13-15.
- [8] Wang Niping, Wei Wei. Antiinflammatory, Immunological and Analgesic Effects of Active Constituents of Chinese Traditional Medicine[J]. Chinese Pharmacological Bulletin, 2003, (04): 366-370.
- [9] Jia Wei, Fan Hua. Effect of Active Polysaccharide Fraction from *Agaricus Blazei* Murill on Mouse Macrophages [J]. Food Sciences, 2011, 32(11): 277-280.
- [10] C Liu, Leung M-Y-K, Koon J-C-M, et al. Macrophage activation by polysaccharide biological response modifier isolated from *Aloe vera* L. var. *chinensis* (Haw.) Berg. [J]. International immunopharmacology, 2006, 6(11).
- [11] Yang Shanshan, Zhang Xiujuan. Effect of *Scutellaria Barbata* Polysaccharides on T Lymphocytes Immune Function of Mice [J]. Journal of Henan Agricultural Sciences, 2014, 43(06): 145-148.
- [12] Liu Ming, Li Nana, Geng Yue. Influences of Sulfated Polysaccharide from Pine Pollen on the Immunomodulatory Effects of B Lymphocytes in Mice[J]. Chinese Journal of Cell Biology, 2014, 36 (04): 461-469.
- [13] X Deng, Luo S, Luo X, et al. Fraction From *Lycium barbarum* Polysaccharides Reduces Immunotoxicity and Enhances Antitumor Activity of Doxorubicin in Mice[J]. Integr Cancer Ther, 2018, 17(3): 860-866.
- [14] Liu Jingtian, Dang Xiaojun, Wang Huiping etc. The Study on the Red Cell Membrane Phase C3b Receptor's Activity Regulated by Chinese Medicine Polysaccharides[J]. Chinese Journal of Modern Medicine, 2002, (01): 7-9.
- [15] Chen Zhaojun, Li Zhiliang, Fu Qiang etc. Effect of Astragalus Polysaccharides on the Phenotype and Function of Human Dendritic Cells in vitro[J]. J South Medicine University, 2009, 29(06): 1192-1194.
- [16] Liu Chunhong. Immunomodulatory Effects of Polysaccharides from Chinese Herbs[D]. Fudan University, 2010.
- [17] Zhan Linsheng, Zhang Xinsheng, Wu Xiaohong etc. Establishment of the Models of Hepatocyte Apoptosis in vivo and in vitro [J]. Chinese Pharmacological Bulletin, 2000, (04): 477-479.