



Review Article

AN OVERVIEW OF IMMUNOMODULATORY ACTIVITY OF RASAYANAS

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ABSTRACT

The term "immunomodulation" refers to the regulation and modulation of immunity, which may be accomplished by either enhancing or suppressing the immuneresponse. A medication with immunomodulatory activity has particular importance given in the current state of pandemics, the rise in antibiotic resistance, and autoimmune diseases. A medicine with immunomodulatory properties that enhance quality of life would be great. Here lies the importance of *Rasayana tantra* which consists of many formulations aiming at increasing the quality of life by imparting longevity, memory, disease-free life, youth, excellence of body, and sense organs. Many *Rasayanas* have been shown to have immunomodulatory properties. *Rasayanas* have a calming effect on the psyche in addition to its intended benefits for physical health. It has also been demonstrated that stress affects immunity. Several *Rasayanas* have been shown to exhibit anti-stress properties. *Rasayana* may thus strengthen the psycho-neuro-immune axis and control the immune system by utilizing the body's warriors, such as phagocytes and cytokines. Research on *Rasayanas* such as *Amalaki rasayana*, *Triphala rasayana*, *Chyavanaprasha*, etc. has been conducted both in vitro and in vivo. These kinds of studies establish the system as evidence-based and shed some light on the mechanism of action. The present review will provide knowledge about immunomodulatory activity and the action mechanism of *Amalaki rasayana*, *Triphala rasayana*, *Rasayana choorna*, *Shatavari Medhya rasayana* and *Chyavanaprasha*.

INTRODUCTION

Indian traditional medicine, or Ayurveda, has been used for thousands of years to treat various illnesses. Numerous studies on Ayurveda drugs are currently being conducted. Single drugs and dosage forms have been carefully examined to produce scientific proof and for human advantage. Traditional herbal remedies are said to be less expensive and safer than synthetic alternatives. They frequently served as the primary source for a wide range of pharmaceuticals that prevent the spread of both infectious and non-infectious diseases. Since infectious diseases are a major problem today, medications that boost immune function have a place in medicine, and several studies are being conducted in this field.

Most of the formulations or drugs mentioned in the *Rasayana tantra* of Ayurveda are found to have a positive impact on immunity. It has been discovered that *Rasayanas* play a part in promoting health by fortifying the host's defenses against various illnesses. In addition, these *Rasayanas* have other qualities such as delaying the onset of senescence and enhancing mental functions by strengthening the psycho-neuro-immune axis.^[1] Research has consistently shown that stress affects immune function and that there may be unrecognized links between the immune system and the neurological system.^[2] In tests, a number of *Rasayana* medications, have demonstrated anti-stress properties.^[3]

Since biologically active compounds from natural sources have long been of great interest to scientists working on infectious diseases or to improve immune functions, several *Rasayanas* and their extracts, active fractions, have been investigated for their ability to modify immune responses. A substance that has the ability to activate, inhibit, or modify any immune system component- including the innate and

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adaptive arms of the immune response is referred to as an immunomodulator.^[4]

Hence, this review attempt has been made to highlight the experimental work on immunomodulation of various *Rasayanas*.

MATERIALS AND METHOD

A comprehensive collection of data on the immunomodulatory potential of *Rasayanas* were obtained by an electronic search and a library search of peer-reviewed scientific papers. A manual search of pertinent textbooks and classic Ayurvedic textbooks were also done.

RESULTS AND DISCUSSION

Amalaki Rasayana

A study was conducted by Jignesh Rajani et al where two *Amalaki Rasayana* prepared by 7 *Bhavanas* (AR7) and 21 *Bhavanas* (AR21) with *Amalaki Swarasa* (Fresh juice of *Amalaki* fruit) were taken into consideration in order to assess their relative immunomodulatory activity against the immunosuppressive effects of cyclophosphamide.

It was found that AR21 significantly reduced the weight loss caused by cyclophosphamide, resulting in a nearly 50% decrease in weight loss caused by the toxicant. Treatment with AR21 significantly and AR7 somewhat corrected the pathological changes in splenic sections caused by cyclophosphamide. Sections of the kidney treated with *Amalaki rasayana* exhibit normal cytoarchitecture, whereas kidney sections from the control groups receiving cyclophosphamide showed minor fatty alterations and glomerular congestion. This study proves that *Amalaki rasayana* can act as an immunostimulant and AR21 has better activity when compared to AR7.^[5] In vivo, effects of *Amalaki rasayana* was also tested in the drosophila melanogaster model and it was found that it has a positive impact on median life span and starvation tolerance.^[6]

Triphala Rasayana

In Ayurveda, *Triphala* is considered as an important *Rasayana*. Individual ingredients of *Triphala* are said to possess a range of biological properties, including antiviral, antibacterial, antiallergic, and antimutagenic properties. *Triphala's* immunomodulatory potential was assessed in rats, and it was discovered that a 48-day *Triphala* therapy enhances neutrophil activities. Professional phagocytes known as neutrophils are the main component of innate defense against a wide range of potentially dangerous environmental microorganisms. Neutrophils' phagocytosis is a crucial defensive mechanism for the host against foreign antigens. A study was conducted in which mice were subjected to prolonged auditory stress found to be having decreased phagocytic activity both *in vivo* and *in vitro*. This may be due to the

increased corticosterone in the blood. Corticotropin-Releasing Hormone (CRH) is secreted by the hypothalamus in stress response, which is triggered by the limbic system of the brain. The pituitary gland secretes adrenocorticotrophic hormone in response to the CRH, and this in turn causes the adrenal glands to produce corticosterone into the bloodstream. There was a reduction in corticosterone levels in the immunized *Triphala* group. This could be one of the causes of the neutrophil function enhancement observed in this group. This is where *Triphala's* calming effects on mental state contribute to its indirect immune-boosting effects. Thus, it is clear that the mind and body are intertwined. Psychoneuro-immunology is a rapidly developing specialty of medicine that examines the interplay among psychological factors, the neurological system, and the immune system.^[7]

Rasayana choornam

Rasayana choorna consist of *Swadamshttra*, *Amalaka* and *Krishna tila*. In Wistar albino rats, the immunomodulatory activity of *Rasayana choorna* was investigated. The results revealed that this formulation has the power to activate the immune system at the cellular level with lymphocytes, cytokines, prostaglandin E etc. It might modulate the systems that rely on T cells but are not dependent on IgE. It was shown that *Rasayana choorna* attenuated the T-lymphocyte mediated responses. This finding could contribute to treating immune-related disorders.^[8]

Medhya rasayana

Mandukaparni

In India, *Centella asiatica* is primarily found in most regions. This plant has several therapeutic applications i.e., sedative, spasmolytic, anti-anxiety and anti-stress action.^[9] The main ingredient in its extract, called asiaticoside, has immunomodulatory qualities that raise the phagocytic index and total WBC count. Water extract of *Centella asiatica* dramatically boosts the proliferation and IL-2 and TNF-alpha production of human peripheral blood mononuclear cells (PBMCs).^[10] Conversely, an ethanol extract inhibited human PBMC mitogenesis and the generation of IL-2 and TNF-alpha.^[11]

Yashti madhu

Liquorice or *Glycyrrhiza glabra* L. (*G. glabra*), is one of the world's most widely used and exploited medicinal plants. Since ancient times, liquorice has been used as a valuable and auspicious traditional medicine to treat a variety of illnesses all across the world.^[12] A team of researchers looked at the immunomodulatory properties of aqueous extract of *Yashtimadhu*, and zinc. Leucocyte count, spleen weight, *in vivo* phagocytosis (carbon clearance method), assessment of cellular immune response, titre of haemagglutination antibody, and plaque-forming cell

assay using sheep red blood cells (SRBC) were the measures. Furthermore, a measurement was made of the extract's impact on systemic anaphylactic reaction. The administration of 1.5gm/kg of aqueous liquorice extract (ALE) was observed to significantly raise both the phagocytic index and leucocyte count when compared to the control group ($P < 0.05$). The combination of 45mg/kg of zinc and 0.75gm/kg of ALE resulted in a statistically significant increase in leucocyte count and phagocyte index when compared to the control group ($P < 0.01$).^[13]

The anti-HIV effect of glycyrrhizine (GL) in HTLV-III/LAV was studied in vitro. At a dosage of 0.6 mM, glycyrrhizin totally prevented the development of HIV-induced plaque in MT-4 cells.^[14] In addition, glycyrrhizic acid effectively neutralises the Herpes simplex virus. irreversibly and works against numerous other DNA and RNA viruses in cell culture.^[15] Interferon (IFN) induction has been identified as the mechanism by which glycyrrhizic acid exerts antiviral effect.^[16]

Guduchi

Tumor-associated macrophage activation is the mechanism by which the medicinal plant *Tinospora cordifolia* carries out its immunomodulatory and anticancer effects. When mice with tumors are given an intraperitoneal dose of *Tinospora cordifolia* extract, it increases not only the macrophages' capacity for phagocytosis but also their capacity to present antigens and secrete cytokines such as TNF-alpha, IL-1, and others. At 5µg/ml, the *Tinospora cordifolia* aqueous extract enhanced macrophage phagocytic capacity in vitro. The aqueous and ethanolic extracts of *Tinospora cordifolia* considerably boosted the animals' production of antibodies at a dose of 10mg/kg (in vivo) as compared to the control. The total WBC count, bone marrow cellularity, and alpha-esterase positive cells were all found to rise in response to the methanolic extract of *Tinospora cordifolia* stem extract. By boosting macrophage activation and splenic plaque-forming cells, the extract also improved humoral immune response. The extract inhibited the growth of solid tumours and worked in concert with cyclophosphamide to decrease the tumours in animals.^[17] More evidence has shown that giving mice oral *Guduchi* extract for 15 days greatly increased their humoral immune response.^[18] When rats with abdominal sepsis caused by caecal ligation were given *Guduchi* as a pretreatment, the death rate was considerably decreased. Increased phagocytic activity has been associated to elevated peritoneal macrophage and peripheral neutrophil counts.^[19] Research conducted on immuno-compromised patients utilising the aqueous extract of *Tinospora cordifolia*. Three doses of a 500mg tablet were given each day. Found improvements in the treatment of obstructive

jaundice, reduction adverse effects of chemotherapy, and accelerated tuberculosis recovery^[20].

Shankupushpi

Clitoria ternatea is a plant from Fabaceae family. Common names for it include cordofan-pea, blue-pea, and butterfly-pea. A study was conducted to assess the immunostimulatory properties of *Clitoria ternatea* leaf and flower aqueous extracts by giving the extracts orally to rats with alloxan-induced diabetes for 60 days. During that time, the rats' serum glucose and cholesterol levels were significantly reduced. The treated animals exhibited a considerable rise in total white blood cells, red blood cells, T-lymphocytes, and B-lymphocytes, but monocytes and eosinophils displayed an opposite trend. These findings also suggested that the plant extracts have immunostimulating properties that strengthen the immune system.^[21]

Shatavari

Shatavari is an important *Rasayana dravya*. According to Vagbhatacharya, a person who consumes *Shatavari Kalka kashaya sidha ghrtha* will not get any illnesses.^[22] In order to evaluate the immunomodulatory effect of *Shatavari* in patients with non-insulin dependent diabetes mellitus, a clinical investigation was carried out. Patients whose blood sugar was under control for a month had their serum protein and serum immunoglobulins (LgG, IgA, and IgM) evaluated. IgG levels increased following a 4-week course of *Rasayana* medication (500mg of *Shatavari* extract taken once daily). There was a non-significant decrease in blood IgG levels in the placebo group. The significance of *Shatavari* as an immunomodulator is illustrated in this study.^[23]

Chyavana prasha

Since ancient times, *Chyavanprasha* has been used extensively as a health supplement and medicine to increase longevity and immunity due to its numerous health advantages.

Tumour necrosis factor-alpha (TNF-α) and macrophage inflammatory protein-1 alpha (MIP-1α) secretions, interleukin-1 beta (IL-1β) levels were stimulated, and phagocytic activity increased significantly when dendritic cells were treated with *Chyavana prasha*. The immunomodulatory properties are supported by increased levels of immunity markers (TNF-α, IL-1β, and MIP1α), NK cell, and phagocytic activity^[24]. Clinical research further demonstrates that *Chyavana prasha* has an immune-booster role, as seen by decreased seasonal influences on illness symptoms, altered IgE and immunity markers C3 and C4 levels, enhanced lung functions, lowered cortisol levels, and enhanced quality of life (QoL).^[25]

CONCLUSION

Rasayanas have strong antioxidant qualities and are typically used as nutritional supplements and rejuvenators. Their main goal is to mitigate the consequences of ageing, diabetes, rheumatoid arthritis, atherosclerosis, cancer, and Parkinson's disease. From the information above, it should be evident that when given at a precise dosage, several *Rasayanas* have immunomodulatory effects in animals and human beings. To determine their pharmacological activity, several screening methods have been employed, both in vitro and in vivo. Immune response regulation by a *Rasayana* in healthy or sick individuals may help to maintain a disease-free state both mentally and physically and thereby increases the quality of life.

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