



Review Article

IMMUNOMODULATION BY AYURVEDA: A NEW FRONTIER IN MODERN HEALTH CARE

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ABSTRACT

Immunomodulation is described as regulation and modulation of immunity that might be achieved by reducing or enhancing the immune response depending on the intended result. Since immunomodulation can be used to treat a variety of illnesses, including cancer, infectious diseases, and autoimmune disorders. Not only does Ayurveda contain the fundamental idea of immunomodulation, but Ayurvedic specialists have been using it for centuries. **Methods:** The completion of this study involved consolidating information from classical Ayurvedic texts, academic research papers, guidelines, as well as searching databases such as PubMed and MedLine. **Results and Discussion:** Immunomodulation through Ayurveda single drugs heralds a novel and holistic approach to enhancing child health. Ayurveda, with its rich heritage of natural remedies, offers a treasure trove of single herbal drugs known for their immunomodulatory properties. **Conclusion:** Many of herbs have been traditionally used to bolster immunity and maintain healthy balance. Utilizing these single drugs in general care can potentially enhance the immune response in all, promoting resilience against infections and diseases. Unlike conventional pharmaceuticals, Ayurveda's natural approach aims to harmonize the body's internal environment, supporting the immune system without adverse side effects.

INTRODUCTION


Immunomodulation represents a ground breaking frontier in general health, focusing on the precise adjustment and regulation of the immune system to optimize health outcomes for all. This innovative approach aims to enhance the effectiveness of the immune response while ensuring a balanced reaction to pathogens and other immune challenges. By modulating the immune system, healthcare providers can potentially reduce the incidence and severity of various diseases, improve vaccine responses, and manage autoimmune conditions more effectively. This strategy not only promotes immediate health benefits but also contributes to the long-term well-being of patients.

As research in this field advances, the potential for developing targeted therapies that cater to the unique immunological needs of children and adult population becomes increasingly promising, heralding a new era in medicine where the focus shifts from treating diseases to proactively managing and optimizing immune health. As scientific interest in *Ayurveda* grows, integrating these time-tested remedies into immunomodulation strategies presents a promising frontier. The immune system of a person changes continuously from the time of fetal development until adulthood. Both accelerated and retarded immune system development are harmful^[1]. Due to their immature immune systems, children are the most susceptible group to sickness.

RESULT

Swarna Prashana

Swarna Prashana is a distinctive Ayurvedic practice in pediatric healthcare. Traditionally, metallic gold is rubbed on a clean stone with honey until fine gold particles are produced. This gold powder is then mixed with fine powder of immunomodulatory or *Medhya* herbs, ghee and honey administered to

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newborns. Nowadays *Swarnabhasma* triturated with honey and *Ghrta* is administered to children up to 16 years of age. Research indicates that these gold nanoparticles are absorbed into the body through both sublingual and intestinal routes reaching their target sites and providing catalytic stimulation to the reticuloendothelial system and enhancing the body's general defense mechanisms.^[2]

Ashwagandha (*Withania somnifera*)

Administering an extract from the powdered root of the plant was observed to boost immunological activity in Balb/c mice. Treatment with *Withania* root extract administered intraperitoneally significantly increased the total WBC count by the 10th day. Additionally bone marrow cellularity and the number of α -esterase positive cells saw a significant rise following the administration of the *Withania* extract. Treatment with *Withania* extract alongside the antigen led to an increase in the circulating antibody titre and the number of plaque forming cells in the spleen. The extract also inhibited delayed-type hypersensitivity reactions in mice. Additionally administering *Withania* extract enhanced the phagocytic activity of peritoneal macrophages compared to the control group in mice. These findings confirm the immunomodulatory effects of *Withania somnifera* extract a well-known immunomodulator in traditional medicine.^[3]

Guduchi (*Tinospora cordifolia*)

Tinospora cordifolia extract has demonstrated immunomodulatory effects in HIV patients. A study revealed that *Tinospora cordifolia* exhibited immunostimulant action indicated by increased TLC, ALC, and lymphocyte percentages along with a reduced infection rate after two months of treatment. A study on HIV positive patients treated with *Tinospora cordifolia* extract found that patients experienced symptoms relief and a reduction in TLC, neutrophil, and eosinophil counts. The identification of an immunomodulatory protein in *Guduchi* stem which exhibits lymphoproliferative and macrophage activating properties supports the use of *Guduchi* preparations in various Ayurvedic medicines for immunomodulation.^[4]

Yashtimadhu (*Glycyrrhiza glabra*)

Glycyrrhiza glabra has been found to stimulate the immune system increasing leukocyte count and promoting the lymphocytic transformation and activation of macrophages. Its root extracts possess immunosuppressive properties. In vitro, glycyrrhizin was able to inhibit mast cell degranulation induced by a histamine releasing agent thereby preventing the release of allergy mediators.^[5] Additionally it has been shown that glycyrrhetic acid is a potent inhibitor of the classical complement system.^[6]

Vacha (*Acorus calamus*)

It has been reported that it has a potent immunomodulatory effect on human neutrophils^[7]. Petroleum ether, alcohol and volatile oil extracts of *Vacha* leaves were found to enhance human neutrophil phagocytosis in an in vitro investigation^[8]. Rats exposed to noise were shown to exhibit higher levels of IL-4 and much less depletion of CD4 T, CD8 T, IL-2 and IFN- γ when given an ethyl acetate extract of *Vacha* rhizome and α -asarone^[9]. Calamus rhizome extract was found to be an immunomodulator in a study where it significantly increased the immune responses as evidenced by the lymphoid organs relative weight, TLC, DLC, immunoglobulin content, bone marrow cellularity and viability and lymphocyte count of the organs. *Vacha* extract treated unstressed rats also showed a decrease in circulating immune complexes and lymphocyte apoptosis in their lymphoid organs.^[10]

Bala (*Sida Cordifolia*)

The aqueous extract of *Sida cordifolia* had the most immunomodulatory activity. Subsequent fractionation and biochemical analysis produced a highly powerful polysaccharide enriched fraction. The complex mixture of polysaccharides known as SCAF5 has a variety of immunomodulatory effects such as phagocytosis, increased expression of pro-inflammatory cytokines, secretion of antibodies and proliferation of immune cells. It also produces nitric oxide. Moreover, pre-treated *Galleria mellonella* larvae with SCAF5 produced a 98% reduction in bacterial load and they were more resistant to infection by methicillin-resistant *Staphylococcus aureus*.^[11]

Plantago asiatica

Its seeds were frequently used in traditional Chinese medicine to aid individuals with chronic illnesses and weakened immune systems. This usage may be associated with the plant's immune-modulating properties. Research on an extract from the seeds of *Plantago asiatica* L. has examined its impact on the maturation of dendritic cells (DCs), which are crucial components of the primary immune system.^[12]

Durva (*Cyanodon dactylon*)

The fresh juice of *Durva* which has a solid phenolic content was shown to protect human DNA from damage induced by doxorubicin according to DNA spectral studies. This suggests a high level of nucleic acid purity in the samples treated with *Cynodon dactylon*. Oral administration of the juice to Balb/c mice resulted in an enhanced humoral antibody response when exposed to an antigen challenge. This was demonstrated by a dose dependent and statistically significant increase in antibody titer in both the haemagglutination antibody assay and the

plaque forming cell assay. Its immunomodulatory function was tested in Balb/c mice by evaluating the humoral antibody response, measured through haemagglutination antibody titer and spleen cell assay.^[13]

Haridra (Curcuma longa)

Curcumin a polyphenol found in *Haridra* regulates various transcription factors, cytokines, adhesion molecules and enzymes associated with inflammation. Besides its anti-inflammatory properties, curcumin has been shown to possess nematocidal activity and inhibit the progression of several infections. Curcumin demonstrates schistosomicidal effectiveness in vivo and modulates granulomatous inflammation and liver pathology in acute schistosomiasis mansoni. Treatment with curcumin alters the cellular and humoral immune responses in infected mice, leading to a significant reduction in parasite load and liver damage in acute murine schistosomiasis mansoni.^[14]

Punarnava (Boerhaavia diffusa)

The effect of Punarnavine on the immune system was investigated by administering it intraperitoneally which resulted in an increased total WBC count. Punarnavine treatment also enhanced bone marrow cellularity and elevated the number of alpha esterase positive cells. When combined with the antigen sheep red blood cells, Punarnavine treatment led to a rise in circulating antibody titer and an increase in plaque forming cells in the spleen. Punarnavine also promoted the proliferation of splenocytes, thymocytes, and bone marrow cells both in vitro and in vivo with or without certain mitogens. Additionally Punarnavine treatment significantly reduced LPS induced elevated levels of proinflammatory cytokines such as TNF-alpha, IL-1beta, and IL-6 in mice. These results highlight Punarnavine's immunomodulatory properties.^[15]

Kalamegha (Andrographis paniculata)

The immunomodulatory activity of a pure powder extract containing a mixture of andrographolides was tested using various in vivo and in vitro experimental models. In the delayed type hypersensitivity mice model the treatment enhanced the delayed type hypersensitivity response. Additionally, it increase the number of plaque forming cells and elevate the hemagglutination antibody titer in the spleen cells of mice challenged with sheep red blood cells. The therapy also induced phagocytosis in mice and after 30 days of treatment with HN-02 there was a significant increase in total WBC count and the relative weight of the spleen and thymus.^[16]

DISCUSSION

The exploration of immunomodulation through Ayurveda drugs opens a significant dialogue on the potential benefits and applications of traditional medicine in modern pediatric care. Ayurveda, with its extensive catalog of single drugs offers a natural and holistic approach to modulating the immune system. These herbs have been historically revered for their ability to enhance immunity, adaptogenic properties and overall health benefits making them ideal candidates for supporting immune health. The primary advantage of using Ayurveda single drugs lies in their potential to harmonize the body's immune response reducing the risk of infections and promoting resilience without the adverse side effects often associated with synthetic pharmaceuticals. Incorporating these Ayurvedic remedies into general care could significantly improve health outcomes particularly in managing chronic conditions, enhancing vaccine responses, and preventing recurrent infections.

CONCLUSION

The integration of Ayurveda single drugs into immunomodulation presents an exciting and promising frontier in general health. These times honored herbal remedies renowned for their natural immunomodulatory properties offer a holistic approach to enhancing and balancing the immune systems of whole population. By leveraging the therapeutic potential of Ayurveda, we can potentially reduce the incidence of infections, improve vaccine efficacy and manage autoimmune disorders in population. This approach not only provides immediate health benefits but also supports the long term well being of children and adult promoting resilience and overall vitality. As scientific research continues to validate and expand our understanding of these traditional medicines. Ayurveda's role in immunomodulation is poised to become a valuable complement to modern medical practices, paving the way for a more integrated and effective healthcare paradigm for our youngest patients.

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