

AYURVEDIC APPROACHES TO DRUG-INDUCED IMMUNOSUPPRESSION: A
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ABSTRACT

Immunosuppressive medications have been used more often in contemporary medicine in recent years to treat cancer, organ transplants, and a variety of autoimmune diseases. However, prolonged use of these drugs frequently results in severe immunosuppression, which leaves patients susceptible to infections and other side effects. Based on the principles of Ayurveda, the article discloses herbal treatments, dietary suggestions, and individualized treatment regimens specific to each individual's nature. It corresponds to the *Ojokshaya*, *Alpa-bala*, condition in Ayurveda. This research investigates how Ayurvedic treatments could be used in addition to other strategies to mitigate medication-induced immunosuppression in this susceptible group.

KEYWORDS: Immunosuppression, Corticosteroids, *Ojokshaya*, *Dushi Visha*.

1. INTRODUCTION

The extensive use of pharmaceutical medications in recent decades has surely transformed contemporary medicine, providing effective treatments for a wide range of medical conditions. However, the therapeutic advantages of particular pharmaceuticals are frequently associated with the risk of producing immunosuppression, a state in which the body's immune system is impaired, making people more susceptible to infections and diseases. This can be caused by the destruction of immune effector cells or the inhibition of intracellular pathways required for antigen recognition or other immune response components.

According to Ayurveda, the *Param Sara* (ultimate nectar) of the seven *Dhatus* from *rasa* to *Shukra* is '*ojas*', which strengthens the body and serves as the foundation for immunity. There are two forms of *ojas*: (i) *par* and (ii) *apar ojas*.

(i) *Par-Ojas* is located in the heart and contains 8 drops or '*Ashabinduk*'. *Par-Ojas* is the life energy; if it is eliminated, the individual dies quickly.

(ii) *Apar ojas* is found in 10 cardiac arteries and circulates throughout the body. Its amount is expressed in gross proportion half *anjali*. The context of modern, immunity is probably related to *apar ojas*. In Ayurveda, the 'strength' produced by *ojas* is known as *Bala*.

In Ayurvedic physiology, *bala* is a multifaceted element that refers to physical and psychological strength, ability developed in reaction to antigen exposure, and resistance

to illness manifestation. It has also been used interchangeably with components that provide strength, survival, and stability to the body, such as *Oja*, *Vyadhikshamatva*, *Balya*, *Sara*, *Balavridhdikara Bhava*, and *Prakrita Sleshma*. There are three varieties of *Bala*.

Sahaja Bala – It is genetic and inborn resistance to disease, which exists since birth. It is said to increase with the growth of tissues and does not depend upon any other cause.

Kalaja Bala - This type of immunity is said to be influenced by seasonal traits and the age of the person.

Yuktikrit Bala – This type of *Sarira Bala* refers to modulation of body's resistance against diseases by resort to appropriate *Ojovardhak* diet, physical exercise, rest, restorative and *Rasayana*, therapies in keeping with seasonal needs.

The gradual depletion of *apar Ojas* leads to loss of strength, immune deficiency and infection.

Drug-induced immunosuppression involves complex and multifaceted pathophysiological mechanisms that impact various components of the immune system. Unfortunately, the drugs used in treatment often affect not only diseased cells but also normal, healthy cells, including those crucial for immune function. Here's an overview of the pathophysiology of drug-induced immunosuppression.

1.1. Direct Suppression of Immune Cells: Many immunosuppressive drugs act directly on immune cells to inhibit their function. For example, corticosteroids such as prednisone can suppress the function of T cells and other immune cells by inhibiting cytokine production and inducing apoptosis.

1.2. Disruption of Signaling Pathways: Some drugs interfere with signalling pathways that are critical for immune cell activation and function. For instance, calcineurin inhibitors like cyclosporine and tacrolimus inhibit the calcineurin pathway in T cells, preventing the production of interleukin-2 (IL-2) and thereby impairing T cell proliferation and activation.

1.3. Inhibition of Lymphocyte Proliferation: Certain drugs target rapidly dividing cells, including activated lymphocytes. Chemotherapeutic agents such as methotrexate and mycophenolate mofetil inhibit DNA synthesis and cell proliferation, leading to a reduction in lymphocyte numbers and function.

1.4. Disruption of Immune Cell Trafficking: Some drugs interfere with the trafficking of immune cells, preventing their migration to sites of inflammation or infection. For example, glucocorticoids can inhibit the expression of adhesion molecules on endothelial cells, thereby reducing the recruitment of leukocytes to inflamed tissues.

1.5. Alteration of Cytokine Production: Immunomodulatory drugs can alter the production and activity of cytokines, which are key mediators of immune responses. For instance, tumour necrosis factor (TNF) inhibitors such as infliximab and adalimumab reduce the production of pro-inflammatory cytokines such as TNF-alpha, thereby dampening inflammation but also suppressing immune responses.

1.6. Induction of Apoptosis: Some drugs induce apoptosis (programmed cell death) in immune cells, leading to a decrease in immune function. For example, glucocorticoids can induce apoptosis in lymphocytes, particularly T cells, through various mechanisms including upregulation of pro-apoptotic proteins and inhibition of anti-apoptotic signals.

1.7. Alteration of Immune Cell Differentiation: Certain drugs can affect the differentiation of immune cells, leading to changes in the balance of different cell populations. For example, methotrexate can promote the differentiation of regulatory T cells (Tregs), which suppress immune responses, while inhibiting the differentiation of pro-inflammatory Th17 cells.

MATERIALS AND METHODS

A comprehensive literature review was conducted to identify relevant studies, clinical trials, and case reports related to Ayurvedic approaches for managing drug-induced immunosuppression. Databases such as

PubMed, DHARA, Google Scholar, and Ayurvedic research repositories were systematically searched. The review included articles published up to the present date, with a focus on studies reporting outcomes of Ayurvedic interventions.

2. Immunosuppression in Ayurveda & Morden

There are no specific references to medication-induced immunosuppression in Ayurvedic literature. However, ayurvedic management concepts and principles are crucial for the management and advancement of medical intervention for these illnesses. *Apar ojas* is likely decreased as a result of the adverse effects of the medication used to treat a variety of illnesses. Its symptoms include the following.

- Symptoms *ojas visransa* - *Sandhi Vishlesh* (looseness of joints), *Gatra sada* (weakness of the body), *Dosha Chyavanam* (provoked *Tridoshas* move away from their normal seats), *Kriya Sannirodha* (inability to perform a normal function).

- Symptoms of *ojas vyapad* - *Stabha gurugatrata* (Stiffness and feeling heaviness in the body), *Vata Shophna* (swelling caused by *vata dosha* impairment), *Varna Bheda* (change in complexion or discolouration), *Glani* (exhaustion), *Tandra* (Drowsiness or stupor), *Nindra* (sleep).

- Symptoms of *ojas kshaya* - *Murcha* (unconsciousness or fainting), *Mansakshaya* (decrease of muscle), *Moha* (mental disturbances especially in judgment), *Pralap* (delirium), *Mrityu* (death).

Drug-induced immunosuppression during contemporary treatment can result in bacterial, viral, fungal, or parasitic infections.

2.1. Bacterial infections

Bacterial infections associated with drug-induced immunosuppression include *Mycobacterium* species, *Listeria* species, *Staphylococcus* species, *Nocardia* species, *Escherichia coli*, *Salmonella* species, *Legionella pneumophila*, *Clostridium difficile*.

2.2. Viral infections

Viral infections associated with drug-induced immunosuppression include Hepatitis B virus, Hepatitis C virus, HIV, Influenza, Varicella-zoster virus (VZV), Herpes simplex virus (HSV), Epstein-Barr virus (EBV), Human papillomavirus (HPV) which can be sexually acquired (genital warts) or non-sexually acquired (viral warts), Cytomegalovirus.

2.3. Fungal and parasite infections

Fungal and parasitic infections associated with drug-induced immunosuppression include *Candida* species, *Histoplasmosis*, *Aspergillus* species, and *Cryptococcus* species.

Ayurvedic Approaches in Drug-induced immunosuppression

As per *Acharya Charak*, The signs of *ojas kshaya* include weakness, fear, exhaustion of the senses, dryness

of the body, mental instability, and depression. There is a lot of *Ojokshaya* involved with sickness and its treatment side effects. During treatment, a patient's *Sharira Balam* (physical strength) and *Satva Balam* (mental strength) will both significantly decline. The body's vitality comes from two factors: *Agni*, which is the body tissues' digestive strength and metabolic rate, and *Ojas*, which is a highly subtle material produced by a healthy body that provides superior strength and vigour and protects against infections. The imbalance of *Agni*, *Vata*, and *Pitta doshas* brought about by drugs and other interventions leads to the creation of *ama*, which is a symbol for impurities and toxins in the body, as well as a drop in *Dhatvagni* and *Dhathukshayam* (where *Dhatus* are the body tissues and *Dhatu agni* is the metabolic rate of the *dhatus*) and *Ojokshaya* in the end. There will be an improper metabolism if *Agni* function is compromised during post-therapeutic medication usage, resulting in *Ojokshaya*, *Alpa-Bala*, and *Dhatu Kshaya* conditions. Following *Deepana-Pachana* and *Shodhana Chikitsa* (Detoxifications), immunomodulatory medications are utilized to flush the body of toxins created by chemotherapy as well as other poisons. Ayurvedic medicines claim that immunomodulation is achieved through the use of *Ojvardhak*, *Balvardhak*, and *Agnivardhak* medicines.

Management According to Ayurveda for Immunosuppression

1. Holistic Approach: Treating each individual rather than only the illness is the focus of Ayurveda, a traditional holistic medical approach to treating illnesses, including drug-induced immunosuppression, by emphasizing the restoration of equilibrium to the body, mind, and spirit.

2. Rasayana Therapy: Known for their revitalizing qualities, *rasayana* herbs are frequently utilized in Ayurveda to boost immunity and energy. The article may highlight specific *Rasayana* plants with immunomodulatory properties, which might help counteract the immunosuppressive effects of prescription medications. Among them, the following Ayurvedic medications are known to specifically boost immunity: *Ashwagandha* (*Withania somnifera*), *Amalaki* (*Emblica officinalis*), *Bibhitaka* (*Terminalia bellirica*), *Haritaki* (*Terminalia chebula*), *Brahmi* (*Bacopa monnieri*), *Bala* (*Sida cordifolia*), *Bhringraja* (*Eclipta alba*), *Jyothishmati* (*Celastrus paniculatus*), *Pippali* (*Piper longum*), *Atmagupta* (*Mucuna prurita*), *Shatavari* (*Asparagus racemosus*), *Kashmari* (*Gmelina arborea*), *Guduchi* (*Tinospora cordifolia*), *Chitraka* (*Plumbago zeylanica*).

3. Panchakarma: In Ayurveda, detoxification techniques called *panchakarma* treatments are used to remove toxins from the body and bring it back into balance. These treatments could help boost immunological function and get rid of accumulated medication residues.

4. Dietary Modifications

I. Eat According to Your Dosha: In Ayurveda, individuals are classified into three doshas - *Vata*, *Pitta*, and *Kapha*. Each *dosha* has specific dietary recommendations. For example, *Vata* types may benefit from warm, nourishing foods, *Pitta* types from cooling and calming foods, and *Kapha* types from light, warming foods.

II. Include Immune-Boosting Herbs and Spices: Ayurveda utilizes various herbs and spices known for their immune-boosting properties. These include turmeric, ginger, garlic, tulsi (holy basil), ashwagandha, and liquorice. Incorporating these into your cooking or consuming them as herbal teas can support immune function.

III. Maintain Agni (Digestive Fire): According to Ayurveda, strong digestion is crucial for overall health, including immune function. Eat regular meals, favouring cooked, easy-to-digest foods and avoiding heavy, greasy, or processed foods that can dampen *Agni*.

IV. Stay Hydrated with Warm Liquids: Drinking warm water or herbal teas throughout the day helps to maintain hydration, supports digestion, and aids in the elimination of toxins, all of which are essential for immune function.

5. Yoga and Meditation: Yoga and meditation offer powerful tools for immunomodulation, helping to balance and strengthen the immune system while promoting overall health and well-being. These practices may help reduce stress, enhance resilience, and support immune function.

I. Pranayama (Breathing Exercises): Pranayama techniques, such as deep breathing, alternate nostril breathing (*Nadi Shodhana*), and *Kapalabhati* (skull-shining breath), can help regulate the nervous system and reduce stress, which in turn supports immune function.

II. Surya Namaskar (Sun Salutation): This sequence of yoga postures is a dynamic way to warm up the body, stimulate circulation, and activate the respiratory system. It can also help release tension and increase vitality.

III. Twisting Poses: Twists like *Bharadvajasana* (Bharadvaja's Twist) and *Ardha Matsyendrasana* (Half Lord of the Fishes Pose) can help wring out toxins from the organs and stimulate digestion and elimination, supporting overall detoxification and immune function.

IV. Inversion Poses: Inversions such as *Sarvangasana* (Shoulder Stand) and *Viparita Karani* (Legs-up-the-Wall Pose) promote lymphatic drainage and circulation, helping to boost immunity by facilitating the removal of waste and toxins from the body.

V. Backbends: Backbending poses like *Bhujangasana* (Cobra Pose) and *Ustrasana* (Camel Pose) open up the chest and heart center, improving respiratory function and circulation. They can also help reduce stress and fatigue, supporting overall immune health.

VI. Restorative Yoga: Gentle, supported poses like *Supta Baddha Konasana* (Reclining Bound Angle Pose) and *Balasana* (Child's Pose) promote relaxation and

activate the parasympathetic nervous system, which supports immune function and the body's natural healing processes.

6. Herbal Formulations: Ayurvedic formulations containing specific herbs known for their immunomodulatory properties may be explored in the article. These formulations could potentially help strengthen the immune system and mitigate the adverse effects of immunosuppressive drugs.

7. Integration with Conventional Medicine: While Ayurveda offers alternative approaches to health and healing, the article likely emphasizes the importance of integrating Ayurvedic principles and therapies with conventional medical care. Collaboration between Ayurvedic practitioners and conventional healthcare providers can facilitate a more comprehensive and personalized approach to managing drug-induced immunosuppression.

DISCUSSION

As previously mentioned, modern immunosuppressant drugs act by either inhibiting or preventing, destroying, inducing, or altering the physiology of targeted cells, as well as normal cells. These drug-induced pathophysiologicals can be likened to the concept of "tikshna virya" in Ayurveda. The impact of immunosuppressants can be understood as causing "Ojokshaya," (a depletion of vitality according to Ayurveda). In Ayurveda, the potency of medicinal substances is classified into three categories: (a) Mridu Virya, (b) Madhyam Virya, and (c) Tikshna Virya, (as outlined by Acharya Chakrapani in the Charaka Samhita). Medications with high potency exert effects at cellular, microcellular, gene, and DNA levels, possessing characteristics such as extreme penetrance and selective toxicity.

Therefore, the characteristics of immunosuppressant drugs can be viewed as embodying the concept of "tikshna viryata" in Ayurvedic medicine, which ultimately exhibits similar qualities to "visha dravya" (toxic substances). According to Ayurveda, visha dravyas possess qualities such as dryness (Ruksha), heat (Ushna), penetrative nature (Tikshna), ability to enter minute pores (Sukshma), quick action (Ashu), widespread distribution in the body (Vyavayi), tissue debilitation (Vikasi), lack of unctuousness (Vishada), lightness (Laghu), and indigestibility (Apaki). The Ushnavirya property of immunosuppressants aggravates Vata, Pitta, and Rakta; their Tikshna property disrupts the coherence of vital organs and induces confusion; their Sukshmata property infiltrates all organs, causing abnormalities; their Ashuguna property rapidly deteriorates tissues; their Vyavayi quality spreads throughout the body; their Vikasi guna weakens and disintegrates Dosha, Dhatu, and Mala; their Vishada guna prevents adherence to any particular location; their Laghu guna complicates treatment; and their Apaki

nature hinders expulsion and leads to long-term issues in the body. Similarly, medications, like toxic substances, can provoke imbalances in Vata, Pitta, and Rakta.

In the physiological context of visha (once inside the body), it affects the blood, disturbs Kapha, Pitta, and Vata, and ultimately reaches the heart, which is considered the seat of "ojas" (vital essence), leading to depletion of ojas. Hence, immunosuppressants can also be understood in this light. Management of such conditions can be approached through therapies such as "sodhana" (purification), "Rasayana" (rejuvenation), "ojovardhaka" (boosting vitality), "balavardhaka" (enhancing strength), and "agnivardhak" (stimulating digestive fire).

CONCLUSION

According to the preceding discussion, the use of immunosuppressive medications has grown more common in current medical practice for the treatment of numerous autoimmune illnesses, organ transplantation, and cancer. Furthermore, long-term usage of these drugs frequently results in substantial immunosuppression. We've also seen how *Rasayan* treatment, *Panchkarma*, and other ayurvedic drugs can assist boost a person's immune. Finally, assessing the efficacy and safety of Ayurvedic therapies in treating drug-induced immunosuppression is critical.

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