Journal of Ayurveda & Holistic Medicine

https://jahm.co.in

eISSN-2321-1563

Short Review

Integrating the concepts of *Prakriti* and Personalised Medicine in the practice of *Ayurvedic* immunology

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ABSTRACT:

Introduction: *Prakriti* is the cornerstone of Ayurveda, on which the entire principles and practices are built upon. Meanwhile, the branch of personalised medicine, which has been evolved separately and practiced worldwide, has striking similarities with the concept of *Prakriti*. Ayurveda can be updated and matched with the current standards of personalized medicine by following *prakriti* based management protocols. This article focuses on the application of this concept in the field of immunology. **Methods**: The pathophysiology and management of immunological disorders and infections are viewed from the angle of *prakriti* and personalised medicine. The references in this regard were selected from PubMed and were reviewed. **Results**: Many concepts in Ayurveda, including *tridosha* theory and *dosha-dhatu-mala* organization, contribute synergistically with the practice of personalised medicine as can be seen from the reflections of many biomarkers including genetic (eg: CYP2CI9, SNIPs), metabolic (eg: Lipid profile, insulin) and gut microbial (signature flora). Their adaptation into the current clinical scenario, accommodating recent advances including gut microbiome, is needed for personalised medical practice in Ayurveda. **Discussion**: There is need to streamline the concepts and practices related to immunity and *prakriti* and to strengthen their rationale with available research findings so that the real benefits of Ayurvedic principles and practices can be delivered better in the health care system.

KEYWORDS: *Prakriti,* Personalised medicine, immunity, immunological disorders, infectious diseases, preventive medicine

RECEIVED ON:
23-04-2025

REVISED ON:
08-05-2025; 19-06-2025

ACCEPTED ON:
10-07-2025

Access This Article Online:

Quick Response Code:

Website Link:

https://jahm.co.in

DOI Link:

https://doi.org/10.70066/jahm.v13i6.1822

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CITE THIS ARTICLE AS

Abhilash Mangampadath. Integrating the concepts of *Prakriti* and Personalised Medicine in the practice of *Ayurvedic* immunology. *J of Ayurveda and Hol Med (JAHM).* 2025;13(6):130-137

1. INTRODUCTION

Even though there are common patterns of physiologically characterised immune responses, there is least possibility of immune response of different individuals to be exactly the same. They differ between them based upon some factors which are genetically or epigenetically determined. Here comes the importance of prakriti in determining the diagnosis, assessment and treatment response in immunological disorders. Being the frontrunner among the personalised medicines, Ayurveda offers enormous possibilities for the consideration of *prakriti* in the assessment and management of immunological disorders [1]. Physiologically also, *doshas* are responsible for determining the immune status of an individual; whereas the inherent *dosha* status is otherwise called as *Prakriti* of the individual. So, a *prakriti* based management plan for immunological disorders can be the best method to apply the *Ayurvedic* principles correctly in clinical practice. Also, this can contribute for better clinical documentation and to save the available resources. Most importantly, for effective delivery of Ayurvedic drugs and procedures considering the peculiarities of the individual and the disease, especially in preventive packages, prakriti based management plan is the only way out.

There is vast application for this topic of personalised medicine even in the case of vaccines [2-4]. It might be surprising that, in future, the dose and type of vaccine for an emerging disease may be fixed based on genetic factors and will be distributed in a personalized manner [5]. Making it clearer, the individualised responses based upon cytokine activity and metabolic events have a key role to play in determining the course of infection, inflammation and tissue repair. In a hospital based cross sectional study conducted among 300 patients with more than 25 years' history of coronary artery disease, it was found out that there is positive correlation between inflammatory markers (hsCRP, TNF-alpha and IL-6) with *vatakapha* and *kapha prakriti* [6]. This result indicates that the inflammatory response in a chronic disease has some difference based upon prakriti and the reason can be traced back to the basic understanding of Ayurvedic principles in the light of human physiology.

2. METHODOLOGY

A detailed search was done in PubMed and Google Scholar using the keywords prakriti and immunity. The articles collected were classified into review articles, descriptive studies and analytical studies (Fig. 1). Their contents were thoroughly analysed and were consolidated. The concepts from *Samhitas* related to this area were taken into consideration and they were examined under the research findings from journals.

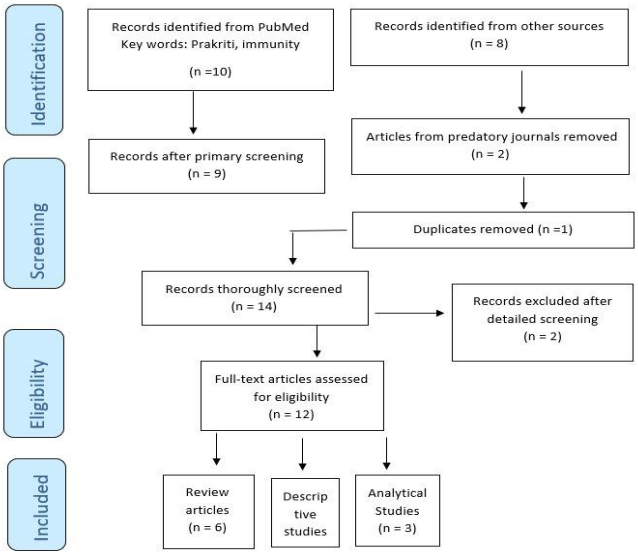

Figure 1 – Flow chart showing the review process

Exploring the basic concepts related to immunity and prakriti

If the perspective changes in the grass root level due to ontological differences are solved [7], Ayurveda can accommodate these principles of modern medicine and thus can analyse things in a better way. First of all, in practical sense, *prakriti* of almost all the individuals will be having the dominance of any two *doshas*. So, clinically, the understanding of the behaviour of *dwidoshaja prakriti* will be more beneficial [8]. The holistic understanding of *tridoshas* reincarnated as input, turn over and output mechanisms [9] that can be applied to all systems; fits to the immune system also, simplifying the entire immune activity into sensing, lysing and stabilizing.

When there is an imbalance in the sensing and stabilizing activities, it results in a *vatakapha* disorder. At the same time, *vatakapha prakriti* individual will be prone to develop issues related to the sensing and stabilization making them susceptible to opportunistic infections and inflammations. On the other hand, a *kaphapitta* prakriti individual is prone to develop imbalance between lysing and stabilising as in the case of allergic disorders. Similarly, a *vatapitta* prakriti individual has a vulnerability when it comes to the balance between sensing and lysing; leading to lysing own cells as in the case of autoimmune disorders. The take home message from these descriptions can be highlighted as the mode of selection of medicine for the prevention and treatment of immunological disorders. Especially, prevention of infections in *vatakapha* prakriti individuals can be achieved by using *ushna-teekshna* medications (Eg: *Indukantha ghrita*). In *kaphapitta* prakriti individuals, who are more prone to allergic disorders, *rooksha-laghu* medications can be used for their prevention (eg*: Guloochyadi Kashaya*). *Vatapitta* prakriti individuals, since they are prone to get affected by common *laghu-teekshna gunas*, can follow *guru-madhura* regimens and therapeutic applications (Eg: *Drakshadi Kashaya*) for the prevention of auto-immune disorders.

This comparative difference between stages and diseases can be seen in different types of cancers also. Ayurvedic principle of *shadkriyakaala*, when applied to cancer therapy, can reveal the progress from the stage of *sopha* to *arbuda* making the route clear for the identification of *dosha* and selection of treatment [10]. In the case of cancer pathophysiology, the balance between destruction and stability is lost and hence there is high risk among the *pitta* and *kapha* prakriti groups [11]. Even though it seems contradictory with the common belief that *vata* and *kapha* are the leading *doshas* in the pathophysiology of *granthi* and *arbuda*, it is not so. The immunological perception in the pathophysiology of *arbuda* gives emphasis to *pitta* and *kapha*. When it comes to ageing, apoptosis and gene expression; the importance of *vata* gets highlighted. Still, prakriti-wise, *pitta* and *kapha* have to be generally considered as high-risk group, as far as immunological connections in cancer pathology are concerned [10, 11]. Thus, basic immune mechanisms and their *dosha* wise inclinations can be best predicted from the understanding of prakriti.

In an immunophenotyping study on CD markers, it was found out that CD25 and CD56 expression was significantly higher in *kapha* prakriti samples than other prakriti groups. Similarly, slightly higher levels of CD14 were observed in *pitta* prakriti samples [12]. The increased level of CD25 and CD56 in *kapha* prakriti may indicate ability to elicit better immune response, which is in conformity with textual references in Ayurveda. The clinical phenotyping method of Ayurveda in the form of prakriti, thus holds the key for future integrative genomic studies for the upliftment of personalized medicine [13]. This can unveil the complex system-surrounding interactions in the background of prakriti, operating through *dosha-guna* and *samanya-visesha* principles, which form the quintessence of Ayurvedic personalised medicine.

Even though the *dosha* status contributed by internal and external factors at the time of fertilization is responsible for the determination of preliminary prakriti in the foetus; this prakriti can get modified by factors during pregnancy (like maternal diet and lifestyle). Still, this *dosha* status interact with external & internal factors which can influence its expression, like age and external climate are two factors which may mask the expression of some features inherent to a particular prakriti (Fig. 2). So, even if prakriti is formed from the *dosha* status, the same *dosha* status to be formed in the individual after birth is in turn determined by his or her prakriti. There are similarities and differences between the expression of prakriti and that of genes when examined in the background of system and surroundings (Fig. 3). Protein can be seen as the key factors which influence the activity of all enzymes, receptors and hormones in one way or other. The protein synthesis mechanism using amino acids is also comparable with the *dosha-dhatu-mala* interactions (Fig. 4).

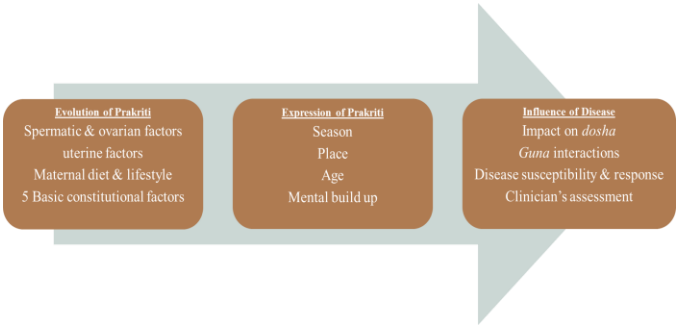

Figure 2. Factors involved in the evolution, expression and interactions of prakriti

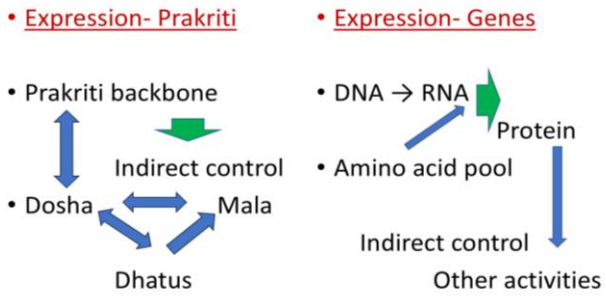

Figure 3. The similarities and differences between the expression of prakriti and that of genes.

(On the left side) According to the Prakriti of the individual, the physiological dosha status of the individual is determined. From each doshik pool, the functional elements of dhatus are formed. (On the right side) The genetic code of the individual determines, which proteins to be synthesized in the body. From the amino acid pool in the body the components of the proteins are selected. Thus formed proteins have direct and indirect control of all the body activities through hormones, enzymes, co-enzymes, glycoproteins etc.

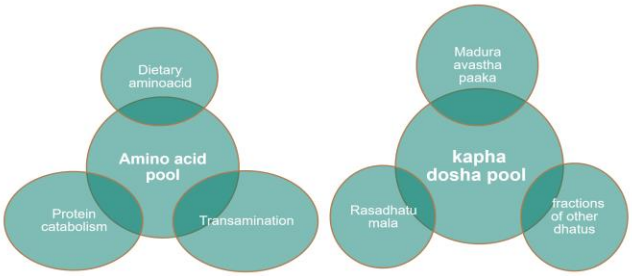

Figure 4. Comparison of protein synthesis from amino acid pool with the fractionation from kapha *doshik* pool [14,15]

The role of gut microbes

Excavating deeper into the concept of self and non-self; the gut microbes which were earlier considered as an external element even though dwelling inside, has changed recently and is now considered an integral part of the individual's physiological response. This concept can be seen correlated with the prakriti concept. Apart from prakriti of the individual, other factors like *desa* (geographical peculiarities*)*, *kaala* (seasonal changes) and *manas* (psychological status) can cause variation in the gut microbiome, which makes the analysis of gut microbes more complex and generalization of the results difficult. Still, since there are connections between these factors on the basis of *dosha*, dedicated interdisciplinary works can solve these issues.

A comprehensive analysis of human microbiome from the gut, oral and skin samples of healthy individuals (n=18) by 16S rRNA gene-based metagenomics using standard QIIME pipeline revealed the following findings. In the three different prakriti samples differential abundance of Bacteroides, Desulfovibrio, Parabacteroides, Slackia, and Succinivibrio were observed in the gut microbiome. Analysis also revealed *prakriti*-specific presence of Mogibacterium, Propionibacterium, Pyramidobacter, Rhodococcus in the *kapha* prakriti individuals Planomicrobium, Hyphomicrobium, Novosphingobium in the *pitta prakriti* individuals and Carnobacterium, Robiginitalea, Cetobacterium, Psychrobacter in the *vata* prakriti individuals. Similarly, the oral and skin microbiome also revealed presence of prakriti-specific differential abundance of diverse bacterial genera. *Prakriti*-specific presence of bacterial taxa was recorded and only 42% microbiome in the oral samples and 52% microbiome in the skin samples were shared. Bacteria known for preventing gut inflammation by digesting the resistant starch were abundant in the *pitta prakriti* individuals, who are more prone to develop gut-inflammation-related disorders [16].

Interdisciplinary studies of Ayurveda incorporating genetic, epigenetic, biochemical and microbiome factors can help us to discover novel paradigms in personalized medicine [17]. The predictive functional profiles of human gut microbiome across the Prakriti groups in both male and female datasets were significantly different. Some of the functional signatures were found to be gender specific. A higher abundance of microbes contributing potential pathogenic and stress tolerance related functions was found in *Kapha* dominant females and *Pitta* dominant males [18]. These correlations between *prakriti* and gut microbes go hand in hand with the similar concepts in Chinese and Korean systems of medicine also [19]. Use of *prakriti* based endo-

phenotypes to explain the variability amongst healthy individuals in gut microbial flora that have important consequences for an individual's health, disease and treatment; incorporating the developments in AyurGenomics has a great future in this regard [20 - 22].

3. DISCUSSION

Various factors related with immunity and immunological disorders, when compared with the concept of prakriti and practice of personalized medicine, revealed interesting categorization based upon *dosha* involvement and other holistic features. The consideration of real time combination of *doshas* and their inherent *gunas* opens up new methods to understand and interpret the changes occurring in the body with respect to different immunological disorders [7 -10]. Such an approach also makes the practice of Ayurveda more advanced and Evidence-based as the quintessence of both Ayurveda and modern medicine are preserved and utilized to their maximum potential for the benefit of mankind. Instead, the routine practice of going before some terms like '*balavardhana*' mentioned in the texts and using such medicines for prevention of emerging diseases cannot be claimed as evidence-based since it does not have scientific or ethical support. The concept and usage of vaccines can be seen as direct application of host-surrounding interaction; whereas when an immunomodulatory *Ayurvedic* formulation is used for preventive purpose, the host-surrounding interactions are indirect, triggering many pathways or synchronizing many active *guna* components as far as *Ayurvedic* principles are concerned. In both the conditions, the future belongs to the identification of personalized peculiarities [2-5] and the clinical decision making accordingly.

The role of gut microbiome in the disease causation, progression and management with respect to the immune responses and their intrinsic control has been highlighted and such relationships are in tandem with the prakriti-wise responses. Even the intrinsic inclination towards *kapha* in males and *pitta* in females can be seen depicted in the pathogenic response of males and females dominated with opposite *doshas* [18]. The concept of *prakriti* as envisaged by the ancient *Acharyas* were highly inclusive and were derived from the clinical observations made during that time. The technology of those times was not competent with todays and hence there is need to update the mode of practicing Ayurveda by making upliftment of clinical standards without damaging the core concepts. The concept of *prakriti* and *koshta* revalidated using the principles governing personalized immune responses inclusive of gut-brain axis can be the pathfinder in future researches [16 -21]. Also, the amalgamation of *Ayurvedic* concepts with more advanced and holistic approaches like AyurGenomics [22] can be considered as the way forward as far as modern-day practice and research in Ayurveda are concerned.

4. CONCLUSION

The concept of *prakriti*; when applied to immunity opens up new horizons for the preventive, curative and health promotive strategies of Ayurveda to be made into evidence based medical practice guidelines. The areas like gut microbiome and AyurGenomics offers enough assistance in such a challenge. The pandemic

situation demands this type of research works from the field of Ayurveda so that the entire world is benefited from the treasures of medical wisdom in Ayurveda.

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Conflict Of Interest – The authors declare no conflicts of interest.

Source of Support – The authors declare no source of support.

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