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Ayurvedic Prakriti and Precision Medicine: Integrating Traditional Wisdom with Modern Biology

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Abstract

The concept of precision medicine has evolved as a pioneering approach in modern healthcare. It focuses on a personalized diagnostic system and treatment which is based on individual factors such as genetic factors, lifestyle factors, and environmental factors. The ancient Indian system of Ayurveda is also based on personalized healthcare through the concept of 'Prakriti'. The phenomenon of Prakriti describes that every individual has a unique constitutional type which is determined by the balance of three doshas - Vata, Pitta, and Kapha. This chapter examines the relationship between ayurvedic prakriti and modern precision medicine. It highlights how the traditional ayurvedic system aligns with modern biology and medicine. Along with this, the chapter integrates traditional Ayurveda with modern systems of medicine. The chapter examines recent studies talking about Ayurgenomics. The chapter also addresses the opportunities and challenges involved in integrating them. The study bridges the Ayurveda and modern biology while contributing to holistic, sustainable, and individual centered healthcare systems.

Keywords: Ayurveda, Modern Biology, Prakriti, Precision Medicine, Genomics, Ayurgenomics, Personalized approach, Genetic, Healthcare, Individualize, Preventive Healthcare.

Introduction

Ayurveda is the oldest health care system in the world. India originated the ayurvedic system thousands of years ago which mainly focuses on balance between the body, mind and the spirit. Ayurveda emphasizes a healthy lifestyle and individualized care and works on the root cause of the problem. While modern medicines treat diseases after they appear. Prakriti is one of the most important concepts of Ayurveda which refers to the natural constitution and unique body type of an individual. According to this, every person has a balance of three biological components known as doshas- Vata, Pitta, and Kapha. This balance influences the

whole body and mind of an individual such as personality, nature, cognition ability, immunity, behaviour and sensitivity towards diseases (Sharma, 2016; Lad, 2002). Ayurveda focuses on the root cause of the problem and works on that while emphasizing the importance of a healthy and good lifestyle.

From the past few years, the modern health care system has started using a more personalized approach known as precision medicine. It aims to provide individual treatment according to the unique characteristics of everyone rather than giving the same treatment to every patient. It helps information related to genetics, environment, and lifestyle to understand why every individual responds differently to diseases and medicines (Collins & Varmus, 2015). For example, there is a particular drug which recovers some patients quickly, but some others may feel side effects and have no improvement at all. Precision medicine examines this problem by designing prescriptions according to the individual's biological profile. The principles of precision medicine are very similar to the traditional ayurvedic concept of prakriti. The traditional ayurvedic system always emphasized that every individual is different and therefore the required personalized therapy and prescription. The lifestyle, foodhabits, environment and genetics are different in everyone, so the treatment methods should also be different for each one. Ayurvedic scholars describe the importance of understanding individual uniqueness and constitution for maintaining health and preventing disease (Mukherjee et al., 2011).

The growing interest of researchers in integrating traditional medicine with modern science led to the emergence of an interdisciplinary phenomenon called Ayurgenomics. This concept combines the traditional ayurvedic systems with modern genomics and systems biology. The resources are exploring prakriti and how differences in prakriti types will lead to variations in genes, metabolism, immune system, and gut. Some studies find that individuals with different prakriti categories have different biological systems. This shows the significance of traditional ayurvedic concepts that are the basis for modern biology (Prasher et al., 2008; Govindaraj et al., 2015). The concept of prakriti becomes more important because it helps in explaining why individuals respond differently to food habits, stress management diseases, and environmental factors. There are differences in dominance between pitta, vata and Kapha. For example, a person who has excessive pitta may have a faster metabolism and a person who has excessive Kapha may have slower metabolism. Similarly, the person with excessive vata may feel variability in the nervous system and mental stress response. This concept emphasizes the importance of precision medicine which gives personalized and individual solutions.

Modern scientific evolution provides a robust tool to study and understand human variability. Scientists understand that health and disease are affected not only by genes, but also by lifestyle, environment, diet, and emotional condition. Ayurveda has also emphasized the factors therefore; both the branches support each other in

creating a more holistic and sustainable health care system (Rotti et al., 2014). The modern health care system focuses on disease treatment whereas Ayurveda gives equal importance to a healthy lifestyle and disease prevention. Personalized dietary advice, yoga, meditation, stress management, good diet, and herbal therapies are key components of Ayurveda. Integrating these traditional approaches with modern health Care technology will help in reducing the burden of chronic diseases such as diabetes hypertension cardiovascular disorders and cancer. The integration of these both has some opportunities as well as challenges.

The chapter explores the relationship between ayurvedic prakriti and precision medicine. It examines the traditional ayurvedic concepts, modern biological systems, and genomic studies. The study also focuses on the emerging field of Ayurgenomics while discussing the opportunities, challenges and the future prospect integrating traditional and modern approaches.

Literature Review

In recent years, the integration of Ayurveda and Precision medicines has become an important area of research. Many researchers have explored the relationship between prakriti and modern biological science such as genomics, metabolomics, and systems biology.

Chatterjee, B., & Pancholi, J. (2011), highlights that with effective integration of 'omics' Prakriti-based medicine can play a vital role in this changing scenario of global health wisdom as Ayurveda offers its modalities by way of ahara (diet), vihara (lifestyle), and aushadhi (medication), which are the three pillars of prakriti-based medicine making it a holistic science. Prakriti-based medicine and other traditional medicine systems have the potential to offer remedies to the challenging health issues like adverse drug reactions, drug withdrawals, and economic disparities among few. An integrative global approach could do wonders about health sciences benefiting a broad spectrum of patients.

Kaushal, S., & Rani, S. (2025) discusses Prakriti in Ayurvedic philosophy, methodologies for its assessment, scientific investigations linking Prakriti with genomics, potential clinical applications, and prospects in integrative healthcare. By correlating Prakriti types with genetic, transcriptomic, proteomic, and metabolomic markers, Ayurgenomics aims to refine predictive, preventive, and personalized therapeutic approaches.

Swathi, K., & Sundaravadivelu, S. (2023), finds that, at the systems level biology, Ayurveda and modern health research could provide a bridge to personalized treatment by considering their impacts in relation to a person's genetic composition (Prakriti). The Ayurvedic approaches focusing on 'omics' disciplines and gut microbiome are of immense significance that may allow us to scientifically validate the Ayurvedic medicines and ensure global acceptance. Ayurvedic modalities could be

better integrated with existing modern sciences, improving the scope of acceptability and applicability of traditional practices in healthcare management.

Prasher, B., Gibson, G., & Mukerji, M. (2016), The identification of genes and pathways involved in development and manifestation of variable states of health, disease and responsiveness to drugs within and across populations will be crucial to integration of personalized approaches in drug discovery and development. This would also simultaneously facilitate the development of biomarker-based drug delivery in a personalized manner. Trisutra, thus, is an operational framework for translational aspects of network medicine with systems understanding. It can also provide a theoretical framework for integrating basic understanding at the systems level with outcomes in health and disease and development of personalized prevention and therapeutics.

Concept of Ayurveda and Prakriti

▪ **Overview of Ayurveda**

Ayurveda is one of the oldest systems of medicine, which was developed in ancient times, in India more than 5000 years ago. It is an upveda of Atharva Veda. It is still popularly practiced in modern times. It is an alternative medicine system and heavily used in India and Nepal, whereas 80% of the population reported that they use Ayurveda. The term Ayurveda is taken from two Sanskrit words: Ayur (life), and Veda (knowledge or science). Hence, it is also called the science of life. The core objective of Ayurveda is to balance physical, mental, and spiritual health through a good lifestyle.

It believes that good health can be maintained by balancing the body, mind, senses, and environment. Ayurvedic treatments combine herbal medicines, healthy diet, yoga meditation, detoxification therapy, etc. It is based on universal principles and emphasizes the connection between mind and body. It also uses the law of nature and highlights the importance of daily routine, which is called Dinacharya, seasonal routine, which is called Ritucharya, proper digestion which is called Agni, and mental balance for maintaining overall health. The ayurvedic system considers that every individual is unique. Hence, the treatment and recommendations are personalized according to individual need and the person's body constitution which is known as prakriti.

▪ **Concept of Tridosha**

The concept of Ayurveda is based on the theory of Tridosha, which highlights that the human body has the combination of three biological energies or doshas:

- Vata
- Pitta
- Kapha

These energies are made from the five basic elements of nature which are earth, water, air, fire, and ether. Each energy has its specific physiological and psychological functions in the body.

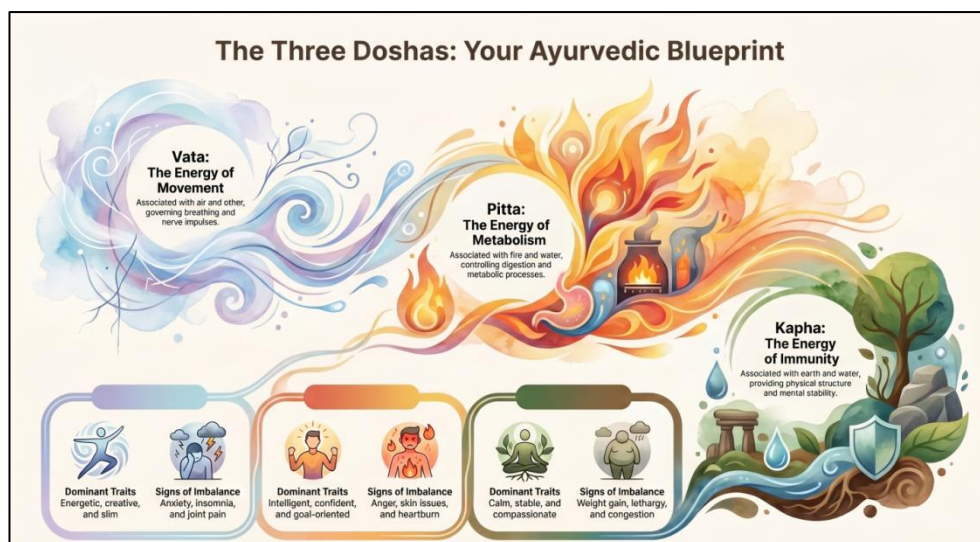


Figure 1: The Three Doshas

Source: Curated by the author using Notebook LM

▪ Vata Dosha

It is associated with the air and ether elements. It governs all body movement, including breathing circulation and nerve impulses. The individuals who have excessive or dominant Vata are mainly energetic, creative, active, and slim. We are talkative and imaginative. They also often experience dry skin and restlessness with a tendency to feel cold. They are quick thinkers but also prone to anxiety, fear, and racing thoughts. When this energy gets out of balance, it may lead to constipation, gas bloating, dry skin joint pain, weight loss anxiety, insomnia, and feeling of being scattered.

▪ Pitta Dosha

It is associated with fire and water elements. It controls digestion, metabolism, and energy transformation. The individuals who have dominant pitta are usually intelligent, confident, goal oriented, strong digestion, and have assertive personality. They are sharp minded light and intense with warm body temperature fear or sensitive skin and strong appetite. The imbalance of this energy can cause heat burn, anger fever, diarrhea, acne, and impatience.

▪ Kapha Dosha

It represents the element of earth and water. It controls the structure of lubrication of joint stability and immunity. The individuals who have excessive or dominant kapha are cool and stable. They are compassionate, bring love and peace,

have strength and patience. The imbalance of Kapha leads to obesity, laziness, slow metabolism, weight gain congestion, and stubbornness. They are strong sturdy build with large attractive eyes and thick hair having fair and smooth skin.

According to the Ayurveda, the health of individuals can be maintained by balancing these energies. Any imbalance can cause physical or mental disorders.

- **Meaning of Prakriti**

The term prakriti refers to the natural constitution or body type of an individual. It is unique that I am changing into an inherent genetic constitution. It is determined at the time of birth. It is influenced by the proportion of Vata, Pitta, and Kapha doshas. It helps in identifying illness susceptibility and guides personalized diet and lifestyle to maintain balance. The word prakriti is derived from Sanskrit which means original or primary creation. Ayurveda determines that every person has a unique prakriti which is unchanging and affects physical appearance, body structure, emotional behaviour, mental abilities, digestion, metabolism, immunity, disease susceptibility and response to medicine. It helps in understanding individual differences and provides personalized treatment.

- **Types of Prakriti**

The following diagram shows 7 different types of prakriti.

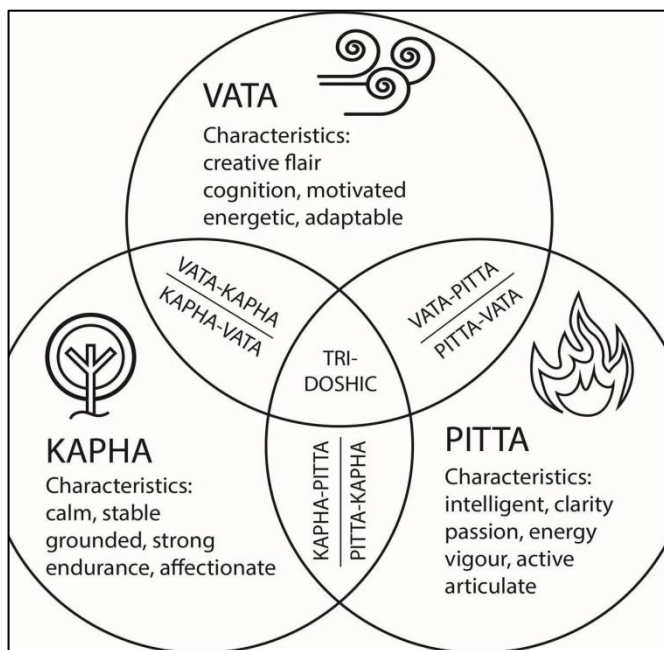


Figure 2: Types of Prakriti

Source: Naadikalp Ayurveda (2024)

The figure shows seven types of prakriti which are Vata, Pitta, Kapha, Vata-Pitta, Pitta-Kapha, Kapha-Vata, Tridoshik (Vata-Pitta-Kapha). Vata, Pitta, and Kapha are individually dominating energies, whereas, Vata-Pitta, Pitta-Kapha, Kapha-Vata are the combination of two energies, where the traits of both energies exist. Tridoshik energy has the combination of these three energies and has the characteristics of these three. Each type differs in different individuals and creates variations in genes, metabolism, immunity, body constitution, etc.

- **Importance of Prakriti**

Prakriti is a person's unique constitution which differs from person to person. Every person has his unique Prakriti type. Prakriti helps with ayurvedic diagnosis and treatment. By understanding once Prakriti helps in identifying the susceptibility of diseases. It guides a personalized health diet and daily routine to maintain balance. Using Prakriti, Ayurveda can recommend personalized diet plans, exercises, daily routine, herbal medicines, and stress management techniques.

The concept of Prakriti has a connection with the modern personalized or president medicine. Modern science studies in genetics metabolic and immunology are widely supporting the ayurvedic view of Prakriti that every individual is different, and they need different personalized prescriptions. Hence, understanding Prakriti is essential for integrating Ayurveda with the modern biological system.

Concept of Precision Medicines

- **Introduction to Precision Medicine**

In the modern health care system, Precision medicine is one of the revolutionary approaches that focuses on providing personalized treatment according to the individual's unique constitution. Unlike the traditional approach, precision medicine considers that every individual is unique and may respond differently to diseases and medicines. The goal of Precision medicine is to improve treatment effectiveness and reduce side effects while promoting preventive healthcare.

- **History of Precision Medicine**

There have been several resources conducted on the advancement of molecular biology, biotechnology, and genetics; the research led to the development of the concept of Precision medicine. In 2003 there was research 'Human genome project' conducted to provide detailed information about human genes and their functions. The research provides comprehensive guidelines towards how genetic differences impact disease susceptibility and treatment response.

- **Components of Precision Medicine**

There is one important component of precision medicine, which is Genomics. The concept of genomics includes a study of genes and genetic differences among individuals. It helps in identifying disease causing genes and predicting health risks. There is one another important component, which is pharmacogenomics, which talks

about how genetic differences affect an individual's response to medicines. This helps doctors in prescribing suitable medicine according to the patient's genetic profile. Proteomics and metabolomics are also important components of Precision medicine. Proteomics studies about proteins and their function in the body. Metabolomics evaluates metabolic processes and chemical changes. They help researchers understand disease mechanisms and individual biological differences.

- **Application of Precision Medicine**

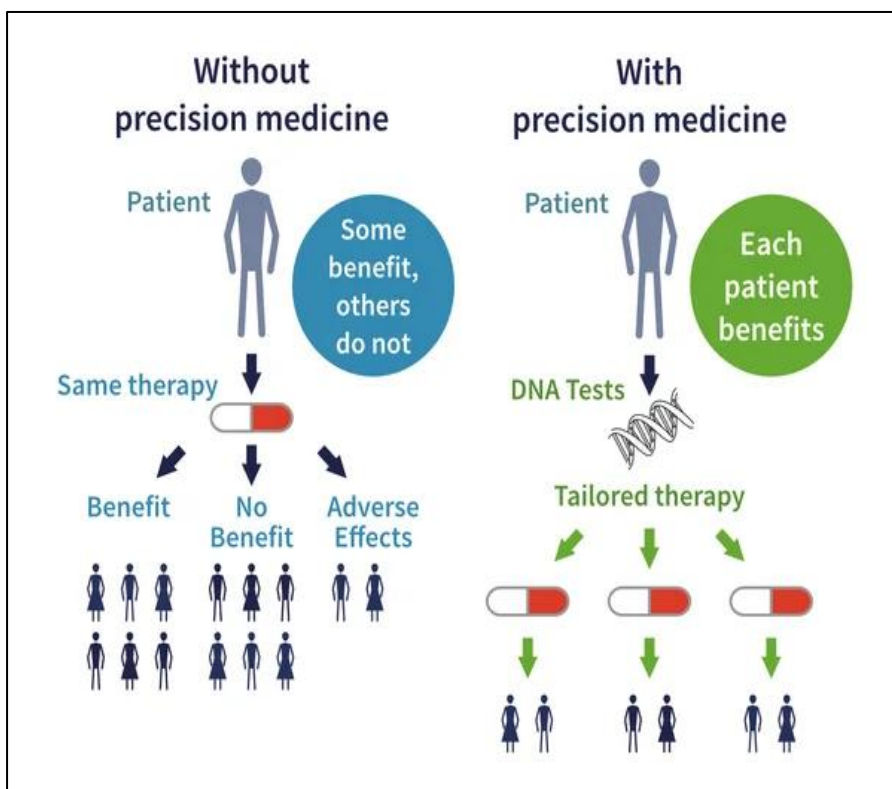


Figure 3: Benefits of Precision Medicines

Source: Khan A.F. (2020), Five Benefits of Precision Medicine

Precision medicine is heavily used in different medical fields such as cancer, cardiovascular diseases, diabetes, Alzheimer, etc. It uses environmental, genetic, and lifestyle related data for disease treatment and prevention. For cancer treatment, it uses oncology, which is the targeted cancer therapy to help identify specific genomic alterations in a patient's tumor. It also uses next generation sequencing NGS to identify rare genetic alterations that are responsible for diseases that are hard to diagnose and take years to diagnose. It also evaluates genetic risk and predicts the probability of developing diseases like diabetes, obesity, or cardiovascular diseases.

- **Ayurveda and Precision Medicine**

There are many similarities in ayurvedic treatment and precision medicine. They both work on similar concepts. Ayurveda has always considered individualized healthcare based on their unique body constitution, lifestyle diet and mental characteristics which is called Prakriti. Similarly Precision medicine is also based on this concept and emphasizes biological individuality. Precision medicine also offers personalized treatment. They both promote a similar phenomenon of healthy living and a good lifestyle.

- **Challenges with Precision Medicine**

There are many advantages of Precision medicine, but it also has several challenges. The main problem is the cost is high and the accessibility is limited. There are some ethical concerns also such as genetic privacy.

Overall Precision medicine is a modern concept which works on the concept of Ayurveda. It promotes personalized diagnosis prevention and treatment. The similarities between the Ayurveda and Precision medicine suggest an integrative approach towards traditional wisdom and modern biology. It has been creating a more holistic, effective, and sustainable health care system.

Similarities between Ayurvedic Prakriti and Precision Medicine

There are key similarities in Prakriti and Precision Medicine, that both focus on individualized and personalized healthcare. Both emphasize preventive healthcare and recognize biological differences among individuals.

- **Individualized Approach**

Precision medicine and Prakriti both focus on individualized healthcare. Ayurvedic Prakriti highlights that every person has a unique body constitution and a unique balance of Vata, Pitta, and Kapha. The balance of these three energies has a significant impact on a person's physical and mental makeup. Similarly Precision medicine studies genetics, environmental and lifestyle differences in individuals. Precision medicine provides personalized treatment. Both approaches Precision Medicine and Prakriti deny the concept 'one treatment for all'.

- **Preventive Healthcare**

Both highlight the importance of preventive healthcare. Ayurveda emphasizes a balanced diet and balanced lifestyle with exercise and daily routine. This helps in maintaining a balance of three doshas and preventing diseases. Through genetic testing and early disease identification, Precision medicine also focuses on preventive healthcare.

- **Biological Variability**

Both Ayurveda and Precision medicine considered biological variations or differences among individuals. Ayurveda signifies that different Prakriti types influence

metabolism, immunity behaviour and disease susceptibility. Similarly Precision medicine also considers genetic variations to understand differences in diseases impact and treatment response.

- **Personalized Diet and Lifestyle**

Ayurveda and Precision medicine both recommend personalized diet and lifestyle. Ayurveda on the basis of Prakriti type and different constitutions of the body suggest different foods, exercise patterns and routines. Precision medicine also supports personalized nutrition and lifestyle based on the person's genetic and metabolic differences.

- **Personalized Drug Response**

Both Ayurveda and Precision medicine acknowledge that every individual is different and responds differently to medicines and therapies. Ayurveda treats according to body constitution and disease conditions. Similarly Precision medicine uses pharmacogenomics to determine suitable drugs. It helps in improving treatment effectiveness and reduces side effects.

Biological Basis of Prakriti

The scientific research conducted on Prakriti has tried to identify the biological basis of Prakriti using genomics and molecular biology. Genomic studies genes and genetic differences among individuals. Researchers have identified that different Prakriti types may show differences in genes related to metabolism, immunity, inflammation, and stress response.

Studies find that there are differences in dominance of pitta, vata and Kapha. For example, a person who has excessive pitta may have a faster metabolism and a person who has excessive Kapha may have slower metabolism. Similarly, the person with excessive vata may feel variability in the nervous system and mental stress response. This concept emphasizes the importance of precision medicine which gives personalized and individual solutions.

The ayurvedic system considers that every individual is unique. Hence, the treatment and recommendations are personalized according to individual need and the person's body constitution which is known as prakriti. The individuals who have excessive or dominant Vata are mainly energetic, creative, active, and slim and often experience dry skin and restlessness with a tendency to feel cold. The individuals who have dominant pitta have strong digestion, intense with warm body temperature and strong appetite. The imbalance of Kapha leads to obesity, laziness, slow metabolism, weight gain congestion, and stubbornness. Modern scientific studies support these observations. Researchers have identified compactors that are also different in individuals such as metabolic rate, hormonal activity, body mass index and energy utilization. This research signifies the scientific relevance of Prakriti.

Ayurgenomics: Integrating Ayurveda and Modern Biology

• Concept of Ayurgenomics

The integration of Ayurveda and genomics suggests the development of a new interdisciplinary field known as Ayurgenomics. It combines ayurvedic concepts with modern genomics to understand the biological basis of Prakriti and individualize healthcare. The primary goal of Ayurgenomics is to understand how traditional ayurvedic classification corresponds to genetic and molecular differences. This field tries to create a scientific bridge between Ayurveda and modern biology.

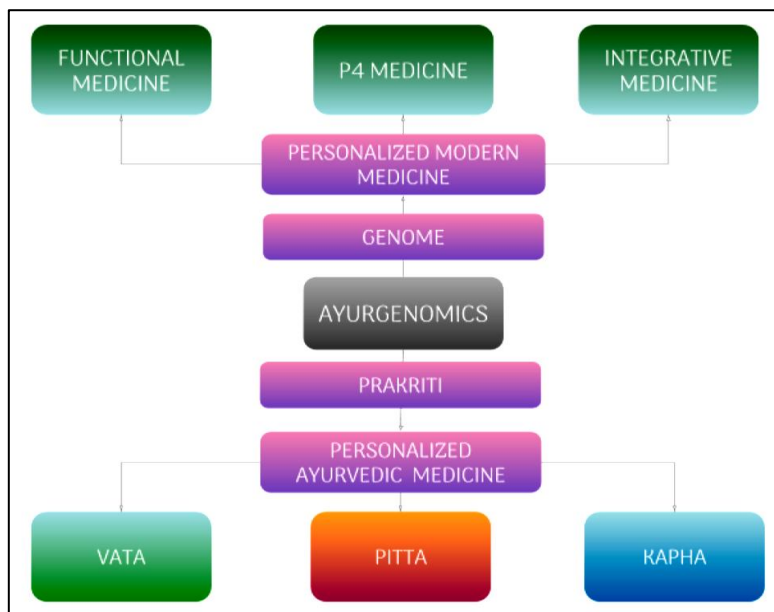


Figure 4: Ayurgenomics and its Relationship to Modern Medicine

Source: Wallace, R. K. (2020). Ayurgenomics and Modern Medicine

The figure is showing Ayurgenomics and its Relationship to Modern Medicine. Ayurveda and genomics can contribute to each other. Modern science can help Ayurveda as an evidence-based system of medicine, and Ayurveda can help modern medicine, particularly through its preventative approaches. This is especially true with P4 medicine, which is based on many of the same principles of Ayurveda. Having time-tested personalized preventative lifestyle recommendations would make it easy for everyone to participate in their own self-care.

• Importance of Ayurgenomics

Ayurgenomics may have a significant contribution to personalized healthcare. By understanding the relationship between Prakriti and Genes, researchers can identify disease susceptibility, treatment response, and preventive healthcare strategies in a more holistic and effective way. The following are the importance of Ayurgenomics.

- Ayurgenomics is working on the basis of Prakriti and genetic differentiations. By understanding the individual's unique body constitution, it helps in improving disease prediction according to the variation in genes, metabolism, and immunity.
- It helps in developing personalized therapies according to body type. Every individual has a unique Prakriti, which creates differences in disease susceptibility.
- Through understanding the individual differences and guiding personalized treatment according to the body constitution, it helps in reducing adverse drug reactions.
- Ayurvedic traditional concepts emphasize the importance of a healthy lifestyle, a good diet, and daily routine. Integrating it with modern biology helps in promoting preventive healthcare.
- Integration of Ayurveda and modern biology supports individual nutrition and lifestyle management according to the balance of energies - Vata, Pitta, and Kapha.

Application and Challenges

• Application in Healthcare

Ayurveda suggests diet and lifestyle according to the individual's unique pretty type. Vata individuals are advised to consume warm and nourishing food as their body has the dominance of air and ether, so they are prone to cold. Pitta individuals must take a cooling diet because their body releases excessive heat, so they must cool down their body. Kapha individuals are encouraged to follow light food and an active lifestyle. Modern Precision medicine also supports fertilized nutrition and lifestyle habits. Modern professionals suggest individualized diet plans, exercise, programs, and stress management techniques according to genetic and metabolic information. With this integration, we improve disease prevention and overall well-being.

Both Ayurveda and Precision medicine suggest preventive Healthcare. Ayurveda emphasizes a balanced diet and balanced lifestyle with exercise and daily routine. This helps in maintaining a balance of three doshas and preventing diseases. Through genetic testing and early disease identification, Precision medicine also focuses on preventive healthcare. Personalized healthcare approaches help identify disease risk before symptoms appear. Modern genomic technology helps in detecting diseases such as diabetes, cardiovascular disease, and cancer at the earliest. Similarly, Ayurveda focuses on maintaining a lifestyle to prevent disease. Integration of traditional Ayurvedic preventive principles with modern technology helps in reducing the burden of chronic diseases and improving lifestyle.

- **Challenges in Integration**

There are some challenges which disturb the integration of Ayurveda and modern technology. Lack of standardized methods for Prakriti assessment is one of the key challenges. Ayurvedic Prakriti is majorly determined by observation and clinical examination by practitioners. Different practitioners might classify the same individual differently. It leads to inconsistency in research findings. There is a need for scientific, standardized, and validated assessment tools. All the many research studies support the biological basis of Prakriti. While there is a lack of large-scale research. Most of the existing studies have tested small sample sizes and limited populations. There is a need for more interdisciplinary and evidence-based ways to research to validate the concept of Prakriti and establish a stronger foundation for modern medicine.

Conclusion

This chapter examines the relationship between ayurvedic prakriti and modern precision medicine. It highlights how the traditional ayurvedic system aligns with modern biology and medicine. Along with this, the chapter integrates traditional Ayurveda with modern systems of medicine. The chapter examines recent studies talking about Ayurgenomics. The principles of precision medicine are very similar to the traditional ayurvedic concept of prakriti. The traditional ayurvedic system always emphasized that every individual is different and therefore the required personalized therapy and prescription. The lifestyle, foodhabits, environment and genetics are different in everyone, so the treatment methods should also be different for each one. Ayurvedic scholars describe the importance of understanding individual uniqueness and constitution for maintaining health and preventing disease.

The growing interest of researchers in integrating traditional medicine with modern science led to the emergence of an interdisciplinary phenomenon called Ayurgenomics. This concept combines traditional ayurvedic systems with modern genomics and biology. The modern health care system focuses on disease treatment whereas Ayurveda gives equal importance to a healthy lifestyle and disease prevention. Personalized dietary advice, yoga, meditation, stress management, good diet, and herbal therapies are key components of Ayurveda. Integrating these traditional approaches with modern health Care technology will help in reducing the burden of chronic diseases such as diabetes hypertension cardiovascular disorders and cancer. The integration of these both has some opportunities as well as challenges. Ayurveda has also emphasized the factors therefore; both the branches support each other in creating a more holistic and sustainable health care system. The modern health care system focuses on disease treatment whereas Ayurveda gives equal importance to a healthy lifestyle and disease prevention.

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