AYURGENOMICS

Swati Dhande, Prachi Salunkhe
Pharmacology Department, Bhartividyaapeeth College of Pharmacy, C.B.D. Belapur, Navi Mumbai, India

ABSTRACT: - Ayurgenomics is the integration of the principles of Ayurveda with genomics. It presents a personalized approach in the predictive, preventive, and curative aspects of stratified medicine with molecular variability. It expresses the study of interindividual variability due to genetic variability in humans for assessing susceptibility, and establishing diagnosis and prognosis, mainly on the basis of the constitution type of a person's Prakriti. Prakriti is a fusion of the comparative proportion of three main things, i.e., Tridoshas, namely, Vata, Pitta, and Kapha. Prakriti is denominator in Ayurveda, which defines physical, physiological, and psychological traits of an individual and is the template for individualized diet, lifestyle counseling, and treatment. Prakriti is a key factor in determining individual’s susceptibility to disease as well as response to treatment include the recognition of both the extrinsic (environmental) and intrinsic factors (physiologic and genetic).

Ayurgenomics is an emerging field of interest where the therapeutic and lifestyle regime selection is made on the basis of clinical assessment of an individual maintaining one’s Prakriti. This Ayurveda-inspired concept of personalized medicine is a novel concept of genomics suitable for one’s genetic makeup with the help of Ayurveda. Here, we propose and present this novel concept of Ayurgenomics and its emerging areas of research, which may unfold future possibilities toward smart yet safe therapeutics.

Keywords: Ayurgenomics, Prakriti, Tridosha, Genomics, Correlation with genes.

I. INTRODUCTION

There has been with many life-style disorders global increase in prevalence of chronic and complex diseases. Due to slow development of new drugs medical need is remain unmet which leads to, many complications. Due to frequent side-effects many of the drugs being withdrawn. With respect to disease and individuals there is massive variability in success of treatment. Due to cancer and infectious diseases, resistance to drugs is a common problem and they required lifetime medication[1]. Most of the diseases are multi-factorial leading to complex interplay of a network of genes and non-genetic environmental factors. Therefore, systems’ based approach is evolved for comprehensive understanding of biology and move towards a network approach in medicine[2]-[5]. Genomics, drug discovery and development programs integrate understanding of disease biology in target identification and also identify responder populations[6]-[8].Thus, correlation between genes and medicine is core of Ayurgenomics therapy, which is personalized according to individual constitution (Prakriti).

II. DOCTORINE PRINCIPLES OF AYURVEDA

According to Ayurveda entire universe is composed of five elements: Vayu (Air), Jala (Water), Aakash (Space or ether), Prithvi (Earth) and Teja (Fire). These five elements form the three basic humors of human body in varying combinations. The three humors; Vata dosha, Pitta dosha and Kapha dosha are collectively called as “Tridoshas”. They control the basic physiological functions of the body along with five sub-doshas for each of the principal doshas. According to Ayurveda human body consists of Saptadhatus (seven tissues) which include Rasa (tissue fluids), Meda (fat and connective tissue), Rakta (blood), Asthi (bones), Majja (marrow), Mamsa (muscle), and Shukra (semen). They are three Malas (waste products) of the body i.e., Purisha (faces), Mutra (urine) and Sweda (sweat). Vata dosha regulate the cellular transport, electrolyte balance, elimination of waste products and its effect is increased by dryness. Pitta dosha maintains the body temperature, optic nerve coordination and hunger and thirst management. Heat conditions of the body exasperate Pitta. Kapha dosha is increased due to sweet and fatty food and it provides lubrication to the joints for proper functioning [9].

The catabolism of the body is maintained by Vata, metabolism by Pitta and anabolism by Kapha[9],[10]. The balance between the three doshas and other factors maintained the healthy state of health. Imbalance between the three causes a state of illness or disease. According to Ayurveda a perfect balance between the nature elements and the Tridoshas of the human body should be maintained for a healthy state of living by following the principles of divine wisdom[9]. The body is composed of seven types of tissues called as “Saptadhatus”. Seven tissues work in coordination with each for proper physiological functioning of the human body. The Raka Dhatu means the blood and it regulates the circulation of blood cells and provision of blood components to the body. The Mamsa Dhatu (Muscle tissue) provides supports in the form of skeletal muscles for the Meda Dhatu (adipose fat). The Asthi Dhatu comprises the bones of the body and the Majja Dhatu is made up of the bone marrow and fluids required for the oeleation of the bones and their functioning. The Shukra Dhatu maintained the functioning of the reproductive organs of the body. Apart from the Doshas and the Dhatus, the other two important factors considered in Ayurveda are the Tri Malas and Trayo Dosa Agni. Tri Malas are type waste products formed in the body due to metabolic and digestive functions of the body. They comprise of the Mutra (urine), Purisa (faeces), and Sveda (sweat). According to Ayurveda if the balance between Tridosha is not maintained, then waste products of the body are not effectively eliminated and these lead to complications like diarrhea, constipation, asthma, rheumatoid arthritis and such.
other complications. If the Mutra Mala (urine) is not removed from the body, it can lead to urinary tract infections, cystitis and gastric pain. If the Sveda Mala is not cleared from the body, it can lead to skin irritation problems, and improper fluid balance. According to Ayurveda the biological fire of the body for all the metabolic function is called as “Agni”. There are thirteen categories of Agni in a human body and the most important is the one responsible for digestive fire, called as Jatharagni. Jatharagni has a connection with Pitta and ultimately Vata of the body. If the digestive fire of the body is increased in the body by increase in acidity conditions, it leads to elevation in Pitta levels. Digestive fire is important in controlling the normal microflora, proper digestive functions and provision of energy to the entire body. Any disturbances in its balance, creates discomfort to the gastro-intestinal tract and results in pathological complications like ulcers, diarrhea and constipation[9]-[11].

Genomics is the study of the entirely of an organism’s genes. Genome means to an organism’s entire genetic make-up. It correlates all genes and their inter relationships. A genome is a complete set of DNAs within a single cell of an organism, and as such, focuses on the structure, function, evolution, and mapping of genomes. Genomics aims at the collective characterization and quantification of genes, which direct the production of proteins with the assistance of enzymes and messenger molecules. Genomics also involves the sequencing and analysis of genomes. In contrast to genetics, which refers to the study of individual genes and their roles in inheritance.

Genomics uses high throughput DNA sequencing and bioinformatics to assemble, and analyze the function and structure of entire genomes. Genomics is the sub discipline of genetics devoted to the mapping, sequencing, functional analysis of genomics. It is the study of all genes present in an organism. It involves the study of all genes at the DNA, m RNA and proteome level as well as the cellular or tissue levels. The discovery of DNA structure is one of the greatest accomplishments of the microscopic studies of the cells. This has developed the science of genomics; which is the study of genes and their effects on our body. On observation it was found that there is genetic similarity with humans(99.9% similar), with chimps (98%), with fish (85%), with flies (36%), with plants (>15%)[12]. Genetic understanding has brought us to the modern stratified and personalized medicine. The 0.01% dis-similarity among humans is made of single nucleotide polymorphisms (SNP – pronounced “snips”). SNP’s represents single unit variations within the shared genetic code of people. The effect of these single unit differences or SNP’s trickle up from DNA level to result in variations in the structure of proteins, function and activity of the proteins, composition of cells, activity of the whole organ, and so on; ultimately impacting health of the individual. Knowledge of genomics has directed us towards seeking its application in health-care. There are many applications of genomics that are being developed at this time. Some use genomic information to advance our understanding of constitutional deficiencies, genetic disease, genetic modification of foods, development of vaccines, etc. To date, there are almost 1000 human disease genes identified. Most of these are single genes that lead to a specific disease. This knowledge is very useful to understand the disease abnormality and the source of abnormality. For example, the disease called phenylketonuria (PKU) results from a genetic mutation that causes build-up of amino acid phenylalanine. The simple treatment for this disease is to modify the diet to limit the intake of the amino acid phenylalanine[13]. Compared to these single gene diseases, many chronic diseases like heart disease, diabetes, Alzheimer’s, multiple sclerosis, etc. involve multiple gene malfunctions. These malfunctions are believed to be due to interaction between the individual genetic information, dietary intake, and the individual’s living environment.

IV. AYURGENOMICS

The therapeutic principles of Ayurveda focus on prakriti and Tridosha, these principles explain that every individual has his unique constitution called as prakriti. Prakriti determines the response of each individual to medications, environmental conditions and dietary factors[9]. ‘Ayurgenomics’ is recently introduced research field, bridges gap between genomics and Ayurveda. It serves as an aid in understanding of inter-individual differences in responses to therapies in various diseases. Ayurveda and omics together can lay a foundation to achieve efficient and cost-effective strategies for prevention, diagnosis, outcome prediction and treatment of
diseases[14]. Identification of genetic variations underlying metabolic variability in prakriti may provide newer approach to pharmacogenomics. The primary challenge of Ayurgenomics establish the correlation between DNA and prakriti. Prakriti-based medicine can help in changing the current scenario of global health wisdom through effective integration of ‘omics’.

Ayurgenomics presents a personalized approach in the predictive, preventive, and curative aspects of stratified medicine with molecular variability, which embodies the study of interindividual variability due to genetic variability in humans for assessing susceptibility, and establishing diagnosis and prognosis, mainly on the basis of the constitution type of a person’s Prakriti[15]-[17]. Ayurveda offers its modalities by way of ahara (diet), vihara (lifestyle) and aushadhi (medication), which constitute the three pillars of prakriti-based medicine. Ayurgenomics plays a vital role in explaining how current drugs can be used more effectively by targeting them on patients of particular prakriti. Identification of genetic variations underlying metabolic variability in prakriti may provide newer approach to pharmacogenomics. The primary challenge of Ayurgenomics establish the correlation between DNA and prakriti. Prakriti-based medicine can help in changing the current scenario of global health wisdom through effective integration of ‘omics’. Disease prevention and promotion of health towards longevity with a better quality of life, the base of PM, could be achieved through these attributes of Ayurveda. The current limitation of clinical heterogeneity in molecular genetic analysis of complex traits can be overcome by prakriti.

V. PRAKRITI

Ayurgenomics focus on prakriti and Tridoshas, and these principles explain that every individual has his unique constitution called as prakriti. Prakriti determines the characteristic response of each individual to medications, environmental conditions and dietary factors [9].

Prakriti is the basic clinical denominator in Ayurveda, which defines physical, physiological, and psychological traits of an individual and is the template for individualized diet, lifestyle counseling, and treatment. Prakriti or constitution of the individual is the sum expression of the individual’s genome. This individual genomic signature is expressed by the individual’s symptoms, likes and dislikes, mental and emotional tendencies, as well as physiological measures like lab/blood tests [16].

The three Doshas, i.e., Vata, Pitta, and Kapha, work in harmony to create a state of good health in an individual while also regulating each other. An individual’s basic constitution, Prakriti is described to be a consequence of the relative proportion of Vata, Pitta, and Kapha. These proportions of Tridoshas are not only genetically determined (Shukra Shonita) but also influenced by the environment during development, especially maternal diet and lifestyle [18].

Prakriti is fixed at the time of birth and remains invariant throughout the individual’s lifespan. Ethnicity (Jatiprasakta), familial characteristics (Kulanupatini), and geo-climatic regions (Deshanupatini) are also implicated in influencing phenotypic variability through their effect on Tridoshas and Prakriti. In an individual, the Tridoshas work in conjunction and maintain homeostasis throughout the lifetime of the individual[18].

Vata contributes to manifestation of shape, cell division, signalling, movement, cognition, etc., and also regulates the activities of Kapha and Pitta. Kapha is responsible for growth and maintenance of structure, storage, and stability. Pitta is primarily responsible for metabolism, thermoregulation, energy homeostasis, pigmentation, vision, and host surveillance.

Phenotypic diversity in a population, according to Ayurveda, is a consequence of a continuum of relative proportions of Doshas. It is categorized into seven possible constitutional types, namely, Vataja (V), Pittaja(P), Kaphaja (K), Vata-Pitta (VP), Pitta-Kaphaja (PK), Vata-Kaphaja (VK), and Vata-Pitta-Kaphaja (VPK). Among these, the first three, which have predominance of one of the three doshas, are considered as extremes, exhibiting readily recognizable phenotypes and are more predisposed to specific diseases. The assessment of Prakriti is achieved through querying the different attributes of an individual such as physiology, anatomy, and mental aptitude[19]. A disease according to Ayurveda is a perturbation of Vata, Pitta and Kapha an individual from his or her homeostatic state. Food or medicines including lifestyle factors have been described to enhance or reduce a particular dosha, and therefore an individual specific treatment is provided. Thus, the beauty of Ayurveda lies in the fact that an individual, a disease condition, drug, diet as well as environment are described in terms of doshic components and appropriate customizations are provided to balance these states. Ayurveda describes not only the functional attributes of Vata, Pitta, and Kapha but also their contribution on different scales in seven different constitutions[18].

VI. AYURGENOMICS A WAY: FORWARD

A. Correlation with HLA Gene

The foundations of Ayurveda for the prevention, diagnosis, and treatment of diseases are based on the concept of three Doshas: Vata (V), Pitta (P), and Kapha (K). Human leucocyte antigen (HLA) gene polymorphism in the human population, classified by the three major Prakriti types. Many chronic diseases such as type I diabetes, ankylosing spondylitis, and rheumatoid arthritis are known to have an immunogenetic basis. Susceptibility and resistance to such diseases is primarily associated with genes encoding peptide-presenting HLA molecules. HLA genes exhibit a high degree of polymorphism in various ethnic groups and have many alternative forms of genes, known in genetics as alleles. The association between HLA alleles and disease is usually
quantified by typing HLA alleles expressed by individuals with or without disease. The relative risk of incurring such diseases is estimated by comparing the frequency of these alleles in healthy and ill populations. Overlap among prakriti types is confirmed by the equal distribution of some alleles in two or more prakriti classes[19].

E. Microbiota axis

Dietary factors interact with the host gut microflora to modulate gut motility, nutrient absorption, and immune system[24]. Differences in digestive capacity, immune differences, and dietary habits among Prakriti types has opened up interesting possibilities to characterize Prakriti-specific microbiomes through metagenomics analysis.

F. Rheumatoid Arthritis (RA)

In general, Rheumatoid Arthritis (RA) is expressed as inflammation and pain of joints. So, over-activation of inflammatory pathways is expected in all RA patients. However, Ayurveda predicts that underlying characteristics between Vata dominant and Pitta dominant individuals are likely very different. The results confirm constitutional based individuality. A patient with Vata constitution and greater expression of inflammatory markers, IL-1β and TNF-α, on the contrary, RA patients with Pitta constitution had greater expression of oxidative stress markers, SOD3 and PON1. Kapha constitution did not favour either inflammatory or oxidative pathways. Altogether, Ayurgenomics demonstrated capacity to clarify underlying mechanisms of destructive process of RA[24].

VII. CONCLUSION

The discovery of the sciences of genomics and epigenetics is beginning to demonstrate the relationships between the outer world, the inner world, and all the interactions between the two worlds. These sciences have brought us to the threshold of individualized holistic medicine. But, we are still figuring out their language and applications in healthcare. Vedic scientists recognized that we are all part and product of our environment. We are all in a relationship with the Earth, plants, animals, birds, bugs and the germs, as much as with people. Ayurgenomics is based on an ancient and proven framework of the observational medicine that respects all these relationships and our place in nature. The language and foundation of Ayurgenomics is well established. It is being successfully used in Ayurvedic clinics across the world. This ancient language and wisdom are helping to fill the gaps that appear in the modern scientific disciplines. Studies have demonstrated the application of Ayurgenomics for predicting genomic variation among healthy individuals. It has also been validated to demonstrate individualized differences among people with the same disease.

REFERENCES


