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Genetics and Epigenetics Conceptual Study in View of Ayurveda

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Abstract

The current generation is concerned about lifestyle disorders and measures to maintain a healthy lifestyle. Individuals' physical appearance, mental qualities, and illness creation are all influenced by genetic elements, according to modern science. Most diseases have a hereditary component, according to human genome studies. Genetic mutations can happen at random or as a result of an external cause. Genetic illnesses can be hereditary or not. Ayurveda is a historic Indian medical practice that dates back to the Vedic era. However, while the current knowledge of human genetics owes largely to Gregor Mendel's work, a number of Indian writings have discussed the scientific concept of genetics before him. Although the name "genetics" was not used in Ayurveda, the concept of genetics is mentioned in several places throughout the traditional texts of Ayurveda, particularly in the Samhitas. The focus of the review is on Ayurveda's therapeutic applications of genetics and to better understand Ayurvedic mechanisms through epigenetics.

Keywords: Beej beejbhag, Beejbhagavayav, Epigenetics, Genetics
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Introduction

Ayurveda is a historic Indian medical practice that dates back to the Vedic era. Ayurveda denotes "Science of Life" in English. Ayus is the Greek word for life, while Veda is the Sanskrit word for knowledge or science. It is a holistic approach to wellness and homeostasis that takes into account the body, mind, emotions, spirit, and surroundings.[1,2] Ayurvedic expertise is methodically chronicled in the form of compendia known as "Samhita." In sanskrit, the Charaka Samhita, Susruta Samhita, and Ashtanga Hridaya are written. Ayurveda uses natural principles to discern and describe many body kinds or constitutions, each with its own set of features and responses to the environment, as well as disease predispositions and drug reactions. It advocates principles for maintaining balance and preventing sickness that are fundamentally based.[3] Personalized medicine and systems biology are hot topics in medical research right now, and going beyond reductionism in the scientific method to model and study complex biological systems can help.

Every drop of human blood, according to Spencer Wells, contains a history book written in the language of genes. Many apparent characteristics, such as height, eye color, complexion, and disease susceptibility, were known to run in families, but the chromosomal, DNA structure, and genes or combinations of genes that underpin these observable characteristics remained unknown. Multiple molecules engaged in the tissue at the time can be characterized using sophisticated informatics derived from highly technical genomes, proteomics, and metabolomics studies of human tissue samples.[4] These data sets, on the other hand, may be static and fail to account for the complexities of intra-tissue interactions and dynamic environmental responses. Disease and pathology must be understood in terms of ecological homeostasis, or how healthy individual/environment interactions are in a dynamic equilibrium, and how homeostatic system abnormalities produce seeds for disease.[5]

Ayurveda may provide a universal perspective on life, health, and even cell and molecular biology. Molecular and molecular genetic mechanisms can be elucidated using Ayurvedic paradigms. The science of epigenetics may be one method to comprehend Ayurveda. Epigenetic factors are thought to play a significant influence in determining long-term health. In time and across generations, epigenetics mediates molecular nuclear reactions to the environment. Epigenetic processes may explain the effects of Ayurvedic herbs and lifestyle guidelines. As a result, the focus of this review is on Ayurveda's medicinal applications of genetics, as well as using epigenetics to better understand Ayurvedic mechanisms.

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Beeja, Beejabhaga, and Beejabhagaavayava

Beeja is a set of functional units that represent the structures and features of all angapratyanga (parts and subparts) of an individual. This functional unit is in charge of the transformation of features from parents to offspring, as well as the growth and development of the offspring.[6] Each species has its own distinct characteristics. As a result, humans and other animals such as elephants and horses have distinct traits.[7] It is critical for a species' individuality to be maintained by having a specific number of chromosomes.

As a result, each species' chromosomal number is distinct, as is the chromosome number of its zygote. Everything in

the universe, according to Vaisheshika thinkers, is made up of panchamahabhootha paramanu, which is responsible for the development of diverse angapratyanga. The production of diverse angapratyanga is caused by the samyogaa (union) of the panchamahabhoota with the help of vayu, karma, and swabhava.[8]

Variation reveals an individual's individuality, while heredity shows how these traits are passed down from generation to generation. Variation aids in a person's adaptation to current circumstances in a certain period of time and is passed down through the generations. As a result, two children from the same parents share both similarities and differences in personality. This is due to three factors: Beeja, beejabhaga, and beejabhagavayava, all of which contain all of the functional units that represent the structures and characteristics of all of the anapratyanga in the body. The attribute of a parent is conveyed to their kids through these. Anuvamsaki is the name given to this transmission system.

Genetic Transmission of Traits Theories

The Caraka Samhitā explains about specificity of the transmission of genetic information within a given species. Only a human being can be born from a human being. Cakrapanidatta, the famous commentator on the Caraka Samhit, points out that the human reproductive element (manusyabijam – the seed from which the human being is born) is made up of many seed parts (beejabhaga) representing the various organs and parts of the body in his commentary on the Caraka Samhita (pratyanga). A replica human person with the same set of parts and organs is born from this seed and its pieces. He goes on to say that the beejabhaga, or component of the seed, has more subdivisions called beejabhagavayava in another context. If the uterus is represented by the part of the seed, then the component of the part of the seed symbolises sections of the uterus. In this way, another life with the general characteristics of humans is born from a human being.[9]

Although there is no indication that there was an awareness of the molecular foundation of genetics as known to science today, it is appealing to equate the divisions of human genetic material into the beeja, beejabhaga, and beejabhagavayava with the Chromosome, DNA, and Gene described in current genetics. Beeja refers to both male and female reproductive materials, namely, Sukra – sperm and Sonita – menstrual blood. In some circumstances, the word beeja can refer to any of them.[9]

Cakrapani describes the beejabhaga as the sections of the beeja that are responsible for the development of various bodily parts and organs. Cakrapani defines the beejabhagavayava as components of the beejabhaga that are responsible for the development of certain sections of a specific organ, such as the uterus.

Transmission of Genetic Diseases from Ayurvedic Texts

Many disorders in Ayurveda have been linked to genetic factors. Juvenile diabetes, also known as diabetes at birth, has been linked to genetic abnormalities in the past (beejadosa). Cakrapani clarifies in his remark that diabetes at birth occurs when the dosa that causes diabetes to appear affects the beeja or genetic material.[9] The same notion is used to explain genetic transmission in the context of skin diseases. The verse reveals that even though the father is afflicted with the disease, if the seed is unaffected, the children will not be afflicted. On the other hand, if the sickness has harmed the father's seed, the disease will be passed down to the child.

The rectum or guda is stated to be made up of three rings termed valis in Ayurveda. In Ayurveda, hemorrhoids are also regarded a genetically transmitted disease. In other words, disease susceptibility can be inherited. Cakrapani adds that the person develops hemorrhoids when the section of the seed (beejabhaga) responsible for the development of the gudavals or rings of the rectum is damaged. The affliction (Upatapa) of the component of the seed that is responsible for the development of a part of an organ has thus been traced as the cause of disease genetic transmission. Furthermore, it has been stated that a defect induced by docas in the seed or part of the seed representing a certain organ will result in the organ's total failure.

The Susrutasamhita explains the genetics of birth disorders such as as blindness, deafness, and dumbness. The concern is posed as to how a child can be conceived and born with abnormalities despite the seed being damaged. The damage to the seed (Beeja) is partial and affects only a portion of the seed, according to the answer (Beejavayava). Only the organs associated to that part of the seed are affected when a part of the seed is compromised. A person is born blind when the component of the seed responsible for eye development is damaged.[10]

In a similar vein, Dalhana explains the genetic basis for the establishment of an individual's docic constitution in his commentary on Susruta Samhita. When the section of the seed that governs the expression of dosas is harmed, the individual displays the dominance of that particular dosa, while the other expressions are unaffected.[10] According to Caraka, a person with mixed sexual traits is produced when the parts of the seed responsible for the development of the male and female reproductive elements are both afflicted.[9]

A barren female is born when the part of the seed (beejabhaga) representing the uterus is afflicted in the female reproductive element (sonita). When the component of the seed that represents the uterus (Beejabhagavayava) is disturbed, the lady gives birth to stillborn children. When the portions of the seed responsible for the manifestation of feminine features are harmed, a transgender woman is born with the external characteristics of a woman who is missing her female genitalia.[9] When the component of the seed (Beejabhaga) representing the male reproductive element is afflicted, a sterile male is born. A male whose progeny does not live is born when the component of the part of the seed (Beejabhagavayava) representing the male reproductive element is diseased. When the components of the seed (Beejabhaga) responsible for the expression of masculine features are harmed, a transgender man is born with the exterior characteristics of a man lacking male genitalia.[9]

Epigenetics and Ayurveda

DNA mutations come in a variety of configurations. Some modifications only affect a single nucleotide, which is a unit of DNA. One nucleotide will be replaced by another, or it will be lost entirely. Rearrangements, deletions, and duplication of lengthy portions of DNA are examples of other DNA changes. Epigenetic

modifications are persistent and heritable changes in gene expression and cellular function that occurs without affecting the original DNA sequence. The dynamic link between the environment and gene expression is described by epigenetics. Epigenetics is the study of how gene expression is controlled at the chromosomal level, as well as what part of the DNA is available for reading (transcription) to generate proteins (translation). External alterations to the DNA that switch genes "on" or "off" are referred to as epigenetics. These changes do not affect the DNA sequence, but they do affect gene expression. DNA methylation and the interaction of DNA and proteins known as histones are responsible for epigenetic alterations. The addition of a methyl group to the cytosine nucleotides in the DNA strand is referred to as DNA methylation. DNA methylation patterns are passed down from parents to children and are essential for human growth and development, as they allow a single cell to develop into a complex multicellular organism with several tissues and organs.[4,5]

Epigenetics is the study of virtually everything that happens to the expressed genes in the phenotype during different stages of life, such as prenatal, postnatal, childhood, lifetime social experiences, diet, nutrition, toxicity exposure, lifestyle, behavior, stress, and environment, and how these factors influence gene expression.[11-16] Environmental variables, ageing, diet and nutrition, toxins, and the use of certain pharmaceuticals are all linked to vata, pitta, and kapha imbalances. According to Ayurveda, Rajaswalacharya and Garbhinicharya ensure that favorable conditions are created, reducing the influence of epigenetic variables. Each individual's phenotypic expression vary depending, on which section of the DNA (genes) is being expressed, as a result of previous exposures, experiences, and impressions, information of which is embedded in the genes in the form of epigenetic alterations.

The phenotypic is ever-changing and dynamic. Lifestyle, behavior, digestion, diet, and nutrition, as well as Stress and Environment, all have an impact on the phenotypic. If the appropriate rules of life and living are followed, these variables will keep the expressed phenotype in excellent health. Changes in health and disease can occur if the appropriate rules are not followed.

Personalized Medicine in Ayurveda

In Ayurved, it is a traditional approach using the genetic information to understand, to prevent or to treat the more specifically some chronic diseases, with respect to Prakriti. Personal genomic information containing types of Prakriti can be used to determine health risks, treatment responses, and take preventive measures to improve one's health. Personalized medicine also allows for the avoidance of risks based on genetic information, family history, and environmental factors. The three basic constitutional types mentioned in Ayurvedic literature each have their own set of hypothesized metabolic activities, with Kapha denoting slow metabolism, Pitta denoting quick metabolism, and Vata denoting variable metabolism. Poor metabolizers have higher drug plasma concentrations for longer periods of time, resulting in drug retention in the body. Intermediate metabolizers kept medicines in the body for a longer amount of time. Extensive metabolizing keeps medications in the body for the shortest time possible, resulting in higher plasma concentrations for a shorter duration.[17]

Ayurveda is known for its Prakriti-specific treatment, which includes medicine, diet, and lifestyle. Individuals with Vatala, Pittala, and Slesmala morbid states are more prone to Vatika, Paittika, and Slesmaja disease, correspondingly. If a Vatala type of individual resorts to something like a Vata aggravators. The Vatika dosa is instantly inflamed. In the case of the remaining two Dosas, this does not occur. As a result, the treatment of individuals or patients with various types of Prakriti must be identified.[18]

Conclusion

Much before modern geneticists, Ayurvedic researchers had a basic understanding of genetics. Ayurvedic remedies have the ability to influence life's genetic and phenotypic expression. How epigenetic pathways are affected in target tissues or immune cells should be part of Ayurvedic modalities and herbal preparations research. In the process of examining Ayurvedic treatments, potential novel paths of cellular, and molecular functioning may be uncovered. Ayurveda is a comprehensive, holistic, and customized method of health care that addresses both hereditary and phenotypic components of life. A rigorous and systemized approach to scientific validation on the subject are required to provide acceptable scientific proof on the genetics outlined in Ayurved.

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