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Epigenetics and Ayurveda: Literature study

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Abstract

This study is done to view Literature of Epigenetics in ayurveda point of view, as Epigenetics shows environment factors and other external factors contributing in etiology of disease.

Modern study on the term epigenetics is already done but to find it's ayurvedic relevance this type of literature study is needed. A literature study can be helpful to prove the relation between Epigenetics and its description in ayurveda.

By connecting these two we could fulfil society's need of better diagnosis of disease and it's causing factors at early stage of disease.

Epigenetic factors are part of Ayurvedic diet, lifestyle, day to day activities etc hence this study will throw importance of ayurveda in today's era

Keywords: Epigenetics; Ayurveda; Genetics; Literature; Lifestyle changes

1. Introduction

Epigenetics is a term coined by Conrad Waddington in 1940s. Epigenetics- epi meaning above genes, something which is above genes. Epigenetics is emerging science it has gained its importance in today's era. Also Arthur Riggs and Colleagues defined epigenetics as "the study of mitotically and/ or meiotically heritable changes in gene function that cannot be explained by changes in DNA sequence." In total Epigenetics meaning study of heritable changes in gene function that occurs independently of alteration to primary DNA sequence. There occurs gene methylation and change in chromatin structure. Epigenetics is a concept which can help us summarize the implications of genes having a memory. Considering an example of our grandparents there lifestyle there eating habits, what they could see, what they could hear can affect there grandchild this can be explained by Epigenetics. Genotype give rise to phenotype without changing the DNA sequence. In Ayurveda there is a concept of deha prakruti (psychophysiological constitution) corresponds to phenotype, janma prakruti corresponding to genotype. Ayurveda covers the whole lifespan, including prenatal, postnatal, childhood, and lifetime social experiences. It has instructions for daily and seasonal routines, which include the time to go to bed, the time to get up, the time to eat, the time to exercise, the time to study, the time to meditate, and the time for other activities. It also has recommendations for proper behavior, and how to deal with peers, individuals who are younger, and those who are older, in general and in different circumstances.

Hence to compare these both and leading to conclusion becomes important.

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2. Material and Method

Ayurvedic literature from samhita, modern literature from articles, books, google scholar and other search engines.

2.1. Review of literature

Epigenetics has the potential to explain various biological phenomena that have heretofore defined complete explication. This describes the various types of endogenous human developmental milestones such as birth, puberty, and menopause, as well as the diverse exogenous environmental factors that influence human health, in a chronological epigenetic context. We see that the entire course of human life from peri-conception to death and chronologically note all of the potential internal timepoints and external factors that influence the human epigenome. Epigenome is something above the genome study.

2.2. Mechanisms underlying epigenetics

As explained, every cell in the organism carries an identical genome, however, despite the stability of these instructions, the terminal phenotype within an organism is not fixed and deviation is caused by gene expression changes in response to environmental cues.

Epigenetics take place in following manner-

- DNA methylation,
- histone modification
- RNA silencing

2.3. DNA methylation

The methylome is the genomic distribution of methylated DNA sequence present in a cell and is capable of under-going modification with respect to the environment or the developmental stage. DNA methylation involves the covalent addition of a methyl group at position 5 of the pyrimidine ring of cytosine that is represented as 5-methyl C or CMe.

2.4. Histone modification

Histones are the core protein components of chromatin complexes, and they provide the structural backbone around which DNA wraps at regular intervals generating chromatin. The nucleosome represents the first level of chromatin organization and is composed of two of each of histones H2A, H2B, H3, and H4, assembled in an octameric core with DNA tightly wrapped around the octamer-. Histones regulate DNA packaging with immense influence on the degree of chromatin compaction, influencing transcriptional activity as well as transcriptional silencing.

2.5. RNA silencing

RNA-associated silencing is a type of post-transcriptional gene modification during which the expression of one or more genes is downregulated or suppressed by small non-coding stretches of RNA, sometimes called microRNAs (miRNA) and small inter-fering RNAs (siRNA). Although microRNAs only represent 1% of the genome they have been estimated to target 30% of genes-. These RNAs can act as switches and modulators, exerting extensive influence within the cell and beyond. These RNAs fine-tune the gene expression as they act as specific modulators based on cell-type specificity of the organism during development as well as pathological conditions.

3. Epigenetics across the human lifespan

The major epige-netic milestones in the human lifespan, integrated chronologically with the various environmental factors that affect the human epigenome and the interaction with these milestones.

In differentiated cells, signals fine-tune cell functions through changes in gene expression across the lifespan. Epigenome gives us freedom to experience new things in life, new changes seen throughout our lives. Epigenetics has a role to play in embryogenesis and after birth every effect of body is noted and the changes are done or suppressed by Epigenetics.

In Ayurvedic terms, the Janma Prakriti or birth Prakriti does not change and is the foundation of the psychophysiological constitution or Deha Prakriti (body Prakriti), which changes and is dynamic. The genotype corresponds to Ayurvedic birth Prakriti and the phenotype corresponds to Ayurvedic Deha Prakriti. Disturbance in the Deha Prakriti is known as

Vikriti in Ayurveda, which correlates with disorders and diseases in the current medical system. Manohar has described the presence of vivid accounts in the ancient Ayurvedic texts about the inheritance of diseases and the genetic basis for the transmission of such diseases from parents to progeny. The Ayurvedic understanding that Deha Prakriti has a genetic basis has been corroborated by current scientific research. For example, the phosphoglucomutase 1 (PGM1) gene has been correlated with Pitta Prakriti (one of the Prakriti types). Research on human leucocyte antigen (HLA) gene polymorphism showed a reasonable correlation between HLA type and Prakriti type.

According to Ayurveda, there are three governing principles of the physiology, known as doshas. The three doshas are Vata, Pitta, and Kapha. Vata governs motion, flow, and communication, including the flow of the blood, the beating of the heart, the transmission of nerve impulses, etc. Pitta regulates digestion, metabolism, and transformation. Kapha governs the structure of the body. These three doshas make up the psychophysiological constitution. In the process of DNA expression, the two strands of DNA separate and the knowledge present in the strand is replicated and comes out as messenger ribonucleic acid (mRNA). The knowledge carried in mRNA is then utilized by transfer RNA (tRNA), which lines up the designated amino acids to form the specified protein. It is proposed that mRNA, tRNA, and protein have features and properties that represent Vata, Pitta, and Kapha at the cellular level. Messenger RNA corresponds with Vata (transmission of information), tRNA corresponds with Pitta (transformation), and protein corresponds with Kapha (structure)

4. Epigenetics and Ayurveda

Epigenetics refers to the external modification of DNA that turns genes on and off, affecting gene expression. This occurs without changes in the DNA sequence. This process produces a change in the phenotype without a change in the genotype. In brief, DNA methylation, histone modification, chromatin remodeling, and micro RNA (miRNA) are involved in modifying DNA expression. DNA methylation is a process in which methyl groups are added to the DNA molecule. This process changes the activity of the DNA. Histones are proteins that DNA wraps around in the nucleus, forming chromatin.

This process condenses DNA into a more compact form and protects the DNA structure and sequence. Chromatin can condense or it can relax, thereby changing the expression of DNA. Histones play a major role in the condensation and relaxation of chromatin and thereby affect DNA expression. Chromatin remodeling refers to the rearrangement of chromatin from a condensed state to a transcriptionally accessible state, allowing transcription factors or other DNA-binding proteins to access DNA and control gene expression. MicroRNA refers to small non-coding RNA molecules that “silence” or stop the functioning of mRNA. It is estimated that 90% of life is controlled by epigenetics—the changes in gene expression brought about by what one does in one’s life. Whatever is done to the phenotype or Ayurvedic psychophysiological constitution (Deha Prakriti) is relayed back to the DNA, which changes its expression accordingly. Thus, the process of epigenetics represents action (Karma—the Sanskrit word for “action”) on the level of the cells.

5. Discussion

In conclusion, it is proposed that the genotype and phenotype correspond to Ayurvedic Janma (birth) Prakriti and Deha (body) Prakriti (psychophysiological constitution), respectively. Imbalance or disorder of the Deha Prakriti is known as Vikriti and corresponds to disorders and diseases in the current medical system. It is proposed that mRNA, tRNA, and protein have features and properties that represent the three governing principles of the physiology or Ayurvedic doshas—Vata, Pitta, and Kapha—at the cellular level. There are four major factors that affect the phenotype or Deha Prakriti in a positive or negative way, depending on what one does in one’s life. These four factors are lifestyle and behavior, diet and digestion, stress, and environmental factors. These factors produce changes in the phenotype or Deha Prakriti that affect the expression of the genotype, the Janma (birth) Prakriti, without changing its basic structure. Ayurveda addresses these four major factors of life and thereby affects both the phenotype and genotype in a positive way through the process of epigenetics.

Thus, it is proposed that epigenetics is an important mechanism of Ayurveda. This correlation and understanding of the process of healing and health maintenance will improve the understanding and communication between Ayurveda and the current medical system, and lead to better integration of both sciences in the management of optimal health. In addition, research on Ayurvedic modalities affecting gene expression will further increase the correlation and understanding between the current medical system and Ayurveda.

6. Conclusion

Everything that is surrounding us can be included in Epigenetics. Ayurveda has mentioned Dincharya, Ritucharya and Ratricharya for making human lives better on day to day basis. Every charya- meaning way of living. It is proved by the study that diet and digestion has its role to be played in healthy living is true but also, in the same manner anxiety, depression, stress –psychological health has equal importance. In order to live healthy life both Ayurveda and modern science in compliance to be used.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] Anway, M. D., Cupp, A. S., Uzumcu, M., and Skinner, M. K. (2005). Epigenetic transgenerational actions of endocrine disruptors and male fertility . *Science* 308, 1466–1469. doi: 10.1126/science.1108190
- [2] Arai, Y., Ohgane, J., Yagi, S., Ito, R., Iwasaki, Y., Saito, K., et al. (2011). Epigenetic assessment of environmental chemicals detected in maternal peripheral and cord blood samples. *J. Reprod. Dev.* 57, 507–517. doi: 10.1262/jrd.11-034A
- [3] Arnheim, N., and Calabrese, P. (2009). Understanding what determines the frequency and pattern of human germline mutations. *Nat. Rev. Genet.* 10, 478–488. doi: 10.1038/nrg2529
- [4] Baer, C., Claus, R., and Plass, C. (2013). Genome-wide epigenetic regulation of miRNAs in cancer. *Cancer Res.* 73, 473–477. doi: 10.1158/0008-5472.CAN-12-3731
- [5] Bagot, C. N., Troy, P. J., and Taylor, H. S. (2000). Alteration of maternal Hoxa10 expression by in vivo gene transfection affects implantation. *Gene Ther.* 7, 1378–1384. doi: 10.1038/sj.gt.3301245
- [6] Vanhees K, Vonhögen IG, van Schooten FJ, Godschalk RW. You are what you eat, and so are your children: the impact of micronutrients on the epigenetic programming of offspring. *Cell Mol Life Sci.* 2014; 71:271–85.
- [7] Robertson SA. Seminal plasma and male factor signalling in the female reproductive tract. *Cell Tissue Res.* 2005; 322:43–52. [PubMed] [Google Scholar]
- [8] Sharma H. Leaky Gut syndrome, dysbiosis, Ama, free radicals, and natural antioxidants. *AYU* 2009; 30:88-105 19. Sumantran VN, Tillu G. Cancer, inflammation, and insights from Ayurveda. *Evid Based Complement Alternat Med* 2012; 2012:306346.
- [9] Singh, S., and Li, S. S. (2012). Epigenetic effects of environmental chemicals bisphenol a and phthalates. *Int. J. Mol. Sci.* 13, 10143–10153. doi: 10.3390/ijms130810143