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GENETICS IN AYURVEDA: A REVIEW

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ABSTRACT

Ayurveda is an age-old science of life. Apart from being old, we can also say that it is complex with the surplus knowledge of its texts given by our *Acharyas Charaka, Sushruta* and *Vagbhatta* whose meaning and interpretations we humans are exploring till date. Today's genetic science has achieved great heights but I can assertively say that somewhere its foundations have already been laid in *Ayurveda*. Although the technical terms like genome, genetics, hereditary etc does not feature in *Ayurveda* but the theme is vibrantly mentioned in various *samhitas*. *Acharya Charaka* has described genetics in three genetic units in form of *beeja* (germinal cell), *beejabhaaga* (chromosome) and *beejabhaagavyava* (gene). *Acharya Sushruta* has classified hereditary and congenital types of diseases that occurs due to defect in genes like *sthaulya, klaibya, prameha, arsha, kushta* etc. Various other concepts like *atulyagotriya*, fertilization, sex determination, *punsavana karma* are measures to prevent birth of physically and mentally handicapped child, concept of *prakriti* and its clinical applications, all come under the shed of topic-Genetics. The review focuses on the literary concepts of genetics described in *Ayurveda* and their interpretation.

KEYWORDS: *Ayurveda*, Genome, Genetics, *Prakriti*, *Acharya Charaka*, *Acharya Sushruta*.

INTRODUCTION

Genetics is a branch of biology concerned with the study of genes, genetic variation and heredity in organisms which came into existence at least 2500 B.C. Modern genetics started with Mendel's studies of the nature of inheritance in plants. Genes are how living organisms inherit features or traits from their ancestors; for example, children usually look like their parents because they have inherited their parent's genes. *Ayurveda* may not have used the modern terms or may not have implicated the pure and literal aspect in much detail but has taken up its applied aspects quite scientifically for example; theory of evolution, role of *panchamahabhuta* in formation of different organs in human body, manifestation of different genetically determined congenital disorders.

Concept of *Garbha (*zygote) and Sex determination

शुक्र शोणित जीव संयोगे तु खलु कुक्षि गते गर्भ संज्ञा भवति ।।च शा 4/5

Term *garbha* is denoted when union of *shukra* (sperm), *shonita* (ovum) and *jeeva* (soul) takes place *in kukshi* (uterus). These two basic factors required in fertilization and development of humans i.e *sukra* and *shonita* resemble to that of sperm and ovum in modern medical science. In the similar contexts, *Acharya Charaka* also stated that dominance of *shukra (*sperm) leads to male child and dominance of *shonita* leads to procreation of female child. This can be corelated with the modern concept of presence of y chromosome leading to male child while its absence resulting in female progeny. There is also a reference of *yamala garbha* which can be compared to monozygotic twins in modern which says that when *beeja* (zygote) has been divided into two by internal *vayu mahabhuta*, two *jeeva* (soul) enter into these *beeja* present in uterus resulting in formation of *yamala garbha* (twins).

Concept of Inheritance

Ayurveda has described the *shad-bhavas* (factors) from which the fetus inherits different entities like *matrija* and *pitrija bhavas* are responsible for organogenesis (formation of different organs), *atmaja bhava* responsible for life span, induces functions of psyche, sense and motor organ, prana etc. The *satmyaja bhavas* are responsible for maintaining health, cheerfulness of sensory and motor function, also maintains the qualities and purity of *shukra* (sperm). From the *rasaja bhaavas*, fetus acquires growth and development and *utsaha* (optimum function), from the *satvaja bhavas*, the fetus acquires its fear, anger, memory, seriousness, softness and its nature.

Concept of Genome (Ayurgenomics)

One of the most difficult challenges today is understanding of the ancient concepts of *Ayurveda* in

terms of modern medicine. The most successful attempts in this field is Ayurgenomics which integrates concepts in *Ayurveda* such as *prakriti* with modern genetics research. Concept of *prakriti* in *Ayurveda* and its relationship with genomics was hypothesized over a decade ago. It is a genetically determined entity categorizing the population into several subgroups based on phenotypic characters like appearance, temperament and habits. As it is genetically determined, it is laid at the very time of conception during the conjugation of *sukranu* and *andanu* in the presence of *beeja* and *kshetra*. This concept is claimed to be very useful in predicting an individual's susceptibility to a particular disease, its prognosis and selection of therapy. *Vata* is the *dosha* involved in transportation in the body, from transfer of molecules to that of nervous impulses. It arises from elements of ether and air. *Pitta* is the *dosha* that governs the process of digestion, as well as all metabolic pathways inside each cell. It has the elements fire and water in it. *Kapha* is the *dosha* that governs structure and cohesion in the body. It is an expression of earth and water. Each individual is born with a particular combination and permutation of these three *doshas* which is assigns as individual's *prakriti*. A number of studies have correlated *prakriti* with specific genetic and physiological measures. In 2005, a study was conducted where correlation between HLA type and *prakriti* type was observed. In 2008, a comprehensive study was done correlating biochemical and genome wide expression levels in subjects from three main *prakriti* groups where many distinct differences in regulation of genes in each of main *prakriti* groups was found. Similarly, in 2010, 2012, 2015 many studies were conducted. 2010 study showed that within *kapha* types there was a down-regulation of CYP2C19 genotypes, a family of genes that is involved in detoxification and metabolism of certain drugs and up regulation in *pitta* types.

Concept of Chromosomal abnormalities

Sex chromosomal abnormality is one of the congenital anomalies having strong genetic susceptibility. *Acharya Charaka* has described a few like *Dwireta*, where individual possess both testicular and ovarian tissues comparing them to true hermaphrodites having 46XX karyotype. One is *Pavanendriya* where there is an unexplained involuntary infertility and azoospermia relating it to Klinefelter's syndrome with karyotype 47, XXY. *Varta* or *Vatik Shanda* where testis is absent but male phenotype is complete correlating it with male pseudo-hermaphrodism having karyotype 46, XY, *Trina-putrika* where there is female genital ambiguity with normal phenotype corelating with female pseudo hermaphroditism with karyotype 46, XX. *Narashanda* having normal male karyotype (XY) but phenotype is of a normal female, vice-a-versa is *Narishanda* where karyotype is female (XX) but external genitalia is virilized resembling normal male. There are some other terms also, like *samskarvahi, vakri, irsyabhirati, vatikshanda* that can be corelated with anaphrodisia, hypospadia, mixoscopia, eviration respectively.

Concept of *Beeja, Beejbhaga* and *Beejbhagavyava*

Ayurveda has described three components as *beeja*, *beejbhaga* and *beejbhagavyava* which can be interpreted as the closest resemblance to modern units of genetics. *Beeja* is referred to as the smallest entity or unit of fertilization called as *shukra* (sperm) and *shonita* (ovum) which is responsible for conception. The birth of twins occurs when *vayu* divides this *beeja* into two, male is born when *shukra* predominant beeja is there and likewise separation of *shonita* predominant *beeja* by *vayu* leads to female. The *beejabhaga* are the components of *beeja* only which pass genetic traits from one generation to other leading to resemblance of characters in off-springs. It is also responsible for development of body tissues and organs. So, defect in *beeja* and *beejabhaga* will ultimately result in defective body organ formation. *Beejabhaagavayava* (gene) is the subtle stage of *beejbhaga* which carry hereditary characters in generation. Disease such as *kushtha* may impart in *bijabhag avyava* and hence may cause same disease in the offspring. The births of *bandhya* female child occur when *beejbhaga* in ovum is vitiated, similarly when the part of *beeja* responsible for sperm production in fetus is vitiated, a sterile male offspring may occur. Vitiation of *beejbhagavyava* may lead to a *putipraja* while similar case in sperm may lead to *putipraj*.

Concept of Congenital and Genetic disorders (*Adibala* and *Janmabalapravitta*)

Acharya Sushruta has given seven-fold of diseases which come under ***trividha dukkha***. *Adibala pravritta* diseases as he mentioned are hereditary in nature and genetically determined depending on the nature of *shukra* of the father and *artava* of the mother. *Acharya Charaka* has named this as *kulaja rogas* means the one which runs in family. *Acharya Vagbhatta* has called it as *kulodbhava* and *Sahaja* meaning present since birth. *Acharya Bhela* has called them as *prakriti bhavadoshas; kushta, arsha, rajyakshma, madhumeha, shvitra* and *apasmara* all have been described under this category. *Acharya Charaka* has given *beejabhaga uptapta* as the main reason for *kulajroga*. They have also described *janmabala pravritta rogas* which come under congenital disorders. *Vata* aggravation or non-fulfillment of longings of pregnant women makes the fetus *kubja* (dwarfa), *kuni* (having a crooked or withered arm or arm without hand or finger), *pangu* (lame, crippled lower limbs), *muka* (dumb) or *minmin* (nasal voice). Further they are of 2 types *raskrita, dauhridapcharkrita*. There is also a reference of fetus resembling snake, scorpion, pumpkin and other abnormal shapes due to the sins by mother in previous life or exposure in pre- conceptional or pregnancy period. In *Madhav Nidan*, *shukragata kushtha* has been described giving idea about its inheritance from one progeny to other. *Acharya Charaka* has described *suchimukhi yonivyapada* in female newborns known to be due to maternal defects. *Shandi yoni roga*, because of the genetic defect in mother, the *vata* in the fetus destroys its developing reproductive organs in the womb

of the mother. In later life, this woman develops aversion for men and breasts do not grow. *Acharya Sushruta* has also mentioned *Sahaja klaibya* as one of the types where the child is impotent by birth due to defect in genes. *Acharya Vagbhata* has described *khanda-aushtha* which is congenital cleft lip. Vititation of *vata* results in splitting of lips into two parts in utero. It may be due to tetra logical reason but mainly it is x-linked or autosomal dominant and runs in family too (hereditary cause). Reference of *khandatalu* (cleft palate) has also been given either present solo or with cleft lip due to similar reasons. Concept of marriage in *atulyagotriya* has also been given to discourage consanguineous marriage to prevent genetic disorders. Reference of *Dusti* in *matruja beejabhagavayava* resulting *dushti* in *gudavali* causing *sahaj arsha* is also given.

CONCLUSION

Descriptions available in our classical texts shows that *Ayurveda* has a rich source of knowledge regarding today's genetic concepts. But still there is a lot of scope for research in this field. In order to create acceptable scientific evidence on genetics described in *Ayurveda*, a scientific and systemized approach is needed for scientific validation on the subject. As they are considered as *asadhya* only we can prevent them is through proper genetic counseling. Ayurgenomic's approach to integrate the epigenetics with *prakriti* of people is a great initiative in this field. Many pilot studies and researches are being conducted to establish the applied aspects of relative genetics mentioned in our texts and to find out its clinical utility which will certainly prove to be useful to the mankind in the forthcoming time.

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