

## Historical Notes

## Medical Genetics in Classical Ayurvedic Texts: A Critical Review

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## Abstract

In the early classical texts of Ayurveda, there are descriptions regarding the genetic basis of diseases. The *Caraka Samhitā* explains that the human body in its entirety is represented in a seed form in the male and female reproductive elements. The complete blue print is called a *bīja*, which is composed of many components called the *bījabhāgas*. The *bījabhāgas* are further made up of smaller parts called as the *bījabhāga avayavas*. Each organ of the body is formed from specific *bījabhāgas* or *bījabhāga avayavas*. Such *bījabhāgas* or *bījabhāga avayavas* are called as *janakas* (progenitors) of specific structures of the body and when defective can cause partial or total defects or absence of specific organs or parts of the body. Birth defects have been listed and described in the early Ayurvedic texts attributing defects of *bījabhāgas* and *bījabhāga avayavas* as the underlying cause. Blindness by birth and sexual anomalies are examples. Additionally, specific diseases have also been said to originate from defects in the components and component parts of the reproductive elements. Examples are skin diseases and haemorrhoids. The texts also differentiate between diseases originating from familial inheritance and other causes that affect the *bījabhāgas*. Congenital diseases are also listed and described separately. This paper is an attempt to critically review the descriptions related to medical genetics in the early classical texts of Ayurveda and to contextualise these speculations in the backdrop of the historical evolution of medical knowledge in the world.

**Key words:** Ayurveda, Medical Genetics.

## 1. INTRODUCTION

Medical genetics refers to the application of genetics in medical care. The diagnosis, management and counselling of patients with genetic disorders comes within the purview of medical genetics. The origin of medical genetics in modern times is traced to the period marking the culmination of the second world war around 1945.

Scholars are of the opinion that Aristotle could be considered to have discovered the principle implied in DNA, referring to the principle of the “unmoved mover” that “acts, creates form and development and is not unchanged in the process” (Vinci, Tom; Robert 2005). It was Aristotle who emphasized the

importance of blood in heredity. He believed that the blood supplied the genetic material for development of all parts of the human body. Even today, we use the phrase “it is in the blood” to mean that certain traits are inherited from the parents. Speculations on heredity seems to have been recorded by the ancient Greeks as early as eighth to fourth century BC. Ancient Greek thinkers observed the inheritance of physical traits in humans. The concept of “Pangenesis” proposed by Hippocrates (460-377 BC) believes that people inherit acquired characteristics. He proposed that the entire organs of the parents contributed invisible seeds that were transmitted during conception to create the characters and features of the child (Manoli & Fryssira, 2015).

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The classical Ayurvedic texts dating several centuries before the Common Era have also proposed interesting observations and concepts about genetic disorders, which have not been adequately examined or acknowledged as contributions to the history of medical ideas. There are vivid accounts in ancient text books of Ayurveda like the *Caraka Saṃhitā* about inheritance of diseases and the genetic basis for the transmission of such diseases from parents to the progeny. In this paper, we will examine some of these descriptions.

## 2. DESCRIPTIONS OF GENETIC DISORDERS IN CLASSICAL AYURVEDIC TEXTS

Classical Ayurvedic texts mention about genetic disorders with various terms like *sahajarogas*, *kulajarogas* or *ādibalapravr̥ttarogas*. Diseases like haemorrhoids, certain skin diseases and diabetes are some of the diseases that have been considered to be inherited in Ayurveda. *Sahajaroga* means that which is present from birth (Agniveśa et al. 2013), *Kulajaroga* means that which runs in families (Agniveśa et al. 2013) and *ādibalapravr̥ttaroga* (Dhanvantari et al. 2008) means that which arises from defects in the male and female reproductive elements. There are also many anomalies at birth which have been traced to have genetic origins in Ayurveda. The ancient physicians put forth theories to explain the phenomenon of genetically inherited diseases. Eight disorders by birth are also described in the Ayurvedic texts - giant and dwarf, obese and thin, hirsute and hairless, albinic and melanoid. Ayurvedic texts have also discussed various sexual anomalies at birth including impotency and maldevelopment of sexual organs.

## 3. THEORIES REGARDING THE GENETIC TRANSMISSION OF TRAITS

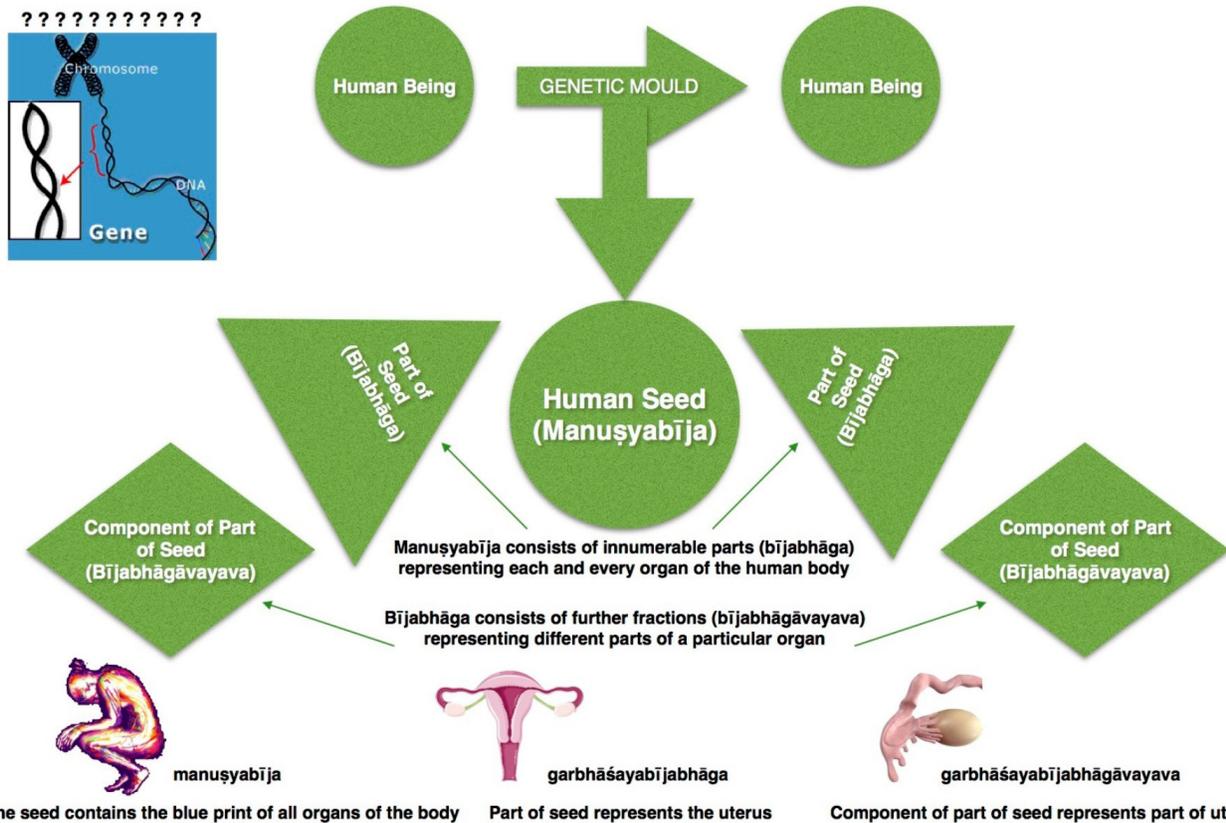
We find some explanations in the *Caraka Saṃhitā* about specificity of the transmission of

genetic information within a given species. From a human being, only a human being can be born. Just like molten metals poured into a mould takes the shape of a mould, even so various factors coalesce together to produce a human being from another human being. How does a human being bring forth another identical human being? In his commentary on the *Caraka Saṃhitā*, the famous commentator *Cakrapāṇidatta* points out that the human reproductive element (*manuṣyabījam* - lit. the seed from which the human being is born) is made up of many seed parts (*bījabhāga*) representing the various organs and parts of the body (*pratyaṅga*). From this seed and its parts is born a replica human being with the same set of parts and organs. He further clarifies in another context that the *bījabhāga* or part of the seed has further subdivisions called *bījabhāgāvayava*. For example, if the part of the seed (*bījabhāga*) represents the uterus, then the component of the part of the seed (*bījabhāgāvayava*) represents parts of the uterus. In this manner, from a human being, another life exhibiting the general features of human beings is born (Agniveśa et al. 2013). It is very tempting to compare the divisions of the human genetic material into the *bīja*, *bījabhāga* and *bījabhāgāvayava* with the Chromosome, DNA and Gene described in modern genetics although there is no evidence to indicate that there was an understanding of the molecular basis of genetics as known to science today.

The schematic representation of the process of transmission of genetic diseases in Ayurveda is illustrated in Fig. 1.

By the term *bīja* both the male and female reproductive elements viz., *Śukra* - semen and *Śoṇita* - menstrual blood are taken. In certain contexts, the word *bīja* means either one of them (Agniveśa et al. 2013)<sup>1</sup>.

<sup>1</sup> *Cakrapāṇi* defines these terms very clearly in his commentary. He says that *bīja* means *śukra* and *śoṇita* - *bījaḥ śukraśoṇite*. This means that both the male and female reproductive elements contribute to the genetic makeup of the individual. In another context, he defines *bīja* as just *śukra* - *bīje iti śukre*.



**Fig. 1** Schematic Representation of the Genetic Transmission of Traits in Human Beings as described in classical texts of Ayurveda

The *bījabhāga* is defined by *Cakrapāṇi* as those parts of the *bīja* that are responsible for the development of specific parts and organs of the body<sup>2</sup> (Agniveśa et al. 2013).

The *bījabhāgāvayava* has been defined by *Cakrapāṇi* as components of the *bījabhāga* that are responsible for the development of specific parts of a particular organ, for example the uterus<sup>3</sup> (Agniveśa et al. 2013).

#### 4. THE TRANSMISSION OF GENETIC DISEASES AS DESCRIBED IN THE AYURVEDIC TEXTS

In Ayurveda, many diseases have been described to have genetic origins. In the

description of diabetes, juvenile diabetes or diabetes at birth has been attributed to arise from genetic defects (*bījadoṣa*)<sup>4</sup>. In his commentary, *Cakrapāṇi* clarifies that diabetes at birth happens when the *doṣa* that is responsible for the manifestation of diabetes damages the *bīja* or genetic material<sup>5</sup> (Agniveśa et al. 2013). In the context of skin diseases the same theory is put forth to explain genetic transmission. The text explains that even if the father is affected by the disease, if the seed (*bīja*) has not been affected, then the progeny will not acquire the disease. On the other hand, if the seed (*bīja*) of the father has been affected by the disease, then the child will also inherit the disease. In Ayurveda, the rectum

<sup>2</sup> *bījasyāṅgapratyaṅganirvartako bhāgo bījabhāgaḥ*

<sup>3</sup> *garbhāśayabījabhāgāvayava ityatrāpi pūrvavadvyākhyeyam, avayavaśabdena garbhāśayasyārtavasya caikadeśa ihocyate*

<sup>4</sup> *jātaḥ pramehī madhumehino vā na sādhya uktaḥ sa hi bījadoṣāt*

<sup>5</sup> *bījadoṣāditi, pramehāraṁbhakadoṣaducmabījajātapramehitvāt*

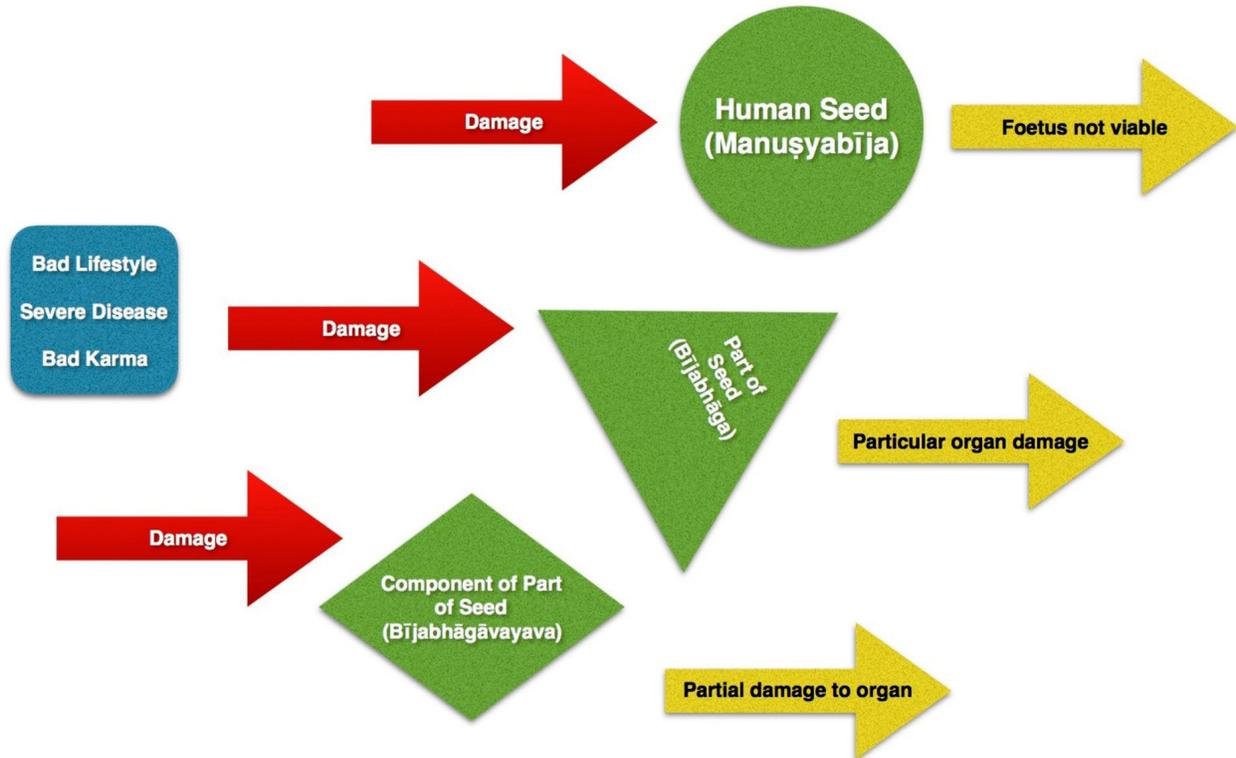


Fig. 2. Schematic Representation of causation of genetic diseases of Ayurveda

or *guda* is said to be made up of three rings called *valīs*. Haemorrhoids is considered to be also a genetically transmitted disease in Ayurveda. In other words, people can inherit susceptibility to the disease. *Cakrapāṇi* explains that this happens when the part of the seed (*bījabhāga*) that is responsible for the development of the *gudavalīs* or rings of the rectum, then the person develops haemorrhoids (Agniveśa et al. 2013).

Thus, the reason for genetic transmission of disease has been traced to the affliction (*upatāpa*) of the part of the seed (*bījabhāga*) that is responsible for the development of the part of an organ<sup>6</sup>. Further it has been stated that defect caused by *docas* in the seed or part of the seed representing a particular organ will result in the complete damage to that particular organ<sup>7</sup>

(Agniveśa et al. 2013). The schematic representation of the genetic transmission of diseases is illustrated in Fig. 2.

In the *Suśrutasaṃhitā*, the genetics of conditions like blindness, dumbness and deafness at birth is explained. The question is raised as to how conception takes place and the child is born with defects in spite of the damage to the seed (*bīja*). The answer is that the damage to the seed (*bījāvayava*) is partial and affects on a part of the seed (*bījāvayava*). When a part of the seed is affected, only the organs related to that part is afflicted<sup>8</sup> (Dhanvantari et al. 2008).

When the part of the seed responsible for the development of the eyes is affected, a person is born blind<sup>9</sup> (Dhanvantari et al. 2008).

<sup>6</sup> *yasya yasya hyaṅgāvayavasya bīje bījabhāga upatāpto bhavati tasya tasya hyaṅgāvayavasya vikṛtirupajāyate*

<sup>7</sup> *yasya yasya hyavayavasya bīje bījabhāge vā doṣāḥ prakopamāpadyante tam tamavayavaṃ vikṛtirāviśati*

<sup>8</sup> *tasmādyā evāṅśo bījasya duṣṭo bhavati tatkāryasyaiva garbhāvayavasya vikṛtirabhāvo vā bhavati*

<sup>9</sup> *yathā - dr̥ṣṭyārambhake bījabhāge duṣṭe jātyandho garbho bhavati na tu garbha eva na bhavati*

In a similar way, the genetic basis for the formation of the docic constitution of an individual has also been explained by *Dalhana* in his commentary on *Suśruta Saṃhitā*. When the part of the seed that determines the expression of *doṣas* get afflicted, the dominance of that particular *doṣa* is seen in the individual and the other expressions are not affected<sup>10</sup> (Dhanvantari et al. 2008).

A person with mixed sexual characteristics is born according to Caraka when the part of the seed responsible for the development of the male and female reproductive elements are equally afflicted<sup>11</sup> (Agniveśa et al. 2013).

When the part of the seed (*bījabhāga*) representing the uterus is afflicted in the female reproductive element (*śoṇita*), then a barren woman is born. When the component of the part of the seed (*bījabhāgāvayava*) representing the uterus is affected, then the woman gives birth to still borns. When the parts of the seed (*bījabhāga*) responsible for the expression of feminine features are affected then a transgender woman is born who exhibits external characteristics of a woman devoid of the female genitalia (Agniveśa et al. 2013).

In a similar way, a sterile male is born when the part of the seed (*bījabhāga*) representing the male reproductive element is afflicted. When the component of the part of the seed (*bījabhāgāvayava*) representing the male reproductive element is afflicted a male whose progeny does not live is born. When the parts of the seed (*bījabhāga*) responsible for the expression of masculine characters are affected then a transgender man is born who exhibits external characteristics of a man devoid of male genitalia (Agniveśa et al. 2013).

## 5. DISCUSSION AND CONCLUSION

Genetic transmission of diseases was understood and described in the early stages of the evolutionary history of Ayurveda. The *Caraka Saṃhitā* and the *Suśruta Saṃhitā*, the earliest texts of Ayurveda, discuss about the genetic basis of diseases and also illustrate the concept citing examples of a few diseases.

Ayurveda also upholds the Indian tradition of marrying outside the *gotra* (Agniveśa et al. 2013). *Gotra* means a clan and refers to people who are descendants of a common male ancestor. People within the *gotra* are considered to be siblings. Scholars speculate that there may be a genetic basis for this practice, though the classical texts are silent on the medical or genetic reasons behind this tradition. There is an opinion that the *gotra* system prevents inbreeding and completely eliminates all recessive defective genes from the DNA.

Formal accounts of the history of genetics and especially medical genetics acknowledge the contributions of Greek thinkers like Aristotle and physicians like Hippocrates in ancient times. The contributions of Ayurveda to the history of medical ideas in the area of medical genetics is not well recognized.

The ancient physicians of Ayurveda put forth the theory that the entire genetic information representing each and every part of the human body was transmitted from the parents to the progeny. While the seed or *bīja* (the male and female reproductive elements) mapped the complete blue print of the human body, the part of the seed or *bījabhāga* represented specific body parts or organs. The part of the seed or *bījabhāgas* were further made up of smaller components called the *bījabhāgāvayavas* which represented

<sup>10</sup> *tathā doṣākhye bījabhāge duṣṭe tatkāryasyaiva garbhaśarīrabhāvasya samadhātorapekayā vikṛtiḥ sphumitakaracaraṇādīlakcaṇā bhavati na tu garbhavyāghātaḥ*

<sup>11</sup> *bījāt samāṃśādūpataptabījāt strīpūṃsaliṅgī bhavati*

parts of the organs. However, there is no evidence suggesting that they were able to decipher or isolate the actual physical structures that preserved and transmitted the genetic information.

The complete damage of the *bīja* makes it impossible for the conception to happen or the fetus to be viable. Partial affliction of the part of the seed or its components cause partial defects to be present in the individual. Even the constitution of the person was considered to be determined by the parts of the seed and its components.

Ayurveda considered genetically inherited disorders to be incurable. The goal was to prevent genetic diseases by application of the methods of rejuvenation and reproductive medicine. Ayurveda also considered bad lifestyle and immoral life to be triggers for genetic diseases. For example, *Cakrapāṇi* explains that the reason for people being born blind is the damage to the part of the seed caused by the effect of past actions (*karma*)<sup>12</sup> (Agniveśa et al. 2013).

The Ayurvedic understanding that physical constitution based on the preponderance of the

docas has a genetic basis has recently found support from modern scientific research. P. Govindraj et al. discovered that PGM1 correlates with phenotype of Pitta as described in the ancient text of *Caraka Saṃhitā*, suggesting that the phenotypic classification of India's traditional medicine has a genetic basis (Govindaraj et al. 2015).

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<sup>12</sup> *andhatvādīndriyopaghātarūpe durdaivameva kāraṇaṃ*