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Review Article

PHYSIOLOGICAL ASPECTS OF GERONTOLOGY IN AYURVEDA

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ABSTRACT

Gerontology aims to explain why almost all living things weaken and die with age. There is not yet agreement in the scientific community on a single answer. The evolutionary origin of senescence remains a fundamental unsolved problem in biology and in the field of medical science too. Our ancient or basic system of Ayurveda has treasure of many theories which may give an answer to these queries. The modern proposed theories in one or another way explain the principles founded by the Ayurvedic scholars thousands years back regarding the ageing process and its retardation. Ayurveda has mainly eight divisions for the area of treatment (Ashtanga Ayurveda) and Rasayan and Vajikaran is one of them. Rasayan is a branch of Ayurveda dealing with the rejuvenation. The physiology regarding 'Sharir' [which is continuously decaying ('shiryati') as the nomenclature suggests], has been explained extensively in Ayurveda. Whatever is formed is going to be finished one day. So, with the creation of an individual in the uterus of the mother its process for growth, maturity, senescence and ultimately for death is carrying on. This article will reveal the facts associated with physiological functions and their retardation towards the ageing and contributing in the process of ageing by affecting the tri-pillar of our body (Tridosha).

Keywords: Gerontology, Geriatrics, Ageing, Dhatu-kshaya, Vriddhavastha, Jaravastha, Rasayan.

INTRODUCTION

Human civilization has always been fascinated overcoming ageing and conserving eternal youth. Nowadays as life expectancy is showing a steady increase, the impact of ageing on the body functions is receiving growing interest. Human quest for youth begins from ancient times and continues from the twentieth century until today. Gerontology is a branch of medical science involved in ageing process. Ageing is the accumulation of changes in an organism over time. Some dimensions of ageing grow and expand (like world event and wisdom) over time while others decline. The ageing process is of course a biological reality which has its own dynamics, largely beyond human control. Gerontology is basically a field of ancient medical science of Ayurveda, was named as Jaravastha. In Ayurvedic texts it is given that all Dhatus undergo kshaya at a particular age i.e. Vriddhavastha which is Parihanikala; thus making an individual prone to ageing. It is a natural process occurring in all individuals. The traditional knowledge has gained acceptability as an alternative therapy in India in the recent past. Being a physiological process Ageing affects both the genders, males and Females equally. The physiology behind the ageing remains similar in them though the speed, rate and intensity may affect differently.

Historical Review of Ageing in Ayurveda

Puranas are the materials prepared for better understanding of Vedas. In Garuda Purana, it is mentioned that the physiological disturbances and Kalaha (quarrelling) are considered as the cause for Ageing. The Garbhadhana (Conception), Garbha-Vriddhi (Foetal Development), Janma (Birth), Balyavastha (Childhood), Kumaravastha (Teenage), Jawani (Young age), Praudhavastha (Maturity), Vriddhavastha (Old age) and Mrityu (Death) are the nine stages of human life (Srimada Bhagwat 11/22/46).[1] It is cherished desire of human being to live healthy and long life from antiquity. In Ayurveda 100 years has been considered as a person's full length of life. In ancient Indian literature a detailed description is available for longevity. In Atharvaveda (4:12) Ageing has been mentioned as a natural process like hunger, sleep and death.

Ageing Physiology in Ayurveda

Ayurveda is a name which ancient Indians gave to their science of life. 'Ayu' means Life and 'Veda' means knowledge. Ayurveda itself signifies the science of longevity. It also deals the method by which longevity can be prolonged and its nature can be understood. While considering the significance of increasing longevity, the science targets all the factors affecting the ageing process. Ayurveda has adapted holistic approach to maintain healthy and long life. Every man wants to live long and healthy. This is possible by promoting rejuvenation, healing, and regeneration of living tissue in the body. Among the elderly population the dependency due to physical and mental disabilities is the major factors responsible for adverse quality of life and health care. The life expectancy has tremendously increased due to recent advancement in the field of medical research in the last few decades.

Ageing a Natural Phenomenon in Ayurveda

In fact ageing in Ayurveda is about something getting old. The definition of Sharir itself is derived from Shiryati iti shariram; the one which is decaying every moment is Sharir. Hence in Ayurveda ageing is supposed to be a continuous and natural process. The decay or diminution starts in the body from its birth. At every 10 years this depletion can be assessed as described in the Sharangdhar Samhita[2]. Vriddhavastha is the last part of the life span and is mainly characterized by degenerative changes. It is stage of life when the ageing has been established and various functioning of the body has already depleted. Every

person passes through a period when various decaying changes take place, is known as Vriddhavastha. This stage is characterized by decay in the body, Dhatu (various anatomical tissues), perception power of the Indriya (Sensory and motor organs), potency, strength and speech, various mental and cognitive functions. During this period there is predominance of Vata Dosha (one of the three biological factors). The major physical changes during his period are graying hairs, skin wrinkling, baldness and a diminishing ability to do physical work.[3] Sushruta has mentioned a group of natural diseases under the heading of Svabha-Bala Pravritta Vyadhi, which includes aging (Jara) also[4]. Other conditions of this group are thirst, hunger, sleep and death. In this way according to Ayurveda aging is a natural disease.

According to Dalhana the Svabhavika diseases occur due to the power of Nature (Prakriti Shakti Jaata). According to Chakrapani the Svabhava or nature of a particular individual depends upon the invisible hereditarily factors brought forward by a particular race to which he belongs. Daurabalyata (weakness) is caused by Svabhava, Dosha and Jara etc. Svabhava includes Matra-Pitra Shukra Shonita Svabhava.

Physiological Concept about ageing in Ayurveda

It is now believed that aging may be the part of genetic plan and not the result of wear and tear of the body. If genetic process that drive aging may be switched off then human can stay externally young. From physiological and pathological point of view the etio- pathogenesis of Ageing constitutes following factors:-

I. Ageing and Dosha
II. Disturbances in Agni
a) Apachan (Indigestion) and
b) Ama formation
III. Ageing and Dhatu
IV. Ageing and Updhatu
V. Ageing and Mala

Ageing and Dosha

A healthy person maintains the homeostasis of Dosha. Certain changes in atmosphere, season, etc. can alter the homeostasis. Ayurvedic texts have pointed out that in childhood there is predominance of Kapha dosha, in adulthood Pitta dosha predominance, and in late life the predominance of Vata dosha occurs.

Vata Dosha

In the old age particularly Vata Dosha predominates; it means whether a person is of any constitution (Prakriti) Vata remains in very increased form at old age[5]. During Hani stage of Madhyama Vaya (middle age) which precedes the old age the diminution of tissues start and it leads to increase in Vata. As Vata has inverse relation with Dhatu i.e. with increase in Vata the diminution of tissues occur, therefore a vicious circle is formed leading to degeneration of tissue and in turn increase in Vata and so on. Interestingly a hymn in Atharvaveda declares the vitiation Prana and Apana as leading to the senile state of life[6]. In the normal condition, Vata sustains all organs of the body[7] but, the vitiated vata affects adversely the strength, complexion, and happiness, the span of life, sense faculties, and functions of motor organs and gives rise to fear, anxiety, bewilderment, and take away the life[8]. Ashtanga Samgraha has attributed the symptoms of loss of body weight, tremors, insomnia, pain in bones, Majjakshaya, constipation etc. The functions of normal and abnormal Vata and characteristic features of ageing seem to be similar. So, it can be considered that during the old age Vata remains in its increased form which may vitiate any time even by the slight indulgence in the causative factors of Vata. Charaka and Sushruta has firstly mentioned "Hiyamana" or "Kshiyamana" regarding ageing, which means there is decrease in the quantity, the relation of Dhatu and Vayu is inverse when Dhatu increases Vayu decreases, and when Dhatu decreases Vayu increases. As per the interrelationship of the doshas and dhatus - asthi dhatu (bone tissue) is the ashraya (abode) for Vata Dosha, so it supposed to be affected more, especially in the old age, because during this age period Vata Dosha predominates in the body[9].

Pitta Dosha

The normal functions of Pitta are digestion, vision, and regulation of body temperature, complexion, velour and anger[10]. Pitta and Agni are diminished during aging. Body can not made Dhatu from Ahara rasa/Rasa due to diminished Agni. The middle age is the time for Pitta dominance. So, it is supposed that in the later period of middle age pitta starts the Ageing Process. The middle age is subdivided in to four parts:-

i. Vriddhi, up to the age of 20 years (Quantitative and Qualitative Growth)
ii. Yauvana- up to the age of 30 years (Qualitative Growth only)
iii. Sampurnata- up to the age of 40 years (Maximum Qualitative growth)
iv. Hani up to the age of 60 years. (Reverse process starts leading to diminution in the tissues)

At the age of Sampurnata one gets the maximum growth of all the body tissues. Thereafter from forty onwards some diminution of dhatu occurs. Therefore the females from the age of 40 years to 60 years have been selected for the present study. In the middle age, the Pitta dominates, it may be stated that up to the age of 20 the functions of Pitta are in optimum level and at the age of 40 years, Pitta gets the maximum qualitative growth also. After the age of 40, gradually the diminution of Dhatu starts, which is a state of malfunction of Pitta.

Kapha Dosha

The normal Kapha is responsible for sturdiness, plumpness, enthusiasm, potency and wisdom[10]. The abnormal Kapha is responsible for the looseness, laziness, impotence and ignorance[11]. Vata has dry, light, moving, etc properties which are opposite to Kapha thus in old age with increase in Vata, diminution of kapha occurs leading to the degeneration of the tissues. Vagbhata adds giddiness, calf muscle pain, insomnia, body ache, burning sensation, pricking sensation, tremors, palpitations etc. as the Kapha Kshaya Lakshanas[12]. As most of the symptoms of Kapha Kshaya are found in the Jara so it can be stated that decreased Kapha is responsible for Ageing Process.

Ageing and Dhatu

Ageing is the phenomenon, which is related with all the functional parts of the body, the changes in the Dhatu should be considered.

In Ashtang Samgraha it is mentioned that one of the sign of Ageing is "Slatha Sara". Sara indicates the best state of individual Dhatu and this special physical character exists by birth. If Sara of a person is being disturbed this suggest disturbance in all the Dhatu. It is cleared that by increasing age there is gradual decline in the Dhatu. Moreover Dhatu-poshan also gets affected with diminished functions of Agni. Sushruta also opines that the period of old age is marked with gradual decrease in Dhatu[13]. Charaka has also considered

'Bhrishyamana Dhatu Guna' i.e. successive decrease in the qualities of Dhatu occurs with age[14]. As per Charaka's view, both qualitative and quantitative decrease in Dhatu occurs during old age. Vagbhata also shares the same notion by stating 'Ksheeyamana Dhatu Guna'[15]. Bhela Samhita throws further light in these regards. In Vriddhapya, the capacity for Viveka i.e. discretion of assimilated nutrients in to Dhatu is hampered due to Kshaya of Dhatu. Therefore, the replacement of Dhatu is also reduced as a result of already existing vitiation. Moreover, it can further be assumed by the word 'Viveka No Yatha Poorvam Vivichyate', that is improper metabolites might also result out of this during old age. Bhela has apparently referred the incapacitation of Dhatu Agni in it[16]. The Kshaya of all the Dhatu bound to occur as per Bhela Samhita, which coins the term 'Sara Dhatu Parikshayat', it means that the depletion of all Dhatu results during Ageing. The following changes can be noticed in individual Dhatu during old age[17]:

Rasa Dhatu

The hallmarks of Vriddhapya such as Palitya (graying), Vali (wrinkling) and Twak Parushya (dryness of skin) refer towards the Rasa Kshaya Lakshana.

Rakta Dhatu

As a result of Rasa Kshaya, the production of next Dhatu i.e. Rakta will also be vitiated. The signs of ageing like Valita, Palitya etc. may contribute for Rakta Dushti.

Mamsa Dhatu

As per Charaka, the term 'Slatha-Mamsa' (Decreased Muscle Tone) suggests Mamsa Dushti. Acharya Vagbhata added the looseness of the Mamsa. This is suggestive of flaccidity of the muscles which occurs in the later period of life.

Meda Dhatu

In sequence of Dhatu Poshan Kram, this dhatu will also be vitiated. Charaka has further explained the Meda Dhatu in Ageing as "Visyandate Na Alpa Medas".

Asthi Dhatu

Slatha Asthi (bone weakness) is a chief symptom involved in the Ageing, as described by Charaka "Na sandhiyate Asthisu Majja". Vata increases in the old age; Asthi and Vata have inverse relation with each other so Asthi Dhatu is decreased during old age.

Majja Dhatu

Kaya Namana (bending of the body) and Vepathu (tremors) are the symptoms, which are common in the aged population. It may be much valuable to consider Majja Kshaya, which is proximal to Shukra Dhatu and Vata Vriddhi in Majja during the old age.

Shukra Dhatu

All the Acharaya note the changes in this Dhatu. The terms Alparetas, Paurusha hani (decresed virility) and Virya hani denote to the Shukra Kshaya. Dalhana commenting on Virya said that the Shukra dhatu is to be considered from the word Virya. In the causes of Klaibya every Acharya has mentioned Jara. Bhela says that Shukra can't be seen in elders as a result of considerable depletion of all the Dhatu.

Ageing and Upadhatu

Upadhatu, the products of the Dhatu also get affected during the Ageing process. Artava Kshaya is the Lakshana found in all the females with increasing age. The sign and symptom of Menopause starts after the age of 40. Artava is the Updhatu of Rasa, which is in Kshaya Avastha during the old age[18]. Rukshta, Parushata, Vivarnata, Saithilya etc. characters of Twaka, suggests the involvement of Twaka (Upadhatu of Mansa dhatu) in the Ageing. The sign "Kayasya namanam" is suggestive if Snayu (Upadhatu of Meda dhatu) involvement in the Ageing.

Ageing and Strotas

If all the Dosha, Dhatu and Upadhatu are directly or indirectly deterioration process then concerned strotas may also be involved in the Ageing in greater or lesser extent.

Gerontology and Ageing

Ageing is any change in an organism over time. Ageing refers to a multidimensional process of physical, psychological and social change (Hultsch and Deutsch). These changes are always degenerative in nature[19]. Some dimensions of Ageing grow and expand over time, while others decline. Reaction time, for example, may slow with age, while knowledge of world events and wisdom may expand (Schaie). Research shows that even late in life potential exists for physical, mental, and social growth and development. Ageing is a normal process accompanied by a progressive alteration of the body's homeostatic adaptive responses. It produces observable changes in structure and function and increases vulnerability to environmental stress and disease. The specialized branch of medicine that deals with the medical problems and care of elderly person is Geriatrics. (Ger=Old age, -iatrics= medicine). Gerontology is the scientific study of the process and problems associated with ageing. The term "Ageing" is somewhat ambiguous. Stuart-Hamilton (1994) notes how distinctions may be made between various kinds of Ageing[20]:

- **Universal Ageing**: Age changes that all people share
- **Probabilistic Ageing**: Age changes that may happen to some, but not all people as they grow older, such as the onset of Type II diabetes
- **Chronological Ageing**: Referring to how old a person is.
- **Social Ageing**: Society's expectations of how people should act as they grow older.
- **Biological Ageing**: An organism's physical state as it ages.
- **Proximal Ageing**: Age-based effects that come about because of factors in the recent past.
- **Distal Ageing**: Age-based differences that can be traced back to a cause early in person's life, such as childhood poliomyelitis
- **Population Ageing**: It is increase in the number and proportion of older people in society.

In Ageing, the chronological age does not correlate perfectly with functional age, i.e. two people may be of the same age, but differ in their mental and physical capacities.

Biology of Ageing for Various Parts of Body

Everyone knows that getting older is inevitable. Angela Epstein (French Doctor) tells the ages when different parts of the body start to lose their battle with time.[21]

Brain- Starts ageing at 20.
As one gets older, the number of nerve cells or neurons in the brain decreases. In the childhood the neurons are around

100 billion, but in 20s this number starts to decline. By 40, one could be losing up to 10,000 per day, affecting memory, co-ordination and brain function.

Gut- Starts ageing at 55.
A healthy gut has a good balance between harmful and 'friendly' bacteria. But, level of friendly bacteria in the gut drops significantly after 55, particularly in the large intestine (Tom Mac Donald, Professor of Immunology at Barts, London Medical School). As a result, poor digestion occurs and risk of gut disease increases. Constipation is more likely as age advances, as the flow of digestive juices from the stomach, liver, pancreas and small intestine slows down.

Breasts- Start ageing at 35
By mid-30s, women's breasts start losing tissue and fat, reducing size and fullness. Sagging starts properly at 40 and the areola (the area surrounding the nipple) can shrink considerably.

Bladder- Starts ageing at 65.
Loss of bladder control is more likely when one hits 65. Women are more vulnerable to bladder problems as, after the menopause; declining estrogen levels make tissues in the urethra thinner and weaker, reducing bladder support. Bladder capacity in an older adult generally is about half that of a younger person.

Lungs- Start ageing at 20
Lung capacity slowly starts to decrease from the age of 20. By the age of 40, some people are already experiencing breathlessness. This is partly because the muscles and the rib cage which control breathing stiffen up.

Voice- Starts ageing at 65.
Voices become quieter and hoarser with age. The soft tissues in the voice box (larynx) weaken, affecting the pitch, loudness and quality of the voice. A woman's voice may become huskier and lower in pitch, whereas a man's might become thinner and higher.

Eyes- Start ageing at 40
Glasses are the norm for many over-40s as failing eyesight kicks in - usually long-sightedness, affecting our ability to see objects up close.

Heart- Starts ageing at 40.
The heart pumps blood less effectively around the body due to decreased elasticity of blood vessels, arteries can harden or become blocked because of fatty deposits forming on the coronary arteries. The blood supply to the heart is then reduced, resulting in painful angina. Men over 45 and women over 55 are at greater risk of a heart attack.

Liver- Starts ageing at 70.
This is the only organ in the body which seems to defy the Ageing process.

Kidneys- Starts ageing at 50.
With kidneys, the number of filtering units (nephrons) that remove waste from the bloodstream starts to reduce in middle age.

Bones- Start ageing at 35
'Throughout our life, old bone is broken down by osteoclasts and replaced by bone-building cells called osteoblasts - a process called bone turnover,' explains Robert Moots, Professor of Rheumatology at Aintree University Hospital in Liverpool. Until mid-20s, bone density is still increasing. But at 35 bone-loss begins as part of the natural ageing process.

Teeth- Start ageing at 40
With age one produces less saliva, which washes away bacteria, so teeth and gums are more vulnerable to decay. Receding gums - when tissue is lost from gums around the teeth - is common in adults over 40.

Muscles- Start ageing at 30
Muscle is constantly being built up and broken down. However, by the age 30, breakdown is greater than buildup, explains Professor Robert Moots. Once adults reach 40, they start to lose between 0.5 and 2 per cent of their muscle each year. Regular exercise can help prevent this.

Ayurvedic Aspect of Gerontology

According to Ayurveda, ageing (jara) is a natural phenomenon like hunger, thirst and sleep. In Ayurveda Ageing is denoted by term "Jara". According to Ayurveda Jara (ageing) is a natural disease. Kalasya Parinama (maturity of time) is cause of Jara and Mrityu. Jara is Svabhava-Bala-Pravritta Vyadhi (Su.Su.1/32-33 and 24/8)[4,22]. It is a state of Physical and Psychological weakness as a result of physiological changes during old age. The word Geriatrics is a Latin word "Gerus" meaning 'To grow old'. The present study is about "Gerontology" which is the study of the ageing process itself. Classification of Age in Ayurveda:-

Baala- Childhood is up to 16 years.
During this period Kapha dominates.

Madhya- Youth and Middle age.
According to Sushruta - 16 years to 70 years and according to Charaka considers its limit up to 60 years. During this period Pitta dominates.

Vriddha- Old age is above 60 or 70 years. During this period Vata dominates. The middle age is further divided in 4 parts by Sushruta (Su.Su.-35/35)[23]

a) Vriddhi (Growth): Age from 16 years to 20 (Growth of the body)
b) Yauvana (Youth): Age from 21 to 30 years
c) Sampurnata (Maturity): Age from 31 years to 40 year. During this period maximum growth of the tissues, senses, strength and vitality occur. In other words thereafter no growth is possible.
d) Parihaani (Diminution): From the age of 40 years onwards. Slight diminution starts in all aspects of the body.

Undoubtedly Jara and death are natural (Svabhavika) diseases and Charaka mentions that Svabhavo Nishprtikriyah i.e. natural diseases are incurable. Chakrapani explains that Svabhavo Nishprtikriyah indicates to the ordinary treatment, thus ordinary treatment has no role in treating the ageing, But Rasayana is the treatment of Jara. Even Rasayana treatment for ageing comes under Yapya type of treatment. Jara in Ayurvedic texts is first among the Yapyanam[24] (Ch. Su. 25/40).

A National Campaign on Ayurveda and Siddha for Geriatric Health Care was started in 2012, which denotes….."May We (Aged) Live Happily for one hundred years or more with Our Faculties of Vision, Hearing and Speech fully intact and without dependence on anybody else"[25].(Yajurveda: 36/24). The specific physical, physiological and psychological changes in relation to ageing process have been described in Ayurvedic literature. The ancient classics give a detailed version on the biological aspects of Ageing including growth, puberty and senility. In Sushrut Samhita several physical and mental symptoms have been described as a consequence of ageing process. It includes Dhatu-

kshaya (Degeneration of Tissues), Indriya Kshaya (Deterioration of sense organs), Bala Kshaya (Loss of Physical strength and Body Immunity), Virya Kshaya (Decreased sexual power), Utsaha Kshaya (Loss of Motivation), Vali (Wrikles), Palitya (Graying of Hair), Khalitya (baldness), Kasa and Shwasa (Cold, Cough and Asthma) and Klishta (Inability to perform physical and mental work). Sushruta in the context of formation of Dhatu from Rasa mentions that in the aged persons Rasa does not produce Dhatu due to aged body (Paripakva Sharira). Sushruta has further mentioned that Ageing is responsible for deterioration of dhatus resulting in emaciation. According to Sushruta the ageing process is progressive and its gross effect can be observed at the age of 70 years[26]. A decade wise psychobiological deterioration with ageing process has been described in all classical texts of Ayurveda. The decline in physical strength, digestion and metabolism, graying of hair and baldness, dypnoea, tremors, decline in cognitive function and learning abilities occurs due to ageing process. Vagbhata and Sharangdhara have described the characteristic feature of decade wise changes in the body brought about by ageing process. Acharya Sharangdhara has given "Dashvidha Kshaya" (Decade wise Ageing) which shows that Ageing happens to be in different body tissues in different manner and does not occur simultaneously. Sharangdhara says there is gradual declination of a particular quality/feature of the body with each decade of life. By the end of that particular decade, the quality is lost which means with ageing certain powers or faculties of the body become diminish. Following table shows the loss of body tissues during various decades of life:

Decade of Life	Vagbhata[15] (Ash.San.Sha. 8/25)	Sharangdhara[2] (Sha. Pu. 6/62)
1st Decade	Baalyam (Childhood)	Baalyam (Childhood)
2nd Decade	Vriddhi (Growth)	Vriddhi (Growth)
3rd Decade	Chhavi (Complexion)	Chhavi (Complexion)
4th Decade	Medha (Intellect)	Medha (Intellect)
5th Decade	Twak (Skin / Skin Properties)	Twak (Skin/ Skin Properties)
6th Decade	Shukra (Reproductive Capacity)	Drishti (Vision)
7th Decade	Drishti (Vision)	Shukra (Reproductive Capacity)
8th Decade	Karnya (Hearing)	Vikram (Valour)
9th Decade	Mind	Buddhi (Knowledge)
10th Decade	All other organs (Sensory and Motor Functions)	Karmendriye (Motor Functions)
11th Decade	Not Mentioned	Mind
12th Decade	Not Mentioned	Life

Vagbhata limits the life span of human beings to 100 years whereas Sharangdhara extends it further by 20 years

Ayurvedic Perspective of Theories of Ageing

There are various theories put forward to explain the above mentioned changes of ageing. Although there are currently over 300 theories to explain the Ageing phenomenon, it is still not well understood why organisms age and why the Ageing process can vary so much in speed and quality from individual to individual[27]. Some of the most widely accepted and major theories of Ageing are:

The "Wear and Tear" Theory

It is believed that the body and its cells are damaged by overuse and abuse. Wear and tear is not confined to organs, but also takes place on the cellular level. Ageing causes a drop in hormone production leading to decline in the body's ability to repair and regulate itself[28]. Sharir is decaying constantly i.e. 'Shiryate iti Shariram" so, decay of the body is must and it is a continuous process and Ageing is a natural phenomenon. Thus natural diseases are due to Swabhava (nature) and depend on Kala (time).

The Genetic Control Theory

This theory focuses on the genetic programming encoded within our DNA. Each individual has a biological clock ticking away set to go off at a particular time. When that clock goes off it signals the body first to age and then to die[29]. Ayurveda describes individual's Prakriti, health etc. depends upon the Bija, Bija-bhag and bija-bhag-avyava (ovum-sperm/ chromosome /gene) as described by Acharya Charak as genetic predisposition (Yatra yatrasya bije-bijbhage va uptapto bhavati, vyadhi jayate ten)[30].

The Free Radical Theory

Free-radicals are required for physiological functions, but free radicals also attack the structure of our cell membranes, creating metabolic waste products (like lipofuscins) which in turn interfere with vital chemical processes causing ageing of the cells[31]. The root of many diseases in Ayurveda as well as in modern science too, free radicals can be understood by the concept of Kupita dosha (vitiated dosha). In Sushrut Samhita[32], it is mentioned that vitiated doshas are circulating throughout the body and wherever they found the appropriate environment to develop a disease, the pathogenesis starts. So, it can be said that a person's diet and life style etc. can be a cause of ageing (whether early or late).

Mitochondrial Theory

The free radical theory is supported by mitochondrial Ageing[33,34]. As described above, the vitiated doshas on finding the appropriate site can cause /potentiate the ageing process by affecting the cell itself. Because, when the entire Vipaka (metabolism) is getting disturbed then the essence of all dhatus (Oja) is depleted in the body may cause ageing.

Waste Accumulation Theory

In the course of their life span, the waste of the can include various toxins which when accumulated to a certain level and can interfere with normal cell function, ultimately killing the cell[35]. This occurs due to Agni-mandata as age advances. So, improper digestion leads to poor absorption of nutrients from the gut and utilization of the same in the body as a source of energy. The semi-digested food gives rise to "Aam" formation at dosha-dhatu-mala level. Aam is the generator of many diseases so can contribute towards a cause of ageing also.

Hayflick Limit Theory

Hayflick theorized that the Ageing process was controlled by a biological clock contained within each living cell. The 1961 studies concluded that human fibroblast cells (lung, skin, muscle, heart) have a limited life span[36]; A Swabhavika roga (natural disease) by Ayurveda so biological clock related.

Death Hormone Theory (Deco)

Denckle speculated that with ageing the pituitary begins to release DECO (decreasing oxygen consumption hormone). The metabolic rate brings on and accelerates the process of Ageing[37]. This Ageing process is in existence since our vedic era. In Shrimada Bhagwat also the 9 stages of human life span has been mentioned as Garbhadhana (Conception), Garbha-Vriddhi (Foetal Development), Janma (Birth), Balyavastha (Childhood), Kumaravastha (Teenage), Jawani (Young age), Praudhavastha (Maturity), Vriddhavastha (Old age) and Mrityu (Death). So, it can be said that whatever has originated must finish one day.

CONCLUSION

Ageing is a natural part of the "turning wheel" of birth, ageing, sickness, and death. Because of our desires, anger, and ignorance we don't make wise choices to realize contentment in this life, hence sickness and aging happens faster. Ageing is the process of becoming old and decaying day by day, which can be quoted by 'Shiryati iti Shariram'. As age advances, several changes take place in the body, externally as well as internally in the condition of Dosha, Dhatu, mala, Agni etc.

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