ISSN-2249-5746
International Journal Of Ayurvedic And Herbal Medicine 2:5 (2012)792:798
Journal Homepage http://interscience.org.uk/index.php/ijahm

A Comprehensive Review On Theories Of Aging

Dr. Arvind Kumar Gupta[1] Dr. Sangeeta S. Mishra[2] Dr. Kedar Lal Meena[3]

1. Ph.D. Scholar, Dept Of Basic Principles, National Institute of Ayurveda, Jaipur
2. Ph.D. Scholar, Dept Of Basic Principles, National Institute of Ayurveda, Jaipur
3. Associate Professor & Head, Dept Of Basic Principles, National Institute of Ayurveda, Jaipur

Corresponding Author Dr. Arvind Kumar Gupta Ph.D. Scholar, Dept Of Basic Principles, National Institute of Ayurveda, Jaipur Email akg101081@gmail.com

Rujantiti Rogah[1] means which produces pain or difficulties to the body or mind is known as disease. Acharya Sushruta has classified the diseases into four types[2]- Disease due to immediate cause (Agantuja Vyadhi), Disease of body (Sharirika Vyadhi), Disease of mental faculty mind (Manasika Vyadhi), Natural disease (Swabhavika Vyadhi). Jara (Old age) is a Natural Disease which occurs due to Kala.[3] Old age is an undesirable, inevitable phase of human life. The onset of sign and symptoms of aging is evident at the age of 60. The decline of each organ, system appears to occur independently of change in the other organ system and is influenced by diet, environment and personal habits as well as genetic factors. Ayurveda has its own concepts in description of ageing which are very much similar to modern science.

Keywords: Aging, Theory, Old age.

Introduction:

Old age is occurring at a good pace among all the peoples of the world now a days, so it is due cause of shortened life-span. Human life is divided in three phases[4] i.e. *Balya* (Young), *Madhya* (Middle) and *Vruddha* (Old). After the middle age, biological aging is best characterized by progressive constriction of the homeostatic reserve of every organ system. The decline often referred to as homeostasis is evident by the 5th decade and is gradual and progressive, although the rate and extent of decline vary[5]. The main causative factor for natural aging is vitiated *Vata* which in turn affects compactness of the body. This happens gradually after a period of time. Other one is theory of natural destruction. *Ayurveda* has theories for aging which are very much comparable to modern concepts.

Review:

The life science of *Ayurveda* explains that, process of senescence begins as naturally *vata* attains provocation and it also agrees that the process of aging is genetically determined. It can be analyzed as follows-

***Sahaja* (Genetic) Theroy:-** *Chakrapani* opines that the time of onset of natural aging varies from individual to individual. It may be delayed in persons having the feature of long life span *(Deerghayu)*, whereas early in persons having the features of medium life span (*Madhyamayu*) and short life span *(Avaryu).*[6] *Charaka* opines that *prakruti guna sampat* i.e. constitutional compactness is one of the prime factor required to achieve long life span, which is genetically determined as explained by *Chakrapani.*[7]

Charaka explanation about *Sarvadhatusara* i.e. compactness of all body tissue is another condition where the onset of aging will be delayed i.e. *Manda jara*.[8] The same constitution compactness is considered as *bala* by *Bhavamishra*.[9]

To summarize, the onset and progress of aging depends on factors like *prakruti* (constitution) and *sara* (compactness of body tissue) which are genetically predetermined. Hence the process of aging can be considered as a genetically predetermined entity.

Sahaja theory seems to be similar to that of programmed aging theory as explained by modern aging. It suggests that aging as a predetermined presumably genetic, age related alteration cellular function that leads to susceptibility to disease and death.[10]

- Till middle age *(prakruti) vata* is responsible for following functions-

A. ***Sarva Dhatu Vuhakarata-*** Providing compactness to body tissue by assessing the type of nourishment required.[11]

B. ***Dosha Dhatu Agni Samata-*** Maintaining state of homeostasis of *dosha* (physiological humor), *dhatu* (body tissues) and *agni* (digestive and metabolic activities).[12]

C. ***Sharira and Manas Kriya-*** Keeping the body and mind under sound functional status.[13]

D. ***Ayu Anuvrittikara-*** Maintaining the body elements in normal physiological condition.[14]

- But as the middle age passes *vata* will be provocated naturally and sets in the molecular program of cellular senescence and bring out the following changes-

1. Impaired *Sarva Dhatu Vyuhakarah*- The provocated *vata* becomes unable to provide the compactness to the body tissues because of faulty assessment of the type of nourishment which is required to the cells. Hence it brings out the formation of *vikruta dhatu* i.e. defective cells, while ultimately resulting in cellular senescence.

***2. Rasa Shoshana* (Error in nourishing elements) -** The health of an individual is a critical indicator of the body's nutritional status. It is nutrition a critical and essential need to the body which has to be fulfilled for the individual to function normally.

Bhavamishara explains that, after the middle age provocated *vata* bring the *shoshanata i*n *poshaka rasa* i.e. errors in nourishing elements which results in inadequate nourishment to the tissues and leading to improper cell *(dhatu)* formation resulting in cellular senescence (*Dhatukshaya).*[15]

3. Dhatu Asamata- *Sushruta* explains that, provocated *vata* by its *shoshana* property becomes responsible for *dhatukshaya*[16]. The same concept is responsible for cellular senescence also that is after the middle age, naturally provocated *shoshana* property of *vata dosha* accumulates in cells *(Dhatu)* and after reacting a certain levels brings out the *dhatukshaya* i.e. cellular senescence.

Sushruta explains that, senescent cells *(Paripakva shariratva)* have decreased capacity for uptake of nutrient *(Poshaka Rasa)* to repair of cellular damage.[17] *Dalhana* commentary on this, adds that under this state

nourishment will be inadequate (*Eeshat)* and only maintains minimal cellular functions *(Jeevana matram karoti).*[18]

4. Agni Asamata- *Charaka* explains that sound functional condition of *agni* i.e. digestive and metabolic activities are responsible for *Ayubala*[19] i.e. to keep the body and mind under sound functional status and keep up the cellular senescence to be locked.

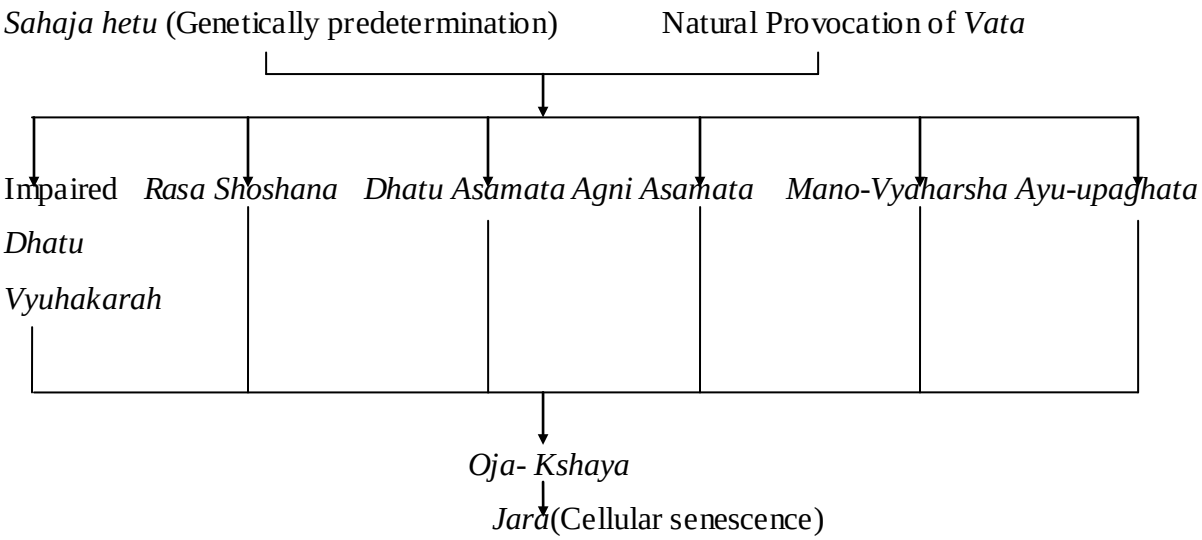
But after the middle age naturally *agni madhyata* occurs which results in improper cellular formation *(vikrita dhatu)* by improper digestive and metabolic activities, which ultimately resulting in cellular senescence.

***5. Mano-Vyaharsha* (Decreased mental function) -** *Prakruta vata* is responsible for all mental function i.e. *"Niyanta praneta cha manasah"* but provocation *vata* decreases the mental function i.e. *Mano-Vyaharshata.*[20]

6. Oja kshaya- *Oja i*s responsible for *sharira sthairya* i.e. compactness of body elements by providing adequate nutritional defense against body element, *oja* will be nourished by *Anna Rasa (*Nutrients).[21]

In old age *Agni kshaya, dhatu kshaya* and errors in nourishing elements leads to the state of *oja kshaya* i.e. inadequate nutritional defense against body elements that leads to the molecular cellular injury to cells, exceeds their repairs capacity this further accelerating the aging process ultimately ending in death.[22]

Schematic Representation of Process of Aging



In modern science a number of theories have been proposed to explain the mechanism of aging and it is now clear that cell aging is multi-factorial. It involved an endogenous molecular program of cellular senescence as well as continuous exposure throughout life to adverse exogenous influences leading to progressive encroachment on the cells survivability so, called wear and tear. In this scenario, molecular injury to cells exceeds their capacity, this accelerating the aging process. Some of the important theories have been proposed to explain the causes of aging are given below.

Genetic Theories:-

1. Somatic mutation theory- L. Szilard proposed in 1959 that aging is due to random mutations (unusual change in genetic material) which destroy genes and cause loss of chromosomes of somatic cells. Due to such mutations, these genes do not produce any proteins or if they do so. The proteins are defective mutation after reaching a certain level, inactivate the cells and cause their death. The organism dies when the number of these cells decreases below a certain levels.

2. Gene regulation theory- Since specific genes direct the synthesis of specific proteins these differences may be due to the difference in the activities of genes. Aging may be due to the failure of the organism to maintain the activities of genes, required for the reproductive and adult phase.

3. Genomic instability theory- Suggests that errors in genetic transcription, translation, resulting in impaired protein synthesis and deterioration in cell function as age.

Non-genetic Theories: - These based on the possibility that the balance on going damage and repair is disturbed.

1. Error theory- Proposed that, errors in amino acid sequences of enzymes like RNA polymerase and aminoacyl t-RNA synthetase which are responsible for protein synthesis. Such mistake may amplify the production of wrong proteins which on reaching critical levels makes the cell function less.

2. Free radical theory- Propo sed that, endo genous oxygen radicals were generated in cells and results in a pattern of cumulative damage. The burden of reactive oxygen species (ROS) production is largely counteracted by an intricate antioxidant defense system that includes the enzymatic scavengers superoxide dismutase (SOD), Catalase and glutathione peroxide and a variety of other non-enzymatic, low molecular mass molecules are important in scavengering the ROS. These includes ascorbate, pyravate, flavonoids, carotenoids and perhaps most importantly glutathione. The antioxidant defense mechanism decreases as age and resulting in arise of inter cellular oxidant levels which has two potentially important effects-

i. Damage to various cell components
ii. Triggering of the activation of specific signaling pathways

Both of these effects can influences the numerous cellular processes linked to aging and to development of age related disease.

3. Hormonal changes- Human growth hormones produced in the pituitary gland plays a critical part in normal childhood growth and development. Its level decreases in about half of all adult with passage of time. The decline of GH seems to plays a role in the aging process at least in some individuals changes in other hormones like estrogen and progesterone alter the gene expression.

4. Change in proteins (Enzymatic Activity) - Some enzymes decreases in activity some increase and several others do not change with age. Some enzymes like acetyl cholinesterase (ACHE) of the brain, whereas Gama amino butyric acid (GABA) and glutamate stimulate it, these effects decrease significantly in old rats. ACHE maintains the level of Acetylcholine (ACH). It is possible that such qualitative changes in the enzyme of brain may account for the decreases in its functions like learning and memory in old age.

5. Other proteins- The rate of protein synthesis is good index of the activity of cells. Collagens the extra cellular protein of connective tissue constitutes about 30% of the total proteins of the body. It becomes insoluble due to increasing number of cross linkers and prevents the flow of nutrients to cells.

6. Age pigments- During the aging of animals, accumulation of age pigment occurs which is also called as lipo-fusion in the cytoplasm of non-dividing cell like neurons, cardiac and skeletal muscles and also in connective tissue cells.

The pigment may arise by metabolic disturbance such as interaction of oxidants with polyunsaturated fatty acids. The cause of accumulation of pigment is not clear, but it is evident that if a large fraction of the cytoplasm is occupied by an insert substance, that will undoubtfully affect its metabolism and function.

7. Cross linkers- J. Bjorkdten proposed that aging is due to cross linking of macro molecules, nucleic acid and proteins, which are vital for cell function. This accumulates with age and may not cross link or more enzymes and inactivate them but also may act at the levels of the genes. Free radicals, atoms or molecules having at least 1 unpaired electron can also cross link 2 molecules. Enzymes and nucleic acids may react with free radical and got inactivated.

8. Immune response- These are gradual decrease in the number of antibody producing cells and hence the defense mechanism decreases with age.[23]

Discussion:

From the above explanations, it is evident that the genetic and non-genetic theories untimely speak about the derangement in cell structure and function which results in cellular senescence.

On keen observation it seems that the above said Modern and *Ayurvedic* theories have got some what similarities as follows-

Theories and Similarities of process of Aging	
Theories	***Similarities***
Impaired *dhatu vyukarata* and gene regulation and genetic instability theory	Faulty assessment of nutrition to the cell
Rasa Shoshana and error theory	Error in nourishing elements
Dhatu Asamata and somatic mutation theory, other protein i.e. collagen change theory	Unusual changes occurring in the cell
Agni asamata and free radical theory and Age pigment theory	Metabolic impairment
Manovyaharsha and enzymatic theory of decreased learning and memory	Diminished mental function

Ayu-anuvritti and hormonal theory	Responsible for growth, development and senescence
Dhatu and *Agni Asamata* and cross linkers changes	Cellular, enzymatic etc.
Oja Kshaya and Immune response	Susceptibility to disease and death

Conclusion:

The necessity of discussion regarding, aging is that, in a large percentage of elderly individual's diet related metabolic disorder are the real causes of mortality. The common conditions are hypertension, coronary heart disease, cerebro-vascular accidents and malignancy. Preventing the onset of these diseases mostly by dietary managing and adopting proper life style will ensure that aging remains physiological and not converted into a pathological condition which leads to death.

Refrences:

1. **Bahadura Rajaradhakntadeva**, 4th Kanda Vyanjanavarnah, Shabdakalpadruma, Amar Publication, Varanasi, Page: 181
2. **Sushruta**, Sutrasthana 1st Chapter, 24th Shloka, Sushruta Samhita, Nibandhasamgraha Commentary by Dalhana and Nyayacandrikakhyapanjika Commentary by Gayadasa on Nidanasthana, Edited by - Vaidya Yadavajitrikamaji Acharya (Upto 9th Chapter) and Narayana Rama Acharya 'Kavyateertha' (Rest), Choukhambha Surbharati Prakashan, Varanasi, Repint Edition-2011, Page: 6
3. **Agnivesha**, Shareerasthana, 1st Chapter, 115th Shloka, Charaka Samhita, Ayurvedadipika Commentary by Chakrapani, Edited by – Vaidya Yadavajitrikamaji Acharya, Choukhambha Surbharati Prakashan, Varanasi, Repint Edition-2011, Page 298
4. **Sushruta**, Sutrasthana 35th Chapter, 29th Shloka, Sushruta Samhita, Nibandhasamgraha Commentary by Dalhana and Nyayacandrikakhyapanjika Commentary by Gayadasa on Nidanasthana, Edited by - Vaidya Yadavajitrikamaji Acharya (Upto 9th Chapter) and Narayana Rama Acharya 'Kavyateertha' (Rest), Choukhambha Surbharati Prakashan, Varanasi, Repint Edition-2011, Page:155
5. **Eugene Braunwald et. al,** Harrison's Principles of Internal Medicine, McGraw Hill Medical Publishing Division, Vol. 1, 15th Edition-2001, Page:37-47
6. **Agnivesha**, Vimanasthana, 8th Chapter, 122th Shloka (Chakrapani Commentary), Charaka Samhita, Ayurvedadipika Commentary by Chakrapani, Edited by – Vaidya Yadavajitrikamaji Acharya, Choukhambha Surbhrati Prakashan, Varanasi, Repint Edition-2011, Page:280
7. **Agnivesha**, Shareerasthana, 6th Chapter, 30th Shloka (Chakrapani Commentary), Caraka Samhita, Ayurvedadipika Commentary by Chakrapani, Edited by – Vaidya Yadavajitrikamaji Acharya, Choukhambha Surabhrati Prakashan, Varanasi, Repint Edition-2011, Page:336
8. **P.V. Sharma,** Charaka Samhita (Text with English translation), Sutrasthana 8th Chapter, 111th Shloka, Vol. 1, Choukhambha Orientalia, Varanasi, 8th Edition, Page:379
9. **Bhavaprakasha,** Poorvakhanda, 7th Chapter 114th Shloka, Edited and Translated By – Dr. Bulusu Sitaram, Choukhambha Orientalia, Varanasi, 1st Edition-2006, Page:681
10. **Eugene Braunwald et. al,** Harrison's Principles of Internal Medicine, McGraw Hill Medical Publishing Division, Vol. 1, 15th Edition-2001, Page:37-47
11. **P.V. Sharma,** Charaka Samhita (Text with English translation), Sutrasthan 12th Chapter, 8th Shloka, Vol. 1, Choukhambha Orientalia, Varanasi, 8th Edition, Page:82

12. **P.V. Sharma,** Sushruta Samhita with Commentary of Dalhana, Nidanasthan, 1st Chapter 10th Shloka, Vol. 2, Choukhamba Vishwabharati, Varanasi, Page:4
13. **P.V. Sharma,** Charaka Samhita (Text with English translation), Sutrasthana 12th Chapter, 8th Shloka, Vol. 1, Choukhambha Orientalia, Varanasi, 8th Edition, Page:82
14. **P.V. Sharma,** Charaka Samhita (Text with English translation), Sutrasthana 12th Chapter, 8th Shloka, Vol. 1, C houkhambha Orientalia, Varanasi, 8th Edition, Page:82
15. **Bhavaprakasha,** Poor vakhanda, 3rd Chapter 196th Shloka, Edited and Translated By – Dr. Bulusu Sitaram, Choukhambha Orientalia, Varanasi, 1st Edition-2006, Page:40
16. **P.V. Sharma,** Sushruta Samhita with Commentary of Dalhana, Chikitsasthan, 4th Chapter 10-11th Shloka (Dalhana Commentary), Vol. 2, Choukhamba Vishwabharati, Varanasi, Page:172
17. **P.V. Sharma,** Sushruta Samhita with Commentary of Dalhana, Shareersthana, 7th Chapter 3rd Shloka (Dalhana Commentary), Vol. 2, Choukhamba Vishwabharati, Page:148
18. **Sushruta**, Sutrasthana 14th Chapter, 19th Sloka (Dalhana Commentary), Sushruta Samhita, Nibandhasamgraha Commentary by Dalhana and Nyayacandrikakhyapanjika Commentary by Gayadasa on Nidanasthana, Edited by - Vaidya Yadavajitrikamaji Acharya (Upto 9th Chapter) and Narayana Rama Acharya 'Kavyateertha' (Rest), Choukhamba Surbharati Prakashan, Varanasi, Repint Edition-2011, Page:64
19. **Agnivesha**, Chikitsasthana, 15th Chapter, 40th Sloka, Charaka Samhita, Ayurvedadipika Commentary by Chakrapani, Edited by – Vaidya Yadavajitrikamaji Acharya, Choukhamba Surbhrati Prakashan, Varanasi, Repint Edition-2011, Page:516
20. **P.V. Sharma,** Charaka Samhita(Text with English translation), Sutrasthana 12th Chapter, 8th Sloka, Vol. 1, C houkhambha Orientalia, Varanasi, 8th Edition, Page:82
21. **Sushruta**, Sutrasthana 15th Chapter, 21st Sloka (Dalhana Commentary), Sushruta Samhita, Nibandhasamgraha Commentary by Dalhana and Nyayacandrikakhyapanjika Commentary by Gayadasa on Nidanasthana, Edited by - Vaidya Yadavajitrikamaji Acharya (Upto 9th Chapter) and Narayana Rama Acharya 'Kavyateertha' (Rest), Choukhamba Surbharati Prakashan, Varanasi, Repint Edition-2011, Page:71
22. **Sushruta**, Sutrasthana 15th Chapter, 19th Sloka (Dalhana Commentary), Sushruta Samhita, Nibandhasamgraha Commentary by Dalhana and Nyayacandrikakhyapanjika Commentary by Gayadasa on Nidanasthana, Edited by - Vaidya Yadavajitrikamaji Acharya (Upto 9th Chapter) and Narayana Rama Acharya 'Kavyateertha' (Rest), Choukhamba Surbharati Prakashan, Varanasi, Repint Edition-2011, Page:71
23. **David A. Warrell et. al,** Oxford textbook of Medicine, 3rd Edition, 2002, Vol. 1, Page-4331