"DHATU *POSHANA NYAYA*: THE SUBTLE WISDOM OF *AYURVEDA* ON AGING"

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ABSTRACT:

Aging is a natural and unavoidable phenomenon shaped by hereditary, environmental, and lifestyle elements. *Ayurveda*, the ancient Indian healing system, provides a holistic frame work for understanding aging, referred to as *Jara*. One of the fundamental concept in *Ayurveda* is *Dhatu Poshana Nyaya*, which describes the sequential nourishment of the body's seven *Dhatus* (tissues). This transformative nourishment process is essential for sustaining vitality, strength, and longevity. According to *Ayurveda*, aging results from a progressive decline in *Agni* (the body's digestive and metabolic fire), accumulation of *Ama* (toxins), and the increasing dominance of *Vata Dosha*, which becomes more pronounced with age. These factors lead to *Dhatu Kshaya* (tissue depletion) and a reduction in *Ojas*—the vital essence responsible for immunity and vitality thereby accelerating the aging process. To counteract these effects, *Rasayana* therapy is emphasized. It focuses on rejuvenation, enhancing *Ojas*, and promoting overall wellness. *Ayurvedic* strategies such as a balanced diet, mindful lifestyle practices and rejuvenative therapies aim to harmonize the *Doshas*, optimize tissue nourishment, and slow age-related degeneration. By applying the principles of *Dhatu Poshana Nyaya*, Ayurveda offers valuable insights into aging that support personalized, preventive approaches to health. These approaches not only encourage graceful aging but also enhance life quality and may extend the health span. This discussion explores the *Ayurvedic* view of aging, highlighting the significance of tissue nourishment theories.

INDEX TERMS - Aging, *Ayurveda, Dhatu Poshana Nyaya, Rasayana, Vata Dosha*

I. INTRODUCTION

Aging is a biological process that is inescapable, normal, irreversible, and constantly progressing. It is linked to a deterioration in both mental and physical abilities. Research on aging at several levels like social, behavioural, physiological, morphological, cellular, and molecular aspects are needed. *Dhatu Poshana Nyaya* explains how nutrients are progressively converted and passed from one tissue to the next, supporting the body's functional harmony and vitality. This principle is foundational to the *Ayurvedic* understanding of tissue metabolism and general well-being. Adequate nourishment of each *Dhatu* is crucial for sustaining strength, immune resilience, and long life. Grasping the concept of *Dhatu Poshana Nyaya* is vital for managing aging and preventing illness.

II. MATERIALS AND METHODS:

Modern literature, published research, and a critical evaluation of classical knowledge serve as the foundation for the current study. A potential correlation between the gathered data and its methodical presentation is done.

III. DISCUSSION:

CONCEPT OF *JARA*

Vyutpatti* and *Nirukti* of *Jara (Derivation of the word *Jara*)

Etymologically the word "*Jara*" is derived from the "जृ" (Jru) Dhatu (root) and "अङ्" (Anga) *Pratyaya*, the feminine gender which means वयो हानौ (Vayo hanou) - growing older.

वयः कृत श्लथमांसाध्यवस्था विशेषः (Vayah Krita Slathamamsadyavastha Viseshaha)
Loosening of muscle and other tissues under the influence of aging. (Vachaspati)

जीर्यन्ति अनयो अङ्गानि इति जर (*Jeeryanti Anayo Angani Iti Jara*)
Degeneration of bodily organ. (*Gurubalaprabodhika* commentary on *Amarkosha*)

Transformation is the inherent hallmark of time, and every living being undergoes changes until complete wear and decline. This continuous cycle of change, termed ***Parinama,*** occurs under the constant influence of ***Kala* (time)**. Thus, ageing—from ***Balya* to *Tarunya, Yauvana, Proudha,* and ultimately *Vardhakya* (Jara)**—is a natural sequential outcome of *Kala*. *Ayurveda* therefore recognises *Kala-Parinama* as a fundamental causative factor in degenerative disease processes and ultimately leads *Jara*. Ageing

is ultimately cellular in nature. Cells require a precisely determined microenvironment to operate optimally. Such an environment requires integrated functioning of the all body systems which is termed as "Samyata"-i.e. equipoised state of 1. Dosha (functional factors) 2. Dhatu (the structural components), and Malas (excretory products). This Samyata is seen to be progressively disturbed with age. Here Kala is responsible for the diminution of Dosha, Dhatu and Mala in Vriddhavastha[1].

Tridoshas and the process of aging

In *Ayurveda*, the phenomenon of ageing is also related to principle of *Tridosha*. The *Tridosha Vata*, *Pitta* and *Kapha* are the most important factor in maintenance of good health and production of disease. These *Doshas* exists in the body all the time but it varies as per age, day and night and after taking meals. The properties of *Vata Dosha* are described as *Ruksha*, *Laghu*, *Sheeta*, *Khara* and *Vishada*. So *Vata dosha* by nature, decreases luster of skin, lessens body strength, dries and decays the body and hastens ageing process. Thus the process of ageing can be evaluated in terms of the *Tridoshika* physiology. The *Tridoshas Vata*, *Pitta* and *Kapha* are the basic components responsible for maintain the healthy status of the body and the mind[2].Amongst these *Doshas*, *Kapha* is predominant in *Balya*, *Pitta* in *Madhya* and *Vata* in *Vriddhavastha*.
Acharya Charaka has explained the importance of *Vata* in "*Vatakalakaleeya Adhyaya*" and in *Vatavyadhi Chikitsa Adhyaya*. *Vayu* is considered as the *Ayu* and and the *Shareera Bala* depends on the status of *Vayu* in the body. If the *Vata* is situated in its *Prakritha Sthana* and *Avastha* the person will live for more than hundred years without any diseases[3]
In the old age, many syndromes are observed which are the result of imbalance in the body constituents i.e., *Vata*, *Pitta* and *Kapha* to a lesser or greater extent. This imbalance varies in velocity and intensity depending upon many factors such as life style, habits, age etc. Thus, these variations are observed in the psychosomatic constitution of a person[4].

Agni and the ageing process

Apart from *Doshas*, *Agni* also plays an important part in ageing process. Body tissues are regularly nourished by dietary substances and *Agni* is said to be responsible for the conversion of dietary substances into tissue elements. *Ama Dosha* both as acute and in chronic state appears to relate to the metabolic disturbances. Basic doctrines of *Ayurveda* consider health and disease revolve round the nutrition and its utilisation by the body under the influence of *Agni*. In old age, more vitiation of *Vata Dosha* occurs which is responsible for *Vishamata* in *Agni* which affects the digestion and creating under nourishment of the tissues. This under nourishment of the tissues may have an impact on low status of *Dhatvagni* which transforms the food stuffs into tissue elements when deranged, leads to the formation of *Ama*. Such *Ama* can get produced either at *Jatharagni*, *Dhatvagni* or *Bhutagni* level and leads to the onset of a disease, which in turn, causes *Dhatu Kshaya*. Classics say that when there is *Atidipti* of *Dhatvagni*, they start attacking *Dhatu* and eventually lead to *Kshaya* of *Dhatu*. If this is not checked, they individual may end up in *Mrityu*[5].
Acharya Charaka mentions various causes like Dietetic indiscretions, adverse effect of therapeutic measures (*Vamana*, *Virecana and Abhyanga*), emaciation or wasting brought by other diseases, incompatibility of *Desha*, *Kala* and *Ruthu*, volitional inhibition of natural urges, mental tension and emotional instabilities leads to *Agni Dushti* and formation of *Amadosha* in the body.
Thus ageing effects are more closely related to *Manda* and *Vishamagni* in the body[6].
The *Samyavastha* of this *Jataragni* ensures the equiliberated state of *Dhatvagni* and *Bhootagni*. These are together responsible for the assimilation, growth and to sustain life. Factors depended on *Agni* are *Ayu*, *Varna*, *Bala*, *Swasthya*, *Utsaha*, *Upacaya*, *Prabha*, *Ojas*, *Tejas* and *Prana*[7].

Aging is a complex biological process characterized by hallmark features accumulating over the human life course, including mitochondrial dysfunction, telomere attrition, epigenetic alterations, Genomic instability, loss of proteostasis, cellular senescence, imbalanced metabolism, stem cell exhaustion, decreased autophagy function, and Dysregulated nutrient sensing[8].
This study mainly focuses on Imbalanced metabolism and Dysregulated nutrient sensing which can be correlate to fundamental principle of *Uttarottara Dhatu Poshana* which will get hampered in *Jaravastha* ultimately lead to *Dhatu Kshaya*.

Ksheera-Dadhi Nyaya

The *Ksheera-Dadhi Nyaya* presents the analogy that milk progressively transforms into curd, then butter, then ghee and by extension of essence (*Ahara-Rasa*) is successively converted into the seven *Dhatus* (*Rasa* → *Rakta* → *Mamsa* → *Meda* → *Asthi* → *Majja* → *Shukra*)[9]. In modern tissue biology this resembles the lineage differentiation and metabolic specialization of progenitor cells for example mesenchymal stem cells (MSCs) differentiated into osteoblasts, adipocytes or chondrocytes each step requiring sequential metabolic shifts, transcription-factor regulation and substrate specialization[10]. Thus, the earliest "*Rasa*" pool (analogous to nutrient plasma) via metabolic and enzymatic transformations gives rise to a "*Rakta*" equivalent (hematopoietic lineage), which in turn supports muscle, fat, bone, marrow etc. This mapping illustrates how the Ayurvedic theory anticipates modern views of precursor product cascades[11].A modern example of *Ksheera-Dadhi* in action is haematopoiesis: haematopoietic stem cells (HSCs) in bone marrow differentiate into multipotent progenitors then into specific blood-cell lineages (erythroid, myeloid, lymphoid) in a step-wise fashion—much like *Rasa* → *Rakta* → next *Dhatu*. The concept also echoes in muscle regeneration: satellite cells (muscle stem cells) get activated, proliferate, differentiate into myoblasts and fuse into myofibres each stage a transformation of cell identity and tissue structure[12]. In the *Ayurvedic* view, dysfunction at an early stage (e.g., impaired *Rasa* formation) may impair downstream *Dhatu* formation; equivalently, in modern physiology, early progenitor dysfunction or nutrient deficits can impair later specialized tissue formation (e.g., stem-cell exhaustion leading to sarcopenia or osteoporosis).

Kedara-Kulya Nyaya

The *Kedara-Kulya Nyaya* uses the analogy of a canal (*Kulya*) distributing irrigation to many fields (Kedara), the nutrient essence flows through channels (*Srotas*) and sequentially nourishes tissues[9]. This corresponds with vascular and microvascular perfusion: for example, after absorption in the gut, nutrients enter the portal and systemic circulation then travels to arteries →

arterioles → capillaries and then tissues thereby receive nutrients based on perfusion, vessel integrity and flow dynamics[13]. A concrete instance: during exercise, increased skeletal muscle perfusion (vasodilation, capillary recruitment) allows rapid delivery of glucose and amino acids to muscle tissue a "channel" like in irrigation[14].

Further, consider ischemia/reperfusion injury when microvascular perfusion is reduced (blocked canal), the downstream tissue becomes starved despite circulating nutrient availability. In the *Kedara-Kulya Nyaya*, context of adipose tissue expansion, increased capillary density is required for healthy adipose growth failure to develop adequate vasculature leads to hypoxia and fibrosis[15]. Thus it predicts that even if nutrient "reservoir" is sufficient, poor channel distribution limits tissue formation. This shows how the channel/irrigation model remains relevant.

Khale-Kapota Nyaya

The *Khale-Kapota Nyaya* uses the simile of pigeons picking selected grains from a field each *Dhatu* selectively absorbs the portion of *Ahara-Rasa* it requires, leaving the rest for others[9]. In modern physiology this is remarkably analogous to cellular receptor-mediated nutrient uptake and tissue-specific transporter expression for example, insulin-stimulated GLUT4 transporter up-regulation in muscle/adipose transferrin receptor up-regulation in erythroid precursors; or LDL receptor up-regulation in hepatocytes[16]. A tissue that expresses the right transporter "picks" the substrate it needs from the circulating pool, while other tissues may leave it. Thus each *Dhatu* (tissue) behaves like a pigeon selecting preferred grains in the nutrient field. Another example in bone tissue formation, osteoblasts require specific uptake of calcium, phosphate, vitamin D metabolites, and express the appropriate channels/transporters (e.g., TRPV6, sodium-phosphate cotransporters). The circulating nutrient pool may have these elements, but only osteoblasts (and related bone cells) with proper expression capture them effectively selectivity in uptake which works on basis of this *Nyaya*[17]. Similarly, in neuronal tissue, uptake of glucose via GLUT3 and amino acids via specific transporters means the brain "selects" nutrients differently from muscle or fat, again aligning with this principle. Tissue-specific nutrient extraction, therefore, Ayurvedic pigeon grain model reflects the tissue nourishment.

Eka-kala Dhatu-Poshana Nyaya

The *Eka-kala Dhatu-Poshana Nyaya* holds that following proper digestion the nutrient essence becomes available simultaneously to all *Dhatus* thus all tissues may receive nourishment at the same time (rather than strictly sequentially)[9]. Modern physiology similarly shows that once nutrients are absorbed and appear in plasma, multiple tissues have concurrent access to them e.g. after a protein-rich meal, amino acids appear in systemic circulation and are available to liver, muscle, adipose, gut mucosa, etc[18]. This reflects the idea of simultaneous supply the key difference then becomes which tissue uses what portion and how fast (selectivity, perfusion, transformation) drawing on the other *Nyayas*. For instance, when parenteral nutrition is administered in critical care, amino acids, lipids and glucose appear in systemic circulation and multiple tissues simultaneously receive substrate for repair, growth and maintenance. The bone marrow may use amino acids to produce leucocytes, muscle may synthesize proteins, liver may produce albumin all concurrently. This shows the simultaneous availability of substrate. The variation in tissue response then depends on channel delivery (Kedara-Kulya) and uptake mechanisms (*Khale-Kapota*) plus subsequent differentiation and transformation (*Ksheera-Dadhi*). In research, tracer studies (e.g., stable-isotope labelled amino acids) show how multiple tissues simultaneously extract substrate from the blood pool, supporting the *Eka-kala Nyaya.*

How does aging affects the *Dhatu Poshana* leading to *Dhatu Kshaya*?

1. *Ksheera-Dadhi Nyaya*

In old age the principle of *Ksheera-Dadhi* (*Kramanuparivartana*) is impaired because *Jataragni* and successive *Dhatvagni* become *Manda* and vitiated the *Ahara-Rasa* is therefore poorly transformed through the normal succession (*Rasa → Rakta → Mamsa → Meda → Asthi → Majja → Shukra*). As *Dhatvagni* declines with age, the qualitative *Parinama* (conversion) that yields a full, mature *Dhatu* is incomplete — resulting in *Dhatu Avayava Shoshana, Dhatu Kshaya* and appearance of *Kshaya Lakshanas* (weakness, depletion, loss of bodily tissue strength)[18].The classical texts state that when *Agni* is *Deergha-Kala* (persistently) *Manda*, the *Ahara* becomes *Ama* and cannot be properly *Parivartita* into the next *Dhatu* hence ageing produces progressive downstream *Dhatu Kshaya* by failure of sequential *Dhatu* transformation[19]. In the *Ksheera-Dadhi* model of *Jara*, clinical features like *Sarvanga Shithila, Hridaya Dosha, Sharira Bala Kshaya* and General *Dhatu Kshaya* are read as signs of diminished *Jataragni* and exhausted *Dhatvagni* leading to truncation of the sequence of *Dhatu* formation[20].

2. *Kedara-Kulya Nyaya*

According to *Kedara-Kulya Nyaya* nourishment reaches *Dhatus* through *Srotas* (the *Kulya → Kedari* irrigation analogy). In *Jara* there is progressive *Srotorodha* (narrowing/occlusion) and loss of *Srotas Kshamata* (patency and carrying capacity) due to *Vriddhi* of *Dosha-Sthana*, *Sroto-Vriddhi* and decreased *Dhatu-Vahanam* therefore even if *Ahara* and *Rasa* are present, distribution to peripheral *Dhatus* is impaired and distal *Dhatus* undergo *Kshaya*[21].The classical authorities emphasize that age-related diminution of *Dharana* and *Samvahana* (transport capacity) and loss of *Srota* elasticity cause poor *Samavahana* of *Poshaka Amsha*, producing local tissue starvation and atrophy (e.g., *Meda Kshaya* → depression of subcutaneous tissue tone *Asthi Kshaya* → shrinking and brittleness)[22]. In this *Nyaya* the hallmark of *Jara-Kshaya* is therefore *Srotodushti* with reduced *Samvahana*, manifested clinically as poor wound healing, thinning tissues and decreased peripheral nourishment[23].

Nutrient channel dysfunction refers to impaired functioning of cellular membrane channels responsible for the transport of essential ions and nutrients such as calcium, sodium, potassium, and glucose. Examples include **calcium channel dysfunction** leading to reduced muscle contraction and neurotransmission, **glucose transporter (GLUT-4) impairment** causing insulin resistance, and **potassium channel alterations** affecting cardiac rhythm and nerve conduction. These dysfunctions can arise due to oxidative stress, glycation, and mitochondrial degeneration that occur naturally with aging. Progressive cellular senescence and decreased ATP production limit the energy required for active transport mechanisms, further aggravating nutrient imbalance within tissues[24-26].As the body ages, the cumulative damage to ion and nutrient channels results in metabolic slowdown, sarcopenia, and neurodegeneration. For instance, reduced calcium channel efficiency in neurons contributes to cognitive decline, while impaired glucose transport accelerates insulin resistance and metabolic syndrome[27-29]. Moreover, lipid peroxidation and chronic inflammation alter membrane fluidity, diminishing nutrient absorption and signalling efficacy[30]. This dysfunction contributes to age-related disorders such as osteoporosis, cardiovascular diseases, and neurodegenerative conditions like Alzheimer's disease, where channelopathies play a major role in disease progression.[31-33]

3. *Khale-Kapota Nyaya*

Khale-Kapota explains that *Dhatus* "choose" *Poshaka Amsha* from the common rasa pool in jara the capacity for *Viveka-Grahaṇa* diminishes because tissues lose *Kshamata* (functional receptor/absorptive capacity) and Agni (metabolic fire), and receptor mechanisms become defective[34]. Consequently, even when *Ahara-Rasa* is systemically available, individual *Dhatus* cannot appropriately extract or assimilate the required *Amsha,* leading to selective *Kshaya* (for example, reduced *Majja Poshana* → cognitive decline, reduced *Asthi Poshana* → osteopenia)[35]. Classical texts discuss that *Vruddhi* or *Kshaya* of the support (*Bala, Ojas, Dhatvagni*) alters the discrimination of *Dhatus* ageing reduces *Ojas* and the precision of *Dhatvagni,* impairing selective uptake and thus causing tissue specific reductions[36]. From the *Khale-Kapota* view of *Jara, Dhatu Kshaya* results from loss of tissue-level capacity to "pick" its *Poshaka Amsha* from rasa, not merely from lack of circulating nutrient.

4. *Eka-Kala Nyaya*

Eka-Kala Poshana proposes that *Ahara-Rasa* becomes available to all *Dhatus* simultaneously after *Paka;* however in ageing the simultaneous availability does not guarantee utilization because systemic and local factors (*Mandagni, Ama, Srotodhatu Vahana Kshaya,* and decreased *Bala/Ojas*) reduce effective uptake and conversion into *Dhatu Sthairya*[37]. The classical viewpoint holds that in *Jara,* even though *Rasa* may be present in *Sarva-Dhatu-Srotas,* the diminished *Dhatu-Shakti* and vitiation of *Dhatvagni* prevent adequate utilization, so all *Dhatus* show gradual *Kshaya Pancha Dhatuka* depletion rather than an isolated failure. Thus, the *Eka-Kala* model explains age-related generalized *Dhatu Kshaya* as failure of *Upashamana* (utilization) mechanisms despite systemic availability: *Sarva Dhatu-Kshaya* emerges when the body's capability to convert and retain *Poshaka Amsha* simultaneously across tissues wanes.

Nutrient sensing:

It can be defined as the cells ability to recognize and respond to fuel substrates such as glucose, lipids and amino acids[38].

Khale-Kapota Nyaya and *Eka-Kala Nyaya* can be understood under Nutrient sensing mechanism. It works by detecting of Specific & measuring the concentration of Specific nutrients or ions in a sample using specialized techniques. Which are called as nutrient sensing pathways.

a. Insulin/ Insulin - like growth factor Signalling pathway.[39]
b. Mechanistic target of rapamycin (mTOR)[40].
c. Adenosine monophosphate-activated protein kinase (AMPK) – pathway[41]
d. Sirtuin pathway[42].

These pathways play a key role in Cell cycle control, DNA replication & repair, autophagy, antioxidant Stress response & glucose homeostasis. Deregulated nutrient sensing is also one of the hallmarks of aging.Nutrient sensing and metabolism are deeply interconnected physiological processes that govern cellular and systemic homeostasis. Cells constantly monitor the availability of nutrients such as glucose, amino acids, and lipids and adjust metabolic pathways accordingly to maintain energy balance and support physiological functions. As research has advanced, it has become evident that nutrient-sensing mechanisms are not only essential for immediate metabolic needs but also play a crucial role in determining **lifespan and healthspan** through regulation of stress-response pathways, inflammation, and cellular repair systems.[43] Dietary interventions have demonstrated that adjusting nutrient input directly influences these pathways, thereby modulating ageing trajectories and disease risk. Among various dietary interventions, **caloric restriction (CR)**—defined as ~30% reduction in caloric intake without micronutrient deficiency—has shown the most compelling benefits across multiple species, including primates and humans[44]. CR activates molecular stress-response pathways that suppress chronic inflammation, enhance autophagy, promote DNA repair, and increase antioxidant defense systems, collectively improving metabolic efficiency and delaying age-associated cellular decline[45]. Importantly, genetic variations that lead to reduced basal activity of nutrient-sensing pathways such as **insulin/IGF-1** and **mTOR** are strongly correlated with increased longevity, highlighting their evolutionary conservation in ageing regulation.[46] Individuals with naturally lower insulin/IGF-1 and mTOR signaling exhibit enhanced lifespan and resilience to metabolic and degenerative diseases, underscoring the biological value of nutrient-sensing modulation in healthy ageing[47].

With advancing age, nutrient-sensing pathways gradually become dysregulated due to cumulative oxidative stress, mitochondrial dysfunction, and chronic low-grade inflammation. As mitochondrial ATP production declines, cellular energy sensors such as AMPK show impaired activation, reducing the capacity to maintain metabolic homeostasis. Similarly, age-related insulin resistance disrupts insulin/IGF-1 signalling, impairing glucose uptake and anabolic processes. Decline in NAD^+ levels limits sirtuin activity, weakening genomic stability and stress-response mechanisms. Overall, altered signaling reduces the ability of cells to adapt to nutrient fluctuations, weakening metabolic flexibility and accelerating cellular ageing[48-50].

Ageing also leads to hyper activation of mTOR signalling driven by persistent nutrient exposure, inflammation, and impaired autophagy, promoting accumulation of damaged proteins and organelles. Chronic inflammatory signals ("inflammaging") further disturb nutrient-sensing networks and antagonize longevity pathways. Reduced autophagic clearance and increased oxidative DNA damage compound metabolic inefficiency. These disruptions blunt protective stress responses, contributing to sarcopenia, neurodegeneration, metabolic syndrome, and reduced lifespan[51-53]. Thus, impaired nutrient-sensing acts as a core driver of metabolic decline and degenerative ageing.

IV. CONCLUSION:

In conclusion, the concept of *Dhatu Poshana Nyaya* provides a profound *Ayurvedic* understanding of how tissues are nourished and transformed throughout life, and how this delicate process gradually weakens with aging. As metabolic efficiency, *Agni*, and cellular regeneration decline, tissues receive suboptimal nourishment, leading to *Dhatu-Kshaya***,** decreased *Ojas*, reduced immunity, and functional deterioration. Ayurveda clearly recognizes aging (*Jara*) as a natural yet modifiable process, where degeneration occurs due to impaired *Dhatu*-nourishing mechanisms and cumulative imbalance of *Doshas*, particularly *Vata Vriddhi* in old age. Thus, maintaining strong *Agni*, balanced *Doshas*, and optimal *Dhatu* metabolism becomes the cornerstone for preserving vitality and delaying age-related decline.

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