

DHATU POṢAṆA NYAYA: INTEGRATING AYURVEDIC PRINCIPLES OF TISSUE NOURISHMENT WITH MODERN PHYSIOLOGICAL CONCEPTS

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Abstract

Nyaya is defined as an expression of a general truth or principle, and in Ayurveda it serves as an important methodological tool similar to *Tantrayukti*, *Tacchilyam* and *Kalpana* to elucidate complex concepts through practical analogies and examples. *Dhatu Poṣaṇa Nyaya* are such explanatory principles employed in Ayurvedic classics and commentaries to clarify the process of formation and nourishment of the *Dhatu*. Proper nourishment of *Dhatu* is essential for the maintenance of health and prevention of disease. Classical Ayurvedic texts describe various *Dhatuposhana Nyaya* such as *Ksheera Dadhi Nyaya*, *Kedari Kulya Nyaya*, *Khale Kapota Nyaya* and *Eka kala dhatu poshana Nyaya* to elucidate the process of *Dhatu* formation [mechanism of tissue development] and distribution of nutrients in the body. Correlating *Dhatu Poṣaṇa Nyaya* with contemporary physiological and biochemical knowledge provides a meaningful bridge between classical Ayurvedic wisdom and modern scientific understanding. Such integrative interpretation strengthens the scientific relevance of Ayurveda, facilitates interdisciplinary discussions and offers a conceptual foundation for translational research, systems biology and personalised healthcare approaches. This article explores these conceptual frameworks, analysing their theoretical foundations and highlighting their relevance in understanding physiological processes in both classical and contemporary contexts.

Keywords: *Dhātu Poṣaṇa Nyāya*; Tissue Nourishment; Ayurvedic Physiology; Modern Physiology.

Introduction

The fundamental principle of Ayurveda is to maintain equilibrium among *Dosha*, *Dhatu* and *Mala*, which constitute the foundational elements of the human body¹. All three are initially nourished through the functional integrity of *Jatharagni*², by which ingested food is transformed into *Ahararasa* (nutritive essence). This nutritive essence is subsequently conveyed sequentially to each *Dhatu* for tissue nourishment. Ultimately, the essential nutrients required for the formation, maintenance, and development of body tissues are supplied through a unified circulatory stream. The entire mechanism of tissue nourishment and the transformation of nutrients into bodily elements is comprehensively explained through the concept of *Dhatu Poṣaṇa Nyaya* (the theory of tissue nutrition). This framework includes *Kṣīra–Dadhi Nyaya* (sequential transformation of nutrients), *Khale–Kapota Nyaya* (selective uptake by tissues), *Kedari–Kulya Nyaya* (transportation and distribution of nutrients), and *Eka Kala Dhatu Poṣaṇa Nyaya* (simultaneous nourishment of all tissues). Collectively, these theories depict the complex and integrated process of tissue nourishment operating at various levels of metabolism³. Although presented metaphorically, these doctrines reflect remarkably complex insights into digestion, absorption, circulation, cellular uptake and metabolic differentiation concepts that are connected strongly with contemporary physiological and biochemical understanding. *Dhatu Poṣaṇa Nyaya* has been described by several authors^{4,5} from different perspectives, there remains a need for a more precise interpretation in the context of recent advances in the light of modern physiology and biochemistry. This article aims to critically analyse the classical *Dhatu Poṣaṇa Nyayas* and correlate them with modern

physiological processes, thereby establishing a coherent, evidence-informed model of tissue nourishment that supports integrative healthcare and translational research.

Source of information

The present review is based on a comprehensive study of classical Ayurvedic literature and their authoritative commentaries, and recent research articles were also searched online from scientific sites, viz. PubMed, Google Scholar, through different keywords like *Dhatu Poshana*, *Nyaya*, nutrition, metabolism, nourishment etc. Articles not related to *Dhatuposhana Nyaya*, studies focusing solely on clinical or pharmacological aspects, publications lacking classical references, non-peer-reviewed articles, and opinion-based reports were excluded.

Review and Discussion

The nourishment of *Dhatu* is accomplished through their respective *Dhatuvaha Srotas* under the influence of *Dhatvagni*. *Ahara Rasa*, after being conveyed through the specific *Srotas* of each *Dhatu*, is acted upon by *Dhatvagni*, which converts it into *Sara* and *Kitta* portions, thereby facilitating the proper formation, nourishment, and maintenance of the *Dhatu*. This sequential and systematic process of *Dhatu* nourishment has been classically explained in Ayurveda through various *Dhatu Poṣaṇa Nyaya*, namely *Kṣira–Dadhi Nyaya*, *Kedari–Kulya Nyaya*, *Khale–Kapota Nyaya*, and *Eka Kala Dhatu Poṣaṇa Nyaya*.

Kṣira–Dadhi Nyaya

This theory postulates that each preceding *Dhatu* undergoes complete transformation into the succeeding *Dhatu*, analogous to the sequential and total conversion of milk into curd, curd into butter, butter into ghee, and ghee into *Ghṛtamanda*. *Rasa Dhatu* undergoes complete transformation into *Rakta Dhatu*; *Rakta* is successively transformed into *Mamsa Dhatu*, and this process continues in an orderly manner until the formation of *Śukra Dhatu*, which is responsible for procreation. This doctrine emphasizes the sequential and gradual transformation (*kramena pariṇama*) of each *Dhatu* into its successor. Owing to this continuous metabolic conversion (*nirantara paka*), the principle is also designated as *Krama–Pariṇama Pakṣa Nyaya*, wherein every preceding *Dhatu* is entirely converted into the succeeding *Dhatu*. *Acharya Chakrapaṇi* refutes the above theory, stating that if a complete transformation of one *Dhatu* into the succeeding *Dhatu* were to occur, then in a person subjected to prolonged starvation for a period during which *Sukra* and *Artava* are stated to be derived from *Rasa* only a single *Dhatu*, namely *Sukra*, would remain which is impossible. He further clarifies that the term *Prasadaja* signifies the nourishment or sustenance of the succeeding *Dhatu*, rather than its actual production.

Metabolism proceeds through three sequential stages: digestion, cellular transformation, and mitochondrial oxidation. Initially, carbohydrates, proteins, and fats are broken down into absorbable units such as monosaccharides, fatty acids, glycerol and amino acids. Within the cells, these molecules are further converted into central intermediates like acetyl-CoA, which enter common metabolic pathways. Finally, they undergo complete oxidation to produce carbon dioxide, water and energy (ATP) in the mitochondria.⁶

This orderly and stepwise transformation of one substance into another closely correlates with the *Kṣira–Dadhi Nyaya*, which illustrates gradual conversion just as milk transforms into curd. Biochemical pathways such as glycolysis, Krebs cycle, gluconeogenesis, the urea cycle and even anaerobic glycolysis (the conversion of pyruvate to lactate in erythrocytes) exemplify this progressive transformation, reflecting the same fundamental principle of sequential change described in *Kṣira–Dadhi Nyaya*.⁷

Kṣhira–Dadhi Nyaya (Law of Transformation) explains the complete transformation of one entity into another, like milk turning into curd, signifying total differentiation. This can be compared to pluripotent and extra-embryonic stem cells, which progressively lose their original identity and differentiate into specialized cells, giving rise to all tissues during embryogenesis and contributing to nourishment after birth, thereby suggesting a common parent cell for all bodily elements.⁸

Thus, the theory of complete transformation described under *Kṣira–Dadhi Nyaya* remains conceptually relevant and may be interpreted through the following physiological perspectives:

1. It explains the processes of transformation and cellular differentiation occurring during embryogenesis, wherein primitive structures undergo progressive specialization to form distinct tissues.

2. The tissues formed during intrauterine development persist throughout post-natal life, wherein they are continuously nourished, maintained and replenished by nutrients derived from the diet. However, complete conversion of one mature tissue into another does not occur.
3. It correlates with intracellular metabolic transformations, including biochemical pathways such as gluconeogenesis, glycolysis and β -oxidation, where substrates undergo sequential conversion into functionally active metabolites⁹.
4. At the level of gastrointestinal digestion, complex macromolecules are completely transformed into simpler absorbable units through the action of specific digestive enzymes.

Kedari–Kulya Nyaya (Law of Transportation)

Kedari–Kulya Nyaya explains tissue nourishment by comparing it to the sequential irrigation of fields through canals, where small plots (*kedara*) are supplied one after another via channels (*kulya*). Similarly, nutrients are transported through *srotas* (microvascular channels) to nourish the *Dhatus* in sequence *Rasa* *Dhatu* first from *Ahara Rasa*, followed by *Rakta* and subsequent *dhatu*s up to *Shukra*. This principle corresponds to microcirculation and tissue perfusion, emphasising that although tissues are bathed in nutrient plasma, effective nourishment requires the coordinated action of other *Dhatu* nourishment factors. *Kedari–Kulya Nyaya* elucidates the nourishment of *Dhatus* through a mechanism of orderly transmission, analogous to the irrigation of agricultural fields by canals, wherein water naturally flows from one field to another according to gradient and availability. In this model, nutrients are distributed sequentially and proportionately, ensuring systematic supply to each tissue.

The concept of targeted drug action is explained through *Kedari–Kulya Nyaya*, where nutrients and therapeutic substances reach specific tissues through designated *Srotas*, similar to irrigation water flowing through specific channels to particular fields. This principle highlights tissue-specific pathways responsible for selective drug transport and action. For example, *Shatavari* (*Asparagus racemosus*) acts as *sukrala* supporting reproductive tissues; *Shukti* preparations and *Sikta Varga* serve as *Asthipoṣaka* promoting bone nourishment; while *Gokshura* (*Tribulus terrestris*) and *Ashwagandha* (*Withania somnifera*) function as *Mamsabalya*, enhancing muscle strength and vitality.

From a modern physiological perspective, this principle closely parallels passive transport across the cell membrane. In passive transport, substances move spontaneously from regions of higher concentration to lower concentration without the expenditure of cellular energy, following concentration, electrical, or electrochemical gradients. This movement may occur as simple diffusion through the lipid bilayer or via facilitated diffusion, wherein specific carrier proteins assist the selective passage of molecules.¹⁰ Thus, *Kedari–Kulya Nyaya* conceptually aligns with the natural, gradient-driven distribution of nutrients observed in cellular physiology.

This *Nyaya* can also be understood as the targeted distribution of nutrients to different tissues, comparable to the behaviour of multipotent and oligopotent stem cells¹¹. For instance, hematopoietic stem cells differentiate into specific blood cell lineages such as myeloid and lymphoid cells based on their location and physiological demand, ultimately forming RBCs, WBCs, and platelets. This *Nyaya* highlights how nourishment is selectively transported and utilized by tissues according to their functional needs rather than being distributed uniformly throughout the body.

Kedari kulya Nyaya may be interpreted through the following physiological perspectives:

1. *Kedari–Kulya Nyaya* correlates with microcirculation and sequential tissue perfusion, where nutrients are distributed to tissues in an orderly manner through vascular channels.
2. It parallels gradient-driven passive transport, in which substances move along concentration or electrochemical gradients without energy expenditure.
3. The *Nyaya* explains tissue-specific drug targeting, where therapeutic substances reach particular *Dhatu* through designated *Srotas*, as seen with drugs like *Shatavari*, *Shukti*, *Gokshura*, and *Ashwagandha*.
4. It also reflects selective cellular differentiation, wherein cells and tissues utilize nutrients according to functional demand, comparable to lineage-specific differentiation of stem cells.

Khale kapota nyaya

Khale–Kapota Nyaya is illustrated through the analogy of a threshing floor (*Khale*) where grains are gathered, and pigeons (*Kapota*) that selectively pick only what they require. Here, *Khale* represents *Ahara*

Rasa the nutrient essence formed after digestion while *Kapota* symbolizes the selective capacity of individual *Dhatu*. Although *Ahara Rasa* circulates throughout the body, each *Dhatu* assimilates only those nutrients suited to its inherent nature (*Svabhava*), the strength of its *Dhatvagni* and its specific functional needs. Thus nourishment is not uniform but tissue-specific¹². For instance, *Asthi Dhatu* preferentially utilizes minerals such as calcium and phosphorus for structural integrity, whereas *Rakta Dhatu* selectively incorporates iron for hematopoietic function. According to this *Nyaya*, each *Dhatu* selectively derives its nourishment from *Ahara Rasa*, enabling precise and targeted tissue development. It also explains the direct nourishment of *Shukra Dhatu* from milk, owing to the presence of *Shukra-poṣhaka* parts, in accordance with the *Guṇa Samanya–Viseṣha Siddhanta*, which emphasizes nourishment based on similarity and specificity.

In this *Nyaya*, *Khale* (the field where grains are gathered) represents the energy-rich source, while *Kapota* (pigeon) symbolizes the carrier or shuttle that selectively transports and utilizes resources. The pigeon, being an aerial being, metaphorically suggests dynamic, energy-dependent processes. This principle signifies selective transport and biosynthesis, wherein specific carriers mobilize nutrients or energy from a common source for targeted utilization, storage, or transformation within the body¹³.

In contemporary biochemical terms, this concept parallels cellular energy transport systems. NADH and FADH₂ function as high-energy electron carriers that deliver electrons to the mitochondrial electron transport chain (Complex I–IV, Coenzyme Q, and cytochrome c). Through sequential redox reactions in the inner mitochondrial membrane, energy is released to pump hydrogen ions and ultimately synthesize ATP, with oxygen acting as the final electron acceptor. Similarly NADPH serves as a reducing agent in biosynthetic (anabolic) reactions essential for cellular growth and maintenance. These energy shuttles, along with active transport mechanisms such as the sodium–potassium pump, calcium pump, proton pump, and other symport and antiport systems, exemplify selective, energy-dependent transport. Together, they reflect the essence of *Khale–Kapota Nyaya*—where specialized carriers utilize energy to ensure precise distribution, specificity, biosynthesis and maintenance of physiological homeostasis.

Khale–Kapota Nyaya represents the principle of cellular selectivity in the uptake of nutrients and biochemical substances¹⁴. Just as pigeons selectively pick compatible grains from a field, cells absorb only those nutrients required for their structure and function. The plasma membrane is selectively permeable, regulating the entry of substances rather than permitting unrestricted passage. Although plasma or blood circulates throughout the body carrying various organic and inorganic nutrients essential for growth and maintenance, individual tissues selectively utilize specific nutrients according to their physiological needs through specialized transport mechanisms. For instance, nutrients such as calcium, iron, oxygen, and amino acids are transported in circulation bound to specific plasma proteins and are subsequently taken up by bones, muscles, and other tissues based on metabolic demand. Thus, this *Nyaya* conceptually corresponds to receptor specificity and selective molecular recognition governing cellular function and metabolism. This *Nyaya* also corresponds to the concept of unipotent stem cells, which possess self-renewal capacity but differentiate into only a single, specific cell type, such as epidermal stem cells for skin regeneration and spermatogonial stem cells for sperm production.¹⁵

Khale–Kapota Nyaya may also be interpreted through the following physiological perspectives:

1. Illustrates selective cellular nourishment, where tissues absorb only compatible nutrients according to their structural and functional requirements.
2. Corresponds to selective permeability of the plasma membrane and transporter-mediated mechanisms regulating nutrient uptake based on metabolic demand.
3. Parallels receptor specificity and regulated biochemical processes, including ion channels, hormone receptors, and energy-dependent transport systems maintaining physiological homeostasis.
4. Reflects lineage-specific cellular differentiation, comparable to unipotent stem cells that selectively develop into specific cell types according to functional necessity.

***Ek Kala Dhatu Poṣaṇa Nyaya* (Law of Simultaneous Nourishment of All Tissues)**

Eka Kala Dhatu Poṣaṇa Nyaya (Law of Simultaneous Nourishment) describes the concurrent supply of nutrients to all *Dhatu* at a given time. This principle can be correlated with systemic circulation, wherein the heart, through each systolic contraction, propels nutrient-rich blood throughout the body. As a result, all tissues receive nourishment simultaneously, ensuring coordinated and uniform sustenance of the entire organism.

The *Nyaya* may also be correlated with endocrine and neurohumoral signaling. Hormones released into the bloodstream are transported simultaneously to distant target organs, where they exert regulatory effects. This systemic mode of communication mirrors the Ayurvedic concept of simultaneous nourishment and functional integration across all *Dhatu*.

When modern physiological principles are considered. *Eka kala poshana Nyaya* can be considered in the following ways:

1. Correlates with electron transport and cellular energy shuttle systems, wherein carriers such as NADH, FADH₂, and NADPH, along with active transport mechanisms like sodium–potassium, calcium and proton pumps, enable energy-dependent and highly selective distribution of molecules essential for biosynthesis and cellular homeostasis.
2. Represents systemic circulation, wherein nutrients absorbed from the gastrointestinal tract enter the bloodstream and are simultaneously distributed to all tissues through the cardiovascular system.
3. Conceptually aligns with neurohumoral and endocrine signaling, in which hormones released into circulation reach multiple target tissues concurrently.

Conclusion

The concept of *Dhatu Poṣhaṇa Nyaya* represents one of the most sophisticated explanatory frameworks in Ayurveda for understanding tissue nourishment, maintenance, and transformation. Although expressed through classical analogies, these *Nyaya* collectively describe a multidimensional process involving digestion, metabolic transformation, selective cellular uptake, transportation, and simultaneous systemic distribution of nutrients. The doctrines of *Kṣīra–Dadhi Nyaya*, *Khale–Kapota Nyaya*, *Kedari–Kūlya Nyaya*, and *Eka Kala Dhatu Poṣhaṇa Nyaya* together illustrate sequential transformation, selective utilization, organized transport, and concurrent nourishment of body tissues, reflecting an integrated view of physiological functioning.

When interpreted in light of contemporary biomedical sciences, these principles demonstrate striking parallels with modern concepts such as embryological differentiation, biochemical metabolic pathways, membrane selectivity, receptor specificity, microcirculation, gradient-dependent transport, systemic haemodynamics, cellular energy metabolism, and endocrine communication. Such correlations reveal that Ayurvedic scholars conceptualized tissue nutrition as a dynamic, regulated, and system-wide phenomenon rather than a simple linear process.

Integrating *Dhatu Poṣhaṇa Nyaya* with modern physiological understanding not only enhances the scientific interpretability of classical Ayurvedic knowledge but also supports interdisciplinary dialogue between traditional medicine and contemporary life sciences. This integrative perspective provides a valuable conceptual foundation for systems biology, personalized medicine, targeted therapeutics, and translational research. Thus, *Dhatu Poṣhaṇa Nyaya* continues to remain clinically and scientifically relevant, offering a holistic model of tissue nourishment that bridges ancient wisdom with modern biomedical insight.

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