



A review on Dhatu Poshan Nyaya: with the principles of stem cell theory

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The concept of Dhatus in Ayurveda refers to the physiology of basic nutritional and structural factor of the body. The Ahara Rasa is the source of for nourishing the Dhatus and Dhatu nutrients are nourished one after another from Ahara Rasa to Shukra. Acharya used Nyaya to elaborate the concept. Dhatu Poshan Nyaya gives us a clear view about how the Dhatus formed and how the conversion of Ahara Rasa takes place in Saptdhatus. Rakta Dhatu is the primary source of longevity and survival in human beings. Its formation is a continues process that sustains life. To understand tissue formation, it is essential to understand the Ayurvedic principles that explain the transformation of Ahara Rasa into Dhatus. Ahara has to undergo digestion by Pachakagni, Dhatvagni, along with Bhutagni. Dhatu gets nourished by Dhatu and nourishes another Dhatu. Theories of Dhatu Poshan Nyaya are not different all together, connected to a sequential process where one step follows another in a linked manner, as the step-by-step transformation of nutrients into body tissue (Dhatus) or the sequential differentiation of stem cells into specialized cells. Modern science explains the formation of blood cells during the embryonic stage with the involvement of mesenchymal cells and later hematopoietic cells. Acharyas postulated theories of tissue nutrition and transformation of tissue nutrients into body elements through Dhatu Poshan Nyaya as Khseera Dadhi Nyaya (law of transformation), Kedari Kulya Nyaya (Law of Transportation), Khale Kapot Nyaya (Law of selectivity), Ek Kala Dhatu Poshan Nyaya (Simultaneous supply of nutrients to whole body).

Keywords: Dhatu Poshan, Ahara Rasa, Dhatvagni, Tissue, Stem cells

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Introduction

In Ayurveda, Acharya Sushruta stated, “*Dosha Dhatu Mala Moolam Hi Shariram*,”[1] meaning the human body is composed of *Dosha* (bioenergies regulating bodily functions), *Dhatu* (structural components), and *Mala* (waste products), all of which are continuously nourished by *Ahara* (food). This food is processed by *Jatharagni*,[2] transforming it into *Ahara Rasa* (nutritive essence) and *Ahara Mala* (waste products like urine and stool). Now this *Ahara Rasa* is acted upon by *Dhatwagni* likewise- *Rasa Dhatwagni*, when acting on *Ahara Rasa*, divides into *Sthoola Bhaga* and *Shukshma Bhaga*. *Sthoola Bhaga* nourishes the *Rasa Dhatu*, whereas *Shukshma Bhaga* is again divided into *Rakta Nirmana Ansh* (which further nourishes *Rakta Dhatu*), *Updhatu* (*Stanya* and *Artava*), and *Mala* (*Kapha*), and so on.[3]

Tissue nutrition and differentiation vary across different life stages. During early intrauterine life (before the 8th week of gestation), the embryo receives histotrophic nutrition. As fetal oxygen demand increases, nutrition shifts to haemotrophic, facilitated by maternal-placental circulation.[4]

After birth, oral nutrition begins, where nutrients are obtained through food intake. Similarly, tissue differentiation follows a specific pattern throughout life. This article explores *Dhatu Poshan Nyaya* to understand the principles governing tissue development and nourishment.

Aim and Objectives

To explain the concept of *Dhatu Poshan Nyaya* through stem cell theory.

Tissue Nutrition During Intra-Uterine Life[5]

As per Acharya Charak *Ahara Ras* of mother gets divided into 3 parts - one part nourishes mother's body, one goes in the formation of *Stanya* and one part nourishes to *Garbha*. During organogenesis, manifested organs receive nourishment through the processes of *Upsneha* and *Upsveda*. The *Dhamanis* (vessels) of the maternal body, which transport *Rasa* (nutrients), extend laterally and longitudinally in all directions, supplying nutrition via *Upsneha*. [4] According to the commentator Indu, *Upsneha* and *Upsveda* refer to *Snighatva* (unctuousness) and *Utkleda* (moistening), respectively.

The unctuous components of amniotic fluid, such as lipids and glycogen, contribute to the growth and development of the fetus, resembling the function of *Sneha* (unctuousness). Meanwhile, the water and electrolyte content of amniotic fluid corresponds to *Upsveda*, ensuring proper nourishment and hydration for fetal development. After organogenesis is complete, nourishment is provided primarily through perfusion, mainly via the umbilical cord, though sometimes also through the hair.

Acharya Sushruta states that the *Garbha-Nabhi-Nadi* (fetal umbilical vessels) connects the fetus's umbilicus at one end and the placenta at the other. The placenta, in turn, is linked to the mother's heart through the *Rasavaha Nadi* (blood vessels), facilitating nutrient exchange.[6]

According to modern science, the developing fetus initially derives nutrition from endometrial secretions or the yolk sac before the placenta forms. At first, nutrition is histotrophic, where the trophoblast absorbs secretions from the oviduct and later from the uterus, known as uterine milk.[7]

Tissue Nutrition During Post-Natal Life

Immediately after birth, a baby receives nutrition from *Stanya*[8] (mother's milk), which is an *Upadhatu*[9] (secondary tissue product) of *Rasa Dhatu*. As the child grows, *Ahara* (solid food) becomes the primary source of nourishment. The nutrients derived from food, known as *Ahara Rasa* (nutrient pool), continuously circulate and sustain the body.

When nutrients reach various tissues through their respective *Shrotas* (channels), they are absorbed and metabolized by *Dhatwagni*, which converts them into tissue components or utilizes them for cellular functions.

Throughout digestion and metabolism, *Dosha* formation occurs in two phases:[10]

1. *Avasthapaka* (stage of digestion) - The *Doshas* produced in this phase are *Mala*
2. *Vipaka* (post-digestive transformation) - The *Doshas* formed here can be considered *Dhatu Roopi*.

This process ensures continuous nourishment, tissue maintenance, and metabolic balance in the body. The *Mala Roopi Dosha Ahara Mala* and *Dhatu Mala* get nurture by the *Kitta* (metabolic waste products) portion of *Ahara Rasa*.

Dhatu Poshan Nyaya**Ksheera Dadhi Nyaya[11] (Law of Total Transformation)**

According to this principle, just as milk undergoes a sequential transformation into curd, curd into buttermilk, buttermilk into butter, butter into *Ghrita* (clarified butter), and *Ghrita* finally into *Ghritamanda*, the *Dhatus* (bodily tissues) also transform similarly. *Rasa Dhatu* (plasma) is completely converted into *Rakta Dhatu* (blood), *Rakta* into *Mamsa Dhatu* (muscle), and so on, until *Shukra Dhatu* (reproductive tissue) is formed, which is responsible for progeny. This principle emphasizes the gradual transformation of one *Dhatu* into the next. Additionally, it is referred to as *Karma Parinama Paksha Nyaya*, as each preceding *Dhatu* is fully transformed into the succeeding one in a continuous metabolic process.

As per *Lok Purusha Samya Siddhanta*[12]

Substance	Dhatu
Ksheera (milk)	Rasa
Dadhi (curd)	Rakta
Takra (butter milk)	Mamsa
Navneeta (butter)	Meda
Ghrita (ghee)	Asthi
Ghritamanda (supernatant of ghee)	Majja
	Shukra - Sarva Dhatu Sara

Dhatu Nirmana Kala from initial *Rasa Dhatu* to the last *Shukra Dhatu* is 7 days according to *Acharya Charak* and 30 days according to *Acharya Sushruta*. [13]

Kedari Kulya Nyaya[14] (Law of Transportation)

According to this *Nyaya* -

Kedar	Field under irrigation	Dhatu
Kulya	Canal that helps to irrigate fields	Shrotas
Jal	Water / Nutritional pools	Ahara Rasa

Water is supplied to the fields through canals. As the water flows through the canal, it first reaches the nearest field. After fulfilling the field's irrigation needs, the remaining water continues to the next field, and this process continues sequentially. Similarly, this principle (*Nyaya*) illustrates the sequential nourishment and time required for the replenishment of the seven *Dhatus*. The nourishing fluid, known as *Ahara Rasa*, initially nourishes *Rasa Dhatu*.

Essential nutrients for its development are absorbed by the *Rasavaha Srotas*, where *Rasa-Dhatawagni* acts upon them to form *Rasa Dhatu*. Once *Rasa Dhatu* is replenished, it then nourishes the next *Dhatu* in the sequence. This process continues until *Shukra Dhatu* is nourished, completing the entire transformation cycle within seven days.

Khale-Kapota Nyaya[15] (Law of Selectivity)

This concept is explained using the analogy of *Khale* (field grains) and *Kapota* (pigeons). After harvesting, grains are piled in the field, and pigeons from different places come to collect them before flying back to their nests. The time taken to return varies based on the distance and direction they travel. As this law explains how *Ahara Rasa* nourishes different dhatus through specific *Srotas*. As *Srotas* extend further, their diameter decreases, slowing the nutrient flow which affects the time taken for nourishment distribution.

Ahara Rasa	Paddy field
Sthayi Dhatu	Nests
Poshak Dhatu	Pigeons
Dhatuvaha Shrotas	Travelling routes of pigeons

Ek Kala Dhatu Poshan Nyaya[16] (law of simultaneous supply of nutrients to whole body) theory explains that with help of *Vyan Vayu*, *Ahara Rasa* nourishes all *Dhatus* uniformly at same time.

Application in Dhatu Nourishment

Similarly, each *Sthayi Dhatu* selectively absorbs the necessary nutrients from *Ahara Rasa* through its respective *Dhatuvaha Srotas*, ensuring proper nourishment. According to *Acharya Sushruta*, *Rasa Dhatu* serves as the transporter of nutrients to the stable *Dhatus*. It spends 3015 *Kala* (approximately five days) in each *Dhatu* before moving to the next. Thus, the complete transformation and nourishment of all six *Dhatus* take about one month.

Dhatus are classified into two types:[17]

1. *Asthayi (Poshaka) Dhatu* - These are unstable or circulating tissues, primarily *Rasa* and *Rakta Dhatu*.
2. *Sthayi Dhatu* (Stable Tissue) - All other *Dhatus*, which are permanent and require nourishment from *Poshaka Dhatu*.

Stem Cells: The Master Cells of the Body[18]

Each type of cell in the body has a specialized structure and function, distinct from its unspecialized precursor cells.

These precursor cells are known as stem cells, often referred to as “master cells” due to their ability to differentiate into specialized cell types.

Key Properties of Stem Cells:

Stem cells are defined by two fundamental characteristics:

1. Self-Renewal - They can continuously divide, producing identical stem cells to maintain the stem cell pool.
2. Differentiation Potential - They can generate all cell types within the tissue from which they originate.

To be classified as a stem cell, a cell must meet three main criteria:

- Unlimited Division - It can divide indefinitely, even after long periods of inactivity.
- Renewal of the Stem Cell Pool - Upon division, each daughter cell can either remain a stem cell or differentiate into a specialized cell, such as a muscle cell, red blood cell (RBC), or brain cell.
- Tissue-Specific Differentiation - Under certain physiological or experimental conditions, stem cells can transform into cells specific to particular tissues or organs.

Classification of Stem Cells Based on Potency[19]

Stem cells are categorized based on their differentiation potential:

1. Totipotent Stem Cells - Can develop into all cell types, including embryonic and extra-embryonic tissues (e.g., a fertilized egg).
2. Pluripotent Stem Cells - Can differentiate into any cell type and give rise to 3 germ layers - ectoderm, endoderm, and mesoderm but are unable to generate extra-embryonic tissues like the placenta.
3. Multipotent Stem Cells - Can give rise to multiple cell types within a limited number of cell types based on the origin of tissue. They are not pluripotent because they lost the ability to become cells of all three germ layers and are present in almost all the tissues.
 - (e.g. Haematopoietic stem cells give rise to different types of blood cells.
 - Mesenchymal stem cells give rise to fat, bone, muscles, and cartilage.
 - Neural stem cells give rise to neurons and oligodendrocytes.)

4. Oligopotent Stem Cells - Can differentiate into a few closely related cell types- Myeloid stem cells.

5. Unipotent Stem Cells - Can only produce cells of their own type but retain self-renewal ability (e.g., muscle stem cells).

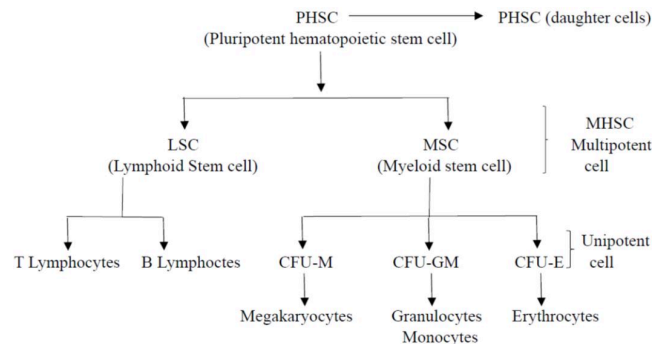


Chart 1: Pluripotent stem cell presentation present in bone marrow of Blood cell formation.[20]

Discussion

Dhatu Poshan Nyaya, which translates to tissue nutrition and differentiation, explains the formation and maintenance of the seven *Dhatu*s (body tissues) throughout life. While the formation of *Dhatu*s begins during the embryonic stage (*Garbha*), their nourishment and upkeep continue lifelong. The type of stem cells determines the differentiation of tissues in the developing fetus at various stages.

Application of *Dhatu Poshan Nyaya* in Stem Cell Differentiation

1. Ksheera Dadhi Nyaya (Law of Transformation)

This principle states that one type of cell undergoes complete transformation into another, similar to milk (*Kshira*) turning into curd (*Dadhi*). It signifies total differentiation, where an initial cell type loses its original form to develop into another specialized form. This can be compared to the differentiation process of pluripotent stem cells and extra-embryonic (placental) stem cells.

These cells, though not immortal, possess a high division potential and sequentially differentiate into specific cell types, forming various tissues during embryogenesis and continuing to contribute to nourishment post-birth. This theory suggests the existence of a common parent cell for all bodily elements.

2. Kedari Kulya Nyaya (Law of Transportation)

This principle can be compared to multipotent and oligopotent stem cells, which differentiate into multiple, but limited, cell types depending on their location. For example, hematopoietic stem cells (multipotent) give rise to different blood cell lineages, such as myeloid stem cells and lymphoid stem cells (oligopotent). These, in turn, sequentially produce red blood cells (RBCs), white blood cells (WBCs), and platelets. This theory illustrates how nutrients are selectively transported and utilized by specific tissues and cells based on their functional requirements.

3. Khale Kapot Nyaya (Law of Selectivity)

This concept aligns with unipotent stem cells, which are capable of differentiating into only one specific cell type while retaining self-renewal properties. Examples include epidermal stem cells (which regenerate skin) and spermatogonial stem cells (which produce sperm). According to this *Nyaya*, each *Dhatu* independently derives nourishment from *Ahara Rasa* (nutrient essence of food), ensuring targeted tissue development. This principle also suggests the direct nourishment of *Shukra Dhatu* (reproductive tissue) from milk due to the presence of *Shukra Poshak Amsha* (nutritional essence beneficial for *Shukra*), based on the Ayurvedic *Guna Samanya-Vishesh Siddhanta* (principle of similarity and dissimilarity in nutrition).

4. Ek Kala Dhatu Poshan Nyaya (law of simultaneous supply of nutrients to whole body)

The concept aligns with the circulation of all nutrients through blood by the heart. It is delivered to all tissues with each systolic contraction of the heart, simultaneously nourishing them.

Nyaya's	Modern Theory	Explanation
Ksheera Dadhi Nyaya	Pluripotent stem cell or extra-embryonic stem cell	Theory that explains the total transformation
Kedari Kulya Nyaya	Multipotent stem cell	Theory that explains sequential differentiation
Khale Kapot Nyaya	Unipotent stem cell	Theory that explains selectivity
Ek Kala Dhatu Poshan Nyaya	Circulation of cells	Theory that explains simultaneous supply of nutrients to whole body

Conclusion

Nyaya, in the context of Ayurveda, refers to the principles that explain the process of tissue nourishment and differentiation through various channels. No single *Nyaya* alone can fully explain this complex process; instead, all *Nyayas* must be considered together to understand the sequential nourishment and transformation of *Dhatus*. Tissue nutrition and differentiation is a continuous process that begins immediately after conception and persists throughout life. However, the stages of tissue differentiation vary at different developmental phases.

Based on this understanding, *Ayurveda* provides a comprehensive explanation of tissue nourishment and differentiation, which closely aligns with modern scientific concepts. During early embryonic development, totipotent and pluripotent stem cells differentiate into the three germ layers - endoderm, mesoderm, and ectoderm. This transformation follows the *Ksheera Dadhi Nyaya* (Law of Complete Transformation), where one form completely changes into another.

Similarly, *Kedari Kulya Nyaya* (Law of Transportation) describes how nutrients flow in a sequential manner, similar to water moving through canals. This is comparable to the behavior of multipotent and oligopotent stem cells, which differentiate into specific cell types while retaining their self-renewal properties. Thus, different types of stem cells contribute to the formation of various structures in the body, reflecting the *Ayurvedic* principles of tissue nutrition and differentiation.

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