“ Applied Correlations of Vāta Doṣa and Agni with Cellular Receptor Physiology: A Narrative Review”

Dr Pushpendra Kumar Pandey

M.D., PhD, Principal

R.N. Kapoor Memorial Ayurved College, Indore, Madhya Pradesh

ABSTRACT

This narrative review explores the applied correlations between *Vāta Doṣa* and *Agni,* two fundamental Ayurvedic principles and modern concepts of cellular receptor physiology. Drawing from classical Ayurvedic texts (*Charaka Saṃhitā*, *Suśruta Saṃhitā*, *Aṣṭāṅga Hṛdaya*) and contemporary biomedical literature, the study establishes conceptual parallels between Ayurvedic models of motion and transformation and molecular mechanisms of signalling and metabolism. *Bhūtāgni* and *Dhātvāgni* are interpreted as elemental and tissue-level metabolic regulators analogous to enzymatic and intracellular metabolic processes, while *Vāta* represents the kinetic and communicative principle comparable to neural conduction and receptor-mediated signalling. The integrated functioning of these entities reflects a sophisticated regulatory network that aligns with the coordination between signal transduction and metabolic adaptation in modern physiology. Understanding *Vāta–Agni* interdependence thus provides a holistic framework for interpreting cellular communication, receptor responsiveness, and homeostatic regulation from an Ayurvedic–biomedical perspective.

Keywords: *Vāta Doṣa*, *Agni*, *Bhūtāgni*, *Dhātvāgni*, Cellular Receptor Physiology, Integrative Medicine

INTRODUCTION

The ability of cells to communicate effectively is fundamental to the maintenance of physiological homeostasis and the coordination of complex biological functions. Cellular communication occurs through several well-characterised mechanisms, including direct cytoplasmic connections via gap junctions, membrane-bound juxtacrine interactions, and the secretion of chemical messengers that act through paracrine, autocrine, endocrine, or synaptic pathways[1]. Central to all these signalling processes is the ligand–receptor interaction, wherein a signalling molecule binds to a specific receptor on the target cell, initiating conformational and biochemical changes that modulate gene expression, cellular morphology, proliferation, and metabolic activity.[2] Thus, the receptor-mediated signalling network represents a highly organised system of regulation, ensuring that cells respond appropriately to internal and external stimuli.

Beneath this molecular framework lies a broader principle that unifies biological communication and transformation. At its core, cellular signalling is a process of movement and metabolic conversion two phenomena that parallel the classical Ayurvedic concepts of *Vāta Doṣha* and *Agni*, respectively. Ayurveda, one of the world’s most enduring systems of life sciences, describes *Vāta* as the principle of motion and communication, and *Agni* as the governing force of transformation and metabolism.[2] When viewed through the lens of cellular physiology, these concepts find resonance in the continuous flow of information and energy that sustains life at the molecular level.

Agni represents the metabolic intelligence of the organism, responsible for digestion, assimilation, and cellular transformation.[3] It functions at multiple hierarchical levels: *Jatharāgni* at the systemic level, *Bhūtāgni* at the elemental level, and *Dhātvāgni* at the tissue level, each overseeing successive phases of biochemical refinement and assimilation.[4] This multi-tiered model of metabolic regulation closely parallels modern understanding of enzymatic networks and receptor-mediated intracellular signalling cascades. Just as enzymes catalyse the conversion of substrates into biologically active molecules, *Agni* is believed to facilitate the transformation of food and sensory inputs into physiological energy and structural integrity.[5] The *Dhātvāgni* concept, which governs tissue-specific metabolic processes, reflects the cellular mechanisms that maintain tissue homeostasis and regeneration.[6]

In contrast, *Vāta Doṣha*, characterised by the predominance of *Vāyu* (air) and *Ākāśa* (ether) elements, governs all forms of motion and communication within the body.[7] It regulates sensory perception, neural conduction, circulation, and the dynamic exchange of information between cells.[8] This concept finds a modern correlate in the kinetics of molecular signalling, such as the movement of ions across membranes, neurotransmitter release, receptor activation, and intracellular transduction pathways.[9] In this context, *Vāta* can be understood as the organising principle behind biological dynamism, ensuring that communication and responsiveness are sustained across multiple cellular domains.

The interdependence of *Vāta* and *Agni* in Ayurveda mirrors the close coupling of signalling and metabolism in cellular physiology. Just as *Vāta* governs the initiation and propagation of biological activity, *Agni* determines the efficiency of transformation and utilisation of these signals into meaningful cellular responses. Together, they form an integrative model of physiological regulation that embodies both dynamic movement and transformative metabolism, fundamental characteristics shared by living systems from the molecular to the organismal level.

This review aims to elucidate the applied dimensions of *Vāta Doṣha* and *Agni* in the context of cellular receptor physiology, exploring their conceptual intersections and mechanistic parallels. By synthesising classical Ayurvedic insights with contemporary molecular biology, it seeks to advance an integrative understanding of how movement, communication, and transformation operate as unified forces in the regulation of life processes.

MATERIALS AND METHODS

This review was conducted through a comprehensive analysis of classical Ayurvedic texts, including *Charaka Saṃhitā*, *Suśruta Saṃhitā*, and *Aṣṭāṅga Hṛdaya*, along with contemporary biomedical literature on cellular receptor physiology. Comparative interpretation was applied to correlate Ayurvedic concepts of *Vāta Doṣa* and *Agni* with modern physiological and molecular mechanisms.

RESULT AND DISCUSSION

1. Panchabhūtāgni: Distributed Elemental Metabolism

Ayurvedic texts describe five *bhūtāgni pārthivāgni*, *āpyāgni*, *taijasāgni*, *vāyvīyāgni*, and *nābhāsāgni,* each corresponding to the five *mahābhūta*. After *jatharāgni* completes the initial digestion, these *bhūtāgni* act on their respective elemental fractions of the digested material, transforming them into subtle forms suitable for tissue assimilation.

The classical sources indicate that although the *yakṛt* (liver) is a primary site of *bhūtāgnivyāpāra*, the action of *bhūtāgni* is not limited to it.[10] *Bhūtāgni* are distributed throughout the body, present in every *dhātu paramāṇu* (tissue cell). Each cell thus becomes a site of continuous elemental transformation, reflecting a decentralised and systemic metabolic process comparable to intracellular metabolism in modern physiology.

This interpretation positions *bhūtāgni* as a functional equivalent of cellular metabolic enzymes that maintain homeostasis by transforming nutrients into energy and structural components.

2. Stages of Bhūtāgnipāka and Sequential Transformation

The process of *bhūtāgnipāka* follows *jatharāgnipāka* and represents the intermediate phase between digestion and tissue assimilation. Classical texts outline successive stages[10]:

- *Madhura bhāva* (initial digestion in *ūrdhva āmaśaya*) corresponding to carbohydrate breakdown.
- *Amla bhāva* (digestion in *adha āmaśaya*) relating to protein denaturation and acidification.
- *Pakvāśaya stage* where separation of *sāra* (nutritive essence) and *kitta* (waste) occurs.

After this, *bhūtāgni* act on the elemental portions (*pārthiva, āpya, taijasa, vāyvīya,* and *nābhāsa*), refining them into assimilable units. This description corresponds functionally to cellular intermediary metabolism, where absorbed nutrients undergo elemental and molecular conversion to generate energy and biosynthetic intermediates.

3. Element-Specific Functions of Bhūtāgni

Each *bhūtāgni* exhibits selective action on its respective elemental group (Table 1) [Chakrapani on Cha.Sa.Chikitsa Sthana 15/12-13].

Bhūtāgni	Mahābhūta	Primary Physiological Role	Modern Correlate
Pārthivāgni	*Pṛthvī*	Formation of solid tissues: muscles, bones, ligaments	Protein synthesis, anabolic processes
Āpyāgni	*Āpa*	Maintenance of body fluids, reproductive tissues, and lubrication	Lipid metabolism, plasma regulation
Taijasāgni	*Agni*	Thermoregulation and mineral metabolism	Enzymatic catalysis, oxidative metabolism
Vāyvīyāgni	*Vāyu*	Neural coordination and regulation of movements	Neurotransmission, bioelectrical signalling
Nābhāsāgni	*Ākāśa*	Maintenance of structural spaces and channels (*srotas*)	Membrane permeability, intercellular communication

This element-specific metabolism establishes a continuum between biochemical transformations and functional tissue differentiation, forming the physiological foundation for receptor-level communication.

4. Bhūtāgni and Sensory System Nourishment

Bhūtāgni not only support metabolism but also sustains sensory perception by nourishing the corresponding *indriya* (sense organs). The subtle essence of each element contributes to the functionality of a specific sense smell (*gandha*), taste (*rasa*), vision (*rūpa*), touch (*sparśa*), and hearing (*śabda*). [Cha.Sa.Chikitsa Sthana 15/3-4, 12-14] In the modern context, this may be compared with the constant molecular regeneration of receptor cells such as olfactory neurons, photoreceptors, and mechanoreceptors requiring continuous metabolic input. This alignment reflects how *bhūtāgni* maintains receptor vitality and responsiveness through steady biochemical turnover.

5. Dhātvāgni: Tissue-Level Metabolic Transformation

The seven *dhātvāgni rasa, rakta, māṃsa, meda, asthi, majjā,* and *śukra* act sequentially within their respective *dhātu*. Each transforms nutritive essence into tissue-specific components, producing *prasāda bhāga* (essence) and *mala bhāga* (by-product).[11]
This *dhātvāgnipāka* can be correlated with anabolic and catabolic pathways within tissue cells. Proper functioning maintains equilibrium, while hypoactivity (*mandāgni*) or hyperactivity (*tīkṣṇāgni*) leads to tissue depletion (*kṣaya*) or pathological accumulation (*vṛddhi*).

Thus, *dhātvāgni* represents the biochemical basis of tissue homeostasis and renewal, analogous to cellular anabolic metabolism and protein turnover.

6. Vāta Doṣa as the Principle of Dynamic Regulation

Vāta, composed of *vāyu* and *ākāśa* elements, governs motion, communication, and coordination across all physiological systems. Its attributes mobility (*chala*), subtlety (*sūkṣma*), and lightness (*laghu*) enable it to act as the carrier of signals and energy.[12]

From a modern viewpoint, *vāta* parallels bioelectrical and signalling dynamics in the nervous and endocrine systems. The five subtypes *prāṇa, udāna, samāna, vyāna,* and *āpāna vāyu* correspond to regulatory divisions of physiological functions such as respiration, circulation, digestion, neural transmission, and excretion.[13]

At the cellular level, *vāta* represents the kinetic and informational component that drives receptor activation, ion channel opening, vesicular transport, and molecular communication processes essential for maintaining receptor responsiveness and intracellular signalling.

7. Integration of Bhūtāgni, Dhātvāgni, and Vāta in Cellular Physiology

The coordination between *bhūtāgni*, *dhātvāgni*, and *vāta* reflects a hierarchical control system comparable to cellular homeostasis mechanisms.

- *Bhūtāgni* refines the elemental nutrients into molecular substrates.
- *Dhātvāgni* assimilates and converts these substrates into functional tissue components.
- *Vāta* regulates the movement and signalling necessary for these transformations.

In receptor physiology, ligand binding initiates a cascade of intracellular events that modify metabolism, gene expression, and cellular function. This parallels how *vāta* initiates *agni*-driven transformations within tissues. Thus, *vāta* may be considered analogous to signal transduction and kinetic energy flow, while *agni* represents biochemical conversion and catalytic activity.

8. Pathophysiological Interdependence

Disruption of any of these regulatory entities manifests as a physiological imbalance.

- Diminished *agni* correlates with reduced metabolic activity, comparable to enzyme inhibition or receptor desensitisation.
- Hyperactivity of *agni* resembles excessive oxidative metabolism or inflammatory hyper-responsiveness.
- *Vāta vṛddhi* (overstimulation) parallels hyperexcitability or dysautonomia, while *vāta kṣaya* reflects impaired signalling or synaptic transmission.

Hence, maintaining *vāta–agni* equilibrium ensures proper cellular responsiveness, receptor sensitivity, and tissue metabolism analogous to the balance between signalling intensity and metabolic adaptability in modern physiology.

9. Therapeutic Implications

Ayurveda emphasises restoration of *vāta* and *agni* balance through dietary, lifestyle, and therapeutic measures. Sweet, sour, and salty tastes (*madhura, amla, lavaṇa rasa*) pacify *vāta*, while *snehana* (unctuous therapy), *swedana* (fomentation), and *basti* (medicated enema) normalise its functions. These interventions enhance *agni*, improve metabolic coordination, and stabilise receptor-level responsiveness, reflecting a holistic regulation of cellular communication and energy dynamics.

10. Integrative Interpretation

The combined evidence suggests that *bhūtāgni* represents elemental metabolism, *dhātvāgni* represents tissue-specific biochemical transformation, and *vāta* embodies the dynamic regulatory force that enables signalling and motion. Together, they form a functional triad that maintains homeostasis across molecular, cellular, and systemic levels.

This triadic framework mirrors modern receptor physiology, where cellular responsiveness depends on the balance between energy transformation (agni) and information transmission (vāta). The ancient Ayurvedic understanding of *vāta–agni–dhātu* integration thus provides a profound, systemic model for interpreting cellular communication and receptor-regulated metabolism.

CONCLUSION

The integrated understanding of *Vāta Doṣa* and *Agni* reveals a dynamic interplay between regulation and transformation that parallels modern concepts of cellular signalling and metabolism. *Bhūtāgni* and *Dhātvāgni* sustain molecular and tissue-level metabolism, while *Vāta* governs their coordination, collectively maintaining physiological equilibrium and receptor responsiveness essential for cellular homeostasis.

REFERENCES

1. Reyes P, Ashraf MA, Brown KN. Physiology, Cellular Messengers. [Updated 2023 Apr 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538154/
2. Sharma H. Ayurveda: Science of life, genetics, and epigenetics. *Ayu*. 2016;37(2):87-91. doi:10.4103/ayu.AYU_220_16

3. Agrawal AK, Yadav CR, Meena MS. Physiological aspects of Agni. *Ayu*. 2010;31(3):395-398. doi:10.4103/0974-8520.77159
4. Charaka Samhita, Sashtri Kashinath, Pt, Chaturvedi Gorakhnath., Dr . Varanasi: Chaukhamba Bharti Academy; 2004. p. 917.
5. Metallo CM, Vander Heiden MG. Understanding metabolic regulation and its influence on cell physiology. *Mol Cell*. 2013;49(3):388-398. doi:10.1016/j.molcel.2013.01.018
6. Dr. Usharani L. R., Dr. B. H. Katti, Dr. Venkatesh Goudar, Dr. M. R. Sajjanshetty. Review on Agni w.s.r. to Jatharagni and its role in Amotpatti. J Ayurveda Integr Med Sci 2021;1:157-165.
7. Vagbhata. Ashtanga Samgraha. Edited by Shivprasadsharma. 3rd Ed., Varanasi: Chowkhamba Sanskrit Series Office; 2012.
8. Soni S, Sasmal G, Bhardwaj V, Physiological concept of Vata Dosha in relation to Brain Function. J Ayu Int Med Sci. 2024;9(5):169-171. Available From https://jaims.in/jaims/article/view/3396
9. Cooper GM. The Cell: A Molecular Approach. 2nd edition. Sunderland (MA): Sinauer Associates; 2000. Pathways of Intracellular Signal Transduction. Available from: https://www.ncbi.nlm.nih.gov/books/NBK9870/
10. Bhojani M.K., Durga Rani. "Bhutagni". Charak Samhita New Edition, edited by Deole Y.S., eds., 1st edition, CSRTSDC, 2020, pp. 239, Doi:10.47468/CSNE.2022.e01.s09.110
11. Agrawal S, Verma V, Gehlot S. Explication on tissue nutrition in prenatal and postnatal life: An Ayurveda perspective. J Ayurveda Integr Med. 2021 Jan-Mar;12(1):198-205. doi: 10.1016/j.jaim.2020.05.002. Epub 2020 Aug 24. PMID: 32855015; PMCID: PMC8039343.
12. Bijita Majumder, Sukalyan Ray. Studies on Functions of Vata Dosha- A Novel Approach. International Journal of Ayurveda and Pharma Research. 2022;10(Suppl 2):117-124. https://doi.org/10.47070/ijapr.v10iSuppl2.2542
13. A Comprehensive Review of Saman Vayu Apropos Regulation of Gastrointestinal Tract. Ayushdhara [Internet]. 2024 Nov. 20 [cited 2026 Jan. 17];11(5):197-203. Available from: https://ayushdhara.in/index.php/ayushdhara/article/view/1742