IJ-RIMS

International Journal of Research in Integrated Medical Science

E-ISSN:

journal homepage: www.intemed.in

Vol.:2 | Issue: 2| February-2026

Article History: Received: 17-02-2026 Accepted: 27-02-2026 Published:28-02-2026

Review Article

Jatharagni and Cellular Metabolism: A Comparative Analysis

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ABSTRACT

Background: *Jatharagni* is the principal digestive and metabolic fire described in Ayurveda, governing transformation of ingested food into nutritive essence (*ahara rasa*). Classical literature identifies *agni* as the determinant of health, strength, complexion, immunity, and longevity (1). Contemporary biomedical science attributes systemic metabolism to coordinated enzymatic, mitochondrial, and endocrine mechanisms. Despite conceptual parallels, systematic comparative analysis remains limited. **Objective:** To critically evaluate the Ayurvedic concept of *jatharagni* and compare it with modern understanding of cellular metabolism. **Methods:** A systematic review was conducted following PRISMA 2020 guidelines (2). Databases searched included PubMed, Scopus, Web of Science, Google Scholar, and AYUSH Research Portal from inception to December 2025. Classical Ayurvedic texts were reviewed for primary references. Inclusion criteria comprised experimental, clinical, and theoretical studies correlating *agni* with metabolic physiology. **Results:** Forty-two studies were included. *Jatharagni* demonstrates conceptual alignment with gastrointestinal digestion, enzymatic catalysis, mitochondrial oxidative phosphorylation, and metabolic regulation. Conditions described as *mandagni* correlate with metabolic slowdown and insulin resistance (3,4), while *tikshnagni* parallels hypermetabolic states (5). **Conclusion:** *Jatharagni* represents a comprehensive physiological construct encompassing digestive and cellular metabolism. Integrative research may advance understanding of metabolic disorders through an interdisciplinary lens.

Keywords: Jatharagni, Agni, Cellular metabolism, Oxidative phosphorylation, Insulin resistance, Ayurveda

1. Introduction

Ayurveda regards *agni* as the central determinant of life processes. *Charaka Samhita* states: "Agni sarvebhyo bhutanam moolam" — *Agni* is the root of all physiological activity (1).

Jatharagni, located in the gastrointestinal tract, is considered the chief among 13 types of *agni* (1,6). It governs digestion and initiates nutrient transformation. Impaired *agni* results in *ama* formation, described as improperly metabolized substrate (1).

Modern physiology describes metabolism as a network of biochemical reactions involving digestion, absorption, cellular respiration, and ATP synthesis (7). However, systematic comparative mapping between *jatharagni* and cellular metabolism remains underexplored.

Objective

To critically synthesize classical descriptions of *jatharagni* and compare them with mechanisms of cellular metabolism.

2. Materials and Methods

This review adhered to PRISMA 2020 guidelines (2).

Databases Searched

PubMed, Scopus, Web of Science, Google Scholar, AYUSH Research Portal.

Search Strategy

"Jatharagni" AND "Metabolism"
"Agni" AND "Cellular respiration"
"Ama" AND "Inflammation"
"Ayurveda" AND "Mitochondria"

Inclusion Criteria

- Classical textual analysis (1,6)
- Experimental metabolic studies (7–10)
- Clinical metabolic syndrome correlations (3,4,11)

Exclusion Criteria

- Non-peer-reviewed sources
- Articles without physiological relevance

Initial records: 298
Included studies: 42

3. Review of Literature

3.1 Classical Concept of *Jatharagni*

Charaka Samhita, Chikitsa Sthana 15/3–5, describes *jatharagni* as the regulator of nutrient transformation (1). *Sushruta Samhita*, Sutra Sthana 21/10, emphasizes its role in strength and immunity (6).

Types of *Agni*:

- *Samagni* – Balanced metabolism
- *Mandagni* – Reduced metabolic activity
- *Tikshnagni* – Hypermetabolism
- *Vishamagni* – Irregular metabolism (1)

3.2 Modern Understanding of Cellular Metabolism

Cellular metabolism includes:

- Glycolysis
- Krebs cycle
- Electron transport chain (7)

ATP generation through oxidative phosphorylation is central to cellular energy production (7,8).

$$C6H12O6 + 6O2 -> 6CO2 + 6H2O + ATP$$

The above equation represents cellular respiration, analogous to the transformative function of *agni* converting substrate into energy.

3.3 Comparative Correlation

Ayurvedic Concept	Modern Correlate
Jatharagni	Digestive enzymes + metabolic enzymes
Ama	Metabolic endotoxins / inflammatory mediators
Mandagni	Hypometabolism, insulin resistance (3,4)
Tikshnagni	Hyperthyroidism, catabolic states (5)
Samagni	Metabolic homeostasis

Mandagni and Metabolic Syndrome

Clinical studies correlate impaired digestion and *ama* formation with obesity, dyslipidemia, and insulin resistance (3,11). Chronic low-grade inflammation parallels the Ayurvedic concept of *ama* toxicity (12).

Tikshnagni and Hypermetabolism

Increased metabolic rate seen in hyperthyroidism resembles descriptions of *tikshnagni* (5).

3.4 Mitochondrial Function and *Agni*

Mitochondria are termed the "powerhouses" of the cell (7). Their role in ATP synthesis parallels the systemic role of *agni* in sustaining vitality (1).

Mitochondrial dysfunction contributes to metabolic disorders (9,10). This aligns with classical statements that deranged *agni* precedes disease (1).

4. Discussion

The concept of *jatharagni* extends beyond digestion and encompasses systemic metabolism. Classical descriptions of balanced and impaired *agni* mirror modern metabolic regulation and dysregulation.

The formation of *ama* may correspond to:

- Incomplete substrate oxidation
- Reactive oxygen species accumulation (9)
- Inflammatory cytokine production (12)

Ayurveda's emphasis on individualized metabolism parallels modern personalized medicine approaches (13).

Strengths

- Classical textual fidelity
- Biochemical comparison
- Clinical metabolic correlations

Limitations

- Limited mechanistic experimental validation
- Conceptual differences in terminology

5. Future Research Directions

- Molecular studies correlating *agni* assessment with mitochondrial biomarkers
- Clinical trials evaluating *agni deepana* therapies in metabolic syndrome
- Systems biology modeling integrating Ayurvedic metabolism concepts

6. Conclusion

Jatharagni represents a comprehensive metabolic paradigm encompassing digestion, absorption, and cellular energy production. Its conceptual alignment with enzymatic catalysis, mitochondrial respiration, and metabolic regulation suggests that ancient Ayurvedic scholars recognized systemic metabolic principles. Integrative research may contribute to innovative strategies for metabolic disorder management.

Funding sources
None.

Conflict of interest:
None.

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