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REVIEW ARTICLE

Physiological Aspect of *Agni* W.S.R. to its Role in Metabolism

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ABSTRACT

Introduction: *Agni* in Ayurveda is a deeply significant concept, often referred to as digestive fire, or biological fire, and it plays a central role in the body's overall health, wellness, and balance. It is a key component of our body's digestion and metabolism. *Agni* is responsible for the digestion, absorption, and assimilation of food, which is necessary for life maintenance.

Materials and Methods: The study methods include exploration of *Agni*-related literary review from classical *Ayurvedic* texts, research articles, and journals such as Google Scholar and Research Gate.

Result: The coordinated function of Jatharagni, Bhutagni, and Dhatvagni ensures the proper transformation of food into energy and tissue elements. This study identifies Agni as the central regulatory force of digestion, metabolism, and overall physiological balance. Balanced Agni maintains systemic equilibrium and overall health, whereas its impairment leads to Ama formation and metabolic imbalance, corresponding to disrupted metabolic functions described in modern physiology.

Discussion: *Agni* plays a crucial role in transforming food components of various origins into a homologous nature, to turn digested food into energy. According to the functions and site of action, *Agni* has been divided into 13 types, i.e., one *Jatharagni*, five *Bhutagni,* and seven *Dhatvagni*. *Jatharagni* is the most important one, which digests four types of food and transforms them into *Rasa* and *Mala*. The discernment of *Agni* ultimately determines which materials enter our cells and tissues and which should be eliminated as waste. Hence, understanding of *Agni* is one of the important concepts for the understanding of its modern interpretations on metabolism.

Conclusion: *Agni* is in charge of absorbing nutrient-dense substances; it is essential for converting food into energy and controls internal metabolic processes. The result is the body being nourished, which improves its complexion, nutritional strength, and overall well-being.

1. INTRODUCTION

In Ayurveda, the term *Agni* refers to the entire process of releasing energy through digestion at the digestive tract level and tissue metabolism. Life-sustaining processes such as food digestion, absorption, and assimilation are physiologically regulated by the *Agni*.[1] It is seen as an essential component at both the physiological and pathological levels. *Agni* is traditionally recognized as the body's metabolic and digestive force. It manifests within bodily secretions and plays a pivotal role in initiating biochemical and digestive transformations. It is also the source of intelligence, nutrition, and awareness in the body.[2] *Agni* is a key component of health considerations since it plays a big role in the majority of illnesses.

As stated in Charak Samhita, *Agni* has numerous derivatives that demonstrate its significance, including *Ayu* (longevity), *Varna* (complexion), *Bala* (strength), *Swasthyam* (health), *Utsaha* (enthusiasm), *Upachaya* (body metabolism), *Prabha* (lustre), *Ojas* (tissue essence), *Agnayah* (bio fires), and *Prana* (life). Since *Agni* and *Pitta* are interrelated, *Pachakpitta* is the form of *Pitta* that is essentially correlated with *Agni*. It can be explained by the manner it carries out the *Pakadi Karma*, i.e., it breaks down food and separates *Sara* from *Kitta*; hence, the name *Pachakpitta*. The seat of *Agni* is *Grahani*. As it receives the food, it is called *Grahani* and is located between *Amashaya* and *Pakwashaya.*[3]

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That is also the place of *Pitta*. Moreover, five types of *Pitta* are also considered in *Agni. Raag (Ranjak Pitta)* with *Rasa Ranjan Karma, Pakti (Pachak Pitta)* with *Ahaar Paachan Karma*, *Tẹja (Alochak Pitta)* with *Darshan Karma*, *Medha (Sadhak Pitta)* with properties to maintain as *Buddhi, Medha*, and *Ushma (Bhrajak Pitta)* have properties to maintain skin complexion. Hence, *Pitta* imbalance can affect *Agni*, leading to poor digestion, inflammation, and metabolic problems.

According to Ayurvedic principles, the impairment of *Agni* is considered the fundamental cause of the manifestation of most diseases.[4] Proper functioning of digestive fire is evident from the normal tone of the digestive system, circulatory system, strong immunity or resistance against diseases, proper tissue growth, and body complexion. Impaired *Jatharagni* leads to compromised digestion, poor blood circulation, dull complexion, fatigue, bloating, and reduced immunity.[5] Thus, a vicious cycle of impaired *Agni* and the production of *Ama* is established. Understanding the basic relationship between *Ama* and *Agni* is of prime importance in treating the diseases. *Agni* catalyzes all body transformations, and any disruption in *Agni* might prevent food from being transformed properly.

2. MATERIALS AND METHODS

This study investigates the concept of *Agni* in Ayurveda and its correlation with metabolism. The research was conducted through a comprehensive review of classical Ayurvedic texts, along with contemporary scientific literature sourced from platforms such as Google Scholar and ResearchGate. The analysis focused on the various types of *Agni*, its physiological significance, and their role in metabolic processes as described in both traditional and modern contexts.

3. REVIEW OF *AGNI* AND METABOLISM

Agni represents the entire process of biological conversion and energy utilization, including digestion, metabolism, and assimilation. The five *Panchamahabhuta*, or fundamental elements, make up our body, according to Ayurveda. Within this *Panchabautika Sharira*, numerous metabolic transformations, or *Paka*, are continually occurring. *Tejas* (fire*) Mahabhuta* is the predecessor of *Agni*, which undergoes metabolic changes with change as an underlying characteristic.

3.1. Types of *Agni*

According to their roles and locations of action, there are 13 different varieties of *Agni,* seven *Dhatvagni*, five *Bhutagni*, and one *Jatharagni*. The most crucial role is played by *Jatharagni*, who breaks down food and turns it into *Rasa* and *Mala*.[6] Seven *Dhatvagni* function on the corresponding tissues at the same time, and the five *Bhutagni* work on particular food elements. The two things that come from this whole transformation process are *Kitta* for elimination and *Prasad* for nutrition.

3.2. *Jatharagni*

The principal fire, or *Pradhantam*, of all the *Agni*, situated in *Amashya*, *Jatharagni* promotes the digestive processes. The *Kala* that is located at the *Pakvashya* entrance is called *Pittadhara Kala*, and it essentially serves as a pathway for food to enter the *Amashya*. *Jatharagni* controls all the functions and balance of the other 12 *Agni* in the body, which are equally important for the body. Its main function is the digestion of food. This *Agni* converts *Ahaar* into *Ahaar Rasa*. This *Ahara Rasa* then undergoes further transformation to nourish the successive *Dhatu* sequentially. The food that is said to be the nourishing factor of the *Sharira, Dhatu*, *Ojas, Bala, Varna,*[7] and other things depends on the *Jatharagni* for its nutritious action because the *Sharira Dhatu* cannot be formed from the undigested food.[8]

3.3. *Bhutagni*

The *Agni* acts on the cellular level of the body. *Bhutagni* is divided into five types of *Agni,* which metabolize the respective *Panchamahabhuta* components, acting as elemental metabolic fires that process and assimilate nutrients into cellular structures and tissues.[9] They serve as the fundamental basic units for the body's elemental development. These *Panchmahabuta*-derived *Agni* will only act on the same portion of the food item that contains the same *Agni* particle. The diet especially nourishes the body's own *Bhuta* even after these components have been digested.

3.4. *Dhatvagni*

*Dhatvagni,/*the metabolic fires residing within each of the seven tissues *(Dhatu),* regulate sequential tissue formation *(Dhatu Utpatti Krama)* by transforming the nutritive essence received through the channels *(Srotas)*. These seven localized *Agni (Rasagni, Raktagni, Maṃsagni, Medoagni, Asthyagni, Majjagni, Sukragni)* selectively process and assimilate nutrients into tissue-specific components, thereby sustaining organ function and immune resilience.[10]

Agni is further classified into four functional types – *Tikshnagni*, *Mandagni*, *Vishamagni*, and *Samagni* – based on its strength and consistency in digestive activity. *Tikshnagni* refers to an excessively intense digestive fire, often linked with *Pitta* dominance, where food is digested rapidly, and when an adequate amount of food is not available to match this rapid digestion, it leads to tissue depletion. *Mandagni*, associated with *Kapha* dominance, is characterized by sluggish digestion, resulting in incomplete metabolism and the formation of *Ama* or toxic byproducts. *Vishamagni*, typically seen in *Vata* imbalance, reflects irregular digestion with alternating patterns of hyperactivity and hypoactivity, causing erratic absorption and assimilation. *Samagni*, the ideal state, signifies balanced digestion and metabolism, where food is properly digested, nutrients are efficiently assimilated, and waste is adequately eliminated, maintaining optimal health and homeostasis.

4. PHYSIOLOGICAL FUNCTIONS OF *AGNI*

Agni plays a fundamental role in various physiological functions essential for maintaining health and balance in the body. It is responsible for digestion, transforming food into essential nutrients and energy needed for bodily functions. In addition, *Agni* regulates metabolism by ensuring the proper conversion of food into tissues, energy, and waste products. It also plays a key role in detoxification, preventing the accumulation of toxins *(Ama)* that can lead to disease. A strong *Agni* supports the immune system, enhancing the body's defense mechanisms against illness. Beyond the physical aspects, *Agni* is crucial for mental and emotional processing, promoting clarity of thought and emotional stability through *Sadhak Agni*. It further ensures the proper formation, nourishment, and regeneration of body tissues *(Dhatu)*, contributing to overall growth and repair. A well-balanced *Agni* ultimately fosters vitality, sustaining energy levels, promoting longevity, and enhancing overall well-being by maintaining *Ojas*, the essence of life and immunity. When the *Agni* is extinguished, man dies,[11] lives a long time in excellent health when it is properly induced, and starts to become ill when it is de-arranged. As a result, *Agni's* role is described as the foundation of life.

4.1. *Agni and Ama*

Ama is a toxic byproduct formed due to improper digestion and is considered responsible for the pathogenesis of many diseases.[12] The major cause behind *Ama* production is the impairment of *Agni*. *Ama* is explained in Ayurveda as undigested or improperly processed food that becomes heavy and sticky in nature.[13] This *Ama* is formed due to *Mandagni*, leading to improper formation of *Rasa Dhatu*, which further contributes to disease manifestation. Due to *Mandagni*, these undigested food particles begin to accumulate in the body and give rise to *Ama Dosha*.[14]

Ama is further explained as the product of weak *Jatharagni* and *Dhatvagni*, which fail to properly digest *Ahara* and *Dhatu,* respectively. The formation of *Ama* can be understood in various stages (*Paka Avastha*). In the first stage, due to the weakness of *Jatharagni*, *Ama* accumulates in the *Amashaya*. In the second stage, due to the weakness of *Dhatvagni*, the *Dhatu* are improperly formed, leading to tissue-level *Ama*. This is sometimes referred to as *Saama Dhatu* or, in severe conditions, as *Ama Visha*. In the third stage, this accumulated *Ama* circulates throughout the body and lodges in various tissues, obstructing *srotas* and initiating disease processes. This *Ama* – whether present in the gastrointestinal tract, circulating with *Rasa*, or lodged in *Dhatu* – is collectively referred to as *Ama*.[15]

Although Ayurveda does not define *Ama* in immunological terms, its behavior in the body resembles that of metabolic toxins or harmful substances that can trigger inflammation and immune dysfunction. As *Ama* spreads, it may contribute to the development of various chronic and systemic disorders.[16]

4.2. *Avasthapaka*

Agni plays a vital role in the process, collectively referred to as Avastha paka, which is categorized into three phases: *Madhuravasthapaka, Amlavasthapaka,* and *Katuavasthapaka*. *Madhuravasthapaka* occurs in the *Amashya*. *Amlavasthapaka* takes place in the *Grahani*.[17] *Katuavasthapaka* occurs in the *Pakvasaya*. These steps illustrate how *Rasa* changes as the digestive process progresses. The digested meal maintains its original *Rasa* at the end of digestion, matching the *Rasa* of the food that was consumed. Distinct *Rasa* have distinct metabolic transforms *(Vipaka)*; *Madhura* and *Lavana* have *Madhura Vipaka, Amla* displays *Amla Vipaka*, while *Katu* and *Kashaya* exhibit *Katu Vipaka*. These ingested *Rasa* metabolic changes are evident in the last stage.[18]

4.3. Metabolism

Metabolism encompasses all the chemical reactions that take place within the body's cells, generating energy required for essential bodily functions and the creation of new organic compounds. The processes of digestion and metabolism are closely interconnected and essential to the healthy functioning of the body. The mechanical and chemical breakdown of food in the mouth starts the digestion process. Digestive enzymes, bile, and stomach acid help break down and process food further as it moves through the digestive system. The nutrients obtained from the food are then taken up by the bloodstream, delivered to different regions of the body, and used for growth, repair, and energy. In contrast, metabolism is the process by which food is transformed into energy through a sequence of chemical events that take place inside cells. These reactions entail the breakdown of proteins, lipids, and carbohydrates to produce energy(catabolism) as well as the synthesis of new molecules from these nutrients (anabolism) to support a variety of physiological processes.

Metabolism encompasses all enzyme-catalyzed chemical reactions in living organisms and can be divided into catabolism (the breakdown of complex molecules to release energy) and anabolism (the synthesis of complex biomolecules using energy).[19] In catabolism, dietary macromolecules are first digested into absorbable units (monosaccharides, fatty acids, and amino acids), which are transported into cells and converted into acetyl-CoA and other intermediates during initial degradation stages. AcetylCoA then enters the mitochondrial Krebs (citric acid) cycle, producing NADH and $FADH_2$ that feed the electron transport chain to drive oxidative phosphorylation and synthesize ATP – this is the primary energy currency of the cell.[20] Finally, the energy released through catabolic pathways powers anabolic processes such as the formation of proteins, lipids, glycogen, nucleic acids, and cellular repair or growth – all tightly regulated by enzymes, feedback mechanisms, and hormones such as insulin and glucagon to maintain metabolic homeostasis.[21]

5. DISCUSSION

5.1. Correlation between *Agni* and Metabolism

The main contents of food, that is, carbohydrates, proteins, and fats, are digested by *Jatharagni, Dhatvagni,* and *Bhutagni* and form an end product. Protein is converted into amino acids in the presence of *Jatharagni,* and in the presence of *Dhatvagni,* it is converted into urea. The end products of carbohydrates and fat are carbon dioxide and energy. If the *Agni* is in a condition of *Mandagni,* then there will be no formation of end products, and intermediate products will be formed which are lactic acids, uric acids, and ketone bodies, and they are a form of *Ama.* Due to the increased formation of these products, they cause many diseases such as *Urusthamba*, *Vatarakta* (gout), and *Madhumeha*. This *Ama* can be correlated with many forms as the undigested *Ras Dhatu* is a form of *Ama*, the accumulation of waste products is *Ama,* and *Dosha Dushti* is also *Ama*.

Agni, the digestive fire, is in charge of the complex processes of digestion and metabolism. It is essential for efficient digestion, metabolism, and the removal of waste from the body. While *Bhutagni* and *Dhatvagni* are crucial for metabolism, *Jatharagni* is in charge of digestion.[22] In modern science, *Jatharagni* is related to the digestion of food, which is done in the stomach and intestines by the chemicals present in the stomach and peristaltic movements in the intestine.

Earth, water, fire, air, and ether are the five fundamental elements (*Bhuta*) that make up the body and the world, and *Bhutagni* is in charge of their metabolism. It converts these components from food into energy. In modern, it can be correlated with the enzymatic functions which are performed by the liver in the metabolism of food particles, as the liver has many enzymatic actions on food digestion as the metabolism of carbohydrates, proteins, and fats, which provide the energy for the biochemical functions of the body.

In contrast, *Dhatvagni* is in charge of the *Dhatu* metabolism, which includes *Rasa, Rakta, Mamsa, Meda, Asthi, Majja,* and *Shukra*. *Dhatvagni* transforms food nutrients into the building blocks of these tissues. Each of these *Agni* has a unique S*rotas* for how it operates. These *Srotas* will provide a pathway for supplying nutrients for metabolism. Each *Agni* presents a *Dhatu. Dalhana* has stated that, ultimately, all of the *Dhatu Sara* is *Oja* or immunity in modern science. *Oja* is considered to be the derivative of *Agni* in Ayurveda. The synthesis of the specific *Dhatu* requires certain nutrients from all of these *Agni*, and the action of these *Dhatvagni* is linked to selective absorption criteria. They obtain the appropriate and same nutrients as

they absorb the specific nutrient from the meal or nutrient to form its specific *Dhatu*.

6. CONCLUSION

The concept of *Agni* in Ayurveda serves as a foundational pillar in understanding the physiological processes of digestion, metabolism, and overall health maintenance. This study highlights that *Agni*, in its various forms – *Jatharagni*, *Bhutagni*, and *Dhatvagni* – is intricately involved in the stepwise transformation of food into energy, nutrients, and ultimately, tissue-specific elements essential for the sustenance of life. The Ayurvedic perspective of metabolism, when aligned with modern biochemical understanding, reveals a remarkable parallel in terms of enzymatic breakdown, nutrient assimilation, and tissue formation. Impairment of *Agni* is shown to disrupt these processes, leading to the accumulation of *Ama* that can be correlated with metabolic toxins, which are etiologically linked to a wide spectrum of diseases. Therefore, maintaining the balance and strength of *Agni* is not only central to digestive health but also critical for cellular metabolism, immune competence, and disease prevention. A clearer understanding of *Agni* from both classical Ayurvedic texts and modern scientific interpretation offers valuable insights for integrative approaches in metabolic health and therapeutic interventions.

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11. CONFLICTS OF INTEREST

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12. DATA AVAILABILITY

This is an original manuscript and all data are available for only review purposes from the principal investigators.

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