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Agni a Biotransformer

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ABSTRACT

The concept of *Agni* is one of the most important contributions of *Ayurveda* to health care system. In *Ayurveda*, *Agni* has a significant role to maintain body homeostasis, body functioning, digestion and metabolism. Countless alterations happen in the body every second in the form of biochemical, biophysical, or other types of biotransformation. The entire spectrum of the body's metabolic and digestive processes is managed by the *Agni*. According to function and site of action, *Agni* is divided into three types i.e. 1 *Jatharagni*, 5 *Bhutagni* and 7 *Dhatwagni*. *Jatharagni* is chief among all types of *Agni*'s because functions of *Bhutagni* and *Dhatwagni* depend on this. *Jatharagni* plays a key role in digestion of food-stuffs composed of the five basic elements and transforms it for utilization by the respective tissues. By this article an attempt has been made to describe the concepts of *Agni* in *Ayurveda* and its modern interpretations.

Key words: *Agni*, *Jatharagni*, *Bhutagni*, *Dhatwagni*, *Biotransformation*, *Digestion*, *Metabolism*.

INTRODUCTION

The Sanskrit word '*Agni*' means 'Fire'. According to *Darshana*, all things in the universe are made from *Pancha-mahabhutas*. *Agni* is one of the *Mahabhuta* out of them. *Agni* is the term given in *Ayurveda* for the whole process of energy liberation through digestion at the level of G.I.T and metabolism at the level of tissues.

Agni converts food in the form of energy, which is responsible for all the vital functions of our body.^[1] The term metabolism is used to refer all the chemical and energy transformations that occur in the body, which is nothing but the function of *Agni*.

Agni in various Literatures

In *Brahmasutra*, *Agni* has been meant to be a sign of life in the body.

In *Shabdakalpadruma*, 61 synonyms of *Agni* have been compiled. These synonyms help in explaining the nature and functions of the *Agni*, e.g., *Vaishvanara*, *Sarva Paka*, *Tanoonpata*, *Amivachatana*, *Damunasa*, *Shuchi*, *Vishwambhar*, *Rudra* etc.^[2]

Nyaya & Vaisesika Darshana divided *Agni* into following categories- *Bhauma* or the physical fire, *Divya* or the celestial fire like the lightning, rays of sun, moon, and the stars, *Audarya* or the abdominal fire which is responsible for the digestion as well as metabolism and *Akaraja* which is present in the metals

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such as gold and silver. It has been shown here that the matter and energy are separable only up to a certain level beyond which they are interchangeable and inseparable from each other.

Acharya Charak mentioned that after cessation of the function of *Agni*, the individual dies and when the *Agni* of an individual is *Sama*, then that person would be absolutely healthy and would lead a long, happy, healthy life. If *Agni* of a person is disturbed either vitiated or diminished, the whole metabolism of the body would be disturbed, resulting in ill health and diseased state. That's why, *Agni* is said to be the *Moola* of life.^[3]

According to *Acharya Sushruta*, there is no other form of *Agni* in the body except the *Pitta*, and when this *Pitta dosha* is vitiated or diminished the digestion of the food material is affected the same way as the combustion of fuel is affected with diminished or vitiated fire in the outer world and both the conditions are tackled in a similar manner.^[4]

Chakrapani has commented on *Pittantargatta*, that the function of *Pitta* inside the body is not combustion but its work is to provide heat energy of *Agni*.^[5] *Pitta* is of five divisions, which is located in the middle of the *Pakvashaya* and *Amashaya*, although it is composed of *Panchabhutas*, because of the predominance qualities of *Tejabhuta*, it is devoid of liquidity. Also, because it does not possess *Snigdha*, *Sita* and such other properties of *Apbhuta*, it is called by the term *Anala*. Because of its function of *Paka* it cooks the food, dividing it into *Prasada* and *Kitta Bhaga*. The *Jatharagni* bestows grace to the other *Pitta* in the body and to the *Dhatvagni* present in the *Dhatu*.^[6] (As.Hr.Su.12/10-12)

In the text *Bhagavat Geeta* it is mentioned that the Lord Krishna says that he lives in *Deha* in the form of *Agni*.^[7]

MATERIALS AND METHODS

All contents and references regarding *Agni* and *Pitta* are collected from *Brihatrayi*, *Laghutrayi*, textbooks of *Ayurveda*, *Kriya Sharir* as well as modern physiology and relevant matter described on journals and websites.

Types of Agni

Table 1: Types of Agni according to different Acharyas.

Acharya Charaka ^[8]	Acharya Vagbhata ^[9]	Acharya Sushruta/ ^[10] Sharangadhara	Acharya Bhavamishra ^[11]
Jatharagni – 1	Bhutagni – 5	Pachakagni	Explained same as Acharya Charaka and Vagbhata
Bhutagni – 5	Dhatvagnis – 7	Ranjakagni	
Dhatwagni – 7	Dhoshagni – 3	Sadhakagni	
	Malagni – 3	Alochakagni	
		Bhrajakagni	

Similarities of Agni and Pitta

Both perform similar function like *Dahana*, *Pachana*, *Abhipravatana* of food.

Both of these in *Vridhhi Avastha*, responses to *Sheeta Kriya*.

According to *Maricha*, *Agni* present in the *Pitta* gives good or bad results when it is in normal or vitiated.^[12]

Ushma is considering as the function of normal *Pitta* and *Agni* in the body.

Acharya Sushruta describes 5 types of *Agni* as variety of *Pitta*.

According to *Bhoja*, *Pitta* as *Agni*, digestive fire is included within *Agni*, which is meant for enzymatic activities of the body.^[13]

Dissimilarities of Agni and Pitta

Table 2: Explained about difference between Agni and Pitta.

Dissimilarities	Agni	Pitta
Color	No	<i>Nila (Ama)</i> , <i>Peeta (Niramaya)</i> ^[14]
Taste	No	<i>Katu</i>
Smell	No	<i>Puti</i> , <i>Visragandi</i> ^[14]

Consistency	Shuska	Drava
Guna	Ruksha	Snigda ^[15]
Intake of Ghrita	Agni Deepana	Pitta Shamana ^[16]
Panchamahabhuta	Agni Mahabhuta	Agni and Jala Mahabhuta
Gati	Urdva	Adho ^[17]

DISCUSSION

Jhataragni is the Agni present in the Jathara. According to Ashtanga Hridaya, Jatharagni, the seat is Grahani, so called because it withholds the food for a certain time inside the Amasaya to facilitate digestion. Jatharagni Paka is described as Avasthapaka in Ayurveda. Avasthapaka is the change in the state of food substance in the Amashaya and Pakwasaya in course of digestive process. Due to action of Agni, Aharapaka starts and food is transformed through three Avasthapaka.

1. Madhura Avasthapaka
2. Amla Avasthapaka
3. Katu Avasthapaka

1. Madhura Avasthapaka:^[18] (Digestion in Upper GIT)

First stage of digestion is called Madhura Avasthapaka. During this stage, there occurs the release of froth like Kapha. Madhura means sweet. Carbohydrate splitting salivary amylase is the first enzyme attacking the food in GIT. So, it is called as Madhura Avasthapaka. Salivary juice and mucous secreted in the stomach serve many protective functions. These are therefore to be included under froth like Kapha. This Kapha is Malarupi in nature.^[19]

Table 3: Madhura Avasthapaka and its Modern interpretations.

Madhura Avasthapaka	Digestion in oral cavity and fundus of stomach ^[20]
In Mukha, Kapha is mixed with food.	In oral cavity, Saliva is mixed with the food
In Amashaya, Kapha is mixed with food.	In stomach, mucine is mixed with food.

Rasa of Ahara becomes Madhura	Digestion of carbohydrates starts due to salivary amylase. End products formed are glucose and maltose which are sweet in nature
Kapha is formed during Madhura Avasthapaka.	Symptoms like dizziness, lethargy, heaviness in stomach are seen which are similar as symptoms of Kapha.

2. Amla Avasthapaka:^[21] (Digestion in Stomach and Small Intestine)

The second stage of digestion is called Amla Avasthapaka. The Pitta present in between stomach and large intestine is called Pacaka Pitta. Though made up of five basic elements, it is dominant in Agni Mahabhuta. So, it is devoid of liquidity and is called Anala. This digests the food and splits it into essential nutrient part called Sara and waste part called Kitta. This Pachaka Pitta is directly responsible for digestion and therefore, should include all amylolytic, proteolytic, lipolytic enzymes and bile salts secreted from different parts of gut and pancreas. The ingested food, undergoing digestion attains acidic nature. During this phase, the bile juice and pancreatic juices are secreted into the duodenum. The bile is liquid in nature and it is the Malarupi Pitta, also called Accha Pitta. This is the Mala of Rakta. Bilirubin is a derivative of hemoglobin metabolism and represents this Accha Pitta. It is called Amla Avasthapaka because proteolytic and lipolytic enzymes act here along with amylolytic.^[22]

Table 4: Amla Avasthapaka and its Modern interpretations.

Amla Avasthapaka	Digestion in pylorus in stomach and small intestine ^[23]
In Amashaya, Pachaka Pitta helps in the digestion of Ahara.	In pyloric end of stomach, HCl is mixed with food.
Rasa of Ahara becomes Amla.	Due to HCl food becomes acidic and sour.
Accha Pitta is formed during Amla Avasthapaka	Bilirubin is a derivative of hemoglobin metabolism and represents this Accha Pitta.

Factors Influencing digestion

1. *Ushma*: “*Ushma Pachati*”^[24]

PH as well as basic temperature is required for proper activation and functioning of enzymes.

Ex: Gastric juice is highly acidic with PH of 0.9 to 1.2 due to presence of HCL.^[25]

2. *Vayu*: “*Vayurapakarsheti*”^[24]

Vata stimulates *Agni* to digest the food. Autonomic nervous system is involved in the regulation of salivary juices and it helps in the process of deglutition, Movements of GIT, Nervous stimulation of digestive juices.

Ex: Myenteric plexus helps in control of motility of gut. Meissner’s plexus controls the secretory activity and blood flow to the gut.^[25]

3. *Kleda*: “*Kleda Shaithilyam Apadayati*”^[24]

Kledaka Kapha helps in the moistening of the food. The mucous which is present in the intestine helps in softening of food.^[25]

4. *Sneha*: “*Sneham mardavam janayati*”^[24]

Bile salts help in the absorption of digested fats from the intestine into blood and helps in the emulsification of fats for proper absorption.^[25]

5. *Kala*: “*Kala Paryaptamabhinivartayati*”

“*Kale Pakvam Samam Samyak Pachatyaayurvivardhaye*”^[24]

There is a specific transit time of chyme in all parts of GIT.

6. *Samayoga*: *Sama* means proper, *Yoga* means collection.

Proper collection or wholesomeness of food.

3. *Katu Avasthapaka*.^[26] (Digestion in Large Intestine)

Last stage of digestion is called *Katu Avasthapaka*. Here absorption of water and electrolytes takes place. At this stage, *Anna* undergoes *Shoshana Karma* by *Agni* and obtains its *Paripindita* form. Due to the activity of bacterial flora, some pungent gases like methane and ammonia releases here, this represent *Katu* nature of *Vata*.^[27]

Table 5: *Katu Avasthapaka* and its Modern interpretations.

<i>Katu Avasthapaka</i>	Digestion in large intestine
In this phase, after absorption of water other nutrients, <i>Ahara</i> becomes dry and <i>Katu</i> .	Food is digested by bacteria. After absorption faeces are formed
<i>Vata Dosh</i> is formed during <i>Katu Avasthapaka</i>	During digestion of bacteria, various gases are formed. E.g. CO ₂ , methane, indole, etc.

Table 6: *Avasthapaaka* in brief

<i>Avasthapa aka</i>	<i>Sthana</i>	<i>Dosha Poshana</i>	<i>Udeera na of Dosha</i>	<i>Panchamaha bhuta</i>
<i>Madhura</i>	<i>Hrudayadur dwa</i>	<i>Kapha</i>	<i>Phenar upi Kapha</i>	<i>Prithivi and Jala</i>
<i>Amla</i>	<i>Naabi Hrudaya Madye</i>	<i>Pitta</i>	<i>Accha Pitta</i>	<i>Agni</i>
<i>Katu</i>	<i>Adho Nabhi</i>	<i>Vata</i>	<i>Vayu</i>	<i>Akasha and Vayu</i>

Bhutagni: The five *Bhutagnis* digest their own part of the element present in the food materials. There are five types of *Agni* namely, *Parthivagni*, *Apyagni*, *Agneyagni*, *Vayuvyagni* and *Akashagni*.^[28] Each and every cell in our body is composed of five *Mahabhutas*. Naturally each cell consists of these *Bhutagni* also. The five *Bhutagnis* digest their own part of the element present in the food materials. Broken down and partially digested food is again exposed to *Bhutagni*. In case of food, *Jatharagni* digests the food and *Bhutagni* functions for releasing qualities of food. The function of *Bhutagni* is to metabolize the ingredients of food and sort them out into 5 groups depending on the predominance of particular *Panchamahabhuta*.

For example: Glucose is converted into glucose 6 phosphate and stored in the form of glycogen. Amino acids are converted into pyruvate and with the help of gluconeogenesis it converted into glucose. Therefore,

releasing of their *Guna*/qualities in the food can be correlated to *Bhutagni*.

The process of *Bhutagni Paka* should start immediately after digestive process in GIT. Hence *Bhutagni* function starts immediately after absorption i.e. portal circulation to the liver ends before assimilation by delivering *Asthayi Dhatwamsha* into the circulation through hepatic vein. So, the *Bhutagni* functions are carried in the portal system, liver and vascular system through which *Ahara Rasa* is circulated in the body for nourishing the *Rasadi Sapta Dhatus*. Hence liver is considered as centre of *Bhutagni Vyapara*. According to the physiology of *Ayurveda*, *Bhutagni Paka* follows *Jatharagni Paka* and it completes the process of intestinal digestion. After completion of *Bhutagni Paka* only, the formation of *Ahara Rasa* is completed and *Rasa* absorption is possible.

Dhatwagni: It is used for the formation of *Dhatu Utapathi Karma*. Seven *Dhatavah* contains their own *Agni* and responsible for conversion of food into *Prasada Bhaga and Kitta Bhaga*.^[29] Metabolism at tissue level is dependent on these *Dhatwagnis*.

For example: Amino acids cannot cross the muscle cell membrane in the absence of certain hormones like Insulin, GH, Testosterone and Thyroxin. So, all these hemocrine hormones can be included under *Dhatwagnis*. Further, once inside the cell, amino acids can be either used for protein synthesis or they may be catabolized for the purpose of energy. If they are catabolized, there will be either formation of Acetyl Co A or some other intermediate compounds of Krebs or TCA cycle and during Krebs cycle, there will be formation of energy as well as wastes like CO₂ and H₂O.^[30]

Action of Panchamahabhuta on Dhatu

Here respective *Panchamahabhutas* nourishes the respective *Dhatus*.

Table 7: Correlation between Dhatus and Panchamahabhuta.^[31]

Panchamahabhuta	Dhatus
Jala	Rasa
Teja and Jala	Raktha

Pruthvi	Mamsa
Pruthvi and Jala	Meda
Pruthvi and Vayu	Asthi
Jala	Majja
Jala	Shukra

Example: *Asthi Dhatu* is mainly formed by *Pruthvi Mahabuta*, however much we eat *Partheeva Dravyas* in food, if *Parthivagni* and *Asthidhatwagni* of *Asthi Dhatu* fail to utilize the *Poshakamshas* like Ca and P of the *Ahara Rasa*, the *Asthi Dhatu* cannot grow at all.^[32]

Types of Agni according to Susruta

Pachakagni:^[33] *Pitta* that is found localized in between *Pakvasaya* and *Amasaya*, helps in digestion of four kinds of food, separate the *Doshas, Rasa, Mutra* and *Purisha*, and it helps the other sites of *Pitta* elsewhere in the body by bestowing properties of fire, this *Pitta* is known as *Pacakagni*. It can be correlated to Enzymes and hormones secreted from stomach, small intestine (succus entericus), pancreas (pancreatic juice) and bile. Ultimately it is responsible for digestion of ingested food by the process of hydrolysis and their chemical and metabolic transformation.

Ranjakagni:^[33] The *Pitta* found in the *Yakrut* and *Pleeha* is known as *Ranjakagni*, and which gives color to the *Rakta*. *Ranjakagni* can be correlated to Erythropoietin, Growth inducers, Norepinephrine, Epinephrine, Androgen hormones

Sadhakagni:^[33] The *Pitta* present in the *Hridaya* is known as *Sadhakagni*, it is responsible for fulfilling the desires of the mind.

Hridaya –HR= *Harana* = Receiving

DA = *Dana* = Giving

YA = *Yayati* = Place of exchange

So here we can consider Brain as the *Sthana*.

All the functions of Neuropeptides and Neuro transmitters like Nor epinephrine, Dopamine, Serotonin, Nitric oxide may be represented as *Sadhakagni*.

Alochakagni:^[33] The *Pitta* present in the *Drsti* is known as *Alocakagni*, it is responsible for perception of vision. Photo receptor cells of retina especially Rods and Cones. The activated rhodopsin and iodopsin present in rods and cones, following exposure to light triggers photo transduction which results in generation of receptor potential in photo receptors. Then the light energy is converted into electrical energy.

Bhrajakagni:^[33] The *Pitta* present in the *Twak* is known as *Bhrajakagni*, it is responsible for digestion and absorption of substances used in the form of *Abhyanga*, *Parisheka*, *Avagaha*, *Lepa* etc. and helps expression of shades and colour on the skin.

Melanocytes present in skin [melanocytes synthesize melanin from amino acid tyrosine in the presence of enzyme called tyrosinase in the melanosome]. Melanocyte Stimulating Hormone secreted from medial lobe of pituitary regulates the Melanin production from the melanocytes located in the epidermis of skin.

CONCLUSION

All the functions of the body like segregation, digestion, absorption, assimilation, conversion of food into body elements, elimination of toxins and waste from the body is performed by the *Agni*. *Jatharagni* can be correlated to the hormones and enzymes in the whole process of digestion in the G.I.T. *Bhutagni* activity may be carried out in the portal system, liver and vascular system. *Dhatwagni* mediate or catalyze further metabolic transformation of the nutrient substances. This is an attempt to explore the concept of *Agni* in *Ayurveda*. Much more research is yet needed to define *Bhutagni* and *Dhatwagni* at physiological, clinical and therapeutic level.

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