CONCEPT OF JATHARAGNI IN AYURVEDA WITH SPECIAL REFERENCE TO ENZYMES

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ABSTRACT:

In Ayurvedic system of medicine, Agni maximally represents digestive & metabolic fire in the body. It is the substance in the secretions of the body which are directly responsible for digestive and chemical changes in the body. Ingested food is to be digested, absorbed and assimilated, which is unavoidable for the maintenance of life, and is performed by the Agni. According to the functions and site of action, Agni has been divided into 13 types, i.e. one Jatharagni (digestive enzymes), five bhutagni and seven dhatvagni (metabolism at tissue level). Jatharagni is the chief among all types of agni’s because function of bhutagni and dhatvagni depend on this. Aggravation or diminution of jatharagni results in aggravation or diminution of bhutagni and dhatvagni. All the diseases are caused due to impaired function of Agni. According to modern science, Gastric juice and enzymes functioning at gastro intestinal level, all are responsible for digestion, absorption and metabolism. Altered function of the enzymes secreted from gastro intestinal tract is responsible for production of gastro intestinal diseases. Function of Agni is likely to be compared with gastric juice and different enzymes at gastro intestinal level.

Key words: Agni, Jatharagni, Digestion, Metabolism, Enzymes

INTRODUCTION:

Agni may be correlates with digestive (pak) and different kinds of hormones, enzymes and co-enzymes activities etc. which participate in these digestive & metabolic functions. Due to increased activity of pitta in yuva- vastha (young stage) digestive & metabolic rate are higher. Vigor & vitality of human being is also maintained by balanced activity of Agni. It is necessary for proper growth & development of the body & their parts1. Due to advancement in age, depletion of Agni is taking place (in old age) which cause instability in Agni, ultimately leads to decrease, decay, atrophy, decay due to defective digestion and metabolism2. For better understanding the concept of Agni, we have needed to establish a relationship with enzymatic theory of medical science. The breakdown of complex form of food into simplex monomers through an enzymatic process in gastrointestinal tract is called digestion. Similarly in Ayurveda, the conversion of panchbhaudic ahar (complex food) into monomers of panchmahabhuta (simplest form of food) is taken place by Jatharagni and bhutagni in human gut respectively.

AIMS AND OBJECTIVES:

1. To emphasize and discuss the importance of jatharagni in Ayurvedic classical literature.
2. To evaluate the process of digestion in Ayurvedic classical texts and in modern texts.
3. To evaluate correlation about digestion w.r.t enzymes and Agni.

**MATERIALS AND METHODS:** Basically this article is review of various Ayurvedic classical texts. Materials related to agni, ahara paka (Metabolic transformations) in Ayurveda and other related topics have been collected from various Ayurvedic classical texts. The references were compiled, analyzed and discussed for a thorough and in-depth understanding of the concept of Agni and ahara paka (Metabolic transformations) in Ayurveda. The samhitas used in the present study were Charaka Samhita, Sushruta Samhita and Astanga Hridaya with commentaries on them. The modern medical literatures as well as other various related information were collected from related websites.

**Concept of Agni:** Human body is derived from food. In healthy state the food consumed is properly digested and assimilated by the body with the help of Agni. Agni provides Bala, Arogya, Ayu, Prana, Swasthyam, Varnam, Utsaha, Prabha, Oja and Teja to the body. All the transformations in the body is catalyzed by Agni, if Agni is impaired, the proper transformation of food, Dhatus and Malas are impaired and this will lead to accumulation of waste products in the body. Agni Dusthi is the causative factor for most of the diseases. The normal activity of the Agni helps the maintenance of physiological activities while its abnormal state produces pathology and its absence causes of death of the human being that is why Agni is known as Mula or Vital force. Agni is closely related to Pitta. The main function of Pitta is described as pachana, separation of sara and kitta, Dahana, Bhinnasanghata, Parinama, Ranjana, Varnakarana and Prabhakarana. The term Agni not only includes Jatharagni but also Bhutagnis and Dhatwagnis. These are responsible for digestion and metabolism at different levels. These are as follows:

[C] Bhutagni - 7

**Importance of Jatharagni:** Vata (Prana, apana, samana and udana) augments the digestive fire. Power of Agni or normal condition of Agni is responsible for strength, health, longevity and vital breath. That’s why it should be protected by proper intake of food and drink because these act as a fuel, if person is deprived of foods and drinks, Agni becomes disturbed. Consumption of food may be of various forms i.e. eatables, beverages, linctus (licked) and masticable foods, which is wholesome if consumed in suitable quantity and free from contamination. These substances undergo metabolic transformation by the effect of jatharagni, bhutagni and dhatagni. Initially jatharagni gives stimulation to bhutagni because consumed food is panchabhoutika, it has to undergo transformation by the respective bhutagni’s then only it becomes easy for digestion by jatharagni and tissue metabolism by dhatagni. Then processed metabolic products circulate inside the srotas continuously by the help of vata dosha (central nervous system). This favours the development, strength, complexion and happiness as well as growth of tissues. Dhatus remain in their normalcy after receiving respective nutrients from metabolised food substances. Jatharagni is the main principle substance responsible for disease and health. During its normalcy it is
responsible for longevity, complexion, strength, health, enthusiasm, well built, lustre, immunity (ojas), temperature; other agni”s (bhutagni and dhatvagni) and other vital functions all are dependent on jatharagni. Healthy state of body and diseased condition both are entirely dependent on agni. Food nourishes body dhatus, ojas, strength, complexion etc. It all depends on equilibrium state of agni otherwise rasa (essence of food like plasma, white blood cells, lymph etc) etc. cannot be produced or manufactured from undigested food. Agni present in the jathara which digests the food is Bhagawan Ishwara- almighty God- himself; it receives (substances of) sweet and other tastes (for growth and maintenance of the body), due to its subtleness (minuteness) it is not possible to perceive him. It is served by prana, apana and samana (the three divisions of vata dosha), by blowing/increasing, protecting and preserving it. It augments other Agni”s to carry out their respective functions. In healthy individuals during awakening and sleep, the digestive fire excited by samana vata due to association of inspiration and expiration and being blown by udana vata proper digestion takes place. Therefore by all means one has to protect jatharagni by consuming suitable wholesome dietetics and behaviour because longevity and strength depends on normal state of Agni. On the contrary one, who consumes unwholesome diet due to greed, succumbs to disease caused by the vitiation of grahani (small intestine). Irregular digestion and metabolism causes imbalance in dhatus. The intense digestion and metabolism and less consumption of food leads to depletion of dhatus.

Jatharagni Vyapara- Process of Digestion at Stomach and Intestine:
By the help of pranavata food enters the kostha (the tubular passage between the mouth and the anus, including the organs through which food passes for digestion and elimination as waste) where the food gets disintegrated by fluids and softened by unctuous substances. Samanavata stimulates the jatharagni which is situated in amashay (stomach including duodenum) as a result proper digestion process starts. Agni performs normal functions when food consumed in appropriate quantity along with appropriate time and quantity serve as promoter of longevity. Fire helps to boil the rice mixed water for proper cooking; in the same way agni stimulates the digestion process for the food substances which are present in amashay for the production of essence and waste products. During the first stage of digestion sweetness is manifested resulting in the stimulation of kapha (immune components), which is thin and frothy in nature. During the process of digestion food remain in the semidigested form i.e. in the form of sourness. This substance moving downwards from the amashay and stimulates the production of transparent liquid called pitta (digestive and metabolism components) and it is the second stage of digestion. When transformed food reaches the pakvashay (intestine) further transformation takes place and it becomes dried up by agni and it attains bolus form resulting in pungent taste and it stimulates vata (central nervous system) and it is the last stage of digestion. This concept of digestion may be correlated to the process in the alimentary canal by which food is broken up chemically, as by
the action of enzymes, and converted into a substance suitable for absorption and assimilation into the body. The process of making food absorbable by dissolving it and breaking it down into simpler chemical compounds that occurs in the living body chiefly through the action of enzymes secreted into the alimentary canal takes place at stomach can be compared to the action of jatharagni. There the saliva-food mixture continues to undergo the salivary chemical process, provided the stomach is not too crowded with protein food at the same time. The stomach is chiefly an organ secreting the chemicals for digesting protein. In its inner surface are lodged glands which produce their characteristic chemicals- hydrochloric acid, pepsin and rennin for digesting protein and lipase for digesting fat. The outer walls of the stomach are composed of muscular and connective tissues. The stomach also has a very rich blood and nerve supply. The blood supplies the glands with the constituent elements necessary for producing the digestive juices. The nerves furnish energy to the cells of the stomach for their mechanical and chemical functioning. The normal, healthy stomach has a good supply of nerve energy.

When the nerve energy is below par, a vicious cycle of digestive disturbances may start. Abnormally delayed motion, or too much or too little secretion of digestive chemicals, is caused when the nerves of the stomach are hyperirritated or depressed. When the strength of vatadosha is diminished leading to a vicious cycle of digestive and motor disturbances causing delayed motion or too much or too little secretion of digestive chemicals. Such events may lead to mandagni, teekshnagni, and vishamagni and favours the development of ama (improperly processed food substance inside the GI Tract), it is the root cause for the development of most of the diseases. The mechanical work of the stomach, like the mechanical work of the mouth, assures that the proper changes take place in the food to reduce it to simpler compounds. The stomach is more complex in its operation than the mouth. It retains food for a longer period of time before it completes its share of the process and sends the food on to the intestines?.

Such events may be compared to events of jatharagni functions. Blood supply and nerve supply concept of modern medicine may be correlated to activities of pitta and vata dosha. The description of Kledaka kapha corresponds, in part, to that of the mucous secreted by the glands of the stomach viz., the Kledaka kapha present in the amashaya moistens the food, disintegrates or breaks and liquefies it. Based on above description that a fatty fluid possessing the aspects of the kapha is secreted in the course of the madhura aspect of the avasthapaka will point to the fact that (a) Kledaka is the gastric mucous and (b) the fatty fluid possessing the qualities of kapha is the mucin reflex secreted by the cardiac glands of the stomach as the food reaches this organ. Chronologically speaking it would appear that the credit of having discovered and described the complicated mechanism of the secretory activities of gastrointestinal tract goes to Punarvasu Atreya, as could be seen not only from the description of the prathamapaka of the avasthapaka, which pertains to the gastric aspects of the digestion of carbohydrates and proteins but also to subsequent events that follow in the wake
of the movement of gastric digest through the pylorus into the duodenum. It is thus seen recorded in Charaka Samhita that “there after as the partly digested food which has attained amlabhava is moved down, acchapitta is secreted. Acchapitta means aghana or light or clear. The term amla refers to the production of pitta under the influence of the ahara or food which has since assumed amlabhava (qualities of sourness). It was also mentioned that the term Jatharagni itself is, in so far as the gastrointestinal digestion is concerned, a complex of powerful digestive substances, and in main, the gastrointestinal cathepsins. The analogues of the cathepsin enzyme was shown to be universally present in all tissues of the body and that these are reminiscent of the concept of the intestine located pachaka pitta(-complex) and the contribution of its amashas to the dhatus.

**Role of Bhutagni:** The digestion of food by jatharagni leads to the breakdown i.e. sanghatbheda of complex panchabhautic food into five distinct less complicated groups of dravya viz. parthiva, apya, agneya, vayavya, & nabhasa. The part of agni (bhutagni) is present in dravya of belonging to each group & this agni, digest the dravya of that group. It means, there is a radical changes in the qualities of each group of substance i.e. vilakshanaguna, said by Chakrapani. Thus, the food substances retain the vilakshanaguna are rendered fit for being absorption, assimilation into dhatu. The end product of bhutagnipaka is known as poshakadravya or poshakrasa and transformed into a homologous substance.

**Reciprocal correlation about digestion w.s.r to enzymes and Agni:** According to modern medical science, food is a chemical combination of mainly carbohydrate, protein, fats and other minor ingredient like minerals and vitamins etc. After digestion, these chemical polymers break into their respective monomers such as carbohydrate into glucose, protein into amino acids and fats into fatty acids and glycerol. Like that, there is no concept of chemical, like carbohydrate, protein and fats as food ingredients in ayurveda. But ancient medical text has own ideal and universal notion regarding to food (ahara) and explained that “every matters of universe is composed of five monomers” i.e. panchmahabhut. It means our food stuff is a different types of combinations of complicated polymers which are build up of their respective monomers (akash,vayu, agni, jala & parthiva mahabhut). Like medical science, after digestion of panchbhautik ahar converts into small monomers like akash etc.
Enzymatic transformation of food

Starch 1* Maltose 2* Glucose
Protein 1** Protease, peptones & polypeptides 2** Amino acids Fats
1*** Emulsified fats 2*** Fatty acid and glycerol

1 *Ptyalin enzyme **Pepsin and Pepsinogen ***Bile salt
2 *Maltase **Trypsin & chymotrypsin & other proteolytic enzymes  ***Pancreatic lipase

Panchbhautic ahar


Note: lc- less complicated, v- vilakshangunyukta, 1* the site of action of jatharagni at enzymatic level where ptyline, pepsin and blie salts act. 2*the site of action of the bhutagni at enzymatic level where maltase, trypsin, chymotrypsin and pancreatic lipase act.

Role of Dhatwagni: Each Dhatwagni attends the digestion supplied to that Dhatu from circulating Poshakamsha. For example the Dhatwagni present in mamsa Dhatu digest the nutrient material required for Mamsa Dhatu only, but cannot digest those of other Dhatus. Dhatwagni is essential for the maintenance and growth of the Dhatu.

Functions of Dhatvagnis are mainly two. One is synthesis of new tissue and second is to yield energy for the function of tissue. If Dhatvagni is impaired both of these will impair. As the weakness of Jatharagni leads to formation of Ama, the weakness of Dhatwagni also leads to production and accumulation of Ama in Dhatu (tissue level) concerned, giving rise to improper Dhatu Vridhdi. If Jatharagni is strong Dhatwagni also become strong. If Dhatwagni is stronger, they utilize quickly the quantity of nutrients supplied and still not getting satisfied and begins to destroy the Dhatu itself. This leads to Dhatukshaya. Hence both vridhhi and kshaya of the Dhatu are vikrita and are mainly due to weak and powerful Dhatwagnis respectively.

DISCUSSION: According to modern science, it is also seen that digestive system is composed of the gastrointestinal tract, three pairs of salivary glands, the liver and pancreas. The digestive system receives the food composed of protein, lipids, carbohydrates, vitamins, minerals and water of them the proteins, lipids, and carbohydrates require digestion but all need to be absorbed from the gut. The food we take is placed first in the mouth and then chewed to make it suitable for swallowing by mixing with saliva, the secretion of salivary glands, the food is then formed into bolus which is swallowed with the help of tongue, pharynx, palate etc and is passed through the esophagus to the stomach. In stomach the bolus is pulverized by the movements of stomach. The food is converted into chime, a semi fluid substance and then sent into the duodenum. In the small intestine the chime mixes with the secretion from liver and pancreas. Along with these two there is also the secretion from the small intestine which also mixes with the chime by the agitation produced by...
the movements of the small intestine and the process of digestion continuous. After digestion, extensive absorption occurs in the small intestine and whatever remains at the end is delivered to large intestine. In colon there is absorption of water and electrolytes along with other materials and the chime is converted into a semisolid mass. This is stored in pelvic colon. During defecation this semisolid material is passed out as stool through rectum and anal canal. The function of Agni can be compared with the gastric juice, different enzymes, hormones at G.I level. Altered function of the enzymes secreted from G.I tract is responsible for production of gastrointestinal diseases. The digestion, absorption, metabolism all are dependent on the different secretion, enzymes, or hormones of G.I system as well as on Agni.

From the above discussion interpretations can be made as follows:

1. Secretion of kledaka-kapha, may be correlated with mucous i.e. secreted in buccal cavity, oesophagus & stomach. Because, both having the same functions, like adherent qualities, low resistance for slippage, amphoteric & digestive properties.

2. Secretion of pachaka-pitta into pachya-manashaya (including stomach & intestine up to illium), may be correlated with secretion of gastric & intestinal, viz. pepsinogen, HCl & mucous by oxyntic gland and mucous & gastrin by pyloric gland of stomach, and intestinal enzymes. Cholecystokinin & secretin are secreted from duodenum & jejunum when acidic chyme entering them.

3. Stimulation of liver & pancreas for secretion of acchapitta. The secretion of bile & pancreatic juice is triggered by cholecystokinin & secretin.

4. Secretions of accha-pitta, may be resembles with bile & pancreatic juice containing bicarbonate ion & enzymes. Because, secreted during the passing of acidic chyme into the duodenum & jejunum.

CONCLUSION: Explaining briefly the digestive and metabolic functions of Agni, Acharya Charaka has mentioned that various types of dietetic materials are digested by their own Agni (Bhutagni), encouraged and enhanced by Antaragni (Jatharagni), which is further digested and metabolized by Dhatvagni to associate the body with the nutritional strength, complexion and happy life along with providing energy to the seven dhatus. It consist digestive (pak) enzymes and different kinds of hormones, and co-enzymes activities etc. which participate in these digestive & metabolic functions. It is a logical conclusion that Ama is produced due to hypo-functioning of Agni. At any level of the three Pakas (digestion and metabolism i.e. Madhur, Amla & Katu avastha paka & vipaka) due to hypo-functioning of the agni concerned unwanted chemical substances are produced known as Ama. Hypo-functioning of any Agni especially of Jatharagni is likely to affect the function of other too, leading to formation of Ama in the different stage of Paka-karma. Lastly we can say that Agni plays very important role in growth, development & maintenance of the body. In healthy individual during awakening and sleep the Agni excited by Samanavata due to association of respiration and being blown by Udanavata. After digestion by pachakapitta, the metabolic products circulate in micro channel under the control of
Vyanavata\textsuperscript{20}. The concept of digestion and assimilation of food, more or less similar to modern science in several aspects. 

\textit{Jatharagni} and \textit{bhutagni} are much close to digestive enzymes because of having less difference in functions and \textit{dhatwagni} is acts at cellular level and play a principle role in assimilation so it may be correlated with the cellular enzymes.

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