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CONCEPT OF DHĀTVĀGNIPAKA IN AYURVEDIC PERSPECTIVE IN COMPARISON WITH TISSUE METABOLISM

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ABSTRACT

Dhatwagni paka (Tissue metabolism) is a unique concept in Ayurveda. It includes total nourishment and development of the body structures. Agni (substance responsible for the metabolic transformations) is the basic functional entity in the Dhatwagnipaka. Dhatwagnipaka refers to the sequential changes undergone by the essence of food consumed through the medium of seven dhatwagni entities. In dosha dhatu mala shaareeram (Ayurvedic Physiology) dhatus (tissues) are the structural and functional units, which act as seats of Doshas and malas. There exist a lot of associations and interactions between these factors. Keeping dhatus in front line the other factors make all changes in the body. This Paper tries to validate this theory scientifically.

Keywords: Dosha, Dhatu, Mala, Dhatwagni, Dhatwagipaka

INTRODUCTION

Agni is key factor in transformation of consumed aharadi dravyas (food articles) of vijatiya (heterogenous) origin to sajatiya (homogenous) nature. Agni is derivative of Tejas mahabhuta (fire element). It carries metabolic transformations in which the inherent feature is change. Agni is having 13 categories. Jatharagni (1 type) looks after the functions of food digestion and absorption. Bhutagni (5 types) turns all the vijatiya panchabhautika dravyas consumed to sajatiya panchabhautika dravyas, i.e. conversion of heterogenous to homogenous. Dhatwagni (7 types) performs Synthesis and breakdown of tissues. The term Dhatu is derived from Sanskrit root “Du dhatru” which means Dharana (to support) & Poshana¹ (to nourish) which promotes the growth of shareera (body) is dhatu. Dhatus (tissues) are seven in number, Rasa (Chyle/Plasma/Lymph), Rakta (blood), Maamsa (muscle), Medo (Fat/Adipose tissue), Asthi (bone), Majja (Marrow), Sukra (Reproductive tissue). Sapta dhatus gets Preenanam (nourishment) from Aahararasa (chyle). Aahararasa is the end product of Jatharagni paka (Intestinal digestion). Each dhatu is of two kinds, Asthayi (mobile or non static) is poshaka dhatu (meant to nourish). Sthayi (fixed, static) is Poshya dhatu (already formed and existing). Srotas do not transport Sthayi dhatus. Dhatus that are formed consecutively from the asthayi dhatus one after another². Seven categories of Dhatwagnis (Rasagni, Raktagni, Mamsagni, Medogni, Asthyagni, Majjagni, Sukragni), & Sapta dhatus (Rasa, Rakta, Mamsa, Medo, Asthi, Majja, Sukra), undergo Paaka (Metabolic transformation) in two different ways for the sustainers of the body. One is Prasaada paaka and other is the Kittapaaka⁴. The prasaada paaka is stated to yield the seven kinds of poshaka or Asthayi dhatus. Kitta paaka is the waste products. In Ayurveda the concept of dhatwagni and dhatwagni paaka (Metabolic transformation) provides an extensive field of research in the present day.

Basically this article is review of various Ayurvedic classical texts. Materials related to Agni, Dhatwagni, Dhatwagni paaka (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 Dhatwagni, Dhatwagni paaka (Metabolic transformations) in Ayurveda. The samhitas used in the present study were Charaka samhita, Shushruta samhita and Astanga Hridaya with commentaries on them. The modern medical literatures as well as other various related information were collected from related websites.

DHATHWAGNI PAKA

Concept of Dhatu

The term Dhatu is derived from Sanskrit root “Du dhatru” which means Dharana (to support) & Poshana (to nourish), Which promotes the growth of shareera (body) is dhatu. Dhatus are seven in number, Rasa, Rakta, Maamsa, Medo, Asthi, Majja, sukra. Sapta dhatus get Preenanam (nourishment) from Aahararasa (chyle). Aahararasa is the end product of Jatharagni paka (Intestinal digestion).

Dhatwagni

Dhatwagnis are seven. Rasagni, Raktaagni, Maamsagni, Medogni, Asthyagni, Majjagni, Sukragni. Dhatwagnis are located in its own dhatus⁵ (tissues). After Jatharagni paaka & Bhootagni paaka aadya aahaara rasa (chyle) circulates in the body to reach all tissues. Seven categories of Dhatwagnis (Rasagni, Raktaagni, Mamsagni, Medogni, Asthyagni, Majjagni, Sukragni), & Sapta dhatus (Rasa, Rakta, Mamsa, Medo, Asthi, Majja, Sukra), undergo Paaka (Metabolic transformation) in two different ways for the sustainers of the body. One is Prasaada paaka and other is the Kittapaaka.

Prasaada paaka

The prasaada paaka is stated to yield the seven kinds of poshaka or Asthayi dhatu. Kittpaka is the waste products. The nutrient fraction of rasa (plasma) provides nourishment to rakta (blood), that of rakta (blood) to mamsa (muscle tissue), that of mamsa to medas (fat), that of medas to asthi (bone), that of asthi to majja (bone marrow), and the nutrient fraction of majja provides nourishment to Sukra (Reproductive tissue). The foetus (garbha) is the product of nutrient fraction of Sukra⁶.

The Poshaka rasa dhatu is transformed in to Rakta dhatu by the heat generated by ranjaka pitta and Rasagni in the body. The Poshaka Rakta dhatu is transformed in to Mamsa dhatu by the Vayu, Jala, tejas and heat generated by Raktagni in the body. The Poshaka Mamsa dhatu is transformed in to Medas dhatu by the Prudvi, Jala, and Mamsagni. The Poshaka Medas dhatu is transformed in to Asthi dhatu by the Prudvi, Vayu, and medasagni. The Poshaka Asthi dhatu is transformed in to Majjadhatu by the Prudvi, Jala Vayu, and Asthyaagni. The Poshaka Majja dhatu is transformed in to Shukra dhatu⁷. The time period of prasada paaka is 6 days and nights. This process is a continuous one like a moving wheel⁸. Each one of the seven kinds of poshaka or Asthayi dhatu is stated to be transported, as it is formed, to the respective poshya (sthayi) dhatu, through srotases (channels), specific to each such sthayi dhatu for being built up as part of the latter. These srotases are known as dhatuvaha srotamsi. These srotases are seven in number, Rasa vaha srotas, Raktavaha srotas, Mamsa vaha srotas, Medo vaha srotas, Asthi vaha srotas, Majjavaha srotas, and Sukra vaha srotas. The nutrient fraction of Rasa, Rakta, Maamsa, Medo dhatu helps in formation of Upadhatu (subsidiary tissue).

Upadhatu (Subsidiary Tissue)

The upadhatu or subsidiary tissue elements do not provide nourishment to subsequent dhatu or upadhatu, but simply sustain (nourish) the body. These are derived from dhatu, because of which these are called upadhatu⁹.

Kitta paaka

During the metabolic transformations malas (waste products) are produced from each dhatu (tissue elements) as part of kitta paaka. Malas (waste products) are Stool, Urine, Kapha, Pitta, Kha mala (waste products excreted from the cavities like ears, eyes, nose, mouth, and genital organs), Sweat, Kesa (big hairs) and loman (small hair) and the unctuous substance present in the eyes, stool & skin¹⁰.

Some extent the associations and interactions of dhatu in Dhatwagnipaka can be correlated with Tissue Specific metabolism.

TISSUE-SPECIFIC METABOLISM

Blood tissue

Blood is a circulating tissue. It transports nutrients like glucose, fatty acids and aminoacids which absorbed from GIT and distributes to all the tissues of the body and excretes wastes from body. Gaseous exchange of oxygen from lungs to tissues and carbon dioxide from tissues to lungs takes place through blood only. It transports various endocrine hormones. It maintains body P^H and temperature etc functions are carried by blood. It consists of Plasma proteins, immune globulins, albumins, lipoproteins etc¹².

Muscle Tissue

Muscle is the largest single tissue and contributes 25-40% of the body weight. Main function of muscle tissue is converting chemical energy released by the breakdown of ATP to mechanical energy in the form of muscle contraction. Sarcomere

is the basic contractile unit of the muscle which is made up of interdigitating filaments. They are thick and thin filament, thick ones are made up of myosin and thin ones are made up of actin. When it gets stimulated by nerve impulse and supply of energy by breaking down of ATP, the thin filaments slide down deeper into the array of the thick filaments and thus Sarcomere length will be reduced. Muscle is made up of number of longitudinal muscle fibres. Muscle fibres intertwine made up of myofibrils. Myofibrils are formed by number of Sarcomeres arranged in end to end form. Muscle contraction takes place by the result of coordinated stimulus on all the Sarcomeres, causes the shortening of the length of the muscle. In the relaxed state, the sarcoplasm has high concentrations of ATP and Mg^{++} . The Ca^{++} concentration is below the threshold level. The Free Ca^{++} is released in to sarcoplasm by the incoming of nerve impulse, and then it is taken up by the calcium binding site. Relaxation brought about when the Ca^{++} moves back from the sarcoplasm to the sarcoplasmic reticulum. Thus muscle contraction and muscle relaxation requires energy from ATP. ATP is produced by reactions of Glycolysis, citric acid cycle and Beta oxidation of fatty acids as in general metabolism¹³.

Adipose tissue

Adipose tissue stores lipids and supplies to tissues as they need. The free fatty acids are absorbed from GIT and resynthesized into triglyceride and stored in adipose tissue. The carbohydrates mean glucose also converted in to fatty acid and stored as triglyceride in the adipose tissue. These processes are enhanced by the action of hormone insulin. Adipose tissue is made up 15 percent of body mass, out of this 2/3 are triacylglycerols only and it present about 5-6 kilograms per person. It can be found under skin. Triglycerides are continuously broken down into fatty acids and liberated in to plasma to meet different types of tissues requirement. Several hormones like epinephrine, Norepinephrine etc stimulate the release of fatty acids from adipose tissue¹⁴.

Bone tissue

Bones consist of Osteoblasts, Osteoclasts and matrix in which mineral salts are present. Bone cavity consists of bone marrow which is rich of lipids, mostly triglycerides. Matrix contains group of proteins and minerals which are of cations, calcium, sodium, potassium, magnesium and anions, phosphate, carbonate, citrate, chloride, fluoride. The osteoblasts are also rich in glycolytic enzymes. For the normal activity of osteoblast vitamin C and A requires. Tooth consist of three layers, dentine, Cementum, Enamel. Dentine is hard and dense, consist 75% of mineral. It surrounds pulp cavity and extends throughout the portion of tooth. Cementum is a layer covering the portion of tooth which buried in the gum. Enamel is a white hard material covering the portion of tooth which projected above the gum. Vitamin A, C and all are necessary for proper development of bone and tooth¹⁵.

Liver Tissue

Liver is one of the most metabolically active tissues. It is having very important role in blood circulation as it is a junction point in between the portal and systemic circulations. The bile pigments, bile salts, cholesterol, heavy metals and the enzyme alkaline phosphatase are excreted through bile. It is a very important organ in detoxification mechanisms. It has important functions in the carbohydrate, lipids and proteins metabolism. It plays major role in the synthesis of plasma proteins. Liver plays a major role in synthesis and storage of carbohydrates as glycogen form. By glycogenolysis it releases glucose. It synthesizes glycoprotein. Liver is concerned in the synthesis,

esterification, oxidation and excretion of cholesterol. The normal cholesterol in the blood is 150-250mg /100ml¹⁶.

Nerve tissue

Nerve tissue constitutes approx 2.4% of the body weight. Nerve tissue consists of brain, spinal nerves, spinal cord and cranial nerves. Nerve tissues are rich in lipids. Brain contains six times more amino acids as plasma and it is rich in aspartic, glutamic acids. The blood capillaries of the brain surrounded by an extra layer of glial cells that limits passage of organic and inorganic charged molecules. At rest brain of the body utilizes 25% of O₂. Carbohydrate is the main substrate for the brain metabolism. Very less 0.1% of carbohydrates present in the brain, so it needs continuous supply of glucose from blood to maintain all the functions of vital tissues. Glucose is readily permeable through blood brain barrier. Decreased O₂ and glucose supply causes decreased metabolism, ATP and creatininphosphate levels of the brain. Glycolysis, citric acid cycles are main pathways of metabolism in brain¹⁷.

DISCUSSION & CONCLUSION

Agni converts food in the form of energy, which is responsible for all the vital functions of our body. Agni is the invariable agent in the process of ahara paka (metabolic transformations). Ingested food is to be digested, absorbed and assimilated, which is unavoidable for the maintenance of life, and is performed by the Agni. Rasa can be compared with Chyle/Plasma/Lymph, Rakta with Blood, Mamsa with Muscle Tissue, Medas with Adipose tissue, Asthi with Bone tissue, Majja with Bone marrow and Sukra with Reproductive tissue in modern medicine. Connective tissue is a group of tissues includes ligament, cartilage, bone, tendons, adipose tissue, Muscle sheaths, the dermis of the skin, capsules of joints, supporting tissue around the blood vessels, nervs and lymphatics. So Part of Sapt dhatu except Shukra dhātu comes under connective tissue only. Ayurveda gives at most importance in maintaining dhatu samyata. Sushruta said that any derangement of doshas, if not corrected in proper time, they go deeper in to the dhatus and it becomes more difficult to correct it. Increasing any dhatu should be controlled by particular measures, otherwise it affects uttarottara dhatus. According to Chakrapani Kayachikitsa means antargneshu chikitsa, it indicates that chikitsa means correct the antaragni and establishing of well formed dhatus. In dhatwagni paka, Prasada paka can be compared with anabolic pathways and Kitta paka with catabolic pathways.

Table 1: Dhatus & Its Functions³

Dhatu	Modern aspect	Function
Rasa	Chyle/Plasma/Lymph	Preenana (Nourishing property).
Rakta	Blood	Jeevana (Provides physical strength and color to the body)
Mamsa	Muscle Tissue	Lepana (Covers Asthi)
Medas	Adipose tissue	Snehana (lubricates the body))
Asthi	Bone tissue	Dharana (Gives support to the body)
Majja	Bone marrow	Poorana (Fill up the Asthi)
Sukra	Reproductive tissue	Garbhothpadana (Helps in reproduction)

Table 2: Dhatus & Its Upadhatus

Dhatu	Upadhātu
Rasa	breast milk and menstrual blood
Rakta	Kandara(tendons) and vessels
Mamsa	vasa(muscle fat) and six layers of skin
Medo	snayus (sinews)

Table 3: Malas

Sl. No.	Ana/Dhatu	Mala(Waste product)
1.	Anna (Food)	Vitmostram (Urine & Stool)
2.	Rasa(Chyle)	Kapha
3.	Rakta (blood)	Pitta
4.	Mamsa (muscle tissue)	Kha mala(waste products excreted from the cavities like ears, eyes, nose, mouth, and genital organs)
5.	Medas (Adipose tissue)	Sweda (Sweat)
6.	Asthi (bone)	Kesa (big hairs) and loma (small hair)
7.	Majja (bone marrow)	Sneha in Akshi,vit, Twacha (unctuous substance present in the eyes, stool & skin)

Figure 1: Dhatwagni paka correlation with modern science¹⁷

Figure 2: Total schematic representation of paka¹¹ (Jatharagnipaka, Bhutagnipaka, Dhatwagnipaka)

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