

A

COMPILATION WORK

ON

DHATUPARINAMA

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CERTIFICATE

This is to certify that the compilation entitled 'Dhatuparinama' is the record of *bona fide* work done by Dr. Abhilash. M., under the direct supervision and guidance of me, in the Dept. of Kriyasareera, Govt. Ayurveda College, Kannur.

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INTRODUCTION

Dhatuparinama is a unique concept in Ayurveda. It accounts for the sum total of nourishment and development (structural as well as functional) taking place inside the body. The basic steps involved in the Dhatuparinama process revolve around the functional entity called as Agni. Agni is held responsible for every minute change in this chain reaction of Dhatuparinama. To be precise, Dhatuparinama refers to the sequential changes undergone by the essence of food consumed through the medium of various kinds of Agni entities.

In the dosha- dhatu- mala system of our body, dhatus are the basic structural units and can act as the seats of the doshas and malas. There exist a lot of associations and interactions between these factors. Keeping dhatus in the frontline, the other factors make all the changes in our body. The changes in dhatus are being expressed more clearly, because of the more structural or materialistic nature of the dhatus. But, while studying the dhatuparinama process, we can visualize the changes in the other factors also, as compared with that occurring in the dhatus. Thus, to study the dhatuparinama process, virtually means to study the organization of human body as a whole.

There is no equivalent concept in the modern medicine, which can substitute the concept of dhatuparinama. There are so many similarities as well as differences between the concept of dhatuparinama in Ayurveda and the modern concept on nutrition and organization of the human body. Still, understanding the modern concept can give new dimensions to our thoughts, helping to improve our theoretical as well as practical proficiency.

The concept of dhatu

The term dhatu is derived from the Sanskrit root “*Du dhatru*”, which means dharana (to support) and poshana (to nourish)

“dha dharanaposhanayo:”

This meaning can be elaborated in the following ways.

1. That which supports the Sareera, Manas and Prana is Dhatu
“dadhati dhatte va sareeram mana: pranam”
2. That which supports the basic tissues of the body viz., rasa, Rakta, mamsa, medas, asthi, majja and sukra is dhatu
“dadhati dhatte va rasa rakta mamsa medo/sthi majja sukra dhatun iti”
3. That which promotes the growth of Sareera is dhatu
“dadhati dharayati sareeravardhakan iti dhatu”(Siddhantakaumudi)
4. That which supports everything in the living body
“dheeyate sarvam asminniti” (Sabdakalpadrumam)

Susruta and Charaka have also accepted these opinions regarding the functional aspects of dhatu.

“Ta ete Sareeradharanat dhatava ityuchyate”

(Su. Soo. 14/ 20)

“Dadhateeti dhatavo rasa Rakta mamsadaya: Kapha pitta pureeshanyapi prakrutani swaakarmana dadhateeti dhatava:”

(Dalhana on Su. Sa. 4)

“Sareeradharakataya dhatwantaraposhakataya cha dhatusabenochoyante”

(Chakrapani on Ch. Chi. 15)

The properties, locations and functions of the seven dhatus can be understood as follows.

Name of dhatu	Gunas	Sthaanas	Karmas
<i>Rasa dhatu</i>	Drava Snigdha	Amasaya Hridaya	Preenana Tushti

	Sara Manda Sveta Apya gunas	Dhamanis Tvak	Rakta pushti
Rakta dhatu	Ushna Tikshna Visra Sara Drava Laghu Spandana	Yakrt Pliha Dhamani Mamsa	Jivana Varna prasaadana Mamsa pushti
Mamsa dhatu	Sthula Sthira Guru Snigdha Picchila Parthiva and apya gunas	Bahya Abhyantara Avayavas	Sarira pushti Medas pushti Mala pushti
Medo dhatu	Snigdha Slakshna Guru Saandra Drava Mrdu pita	Sphik Udara Vapavahana Vrkka Asthi	Snehana of eyes and body Svedakaaraka Drdhatva Asthi pushti
Asthi dhatu	Guru Sthira Kathina Khara Sveta Parthiva gunas	Saakhas Kati Jaghana Prshtha Uras Siras	Dharana Majjapushti
Majja dhatu	Saandra Drava Snigdha Slakshna Mrdu Pita Sarakta	Asthi abhyantara	Snehana Balakara Sukra pushti Asthipurana

<i>Sukra dhatu</i>	Sphatikaabha Drava Sita Snigdha Bahala Madhu Gandhi Madhura	In males: Vrshana & sepha In females: Phalakosha Yoni	Dhairya Chyavana Priti Dehabala Harsha Garbhotpaadana
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From these observations, we can assume that by the word dhatu, what the Acharyas mean, is not just some structural forms in the body in the form of Rakta, Mamsa etc., but it is in a broader sense. In other words, Raktadhatu is not the so-called Rakta, but it is something that supports the so-called Rakta. This is the same for all the 7 dhatus.

The concept of Parinama / Paaka

All the transformation in the universe are brought about by the single principle Agni or tejas according to the ancient Indian philosophy i.e. darsana. Similarly all the changes or transformations in the universe are represented by a single term paaka. The paaka has been defined by in Amarakosa as that which causes parinamana-conversion of transformation and paravritti- transmutation. Obviously the concept of paaka is based on the concept of agni (tejas), kaala and dik; the first one being the primary factor and the remaining two, the contributory factors.

According to nyaya vaiseshika darsana, the paaka is interpreted as parinamana and paravrtti and these paakas are brought about by the influence of the Agni or tejas. When an object is brought in contact with tejas, karma is stated to occur in the ultimate constituent of that object due to abhighata or nodana of tejas. This karma, in its turn, is held to produce vibhaga, which results in the destruction of the samyoga that existed between the various constituents of the substrate resulting in the breakdown into the ultimate particles i.e. paramanus. When these paramanus are brought in contact with a new group of Agni or tejas, their original gunas undergo changes. Subsequently, repeated contacts with tejas result in the production of new gunas, which may entirely differ from the previously existed gunas of the same

paramanus. According to Annambhatta, the kind of paaka is different in each kind of transformation, i.e. each type of paaka is highly specific in nature. This is referable to the samyoga and vibhaga that goes on in different kinds of transformations.

The paaka (transformations) is of two types- Pilu paaka and pitara paaka. The term pilu refers to paramanu and the term pilu paaka refers to the transformations brought about to the substance at its paramanu level. The destruction and reconstruction that take place to the bonds between paramanus are responsible for the transformation in the physical and chemical characters of the substance. The factors affecting this process are:

- 1) The nature of constituent substance
- 2) The intensity of the tejas to which the substance is exposed.

The pitaras are composed of clusters of pilus and hence the term pitara paaka refers to the changes, which are not so subtle or radical like that occur in pilu paaka. Whatever may be the condition, the paakas are brought about by the action of tejas or Agni. The concept of these two types of paaka represents the most fundamental level of transformation.

The Ayurvedic concepts are evolved in a strong intellectual background of darsanas. Along with the above-mentioned concept of paaka from the field of darsanas, Ayurveda texts explain some other types of paaka, which are so important in the theoretical as well as treatment point of view.

Pachakapitta is the Agni concerned with the building up procedures in the body. It has 13 divisions. viz. 1 Jataragni, 7 Dhatwagnis and 5 Bhutagnis. The Dhatu parinama process incorporates the reactions of all these forms of Agni. In fact, for each dhatu and for each fraction of the dhatu, there is a corresponding Agni. In other words, every part of the body has its own inherent Agni.

The form of food ready for assimilation is termed as aahara rasa. Samana vayu transports aahara rasa to hridaya and from hridaya it is circulated all over the body to reach minute channels which supply nutrition to all the dhatus spread all over the body. This is influenced by vyana vayu. This aahara rasa is in such a

panchabhautik form that any particular dhatu can select its nutrition from it according to the homogeneity of particles as to suit the panchabhautik composition of each dhatu.

Types of paaka

The aim of all the paaka processes undergone by the food consumed, is to contribute to the formation and maintenance of any of the 7 dhatus. The paaka or metabolic transformations of all the 7 dhatus are of two different types.

- 1) prasada paaka- contributes to the formation of saara or essence.
- 2) kitta paaka- contributes to the formation of mala or waste.

Both these occur at different levels of paaka, i.e. at the jataragni paaka level as well as at the dhatvagni paaka level. By this there happens the separation of the essence portion of the food ingested from the waste portion. At the level of jataragni paaka, the essence is the aahara rasa and the wastes are the pureesha and mutra. The mala in solid form becomes the pureesha or feces, while that in liquid form becomes the mutra or urine. At the level of dhatvagni paaka, the prasada paaka contributes to the formation of dhatu, i.e. sthaya dhatu and upadhatu while the kitta paaka contributes to the formation of different dhatu malas. It is the nutrient fraction of dhatus, which provides nourishment of the other dhatus in succession. Sukra however is an exception in as much as it has only nutrient fraction and no waste products.

“Prasadakittow dhatunam paakadeva dwidharchhata:”

(A. H. Sa. 3/ 64)

Now, let's examine this process in detail.

Steps in the formation of Dhatus

The process of digestion and metabolism starts from ingestion of food. It can be divided into 3 stages:

1. Jataragnipaka /Avasthapaka – where the jataragni has major role.
2. Bhutagni paka – where the bhutagni has major role.

3. Dhatwagni paka – where the dhatwagni has major role.

1. **Avasthapaka:** The food is ingested with the help of pranavayu, which brings food to aamasaya. Inside aamasaya, with the help of kleda, sneha and samana vayu, the jataragni digests the food. The whole process takes place in mahasrotas. The process starts in aamasaya and ends in pakwasaya. The ingested food is divided into two portions – saara and kitta. Saara portion undergoes bhutagnipaka, whereas kitta contribute to the formation of pureesha and mutra as well as tridosha.

This process occurs in 3 stages: - Madhura, Amla and Katu avasthapaka.

- Madhura Avasthapaka: This is the first stage that begins from the mouth and ends in aamasaya. The foods, which have madhura and lavana rasa, get digested in this stage. The result being production of kapha dosha.
- Amla Avasthapaka: This begins from the aamasaya and continues in pachyamanasaya. In this stage, amla rasa dravyas are mainly digested. The result will be production of Pitta dosha.
- Katu Avasthapaka: This is last stage that takes place in pakwasaya. Here, the foods having katu, tikta and kashaya rasas are digested. With this stage, the process of Avasthapaka is completed.

Avasthapaaka	Location	Condition of food	Resulting dosha
Madhura	Amasaya	Bhuktamatram, shadrassa yuktam	Kapha in phenarupa
Amla	Pachyamanasaya	Vidagdham	Pitta in achharupa
Katu	Pakvasaya	Soshyamanam	Vata

It should be noted that the digested portion of the food (i.e., saara bhaga) would be different when compared to the original food that was ingested. This different form is called vipaka, which occurs due to jataragni.

2. Bhutagnipaka: This follows Avasthapaka. The saara portion of digested food is being acted upon by the five bhutagnis. They again digest their specific portions and subtle products are formed which can be easily assimilated by the dhatus. The qualities potentially present in food are separated by jataragnipaka and reorganized by bhutagnipaka in the final stages of digestive process in the adho-aamasaya, before they are utilized by dhatus. (Ch. Chi.15/13 – Chakrapani). Now, the mahabhuta portions, which were vijatiya, are converted into sajatiya. The result is the formation of rasadhatu, which is transported through different srotas for further transformation.

Bhautic group	General qualities	Specific qualities
Parthiva	Guru, Khara, Kathina, Manda, Sthira, Visada, Saandra, Sthula, Gandha	Gandha
Apya	Drava, Snigdha, Sita, Manda, Mrdu, Picchila, Sara, Rasa	Rasa
Agneya	Ushna, Tikshna, Sukshma, Laghu, Ruksha, Visada, Rupa	Rupa
Vayavya	Laghu, Sita, Ruksha, Khara, Ssukshma, Sparsa	Sparsa
Nabhasa	Mrdu, Laghu, Sukshma, Sabda	Sabda

3. Dhatwagnipaka: This is the final stage of food transformation, i.e., metabolism. The ahara rasa is transported to different dhatus in their respective channels. When they reach their respective dhatus, the dhatwagni present at that place further transform this ahara rasa and again there will be formation of saara and kitta portions. The transformation is in the form of rearrangement of panchabhoutika factors to form body tissues. The saara portion contributes for the dhatu proper and upadhatu. The kitta portion forms various metabolic wastes.

The prasada and kitta types of paaka with respect to the seven dhatus, explained by Vagbhata are as follows;

*“Rasasya saaro raktam mala: kapho laseeka cha
 Raktasya saaro mamsam kantarasisrascha mala: pittam
 Mamsasya saaro medastwacho vasa cha kittam
 karna akshi nasika asya romakoopa prajanana malaa:
 Medasa: saaro asthi snayu sandhaya: kittam sweda:
 Asthna: saaro majja kittam kesaromanakhaa:
 Majjastu saara: sukram malo /kshi vit twacham sneha:
 Sukrasya saaram oja: atyantasuddhataya/sya malaabhava:
 Anye punarata eva tasya nechhanti paakam
 Apare puna: sukrasaaram garbhamevaamananti”*

(A. S. Sa. 6/ 29)

Upadhatus and Malas

Upadhatus and Malas are the bye-products of Dhatuparinama. The bye-products are categorized into one of these groups according to their functional importance.

The term dhatu represents two functions attributed to them: The dharana (to support) and poshana (to nourish). So, a dhatu supports the body and nourishes the subsequent dhatus. But the upadhatus only support the body and they neither undergo metamorphosis nor nourish any subsequent tissue. Hence they are not considered as dhatus in the complete sense. Even though they are devoid of progressive transformations they are derived from dhatus. That is why they are counted secondary tissue elements, i.e. upadhatus

(Chakrapani on Ch. Chi. 15/ 17)

Charaka describes stanya and rajas as the upadhatus of rasa. The nutrient fraction of rakta nourishes Kandara and Sira. The mamsa nutrient fraction aids the formation of Vasa and the six-layered twak. The Snayus are nourished by the nutrients from medas. The next dhatus are devoid of upadhatus.

“Rasad stanyam tato raktam asrija: kantara siraa:

Mamsad vasa twacha: shad cha medasa: snayusambhava:"

(Ch. Chi. 15/ 17)

Sarngadhara considers stanya as the upadhatu of rasa; arthava as the upadhatu of Rakta; vasa as the upadhatu of mamsa; sweda as the upadhatu of medas; danta as the upadhatu of asthi; kesa as the upadhatu of majja and ojas as the upadhatu of sukra.

"Stanyam rajascha naareenam kale bhavati gachhati

suddhamamsodbhava sneha: sa vasa parikeertitaa

swedo dantasthatha kesastathaivoja: saptamam"

(S. S. Poorvakhanda. 5th Chapter)

All the dhatus except Sukradhatu are having another group of bye-products in the form of malas. Different malas are produced during the jataragni paaka as well as the dhatvagni paaka. The malas formed from different tissue metabolism are termed as the dhatu malas. During the transformation of each dhatu, dhatu mala is formed. The sukra is the only dhatu, which is devoid of dhatu mala owing to the utmost purity of this dhatu. The different dhatumalas have been enumerated by Acharya Susruta as follows,

"Kaphapittam mala: kheshu sweda: syad nakharoma cha

Netra vit twakshu cha sneho dhatunam kramaso malaa:"

(Su. Soo. 46/ 529)

Charaka also enlists these malas with only one difference. He names kesa instead of nakha.

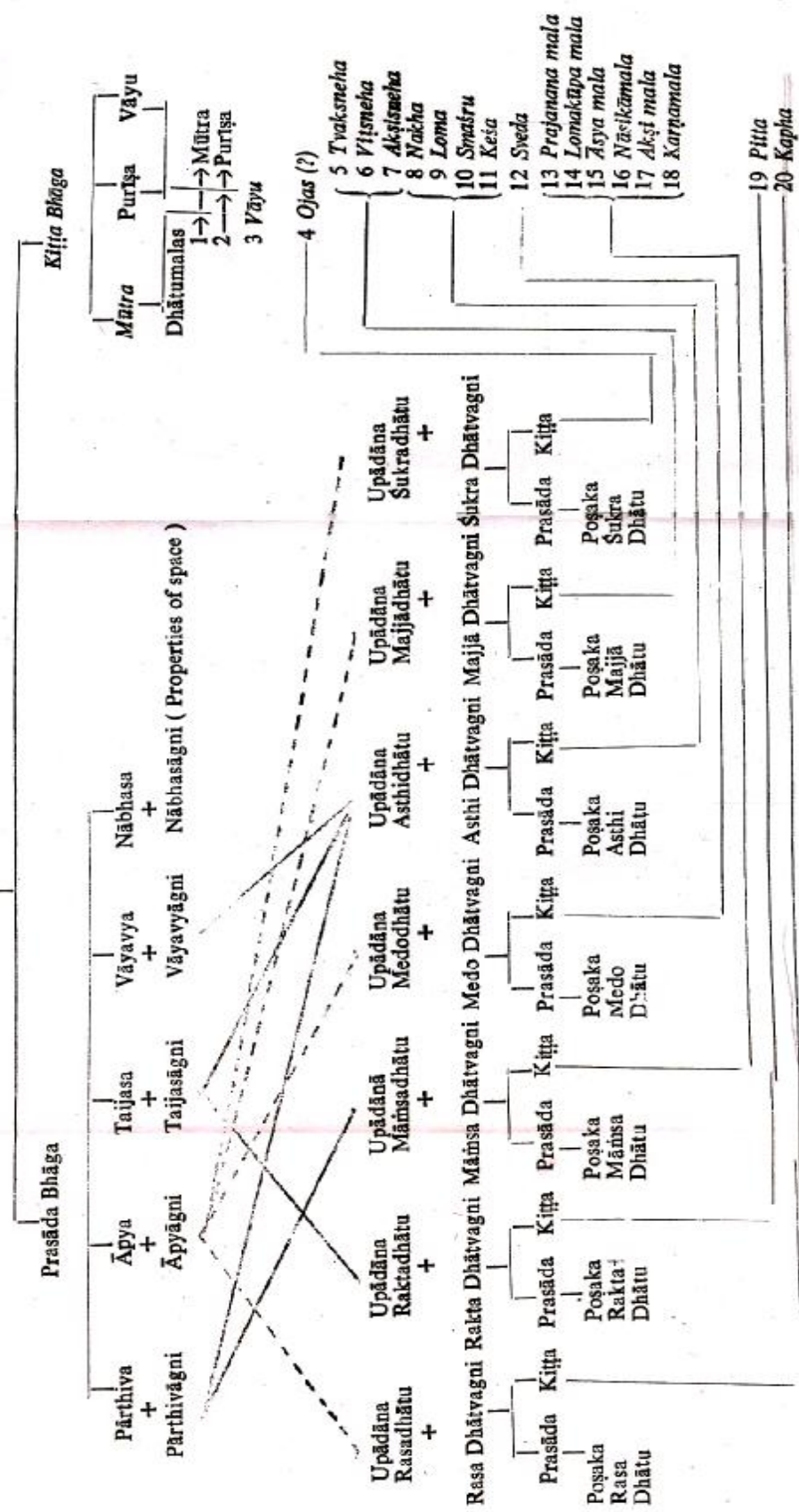
(Ch. Chi. 15/ 18-19)

From these descriptions, it can be understood that the terms upadhatu and mala are contextual. The same thing told as upadhatu can be seen as a mala in another context. So, we will be able to deduce the physiological importance of a factor by referring to its position in the dhatu- upadhatu- mala system in a particular context or in a particular physiological process.

This whole process of Dhatuparinama can be represented schematically as follows.

SCHEME SHOWING DIFFERENT STEPS ĀHARADRA VYAS UNDERGO TO BE TRANSFORMED INTO DHĀTU

ĀHARA + JĀTHARĀGNI



The seven dhatus can be analyzed on the basis of the panchabhowtik constitution as well as its structural and functional contributes as follows.

Panchabhowtik Constitution

DHATU	CHAKRAPANI	DALHANA
RASA	AP	AP
RAKTA	AP	AGNI
MAMSA	PRITHWI	PRITHWI
MEDA	PRITHWI, AP	AP
ASTHI	PRITHWI, VAYU	PRITHWI, VAYU, AGNI
MAJJA	AP	AP
SUKRA	AP	AP

Dhatu	Main Function	Upadhatu		Mala
		Charaka	Sarngadhara	
Rasa	Preenana	Stanya, Artava	Stanya	Kapha
Rakta	Jivana	Kandara, Sira	Raja	Pitta
Mamsa	Lepa	Vasa, tvak	Vasa	Kha-mala
Medas	Sneha	Snayu	Sveda	Sveda
Asthi	Dharana	-	Danta	Kesa, Loma
Majja	Poorana	-	Kesa	Akshi vit, Tvak Sneha
Sukra	Garbhotpada	-	Smasru	Ojas

In the digestive procedures performed under the influence of jataragni throughout the koshta, the bhutagni rearrange their respective particles (the panchabhoutik composition and the molecular arrangement), so that they can be assimilated in the living body before they get absorbed in the pakwasaya. The form of food ready for assimilation is termed as aahara rasa. It is the precursor of and is concealed in rasadhatu. Consequently formed rasa is carried to hridaya and from hridaya it is circulated all over the body to reach minute channels which supply nutrition to all the dhatus spread all over the body. This is influenced by vyana vayu.

The aahara rasa, dissolved in rasadhatu is in such a panchabhoutik form that any particular dhatu can select its nutrition from it according to the homogeneity of particles as to suit the panchabhoutik composition of each dhatu.

*“Vyanena rasadhaturhi vikshepochitakarmana
Yugavat sarvato/jasram dehe vikshipyate”*

(Ch.Chi.15/36)

There are three theories about the modes of dhatu formation (nourishment).

1. Ksheera-dadhi-nyaya (The law of Transformation):

According to this concept, the preceding dhatus get transformed into the succeeding dhatus. This is on the analogy of transformation of milk into curd. Thus the whole Rasadhatu being cooked by the respective agnis becomes Rakta similarly the Raktadhatu changed as mamsadhatu and Mamsadhatu changed in Medo dhatu and like wise and termed as Ksheera - dadhi nyaya. (Ch.Chi.15/15-16, Su. Su. 14/10, Dalhana).

2. Kedari - Kulya - Nyaya (The law of transmission):

According to this theory, the process of nourishment of tissues can be likened to the irrigation of different fields by water from a canal. The water first irrigates the nearby fields and only thereafter the distant ones are irrigated. Thus, the Rasa after supplying nutrition first Rakta proceeds to provide the nourishment to Mamsadhatu. In this way, the nourishment is taken to all the dhatus by Ahararasa due to this order each dhatu can pick-up its own nutrients. According to this concept, one dhatu alone can get affected without involving other tissues (Ch. Su 28/4), (Ch. Chi. 15/ 36).

3. Khale Kapota Nyaya (The law of selectivity):

According to this concept, the nourishment of dhatus takes place by selection. The nourishing fluid travels to different dhatus through different channels. In the beginning, the nearby dhatu draws its nutrient fraction from the nourishing fluid and the distant ones get nourished at later stages. Thus, the nourishment of tissues takes place through different channels. This is on the analogy of the pigeons carrying grains from a thrashing field and flying out in different directions.

Vagbhata says that, as the flame of the forest fire tends to increase or decrease according to the quantity of 'indhana', so also is the case with Dhatuparinama. Dravyas are either 'tulya' or 'visishta', which cause an increase or decrease, as the case may be, of the dhatus due to properties potentially inherited by them, as in the case of a seed; "homologous properties of dravyas cause sufficient and rapid increase of identical or homologous properties in the dhatus".

(A. S. Soo. 19/ 16-18)

"Swasthanasthasya kayagneramsa dhatushu samsrita:

Tesham sadagnideeptibhyam dhatu vriddhikshayodbhava:"

(A. H. Soo. 21/ 34)

Sthayi and Asthayi Dhatus:

To solve the controversy, whether this process of Dhatuparinama takes place as a chain reaction or it is an aggregation of different reactions (i.e., according to which nyaya, it takes place), Chakrapani has postulated the concept of *poshaka* and *sthayi* dhatus.

"Yato dwividho rasa: - sthayi poshakascheti, tatra dhatu poshaka poshya rasamsayor bheda vivakshaya bheda ukta:, Iha sthayi poshaka rasamsaavapyekatayaa nirdishtow, stayirasa poshakarasa bhagayo: sthanabhedadyabhaavaadekatwam, evam kritwa saptadhatukam sareeramuchyate"

(Chakrapani on Ch. Chi. 15)

Thus, the seven dhatus can be further classified into two types: - sthayi (poshya) and asthayi (poshaka) dhatus.

The sthayi dhatus are dhatu proper, which stays constantly in the body right from birth to death. They are responsible for the support and maintenance of the body. Their increase or decrease depends on asthayi dhatus.

The asthayi dhatus are the elements that are formed after bhutagni paka. They are the specific nutritive homologues of the particular dhatu. They circulate through specific srotas and nourish specific dhatus. The sthayi dhatu receive the nutrition and convert them to similar body tissues by the help of specific dhatwagni. Asthayi dhatus are important for nutrition and to compensate the wear and tear phenomenon of the body.

A consensus on the nyayas:

In Dhatuparinama, the saara portion of aahara rasa is converted into poshaka rasadhatu, which by the influence of rasadhatwagni, is converted into sthayi rasadhatu. The major share of the remaining minute fraction is converted into raktadhatu by the action of rakthadhatwagni. Upadhatus and malas of rakta are formed here as bye products. Again, the remaining portion is being acted upon by mamsadhatwagni. This process continues up to sukradhatu. The schematic representation of this process is given in the next chapter while dealing with the formation of medas.

All these processes are taking place in the medium of rasadhatu, as explained by the kedarakulyanyaya (Ch. Chi. 15/ 36). The nutrition to each dhatu is specific as explained by khalekapotanyaya. And the conversion of poshakadhatu as the corresponding stayidhatu, upadhatus, malas and as upadanadravya for the succeeding dhatus can be explained on the basis of ksheeradadhinyaya.

Each dhatu is having a poshaka (asthayi) fraction and a poshya (sthayi) fraction. In the case of medas, these relations are direct and very clear. While adipose tissue can be considered as poshya medodhatu; Chylomicrons, lipoproteins etc. comes under the poshaka variety. Still, a dhatu can take its relevant portions from the upadanarasa obtained from the preceding dhatu, following kedarakulyanyaya; or it can directly take its portions from the aahararasa, following khalekapotanyaya.

This is determined as follows. The example of medodhatu is very much suited to explain the principle underlying this. When we follow an ordinary diet pattern, the

dhatu is nourished as per the former phenomenon. And there is no significant increase for medodhatu. Whereas, when we take a large amount of snigdha as well as madhura substances, the mechanism of Dhatuparinama is shifted to the latter type and there occur a significant increase in medodhatu.

Time Period for Dhatuparinama

There is difference of opinion among the Acharyas regarding the time period needed to complete the process of Dhatuparinama. Some Acharyas consider it as one day; whereas others consider it as 7 days. Still some others are of the view that, 1 month is needed to complete the whole Dhatuparinama process.

“Kechidahurahoratrada shadratrada pare pare

Masad prayadi sukratwamannam paakakramadibhi:”

(A. S. Sa. 6/ 37)

The mostly accepted time period is 7 days. Susruta opines that the rasadhatu, when imparts nutrition to every dhatus, will take 3015 kalaas to cross one dhatu. In this manner, it will take 18,090 kalaas for the nutrition from rasadhatu to reach sukradhatu; which is equal to 1 month.

(Su. Soo. 14/ 14- 15)

Arunadatta, in his commentary on Ashtanga Hridaya states that, aahara is converted into rasadhatu in the next day itself; raktadhatu is formed in the third day; maamsadhatu in the fourth day; medodhatu in the fifth day; asthidhatu in the sixth day; majjadhatu in the seventh day; and sukradhatu in the eighth day. Therefore, he says, pathyanushtana for seven nights will purify the seven dhatus.

(Arunadatta on A. H. Sa. 3/ 64)

There are 2 hypotheses regarding this manner of dhatuposhana. One hypothesis, namely **ekakaala dhatuposhana** states that, the aahararasa can provide nutrition to different dhatus by entering their respective srotases in the same time.

“Aahararasadekakaalam saptasu dhatusrota:su pravesitad

Rasraktadayo dhatava utpadyante iti ekakaaladhatuposhanapaksha:”

(Arunadatta on A. H. Sa. 3/ 62)

According to the second hypothesis, namely **kaalabheda dhatuposhana**, there is some definite time difference between the nourishment of different dhatus. This hypothesis has more acceptance than the first one.

*“Evamannarasa evam sakshad sarvadhatun kenechideva
kaalabhedena pushnati. Na punardhatavo dhatwantarataam
swaroopopamardena pradipadyanta iti”*

(A. S. Sa. 6/ 31)

Srotas and dhatu poshana

Srotas represents the internal transport system in the body. The structural and functional integrity of srotas is essential for the maintenance of physiological state. The srotases are broadly classified into bahyasrotas and abhyantara Srotas. The class of abhyantarasrotas includes the dhatuvahasrotas.

Each dhatu has its own srotas. These are the channels, which are specific to the concerned dhatu. Vagbhata says that the srotamsi are coloured like the concerned dhatu, these are circular, either big or small and are spread in different parts of the body.

*“Swadhatusama varnani vritta sthulanyanooni cha
Srotamsi deerghanyakriya pratanasadrisani cha”*

(A. S. Sa. 6/ 33)

Also, Vagbhata says that, through these concerned srotamsi, each dhatu is nourished by the circulating rasadhatu.

*“Bisanamiva sookshmani dooram viprasritani cha
dwarani srotasam dehe raso yairupacheeyate”*

(A. S. Sa. 6/ 36)

Charaka opines that the srotamsi are the channels for the transport of prasada and mala portions of dhatu.

“Tesham tu malaprasadakhyanam dhatunam srotamsyayanamukhani”

(Ch. Soo. 28/ 5)

He also states that, through the srotamsi, the portions of dhatu, which are being subjected to change, are getting transferred. Commenting on this, Chakrapani says, it is the poshakadhatus, which are getting transferred through these srotamsi and not the sthayidhatus.

(Chakrapani on Ch. Vim. 5/ 3)

Vagbhata, again describes that the succeeding dhatus are nourished by the srotamsi going deep and deep. And as far as we are following the correct dietary pattern, there will not be any derangement either to the srotamsi or to the dhatus.

(A. S. Sa. 6/ 27)

Also, it should be noted how the concerned dhatu and the related dosha influence the srotas. It is said that the aaharas and viharas, which are similar to the qualities of dosha as well as opposite to the qualities of dhatu vitiate the concerned srotas.

*“Aaharascha viharascha ya: syad doshagunaissama:
dhatubhirviguno yascha srotasam sa pradooshaka:”*

(A. S. Sa. 6/ 34)

Generally the srotases can be visualized as the channels, which transport various body factors. And because of this fact, there cannot be any development or atrophy of the particular body factor with out the involvement of Srotas. This approach is applicable to all the srotases. More specifically the dhatuvahasrotases are those channels, which transport the continuously transforming dhatus. As stated already, the poshya dhatu or sthayi dhatu which represents formed dhatu are get nourished regularly by the nutrients derived from food. The other type i.e. the poshaka dhatu or asthayi dhatu represents the portion of specific nutrients, which needed for the development and maintenance of the sthayi dhatu. The transportation of this poshaka dhatu to the poshya dhatu is carried out by these dhatuvahasrotas. Any type of pathology to the particular Srotas lead to the impairment of the concerned dhatu as the proper supply of nutrients is being arrested.

The dhatus are formed and nourished by the action of all these paakas i.e. avastha paaka, bhutagni paaka and dhatvagni paaka. Healthy dhatus are produced and maintained, provided proper food is consumed, all agnis are normal and the transporting system i.e. Srotases are normal. Health of the individual is maintained as long as this equilibrium is preserved. By the disturbance in any of these factors, this equilibrium is lost and the result is the vitiation of dosha or dhatu or mala.

Ojas as the essence of dhatuparinama

The term ojas is derived from the root, 'ubj' which means to express itself. It is used to indicate in person, vigour, vitality etc. It is described as the quintessence of all the dhatu, but it is not described under any of the structural categories. At the same time it is not a mere a functional unit. So it is something, which has some special status with respect to other structural or functional units of the human body.

In general it is considered as the 'bala' or physical strength and at special milieu it is considered as body resistance. But when the Ayurveda classics are analyzed thoroughly it is obvious that the concept of ojas have many other potential ideas to cover. In short, it is not only a source of resistance but also an excellent icon of energy.

Ojas is the imperative essence of all the fundamental principles, dhatus, of body that is almost identical with what is termed as vital power. It is formed as a result of the complete metamorphosis of food i.e. after the jataragni paaka, bhutagni paaka and dhatvagni paaka of Aahara. It is the principal entity of the body up on which the entire life is depended. The salient features like vigour, vitality, charm, and intelligence of an individual are based on ojas only. The decline of ojas in quality and quantity leads to the total derangement of the individual's health and even to the death. This is the potential unit, which is responsible for the entire well being of the person. The ojas is a unique entity as it is the one and only one thing in the body, the excess of which is always desirable.

The ojas is the first entity formed in the foetal life even before the proper development of dhatus. Hence it should be understood that, ojas is nourished by the

rasa dhatu of mother which nourishes the foetus. This haulage of ojas is lucid only after the eighth month of gestation.

The development of ojas in an individual's body is compared to the formation of honey. Like the honeybees collect the honey from different flowers little by little as essence from them; the ojas is also formed from the best qualities of all the dhatus as the purest entity. Because of this, the ojas is also derived from the ingested food. As already stated, for any type of conversion some sort of Agni is required. This rule is applicable in the case of ojas also. The Agni, which aids to the formation of ojas is nothing but the sadhaka pitta.

The main site of ojas is hridaya, but it circulates all over the body along with rasa through the 'dasadhamani', which are based on hridaya. These dasa dhamanis are also called ojavahini dhamani due to this. Being the seat of ojas and thus the praana, hridaya is given the name 'mahat'. Ojas is of two types.

1. Para ojas- It is the prime variety of ojas and it is situated in hridaya. It is very less in quantity and almost measures 8 drops only because of which even the slightest decrease of it is highly dangerous to the life
2. Aparaj ojas- It is subordinate variety of ojas and always circulates through the dhamanis. It is half an anjali in quantity and it is the variety of ojas, which gets depleted, in chronic ailments.

The essence of dhatu saara i.e. ojas is directly related to food and activities of the individual, during which the role of satmya (the habituation of the body to certain food and activities) comes into play. The regular intake of snigdha food like ghee, milk, oil, meat broth and sarva rasa ahara, regular exercise, avoiding cold and hot weather helps to increase the strength of the body and in turn increase the excellent state of dhatu (saarata). The body strength and the excellent state of dhatus are the promoters of ojas. In the contrary, habituation of ruksha and eka rasa ahara, addiction to alcoholic beverages and narcotics, excessive exposure to extreme hot and other deleterious weather will deplete the strength and ojas.

Saara and dhatuparinama

The complete healthy state of dhatu is represented by the saarata. Thus the corresponding saaras represent qualitatively and quantitatively perfect dhatus i.e. dhatus in their excellent state.

The term 'saara' is derived from the root 'Sr sthire' with suffix 'ghan'. It means essential, best, highest, most excellent, real, true, genuine, strong, and vigorous. It is also considered as the 'bala' and 'sthiraamsa'.

The concept of saara is related with the excellence of dhatu. Though, the body of every individual is made up of seven dhatus, it is found that at the level of the excellence of dhatus each individual differs from another. This may be due to the divergence of dhatuparinama. The ratio of dhatuparinama is not same in each and every person, thus the body, which is composed of seven dhatus of different quantities, vary from one another. One of the main factors affecting the paaka, which contributes to the maintenance of dhatus saara, is dhatvagni, without which even the formation of dhatu is not possible. Hence the saara not only represents the healthy state of dhatu, but also projects the perfect performance the respective dhatvagni.

The individuals, on the basis of saara, have been classified into various categories depending on the predominance of particular dhatu. (The satvasaara is an exception and it is a measure of the three gunas, i.e. satva, rajas and tamas in the mental activities.) The narrated saaras are:

- Ø Tvak saara
- Ø Rakta saara
- Ø Mamsa saara
- Ø Medas saara
- Ø Asthi saara
- Ø Majja saara
- Ø Sukra saara
- Ø Satva saara
- Ø Sarva saara

In saara typology, the term 'rasa saara' is not being used. It is described as tvak saara probably due to the reason that the functions of rasa dhatu are, primarily

and in a better extent, manifested in the tvak. So by tvak saara, the rasa residing in tvak is being considered.

(Dalhana on Su. Soo. 35/16)

Saara gives an idea about the excellent state of dhatu and mind. The saara concept of 'visuddhatara dhatu' signifies the good qualities of dhatus and mind with respect to the structure, function and properties. These are very much dependent upon the dhatvagni vyapara. The physical, physiological and psychological characteristics of different saara are reflections of status of dhatu saara in the form of structure and functions. Through different saara lakshanas, it is easy to assess and grade the healthy and excellent state of dhatus.

Gender difference in Dhatuparinama

The maturations of rasadhatu to form the sukradhatu is the basic phenomenon taking place in the process of dhatuparinama. It is very much interesting that both the rasadhatu and sukradhatu are kapha predominant and the only difference is the maturation, which is brought by the functions of dhatwagnis, which are in turn different active forms of pittadosha. This influence of pitta is more in females as the arthava (that combine with sukra to form the garbha) is considered as more paittika than the sukra.

Acharya Charaka considers arthava as the upadhatu of rasadhatu; while Acharya Sarngadhara considers it as the upadhatu of rakta dhatu. This contradictoriness can be solved, if we examine the dhatuparinama process in detail, in the light of the variation of the doshik equilibrium according to the menstrual cycle. The period of menstruation (bahya arthava) is the stage of vatakopa. The period just before this, is the stage of pittakopa. This vata pitta dominance influences the conversion of rasadhatu in to raktadhatu. Instead of being converted into raktadhatu, the rasadhatu is transformed in to a vitiated form i.e., arthava which is expressed out due to the vata dominance in the garbhasaya. Charaka considers it as the upadhatu of rasa because it is derived from the rasadhatu. While sangadhara considers it as the upadhatu of rakta because it has more similarities with rakta, as it would have been transformed into raktha dhatu in the absence of menstruation.

*“maseno pachitam raktam dhamani byamrthowpuna:
eeshath krshnam vigandham cham vayur yonimukath nudeth”*

[A.H. Sa. 1/22]

It is not this bahya arthava, which is responsible for fertilization. This is only an upadhatu and it does not have the potency of the sukradhatu to conjugate with the sukra of the male. There is a ‘prasastha ritu’ (ovulation) when the matured female sukradhatu is expressed and it is described as the ‘garbhadharana’ period in Ayurvedic texts.

“rithu beejakalmavekshata”

[K.Sa]

*“rithustu drishtarthavo dwadasharatram bhavathi
shodasharathramityanye shudha yoni garbhasaya arthavaya
masamapi ke chit tadwath drishta arthavo api asthi ithi apare”*

[A.S.Sa1/19]

This period of “anthararthava” is characterized by the maximum accumulation of kapha in garbhasaya together with the process of pitta starting to increase; hence leading to the expression of female sukradhatu. As we have already discussed, this period of kapha pitta dominance makes the ovulation possible. The pitta chaya and prakopa processes make the female sukradhatu (arthava that combine with the male sukra) more paittika.

These descriptions do not mean that the dhatuparinama is shifted to any part in any situation or rasadhatu is predominant in the menstruation phase and sukra dhatu is predominant in the ovulation phase. The dhatuparinama process is the same all the time. But it is only the variation in the doshik equilibrium that makes these changes. Female sukra dhatu, like that of the male, remains the same in all phases of the menstrual cycle. Kasyapa says that the only difference in the expression of the sonitha (female sukra dhatu) and the sukra (male sukra dhatu) is that the former is expressed according to the “kaala”, why the latter is expressed according to the “karma”.

“ Yatha cha pushpamadhye phalanirvridham sasookshmasthi

*na chopalabhyathe yatha agni darushe sarvagatha
prayatnabhavat nopalabhyathe tattha streepumsayo
sonithasukle kalaveksha swakarmaveksha cha bhavatha”*

(Kasyapa Samhitha. Jathisoothreeyam Sareeram)

The concept of Koshta and Sakha in relation with Dhatuparinama

The Ayurvedic principles are formulated based upon some concepts, which are structurally as well as functionally specific and their interpretation, which could help in the generalization of the matter. Such a concept is the concept of Koshta and sakha. In Ayurveda, the transfer of nutrients, the exchange of body fluids etc. are facilitated by the mechanism of Koshta-Sakha interaction. Vata plays a key role in this interaction.

Generally, the term Koshta means a hollow viscus; while Sakha means its surroundings. These terms are also used in another context. Koshta is said for the rasadhatu; while Sakha indicates the succeeding dhatus. That is Koshta is the primary stage and Sakha is the advanced stage in dhatuparinama. These terms Koshta and Sakha are used in different meanings according to the situation. There are several Koshtas and Sakhas in the body. But they can also be taken as a single Koshta and Sakha, when a systemic pathogenesis is considered.

Doshas are exchanged between the Koshta and Sakha according to the condition of the body as well as the condition of the environment. This balance of the exchange of doshas between the koshta and Sakha is needed in the normal functioning of both of them.

Actually, any part of the body can be considered as a part of either koshta or sakha. For example, all the srotases, come under koshta, while the dhatus come under sakha, rasadhatu being an exception. i.e. the koshta and Sakha, whether they are micro or macro, the mechanism behind their normal functioning is the same. When this mechanism is disturbed, there occurs a shift of doshas towards one side, which can be considered as a srotodushti or an avarana, depending upon the condition

We have already seen that the exchange of doshas between the koshta and sakha plays a great role in maintaining the homeostasis mechanism of the body. We also understood that the koshta gati is less important, as it can more easily be treated when compared to the sakhagati. In another perspective the koshtagati is a normal phenomenon, because when the doshas are in the koshta, the body can itself control their activities; i.e. the increased doshas can be expelled and the decreased doshas are saturated with the nutrients from the food. While sakhagati is a pathological change and it should be reversed as early as possible. Marmasthisandhigati is also a form of sakhagati, which involves deeper structures.

The dhatu parinama process progresses by the saara of the food being converted in to more and more minute as well as deep structures. Actually, what happens here is the dhatus of the sakha are nourished one by one. The energy for the assimilation of such nutrients is provided by their inherent Agnis. However, it should be noted that as the process of nourishment of dhatus is progressed deeper to the sakhass, the doshas are driven towards the koshta.

This statement can be made clearer, if we examine the dhatu parinama process in detail. Let us consider the rasadhatu being converted in to the rakta dhatu. Here, kapha is produced as the mala. In fact, raktadhatu when takes its portion from rasa dhatu, gives back the kapha fraction to the rasadhatu. i.e., towards the koshta. Same thing happens in the case of rakta dhatu being converted into the mamsa dhatu. Here, pitta is propelled in the opposite direction of dhatuparinama. This shift of doshas, opposite in the direction with that of the dhatu parinama can be taken as the koshtagati of doshas.

This can be compared with the electron transport system, where the energy is transferred in a direction opposite to the direction of electron transport. Like wise, doshas are propelled in a direction opposite to the direction of dhatu parinama. This normal koshtagati of doshas are maintained by the normal functioning of agni. When any of the dhatwagni becomes deranged, an error is developed in that portion of dhatuparinama. Then there will be a shift of doshas towards that portion. This shift

impairs the koshtagati of doshas and then the gati becomes the sakhagati, which is abnormal and is indicative of the derangement of dhatwagnis.

A modern comparison

There is no single concept in modern medicine, equivalent to the Ayurvedic concept of dhatuparinama. Still, it can be compared with various metabolic reactions taking place in our body. The anabolic (building up) and catabolic (Breaking down) pathways can have some resemblance with the Ayurvedic concepts of prasadapaaka and kittapaaka respectively. The forethought of our Acharyas seems evident in giving dhatuposhana (building up) as well as malaroopa (breaking down) attributes to the doshas, parallel to the concept of anabolic and catabolic changes in modern medicine.

The main metabolic reactions taking place in our body are those of carbohydrates, proteins and lipids; which are very much interrelated also. These three types of metabolic processes can be represented in short as follows.

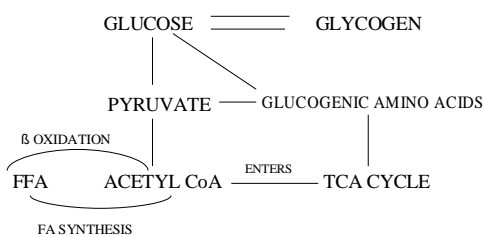
Carbohydrate Metabolism

The conversion of glucose to glycogen for storage in the liver and skeletal muscles is the principal glucose anabolic reaction. It is termed as Glycogenesis. As far as the glucose synthesis is concerned, the conversion of glycogen to glucose is also an anabolic reaction and it is called Glycogenolysis. This occurs between meals. Another group of reactions known as Gluconeogenesis is the conversion of noncarbohydrate molecules to glucose.

Glucose catabolism or glucose oxidation is also called cellular respiration. The complete oxidation of glucose to carbon dioxide and water involves glycolysis, the Krebs cycle and the electron transport chain. Glycolysis refers to the break down of glucose into two molecules of pyruvic acid; there is a net production of two molecules of ATP. When oxygen supply is short, pyruvic acid is reduced to lactic acid; under the aerobic condition, pyruvic acid enters the Krebs cycle. Pyruvic acid is prepared for entrance into the Krebs cycle by conversion to a two-carbon acetyl group followed by the addition of coenzyme A to form acetyl coenzyme A. The Krebs cycle involves decarboxylations and oxidation and reductions of various

organic acids. Each molecule of pyruvic acid that enters the Krebs cycle produces three molecules of carbon dioxide, four molecules of NADH and 4 H⁺, one molecule of FADH₂, and one molecule of ATP. The energy in the glucose molecule and then pyruvic acid is transferred primarily to reduced coenzymes NADH and FADH₂. The following step involves electron transport chain and at the end of the process, 32 or 34 molecule of ATP and 6 molecule of H₂O are produced.

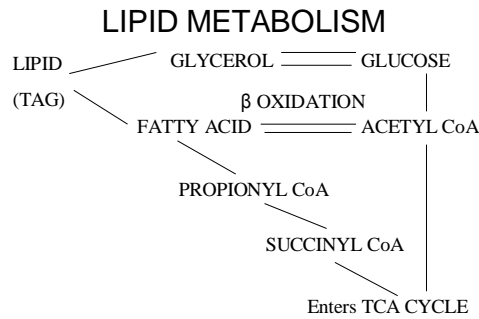
CARBOHYDRATE METABOLISM



Lipid Metabolism

The synthesis of lipid molecules from glucose or amino acids is called lipogenesis. This occurs when one consumes more calories than actually needed to satisfy the energy requirement of the body. Excess carbohydrates, proteins and fats all have the same fate. The glucose is converted to glyceraldehydes-3-phosphate, which can be converted either to glycerol or to acetyl coenzyme A. Many amino acids can be converted to acetyl coenzyme A. Both glycerol and acetyl coenzyme A can be converted to simple lipids.

The lipid catabolism can also be termed as lipolysis. Triglycerides, absorbed from the intestinal wall and subsequently stored in adipose tissue are split into fatty acids and glycerol and released from adipose tissue under the influence of various hormones. This happens when they are needed for the production of ATP. Glycerol can be converted into glucose by conversion into gluceraldehyde-3-phosphate. In beta-oxidation of fatty acids, carbon atoms are removed in pairs from fatty acid chains; the resulting molecules of acetyl coenzyme A enter the Krebs cycle. The formation of ketone bodies by the liver is a normal phase of fatty acid catabolism.

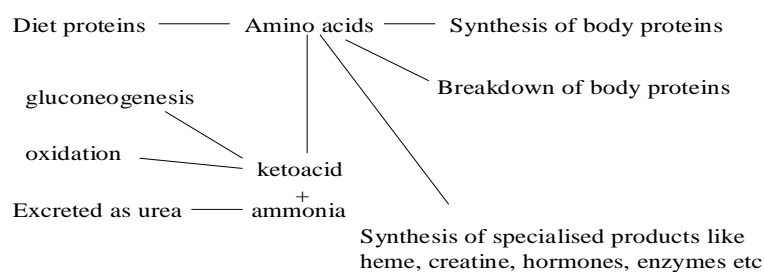


Protein Metabolism

Protein anabolism involves the formation of peptide bonds between amino acids to produce new proteins. Ribosomes are the site of protein synthesis and the process is directed and mediated by the cell's DNA and RNA. Out of the 20 amino acids in the human body, 10 are considered as essential and they cannot be synthesized in the human body. The non-essential amino acids can be synthesized by a process called transamination, the transfer of an amino group from an amino acid to a substance such as pyruvic acid or an acid of the citric acid cycle.

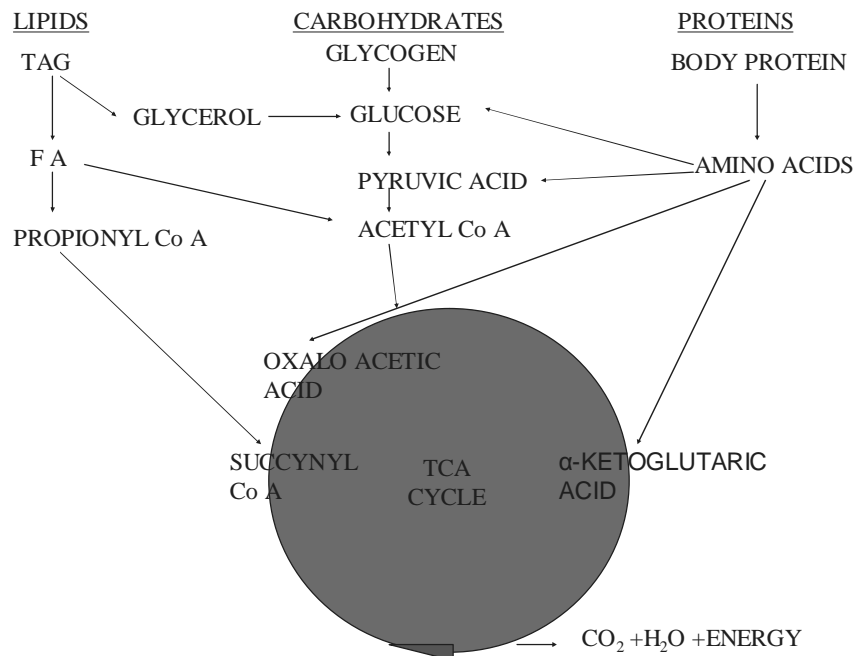
Apart from the proteins derived from food, proteins are extracted from worn out cells, such as RBC, and broken down to free amino acids. Before amino acids can be catabolised, they must be converted to substances that can enter the Krebs cycle; these conversions involve deamination, decarboxylations and hydrogenation. Amino acids may also be converted into glucose, fatty acids and ketone bodies.

PROTEIN METABOLISM



The interrelation of these reactions is being represented in the following diagram. From this, it can be understood that Krebs cycle is the central metabolic

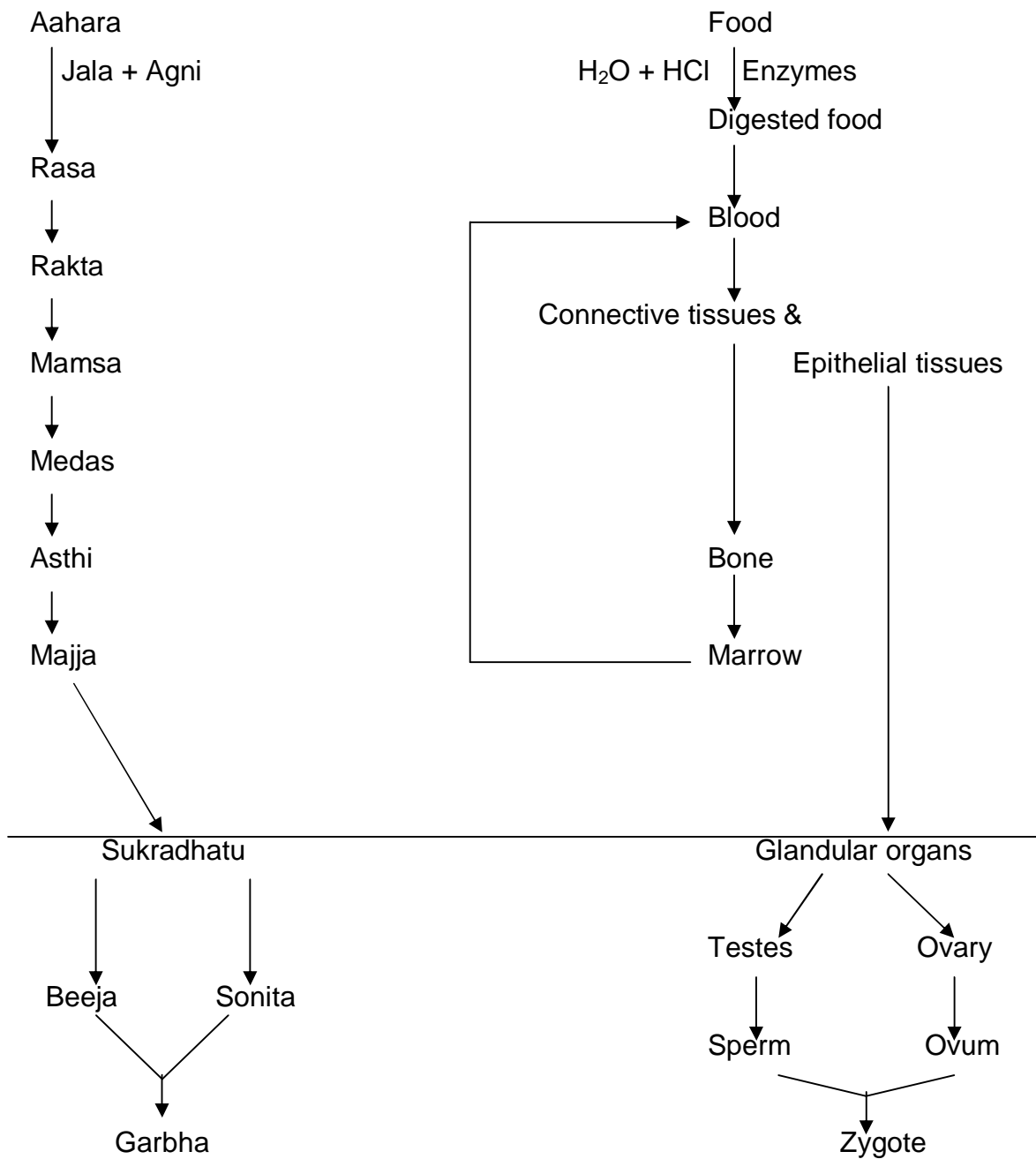
pathway or final common oxidative pathway for carbohydrates, fats and amino acids and it connects almost all the individual metabolic pathways. Besides, it provides intermediates required for the synthesis of amino acids, glucose, haem etc.



Thus, the action of different dhatwagnis at various levels of dhatuparinama process can be correlated to an extent with the modern concepts as follows.

- Ø Rasa dhatwagni – glucose metabolism, circulation in portal vein, formation of WBC
- Ø Rakta dhatwagni – hemopoiesis (formation of RBC and platelets), iron metabolism, protein metabolism (heme synthesis)
- Ø Mamsa dhatwagni – protein metabolism
- Ø Medo dhatwagni – lipid metabolism
- Ø Asthi dhatwagni – Ca and P metabolism, thyroid & parathyroid control
- Ø Majja dhatwagni – protein metabolism, iron metabolism, hemopoietic & erythroclastic activity
- Ø Sukra dhatwagni – glucose metabolism (fructose), protein metabolism, vitamin E metabolism

A comparison of the dhatuparinama concept in Ayurveda and the basis of nutrition in modern medicine can be represented as follows.



DHATUPARINAMA vs. NUTRITION

Conclusion

Ayurveda gives utmost importance to the maintenance of normal dhatus and a smooth Dhatuparinama process. Susruta says that, any derangement of doshas, if not corrected at the right time, will go more and more deep into the dhatus, rendering it that much difficult to correct.

*“Kramenopachayam prapya dhatunanugata: sanai:
Na sanya unmoolayitum vridho vriksha iva aamaya:
Sa sthrawad mahatwacha dhatwanukramanena cha
Nihantyaushadhaveeryani mantran dushtagraho yatha”*

(Su. Soo. 23 / 15- 16)

He also suggests that the increase in any particular dhatu should be controlled very early by appropriate measures. Otherwise, it will affect the succeeding dhatus also.

*“Poorvaporvo/tivridhatwad vardhayed hi param param
Tasmad atipravridhanam dhatunam hrasanam hitam”*

(Su. Soo. 15 / 18)

Moreover, by defining ‘*Kayachikitsa*’ as “*kayasyantaragneschikitsa*”, Chakrapanidatta indicates that the aim of Chikitsa is nothing but to correct the inner Agni. In other words, all the treatments aim at the establishment of well-formed dhatus.

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