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BROAD SPECTRUM

## METABOLISM AND DISEASES IN TRADITIONAL MEDICINE

*Prachote Plengvidhya\* Ph.D.*

A cell's or organism's *metabolism* may be defined as the totality of the chemical processes that is capable of performing. These chemical changes have their purpose to provide energy for intake of essential material for living process, releasing of energy for utilization, synthesis of new cellular component and waste removal.

All aspect of metabolism are not actually become apparent or being expressed at any given instant. Factors which control this expression or *metabolic regulators* are of intrinsic origin such as heredity or extrinsic such as environment. Regulation of metabolism is performed by a delicate set of interrelated checks and balances.

Speculation and knowledges on living processes should be a subject of interest since prehistorical period, considered that normal living process is a basis for good health. Thus is practice of medicine, metabolism and its derangement form a ground work of utmost importance both at present and in the past.

Undoubtedly, the concept of living processes as known among Thai people before introduction of western scientific and technological knowledges, was based on concepts from Aayurveda Siksha and Buddhist philosophy from Indian subcontinent, intermingled with old customs and believes which originated by their own observations.

According to principle of Thridhaatu Siddhanta in a book of Deha Dhaatu Vijnanam of Aayurveda Siksha, the constituent of the living human body composed of 13 Deha-Dhaatus categorized into 3 main groups.

1. Thri-Dhaatus or Thri-Doshaas or Doshaas
2. Sapta-Dhaatus or Dhaaranaath-Dhaatus or Dhaatus
3. Thri-Malaas or Malaas

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Thri-Dhaatus or Thri-Doshaas are interchangeable, when in the state of equilibrium for supplying necessary nutrition and energy and also performing their life supportive role they are called Thri-Dhaatus. Any derangement in these condition they are called Thri-Doshaas. Accordingly when described a certain condition of living processes Thri-Dhaatus and Thri-Doshaas are often used synonymously. Thri-Dhaatus are Vaata, Pitta and Sleshma. These are the most important constituents of life. They pervade throughout the whole body. Each of them have different seat, function and characteristics in gross and subtile state.

(See Appendix I)

Sapta-Dhaatus or Dhaaranaath-Dhaatus are supportive elements of the body. They are seven in number i.e. chyle, blood, flesh, fat, bone, marrow, and semen. All of them derived from foodstuffs and under controlled of Thri-Doshaas.

(See Appendix II)

Thri-Malaas or Malaas are excretion or wastes which the body has to get rid off. They are faeces, urine and sweat.

All living beings according to Aayurveda, in addition to the physical body, posses Chaitanya (Aatma-Soul) and Manas. Chaitanya alone is responsible for conscious reactions. It is the intelligent, immaterial and immortal part of man. The three Dhaatus are derived by combination of Chaitanya and physical body or the Panchabhootas. The Manas is the connecting link.

#### **Intake essential material for living process**

Thri-Dhaatus exist in gross and subtle state. In gross state they are secretions in alimentary canal. Thri-Dhaatus which are already in the body enter into the alimentary canal and replenish themselves with essence of food. Having replenish themselves, they feed the Sapta-Dhaatus or the tissues of the body whereas debris left, turn into Malaas and excreted. Alimentary canal (Maha Srotas) is considered as one tube commencing from mouth to anus and the whole human frame as the body in which this tube or cavity exists. The alimentary canal, though inside the body, is considered to be outside as it is in fact connected at both ends with the outside at the mouth and the anus.

The alimentary canal is sub-divided into three parts, the upper most is Sleshma Sthaana, the middle Pitta Sthaana and the lower Vaata Sthaana. The food which enter Maha Srotas or alimentary canal is digested and converted into Thri-Dhaatus by three digestive process or three Vipaakaas. All food consumed is composed of six tastes or Shadrassa i.e.

Madhura	-	Sweet	Amla	-	sour or acid
Lavana	-	salty	Tikta	-	bitter
Katu	-	pungent	Kashaaya	-	astringent

In alimentary canal, as soon as food which contain Shadrasa in taken in the mouth and continues to the first part of stomach, the first change into Madhurabhaava occurs and the whole of indigested food is turned into sweet pulpy mass. A frothy Sleshma in produced. Then begins the next change into Amlabhaava in the pyrolic part of the stomach and continues in the duodenum and as a consequence a clear Pitta is produced. The third change into Katubhaava begins in intestines and continues throughout the small intestines until the whole mass assumed a solid consistency and as a result Vaata is produced.

Transformation of Shadrasa to Thri-Dhaatus is affected by some active principles namely Kaphaagni, Pittaagni and Vaataagni. Thus Thri-Dhaatus come out of the body into alimentary canal or Maha Srotas which considered to be outside, as secretions in order to assimilate food. When they come out to take food, they gather such of material from food as are suitable for assimilation into each of them, by means of various "Agni" which they possess. With these Vipaakaas they augment themselves and enter the body again.

Thri-Dhaatus however cannot eat up the whole food because human body which composed of Thri--Dhaatus can utilize certain parts only of the Shadradas, this may be called Aahaara-rasa or assimilated food. After the last particle of Aahaara-rasa is absorbed only the solidified rejected matter remains in large intestines. These matter is not only those part of the broken up Shadrada which have not been assimilated by the Thri-Dhaatus but also some portion of the Thri-Dhaatus themselves because Thri-Dhaatus had to enter in the very composition of Shadrada in order to devour them. The rejected matter has been name Malaas which can be solid or liquid.

As compare to digestive process in modern sense, when food enter the mouth, it will be thoroughly mixed with mucus and enzyme in saliva, some of starch food will be converted into sugar. At this part it is comparable to Sleshma Sthaana where food is changed into Madhurabhaava or "Sweet" state and occurrence of Sleshma (mucus). Changing from starch into sugar (in a sense to produce sweet taste or Madhura) can be achieved by enzyme ptyalin which is comparable to Kaphaagni. Secretion of enzyme in the mouth occurs together with secretion of saliva which is mucus in composition. In Aayurveda, secretion in sleshma Sthaana is Sleshmika which predominantly contain Sleshma with very small proportion of Pitta and Vaata, and Sleshmika contain Kaphaagni whose function is to bring about internal change in food stuffs.

In stomach where there is a secretion of acid and enzymes so that the content in stomach can be said it be sour taste or Amlabhaava in Aayurveda and as the food in stomach mixed with acid enzymes and mucus, it turns into a pulpy mass called chyle some of the nutrients in food is assimilated. It is then transferred into upper part of intestines or duodenum where secretions from gall bladder and

pancreas come to work. Digestion of fatty food in duodenum depends on secretion of bile from gall bladder. This is Pitta in Aayurveda in gross state that came out to digest fatty food in form of secretion called Paittika which contain the most powerful "agni" activities called Pittaagni, corresponding to various enzymes from pancreas in modern sense.

When partially digested food pass along intestines, they are further digested by the help of various enzymes of succus entericus and the assimilated food is absorbed. According to Aayurveda this is an action of Vaataagni in Vaatika substance to feed upon whatever remain of the Shadrasa.

We do not know for sure how much knowledge of Thri-Dhaatus Siddhanta were transfered from generation to generation of Thai people. Knowledges of living processes extracted from about 25 text books of medicines left in Rattanakosin period indicated that living body composed of 4 Mahabhootaroota or 4 Dhaatus i.e. Aapo (water or liquid), Tejo (fire), Vaayo (wind or gas) and Pathavi (earth or solid). According to Bhuddism, Thai people believe 4 Dhaatus nourished by their food (Aahara). The digestive process occurs by means of digestive fire called Parinamaagki. Assimilated food is carried throughout the body by Vaayo called Aangka maangka nusarinoavaata, thus the digestive process according to Thai believe is a function of Tejo and Vaayo to nourish Aapo and Pathavi.

(See Appendix III)

Beside Parinamaagki of Tejo Dhaatus which digest food, Thai people believe also that there is another Vaayo Dhaatus which move in alimentary canal called Koshthasayavaata helping Parinamaagki in digestive process. This Koshthasayavaata may be considered to be equivalent of peristaltic movement of digestive organ, particularly intestines, any obstruction or malfunction of this Vaayo causes indigestion diarrhea and many other diseases of digestive organs.

Eventhough a concept of Mahabhootaroota or 4 Dhaatus appears to deviate from Thri-Dhaatus concept, yet Thai people believe that a proper interaction among the 4 Dhaatus is a basis for good health similar to what has been stated in Thridhaatus Siddhanta. Thai people also put most emphasis on roles of Vaayo (in Mahabhootaroota) as metabolic regulator, which is analogous to the role of Vaata in Thri-Dhaatus.

### **Derangement of Metabolism**

It is well accepted that metabolic derangement is both causes and effects of certain diseases. Knowledges on causes and effects of diseases are described in Chikitsaa which is a textbook of medicine of Aayurveda Siksha. However it is uncertain that whether Thai people selectively accept only a certain parts of Chikitsaa or knowledges on diseases and treatment were lost with the ruin of Ayutthaya. From about 25 texts on diseases and medicine used for treatment which remains nowadays many of them were written during early years of Rattanakosin period,

and all of the texts stress mostly on drugs used in the management of various symptoms. Causes of diseases and pathological aspects are less emphasized. Nevertheless, concepts on etiology, symptomatology, prodromata of diseases as state in Nidana chapter of Chikitsaa can be found fragmentedly in all of the texts. The only text which described state of disease very similar to Chikitsaa, remained at present time is Kambhira Vorayogasara or commonly known among physician as "Textbooks of Medicine by Ceylonese Physician."

No matter how much knowledges of Chikitsaa in Aayaraveda Siksha were transferred, derangement of metabolism is considered by Thai physician to be a cause of diseases. As indicated in Khambhira Vorayogasara, diseases can be grouped into

- a. Sareerapayathi – diseases of living body
- b. Manaasikapayathi – mental diseases
- c. Aaganthugapayathi – disorders caused by injuries, burns, violences, and poisons.
- d. Sahaajapayathi – disorders in senescence

### **Etiology**

According to Khambhira Samuthaanavinichaiya or Textbooks of Etiological Analysis, and from many Khambhira written later on, there are 5 groups of factors which may be considered to cause imbalance of Dhaatus that lead to pathological changes and diseases. Those 5 groups of etiological factors are

#### *a. Dhaatu-Samuthaanaa*

Imbalance of Dhaatu themselves which cause diseases. Thus deviation in normal function of Dhaatu or disintegration of Dhaatu are ethiological causes of diseases

#### *b. Rudoo-Samuthaana*

Changes of climate in different seasons of a year cause deviation in normal function of Dhaatu and these will lead to disease states.

#### *c. Thetsa-Samuthaana*

Habitat of man has strong influence on balance of Dhaatu, thus habitat is one of etiological factors.

#### *d. Kala-Samuthaana*

Chronological time of a day regulates function of Dhaatu. Increase or decrease functioning of Dhaatu is one of factors which considered to be causes of diseases.

#### *e. Aayu-Samuthaana*

Functioning of Dhaatu decreases with age, therefore age of man control balance of Dhaatu's function and with increase in age certain diseases will be apparent.

From various etiological factors described, it is obvious that Thai physicians concentrate more interest in extrinsic factors such as climate, habitats, time and age as etiological factors, in other words Thai physicians believe that nature govern the state and function of the four Dhaatus.

### **Pathophysiology**

Thai physicians considered derangement of metabolism is an effect of deviation in normal function of Dhaatu (Dhaatu-Phigara) and disintegration of Dhaatu (Dhaatu-Phinaa). The deviation in normal function or degeneration of Dhaatu may occur individually such as deviated functioning of Aapo Dhaatu or disintegration of Tejo Dhaatu, however all of the four Dhaatu may deviate from normal function together in such case Sannipata diseases are resulted.

Besides, since each Dhaatu is composed of various elements (20 elements in Pathavi Dhaatu, 12 elements in Aapo Dhaatu, 6 elements in Vaayo Dhaatu and 4 elements in Tejo Dhaatu), deviated functioning or disintegration of any element in each Dhaatu will result in pathological state. For instance, disintegration of Parina-maagki element of Tejo Dhaatu will lead to indigestion, flatulence, heart-burn, continue coughing, edema of hands and feet.

### **Symptomatology**

Of various symptoms resulted from deviated functioning or disintegration of Dhaatu, the two most common symptoms described in text book of traditional medicines are "Pen Kai" and "Pen Lom". The term "Pen Kai" in traditional medicine does not correspond exactly to the term "Fever" in modern sense but very similar to the term "Jwara" in Aayurvedic medicine, which is characterized by a rise in body temperature or a feeling of burning heat in the body, fatigue, restlessness, loss of appetite, watery eyes, pain in various part of the body. The other one, "Pen Lom" includes so heterogenous groups of symptom that no definition can be stated. However, of different symptom which can be called "Pen Lom" most of them are very serious and life-treatening.

Whenever symptoms appear Thai people consider that it is very important to avoid some kinds of food or to decrease some daily behavior. For example, when skin and eyes appear yellow having burning sensation, dizzy, restless, these are symptom of deviated functioning of Tejo Dhaatu, the followings should be avoided i.e. pungent-taste food, alcoholic beverage, bad temper, expose to sunlight, strenuous studies.

It is very difficult indeed to understand various aspects of human metabolism from existing sources of information. We can only come to conclusion that Aayurveda Siksha provided very important and very basic concepts on living processes which some of these concepts were studied and transferred from generation to generation by Thai people. However some of them were deleted and some new concepts originated by their own studies were added, as the years passed by, ambiguity became more and more apparent. Ruin of Ayutthya where much of texts were destroyed, westernization of medical practices where knowledges on traditional medicine were rejected, further aggravated the confused situation. Traditional medicine as practice nowadays means only how to use medicinal herbs. Understanding of living processes both in normal and pathological condition appears to be formidable tasks in traditional medicine.

## Appendix I

### Seats of Thri-Dhaatus

Dhaatu	Seat
<b>Sleshma</b>	
Kledaka	Mouth and Stomach
Avalambaka	Thorax
Bodhaka	Mouth
Tarpaka	Head
Sleshaka	Joints
<b>Pitta</b>	
Paachaka	Between Stomach and duodenum
Ranjaka	Liver and Spleen
Aalochaka	Retina
Bhraajaka	Skin
<b>Vaata</b>	
Praana	Head, Neck and Chest
Udaana	Chest, Neck, Upper abdomen
Samaana	Umbilical region
Vyaana	Heart and Whole body
Apaana	Pelvis and lower part of body

### Functions of Thri-Dhaatus

<b>Sleshma</b>	
Kledaka	- converts solid food into liquid by supplying moisture in form of mucus.
Avalambaka	- body water which pervades through every part, unites each individual cell of body, acts as vehicle for nutrients maintains physical and mental fitness, regulates smooth functioning of joints.
Bhodaka	- perception of tastes
Tarpaka	- nourishes and refreshes of sensations
Sleshaka	- unites different elements of the body, lubricates joints, gives compactness of tissues.



Normal functions of slesma as a whole :

Oily smoothness, smooth working of joints, general stability of body, general build, potency, strength, forenearance, courage and greedlessness

**Pitta**

- |           |  |
|-----------|--|
| Paachaka  | - digestion  |
| Ranjaka   | - production red blood cell by acting as haemo-<br>poietic principle.  |
| Aalochaka | - vision of the eyes   |
| Bhraajaka | - maintains normal appearance of skin by regu-<br>lation of sebum production, perspiration and<br>control peripheral body temperature. |

Normal functions of Pitta as a whole :

Digestion, vision, normal temperature regulation, skin complexion, courage, bravery, pleasure, satisfaction, cognition

**Vaata**

- |         |  |
|---------|--|
| Praana  | - mental function, perception of special sense<br>organs, circulation respiration and deglutition. |
| Udaana  | - speech   |
| Samaana | - digestion  |
| Vyaana  | - motor function, sensation, and function of<br>vasomotor system.                                  |
| Apaana  | - excretion  |

Normal functions of Vaata as a whole :

regulates normal function of movement, breathing, speech, excretion. It also maintains equilibrium of several element of the body by acting as nervous systemic regulator. It bears all the objects of the sensess to the mind. It is the origin of joy and cheerfulness.

### Characteristics (Gunas) of Thri-Dhaatu

**Sleshma**

viscid, cold, heavy, slow, soft, slimy, motionless

Taste : immature-saltish mature-sweet

**Pitta**

slightly viscid, active, hot, light, blood-like smelling, quickly penetrating, liquid,

Taste : bitter color : immature-green mature-yellow

**Vaata**

dry, light, cold, rough, invincible, motile,

Taste : astringent color : light red

## Appendix II

### Sapta-Dhaatus

Rasa	- chyle and lymph, assimilated nutrients
Rakta	- blood
Maamsa	- muscles and tendons
Medas	- fat
Asthi	- bone
Majjaa	- bone marrow
Sukram	- sperm or vital fluid

Dhaatus	Function	Formation
Rasa	- satisfaction - pleasure	of Rakta
Rakta	- life-giving - healthy complexation	of Maamsa
Maamsa	- fullness of body	of Medas
Medas	- firmness - giving oily and warmth to the body - stability of bone - bone growth	of Asthi
Asthi	- supports the body	of Majja
Majja	- strength of the body - fills up interior of bone - amorousness	of Sukram
Sukram	- bestows courage, strength. - create love - reproduction	

## Appendix III

### 4 Mahabhootaroopa

Dhaatu	Elements
Aapo	1. bile 2. phlegm 3. pus serum 4. blood
	5. sweat 6. body fat 7. tear 8. (bile)? body oil
	9. saliva 10. nasal secretion 11. synovial fluid 12. excreta

<b>Dhaatu</b>	<b>Elements</b>		
Tejo	1. Santapagki [fire of life]		
	2. Paridayaagki [body temperature]		
	3. Chiranaagki [fire of senescence]		
	4. Parinamaagki [digestive fire]		
Vaayo	1. Uthangkamavaata [wind blows from navel to head]		
	2. Athokamavaata [wind blows from navel to toes]		
	3. Kosthasaayavaata [wind flows in alimentary canal]		
	4. Aangkamaangka nusarinoavaata [wind blows throughout the body]		
	5. Kutchitsaayavaata [wind blows outside alimentary canal]		
	6. Assaasapasaasavaata [inhaled and exhaled gas]		
Pathavi	1. hair	8. bone	15. lungs
	2. body hair	9. bone marrow	16. large intestine
	3. nail	10. spleen	17. small intestine
	4. teeth	11. heart	18. brain, spinal cord
	5. skin	12. liver	19. chyle
	6. muscle	13. fascia	20. food debris
	7. tendon	14. kidney	

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