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Sharira-Kriya Vijnan

A TEXT BOOK OF
Sharira-Kriya Vijnan

(According to the Syllabus of CCIM, New Delhi)

Dr. Prof. Subhash Ranade
Dr. Prof. R.R. Deshpande
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THE
CHAUKHAMBA AYURVIJNAN STUDIES
82

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(According to the Syllabus of CCIM, New Delhi)

[PART - 1]

By

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PREFACE

Sharira-kriya is the fundamental subject for the study of Ayurveda. This subject explains all the basic concepts starting from Triguna, Panchamahabhuta, Tridosha & their sub-types, Dhatu, Upadhatu, Mala, Prakriti, Agni, Dietetics, Digestion, Nutrition, Respiration and Circulation. The subject also deals with the fundamental concepts of Embrylogy and the formation of fetus.

If the concept of Sharira-kriya is understood correctly, all other subjects, which depends on this subject like Vikriti Vijnana and Kayachikitsa are also understood in proper way. Many important concepts in Kayachikitsa like how basti acts on Vata dosha, how basti treatment is effective in joint disorders, why Sāma Pitta is digested by herbs and minerals having good smell are all based on the concepts in Sahrira-kriya.

We have taken great care to include all the necessary references from various classical texts like Charaka Samhita, Sushruta Samhita, Ashtanga Sangraha and Ashtanga Hridaya with their explanations. These explanations are according to the references and wherever necessary, we have made them easier to understand by adding examples from day to day life also. Syllabus of Sharir kriya has an excellant blend of treasure of Ayurvedic knowledge, supplemented by essential concepts from Modern physiology (like cardiac cycle, ECG, Lung function tests, Digestion etc.). This matter has been included properly. So Students will not need to refer any other book for modern physiology.

We have also taken care to include line diagrams at proper places to explain the points mentioned in the text, so that the students will understand the subject better. The entire book has been written as per the syllabus of CCIM, New Delhi and like our other text books, we are sure that students and teachers will appreciate our work.

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Chapter 1

Introduction

Ayurveda is a healing science, based on the studies and keen observations of intellectual seers from India.

Etymology of the word Ayurveda

'आयुष: वेद आयुर्वेद:' । (A.H.Su. 1:1, Arunadatta)

Veda means knowledge. Ayus means life. Therefore Ayurveda means the knowledge and understanding of life. Ayurveda is not only a medical science, but it is a Science of Life.

Definition of Ayurveda

'हिताहितं सुखं दु:खमायुस्तस्य हिताहितम् ।
मानं च तच्च यत्रोक्तमायुर्वेद: स उच्यते' ॥ (C.Su. 1:41)

Life can be of four types - 1) beneficial (hitakar), 2) harmful (ahitakar), 3) pleasurable (sukhakar), 4) unpleasurable (duhkhakar).

Ayurveda describes all above four aspects which are related to human life; for example – smoking may seem to be pleasurable for some time, but it is not at all beneficial to life. As opposed to this, getting out of bed, early in the morning may be unpleasurable, to begin with, but it is beneficial.

Ayurveda has also mentioned about quantitative aspect (mana). e.g. What is the normal life span? Ayurveda has also explained about quantitative assessment of various biological elements like normal height of a person, normal values of different body tissues (dhatu) like rasa (plasma), rakta (blood) etc. A whole lifespan can be studied qualitatively and quantitatively with the help of Ayurveda.

Aims & Objectives of Ayurveda

'स्वस्थस्य स्वास्थ्यरक्षणम् आतुरस्य विकारप्रशमनम् च' । (C.Su. 30:26)

Swastha means healthy person. Swasthya means healthy condition. Ayurveda gives priority to maintain the healthy state of a normal human being. Atur means patient. Vikar means disease. Prashaman means to cure. Second aim is to treat the disease of patient (curative aspect). The above sequence is also important. Ayurveda has given more emphasis for preventive aspect.

Features of Healthy Person

'समदोषः समाग्निश्च समधातुमलक्रियः ।
प्रसन्नात्मेन्द्रियमनाः स्वस्थ इत्यभिधीयते' ॥ (S.Su. 15:47)

The person is called as healthy (swastha), if he has balanced or equilibrium condition of dosha (bio-energies), dhatu (body tissues), mala (waste products), agni (digestive fire) and happy and balanced state of soul, sense organs and mind.

Equilibrium is of 3 types – 1) In structure & composition (dravyatah), 2) Properties (gunatah), 3) Functional (karmatah).

Dosha, dhatu, mala and agni – these are specific Ayurvedic concepts, as they are very important body elements. Sharirakriya Vijnan (Ayurvedic physiology) is also called as 'Dosha-dhatu-mala Vijnan' (science giving details of these elements).

Brief explanations about Scientific terms

1) Dosha – Three important body elements i.e. Vata, Pitta & Kapha which can be called as three bio-energies or functional and structural units of body.

2) Dhatu – Seven tissues (dhatu) responsible for the stability & growth of the body. They are – 1. Rasa (plasma), 2. Rakta

(blood), 3. Mamsa (muscle tissue), 4. Meda (adipose tissue), 5. Asthi (bones), 6. Majja (nerve tissue) and also bone marrow. 7. Shukra (reproductive tissue).

3) Mala – These are waste products. They are mainly of two types - gross and subtle. The gross waste products are – 1. Mutra (urine), 2. Purisha (feces), 3) Sweda (sweat), while the subtle waste products are called as 'kleda'.

4) Agni – It is the factor responsible for different types of digestion and metabolism.

Fitness at the Psychological Level

In the second line of the definition of a healthy person, there is an understanding about subtle elements of body, like one must have psychological, emotional and social fitness. There should be alertness, activeness, freshness of senses, mind and soul. Prasannatva (freshness) of these elements can be judged as follows:

i) इंद्रिय – पटुत्वेन ।
ii) मनः – आमोदेन ।
iii) आत्मा – सन्तोषेन ।

If senses are eager to perceive their sensory objects skillfully (patutva) they are fit. Mind should be delightful and happy, in the condition of enjoyment and lastly fitness of soul can be assessed by asserting level of satisfaction (santosha) in a human being.

Indriya are of two types:

1) Jnanendriya (Sensory organ)
Shrotra : Auditory sense (ear)
Twak : Tactile sense (skin)
Chakshu : Optic sense (eye)
Rasana : Gustatory sense (tongue)
Ghrana : Olfactory sense (nose)

2) Karmendriya (Motor organs)
Vak : Speech (speech centers, speech apparatus)
Pani : Hands
Pada : Feet
Payu : Rectum & Anus
Upastha : Genitals

How to remain Healthy?

Swastha means healthy, and Vritta means rules and regulations. Swasthavritta* is a subject, which gives information for living healthy and happy. This includes - 1) Dinacharya (daily regimen), 2) Ritucharya (seasonal regimen), 3) Ahara (dietetics), 4) Vyayam (exercise) and 5) Sadvritta (social code of conduct).

Ayurvedic Treatment

Ayurveda describes the holistic management for treating a patient. The basic aim of treatment is to achieve the balance in dosha-dhatu-mala, because imbalance (hyper or hypo state) is a disease condition.

Eight branches of Ayurveda

'काय-बाल-ग्रह-ऊर्ध्वांग-शल्य-दंष्ट्रा-जरा-वृषान्' । (A.H.Su. 1:5)

1) Kayachikitsa (Internal medicine) - Treatment of body, mind or digestive fire disorders.

2) Bala (Pediatrics) - The period from birth up to 16 years of age is considered as bala (childhood). This branch deals with all the physiological and pathological aspects in this period.

3) Graha (Psychiatry or branch which deals with diseases due to bacteria and viruses) - Ayurveda has described these microscopic, causative factors for a disease, by different names like bhuta (ghost), pishacha, rakshasa (demons). The

* For the 2nd BAMS, student there is a special subject called as Swastha-vritta, which includes all the preventive regimes.

symptoms caused by these factors and its management are mentioned in this branch.

4) Urdhwanga (ENT & Ophthalmology) - This branch deals with diseases of all parts which are above the clavicle - ear, nose, throat, head, face, eyes etc.

5) Shalya (Surgery) - This branch deals with major and minor surgical procedures and fundamental principles of wound healing, burns, fractures, bandages etc.

6) Damshtra (Toxicology) - Damshtra means teeth. Due to bites of snake, scorpion, rabid dog, the toxins enter in the body of human being. This branch deals with the description of diseases and their treatment. Similarly it also deals with the study of poisonous substances (plant, mineral, animal origin), their effects and anti-dotes (agada). Hence this branch is also known as Agadatantra. Medical jurisprudence is also included in this branch.

7) Jara (Geriatrics) – Ageing problems and its prevention and the treatment is discussed in this branch.

8) Vrishana (Sexology) – Vrishatva means forceful sexual activity and reproduction capacity. Various means of increasing the sexual power and treatment methods have been described in this branch.

Dashavidha Parikshya Bhava

'दूष्यं देशं बलं कालमनलं प्रकृतिं वयः ।
सत्त्वं सात्म्यं तथाऽऽहारमवस्थाश्च पृथग्विधाः' ॥

(Ash.H.Su. 12:66)

While treating the patient, following ten points are taken in to consideration:

1. Dushya : This means any organ, tissue that has been affected by aggravated doshas.
2. Desha : Geographical area - habitat of a patient and also the physical body of the patient.

3. Bala : Strength of a patient.
4. Kala : Season and the period of occurance of a disease.
5. Anal : Digestive fire of the patient.
6. Prakriti : Constitution of the patient.
7. Vaya : Age of the patient (child, youth, old)
8. Sattva : Psychological strength of a patient.
9. Satmya : Tolerance and non-tolerance of a patient (about food, environment etc.)
10. Ahara : Dietary habits of the patient.

Different Steps in Ayurvedic Management

1) Nidan-parivarjanam – to avoid the causative factors.

2) Treatment – External (application of paste, ointment, oils etc.) and internal (tablets, powders, liquids)

3) Advice about do's and don'ts – for diet, lifestyle, exercise etc.

4) Detoxification processes : Panchakarma - vamana, virechana, basti, raktamokshana and nasya.

5) Rasayana Chikitsa – This is specialty of Ayurveda. For rasayana various herbs, minerals and metal oxides as well as procedures are used for achieving immuno-modulatory effect and to avoid remissions, correcting and increasing the immune power of the body.

Importance of Knowledge of Sharira-kriya

Knowledge of Sharirakriya is very essential to achieve two goals of Ayurveda – 1) to keep fit and 2) to cure the patient.

Sharira Kriya Vijnan = Sharira+Kriya+Vijnan

1) Sharira

'शरीरस्य अधिकृत्य कृतं तन्त्र शारीरम्' ।

What is Sharira ? Sharira means the information about human body.

'तत्र शरीरं नाम चेतनाधिष्ठानभूतं पञ्चमहाभूतविकारसमुदायात्मकं समयोगवाहि' । (C.Sha. 6:4)

Human body is composed of five basic elements (Pancha-mahabhut vikar) and soul (chetana). Human body = five basic elements + soul (with proper co-ordination of all these factors).

Nirukti

'शीर्यते तत् शरीरम्' ।

1) Sharira - Human body is that which is conglomeration of five elements and chetana or atma. It has to undergo wear and tear. This wear and tear in the physical body takes place constantly from birth to death. Degeneration is faster as the age advances.

2) Kriya - Movements or activities.

'प्रवृत्तिस्तु खलु चेष्टा कार्यार्था, स एव क्रिया, कर्म, यत्नः कार्यसमारम्भश्च' । (C.Vi. 8:77)

Any movement or activity done for particular time is called as pravritti, which has synonyms like kriya or karma.

There are various meanings of the word kriya e.g. treatment procedures, shatkriya kala - six stages of pathogenesis, various actions like utkshepana, apakshepana, akunchana, prasarana etc. and various other actions of the body like speech, psychological functions etc., and direction and speed of doshas.

3) Vijnan - Vi+jnan = Vishesh jnan = Special knowledge. Sharirakriya vijnan, explains the different body elements like dosha, dhatu and mala and study important physiological processes like digestion, circulation, respiration, excretion etc.

Practical utility of Sharirakriya Vijnan

1) To keep fit – After understanding the composition,

properties and functions of important body elements like dosha, dhatu and mala, the physician can give guidance regarding how a person can maintain the balanced condition of these elements.

2) To cure the patient – One must know physiology to understand pathology. For example, to assess the severity of breathlessness (asthmatic patient) one must know the normal respiratory rate and its mechanism.

Importance of the Knowledge about Human-body

'शरीरविचयः शरीरोपकारार्थम् इष्यते। ज्ञात्वा हि शरीरतत्त्वं शरीरोपकारकेषु भावेषु ज्ञानम् उत्पद्यते। तस्मात् शरीरविचयं प्रशंसन्ति कुशलाः' (C.Sha. 6:3)

Vichaya means description. Description about human body is useful for keeping it healthy. By studying the properties of body elements, one can understand the factors useful or harmful for these elements. Hence scholars recommend the descriptive understanding of human body. Human body can be studied by two methods –

1) Sharir-Rachana (Anatomy)
2) Sharir-Kriya (Physiology)

1) In anatomy, mainly the structure, position, measurements of different organs are studied like heart, lungs, liver, number of bones, muscles etc. In physiology, we study the functional activities of these body organs e.g. circulation, respiration etc.

2) Anatomy is studied by surface marking, clinical examination and by dissection of the dead person. But to study physiology, living human being is necessary. Activity can not be studied in dead person.

3) In medical practice, anatomy is more specifically useful for surgery or surgery related branches like ENT, Ophthalmology, and Gynaecology. But physiology is useful in every branch of medical practice.

What is Ayu ?

Ayurveda mainly deals with human body and human life. Up till now, we have taken primary information about human body. Let us see about human life.

'आयु इति जीवितकाल:' । (C.Su. 1:42, Chakrapani)

The time period from birth to death is called as life (ayu). The definition and synonyms of Ayu are given in the following verse:

'शरीरेन्द्रियसत्त्वात्मसंयोगो धारि जीवितम् ।
नित्यगश्चानुबन्धश्च पर्यायैरायुरुच्यते' ॥ (C.Su. 1:42)

Union and amalgamation of Sharira (body) + Indriya (sensory and motor organs) + Sattva (mind) + Atma (soul principle) is called as Ayu (life). Dhari, jivitva, nityaga and anubandha are the synonyms of Ayu.

1) ***Dhari*** (which holds the life)

'धारयति, शरीरं पूतितां गन्तुं न ददाति इति' ।
(C.Su. 1:4, Chakrapani)

It is important in life, to preserve and to hold the body elements from wear and tear and from decay (*putitam*).

2) ***Jivitam*** (to live)

'जीवयति, प्राणान् धारयति इति' । (C.Su. 1:42, Chakrapani)

In life the living process is important. For this matter preservation of prana is essential. Prana means life force, necessary for living. Food, air and water can be considered as external life forces and mind and soul principle can be called as internal prana (life force). Life can be sustained with proper condition of these two types of life forces.

'नित्यं शरीरस्य क्षणिकत्वेन गच्छति इति' ।
(C.Su. 1:42, Chakrapani)

3) ***Nityaga*** (continuity)

There is continuity in the contact of soul, mind, indriya and

body. By each moment, life period becomes shorter. This is a continuous ongoing process.

4) ***Anubandha***

'अनुबध्नाति आयुः अपरापरशरीरादिसंयोगरूपतय इति अनुबन्धः' ।
(C.Su. 1:42, Chakrapani)

Continuous contact of para-sharira (soul) and apara-sharira (physical body - pancha bhautik sharira, mind and sense organs) is must for maintaining the life. In short, with these different synonyms, one can understand various important aspects about life.

The science of Ayurveda is everlasting, it is with us from the time immemorable and the principles of Ayurveda are permanent and do not change. As the time goes by there may be changes in the symptoms, nomenclature of diseases and the treatment may also change accordingly, but the principles behind the same remain constant.

Chapter 2

Basic Principles of Ayurveda

Success of any science depends on its fundamental principles. Siddhanta is an Ayurvedic term, which denotes basic or fundamental principles. These principles have remained as everlasting truth, for the last thousands of years. This is the specialty of Ayurveda, which proves the eternal nature of Ayurveda. Although, the principles remain same, Ayurvedic practice has adopted the necessary changes as and when it was required. For example, Ayurveda states the three-fold examination method as - 1) Darshan (inspection), 2) Sparshan (palpation, percussion) and 3) Prashna (interrogation). Since thousands of years, this principle of examination of the patient has remained the same. Only there are some changes in its application. Previously, physicians used to see temperature of patient by touching his own hand (sparshan), but today this can be determined by touch of thermometer (in spite of hands). Here, the principle of touch has remained the same, and the only change is in its practical application. In this chapter, we are going to see some important principles.

1) *Purushasya lokatulyatvam* (Theory of microcosm and macrocosm)
2) *Sharirasya panchabhautikatvam* (Theory of five primordial substances)
3) *Shad-dhatvatmaka purusha* (Purusha having six elements)
4) *Sharirasya dosha-dhatu-malamulatvam* (Theory of bioenergy-tissues-wastes)
5) *Roga-arogya-karanam* (Cause of disease and health)
6) *Roga-arogyasya lakshanam* (Features of health and illness)

7) *Samanya-vishesha-sidhhanta* (Principles of homologus and heterologus)
8) *Karya-karan-sidhhanta* (Cause-effect relationship)
9) *Dravyasya rasa-virya-vipak sidhhanta* (Energetic principle of taste, post-digestive effect and potency)

Basic Principle : 1

Purushasya lokatulyatvam

Comparison of human body and nature

Purusha means human body and Loka means Nature. Tulyatvam means similarity. Human body and nature is compared in this principle. All principles in macro-cosm are present in micro-cosm, in subtle form.

'यावन्तो हि लोके भावविशेषाः तावन्तः पुरुषे । यावन्तः पुरुषे तावन्तः लोके' ।
(C.Sha. 5:3)

Whichever (*yavanto*) elements are present in the nature, are also present in human body and vice versa. This principle is also called as - '*pinda-brahmanda nyaya*'. The following two main things are understood by this principle:

1) The composition of human body is just like the composition of nature (anatomical similarity).
2) Activities in human body are also similar to that occurring in universe. (functional similarity).

I. Anatomical/Structural similarity

Universe is developed from five elements or primordial substances (Panchamahabhuta). The human body is formed from same basic elements. 1. Prithvi (earth), 2. Ap (water), 3. Teja (fire), 4. Vayu (air), 5. Akash (ether).

Mahabhut = Maha+bhuta. Maha = all pervading, Bhuta = *'bhu-bhavati'*, to exist.

This means that mahabhuta or elements are all pervading. Hence, Ayurveda states that each and every element on this earth is formed from these five basic elements.

'सर्वं द्रव्यं पाञ्चभौतिकम् अस्मिन् अर्थे' । (C.Su. 26:10)

II. Functional similarity

In Universe, as long as there is balance in these elements the Universal activities are regular and are very smooth. The imbalance disturbs all Universal functions. For example when there is excess activity of principle of Vayu mahabhuta, we observe that it can result in various cyclones, storms, earthquakes etc. Excess activity of the Jala mahabhuta can cause heavy flood etc.

'विसर्गोदानविक्षेपैः सोमसूर्यानिला यथा ।
धारयन्ति जगद्देहं कफपित्तानिलास्तथा' ॥ (S.Su. 21:8)

All the activities of the universe are mainly of three types – 1) Visarga – to give strength, union. 2) Adana – to take away transformation-change-digestion. 3) Vikshepa - movement.

These three main functions are carried by the principles present in moon and rain, sun and wind respectively.

Moon and rain contain the principle of cohesion which is responsible for keeping the molecules intact and thereby helping the new growth. The Sun is the representative of principle of thermogenesis or transformation. Due to the heat provided by this principle, transformation takes place in crops, fruits etc. Principle of movement is represented by wind because we think that wind moves things in the Nature. Actually the principle behind the wind is responsible for all types of movements like sea tides, movement of planets etc.

These functions keep the balance in nature. The same functions take place in the human body due to their minute energies which are known as Kapha, Pitta and Vata respectively. These three energies maintain the balance of all functions in the human body. These three elements are called as Tridosha.

Activity	*Nature*	*Human body*
1. Union and structure	Moon	Kapha
2. Transformation, Digestion	Sun	Pitta
3. Movement	Wind	Vata

Examples: 1) Sun or other type of heat is essential for ripening of fruits. Similarly, digestion occurs due to Pitta dosha which is governed by the heat principle.

2) Leaves of a tree, move by air current, similarly movements of legs and hands, circulation, excretion occurs due to Vata dosha, which is governed by the principle of propulsion.

3) Vegetables and fruits and plant kingdom are preserved by the principle of cold, cohesion present in rain or moon, which occurs due to Kapha dosha which is governed by the principle of cohesion.

In short this principle explains that human body is an epitome of universe. Man is a part of nature. Therefore environmental changes affect the human body favourably or adversely. Hence Ayurveda teaches us how to make a friendship with nature for maintaining our health.

Basic Principle : 2

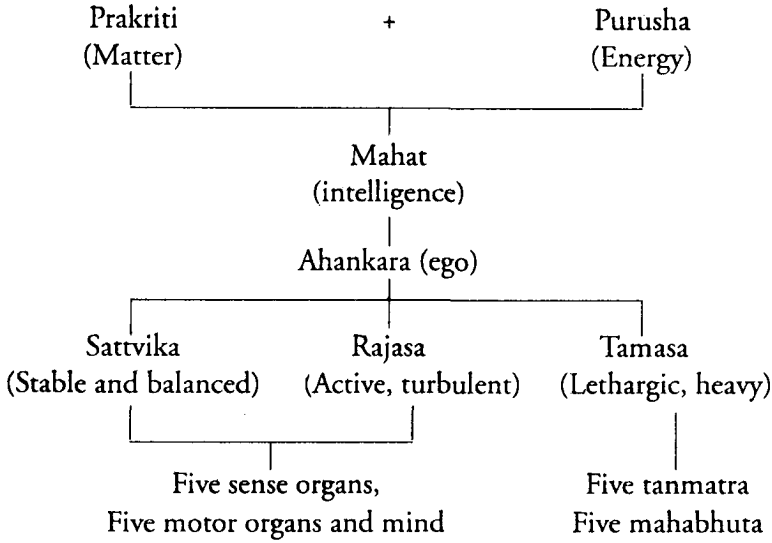
Sharirasya panchabhautikatvam

(Principle of five elements)

This principle deals with the five basic elements, which are responsible for creation and composition of human body. Human body is composed of five basic elements known as 'Panchamahabhuta'. Balance in these elements means health and imbalance means disease.

'सर्वं द्रव्यं पाञ्चभौतिकम् अस्मिन् अर्थे' । (Cha.Su. 26/10)

Each and every element on this earth is basically made up of five basic elements. The micro and macro elements of human body are also made up of these elements. Following flow chart will explain the genesis of five basic elements.



Five basic elements are derived from precursor (tanmatras) by the special process called as '*Bhutantaranupravesh*'. The process occurs as follows:

1) Ether element from shabda tanmatra
2) Air element from shabda + sparsha tanmatra
3) Fire element from shabda + sparsha+rupa tanmatra
4) Water element from shabda+sparsha+rupa+rasa tanmatra
5) Earth element from shabda+sparsha+rupa+rasa+gandha tanmatra.

Because of this process, each (onward) element has an addition of one property from the previous substance as follows:

Mahabhut	*Properties*
1) Ether (Akash)	Shabda
2) Air (Vayu)	Shabda+Sparsha
3) Fire (Tej)	Shabda+Sparsha+Rupa
4) Water (Jal)	Shabda+Sparsha+Rupa+Rasa
5) Earth (Prithvi)	Shabda+Sparsha+Rupa+Rasa+Gandha

'तेषामेकगुण: पूर्वे गुणवृद्धि: परे परे।
पूर्व: पूर्वगुणश्चैव क्रमशो गुणिषु स्मृत:' ॥ (C.Sha. 1:28)

'महाभूतानि खं वायुरग्निरापः क्षितिस्तथा ।
शब्दः स्पर्शश्च रूपं च रसो गन्धश्च तद्गुणाः' ॥ (C.Sha. 1:27)

Each mahabhut has its specific characteristic feature and an addition of one property like shabda.

'खरद्रवचलोष्णत्वं भूजलानिलतेजसाम् ।
आकाशस्याप्रतीघातो दृष्टं लिङ्गं यथाक्रमम्' ॥ (C.Sha. 1:29)

Kharatva (roughness), dravatva (fluidity), ushnatva (heat), chalatva (mobility), and apratighata (non-obstruction) are the specific properties of Prithvi, Ap, Teja, Vayu and Akash respectively.

Shad-dhatvatmak purusha

(Man made up of six elements)

Ayurveda has described the composition of human being as follows:

'खादयः चेतनाषष्ठा धातवः पुरुषः स्मृतः' । (C.Sha. 1:16)

'Kha' means akasha. The five basic elements like akasha, vayu etc. and chetana (soul principle) form the human body. Therefore human being is called as 'shad-dhatvatmaka purusha'. The elements formed from prithvi, ap, teja, vayu and akasha are called parthiva, apya, taijasa, vayaviya and akashiya respectively.

According to law - '*sarvam idam panchabhautikam asmin arthe*' - earth and every element on this earth is made up of five primordial substances. But parthiva element means which contains predominantly prithvi mahabhut and lesser quantity of the other elements. This method of nomenclature, according to predominance is called as '*vyapadeshastu bhuyasah nyaya*'. By this method one can also understand the meaning of other elements like jaliya, taijasa etc.

Primordial elements or panchamahabhutas are unable to perceive by senses.

Although all the elements from nature and human body are made up of five primordial substances, mahabhutas by themselves cannot be perceived by senses. Whichever elements we can see are the products of five elements and not mahabhutas themselves. For example - whatever landpiece we see in our house or in nature is not prithvi mahabhuta, but it is combination of all mahabhutas with predominantly parthiva elements.

Panchabhautik Elements in Human Body

i) Parthiva elements:

'तत्र यद् विशेषतः स्थूलं स्थिरं मूर्तिमद्गुरुखरकठिनमङ्गं नख-अस्थि-दन्त-मांस-चर्म-वर्चः-केश-श्मश्रु-लोम-कण्डरादि तत् पार्थिवं गन्धो घ्राणं च' । (C.Sha. 7:16)

Body elements: Whichever heavy (shula), stable (sthira), with some structure/dimensions (murtiman), rough (khara), hard (kathin), are called as parthiva elements, e.g. nails, teeth, bones etc.

ii) Apya elements:

'यद् द्रव-सर-मन्द-स्निग्ध-मृदु-पिच्छिलं रस-रुधिर-वसा-कफ-पित्त-मूत्र-स्वेदादि तद् आप्यं रसो रसनं च' । (C.Sha. 7:16)

Body elements: Whichever, liquid, fluid, slow (in activity), unctuous (snigdha), soft (mridu), slimy (picchil) are apya elements. e.g. rasa, rudhir (blood), vasa (fat in the muscles), kapha, pitta, urine, sweat, gustatory organs etc.

iii) Taijasa elements:

'यत् पित्तम् ऊष्मा यो या च भाः शरीरे, तत् सर्वमाग्नेयं रूपं दर्शनं च' । (C.Sha. 7:16)

Body elements: Whichever substances having qualities hot and sharp are taijasa elements e.g. pitta, digestive fire, skin texture and luster, eyes etc.

iv) Vayaviya elements:

'यदुच्छ्वासप्रश्वासोन्मेषनिमेषाकुञ्चनप्रसारणागमनप्रेरणधारणादि तद्वायवीयं स्पर्शः स्पर्शनं च' । (C.Sha. 7:16)

Body elements: Whichever responsible for expiration, inspirable, closing and opening of eyes, contraction and relaxation, movements, stimulation, controlling activities, and tactile sensations are vayaviya elements.

v) Akashiya elements:

'यद्विविक्तं यदुच्यते, महान्ति चाणूनि स्रोतांसि तदान्तरीक्षं शब्दः श्रोत्रं च'।
(C.Sha. 7:16)

Body elements: Whichever having space, porosity (vivikta) and macro-micro body channels, ears are akashiya elements.

Mahabhuta – Properties – Senses

Shabda (sound), sparsha (touch), rupa (vision), rasa (taste), and gandha (odor) are properties of akasha, vayu, teja, jala and prithivi respectively can be understood by five senses of hearing, touch, vision, taste and smell.

Important Features and Functions of
Five Primordial Substances

1) Heavy property of Prithivi mahabhuta: This element helps for stability, support and composition of the substance. Roughness also controls the movements. It is also responsible for different odors.

2) Fluidity, unctuousness of Jala mahabhuta: This is responsible for softness and union of various substances. To understand taste, water is essential.

3) Hot and penetrating nature of Teja mahabhuta: This element is responsible for transformation, conversion and digestion. Visual understanding of a substance depends on its content of tej mahabhuta.

4) Mobility of Vayu mahabhuta: It is responsible for all sorts of subtle and gross movements. Vayu mahabhuta is responsible for tactile sensation also.

5) Space and hollowness by Akasha mahabhuta: Because of its nonobstruction property, movement and transport of many useful materials in the body through various srotas or channels is possible. Akasha mahabhuta is responsible for the creation of variety of sounds.

How to Examine Panchamahabhuta?

Examine the properties, function and the concerned body elements.

1) Examination of Parthiva elements

- From the odor of stool, urine, sweat, kapha and pitta, we can understand the normality or abnormality of parthiva elements in the body. In some diseases one can find a body odor in patient's breath or urine e.g. diabetic keto-acidosis, lung cancer.
- To assess stability and nutrition of the body, examine the height, weight ratio.
- Observe the structure and composition of bones (bone densimetry), nails, teeth and hair.
- Parthiva element shows specific shape, hence one can examine the external structure e.g. examination of size and shape of various glands and tumors.

2) Examination of Jaliya elements

- Taste examination e.g. in diabetes mellitus, due to glycosuria, the taste of the urine becomes sweet. This fact is very well noted in Ayurvedic texts (ants gather around the urine of a diabetic patient). Also pitta (jaliya element) when gets vitiated it gives rise to explicit sour or bitter taste in the mouth, which helps in diagnosis.
- Examination of fluidity in rasa, rakta, mutra (urine) can be helpful in some diagnosis. Because if the viscosity of these substances increases it can affect its transportation, and can be responsible for formation of various diseases.

3) Examination of Taijas elements

- For testing rupa (appearance) physician can examine skin color, complexion and texture by eyes and the inner mucous lining by endoscopy. Paleness, hypo-pigmentation or cyanotic patches or any discoloration suggests abnormality in taijas elements. Due to excessive heat and piercing nature of tejas elements, the gastric mucosa shows inflammatory changes, this can be seen by gastroscopy examination.
- Examine different digestive and metabolic activities.
- Note the body temperature, or the temperature of different body parts.

4) Examination of Vayaviya elements

- This can be done by touch or tactile examination. Note different movements of different body parts e.g. respiratory and cardiac movements manually by hands or by stethoscope. Pulse examination is a type of sparsha (touch) examination. E.C.G. is also a touch examination, with instrumental aid.

5) Examination of Akashiya elements

- Physician can examine the cavity or lumen of different hollow organs by various methods. With the help of these examinations, non-obstruction (apratighata) can also be assessed. Space in the lungs, heart and abdomen can be examined by percussion. If the normal cavity in these organs is filled by water, pus or tumors then percussion note becomes dull or otherwise. X-ray examination or USG can be done to observe hollowness of different organs.

Practical Utility of the Study of
Five Primordial Substances

Diet having all the five elements is essential for the growth and development of Panchabhautik human body. Proper replacement with panchabhautik food in particular deficiency

is essential, for example – If osteo-arthritis is developed due to deficiency of parthiv elements, the patient is suggested to take diet consisting more parthiv element like wheat, black gram or medicines like coral, deer horn oxide. In cholera vomiting, diarrhea, dehydration occurs. In this deficiency of jaliya element takes place. To treat this condition - oral rehydration therapy (ORT) or I.V. saline is given.

Therefore, we have acquired the knowledge of basic elements of human body by studying the principle of *Sharirasya panchabhautikatvam.*

Basic Principle : 3

Sharirasya dosha-dhatu-mala-mulatvam

Roots of tree are very important for maintenance, stability and growth of a tree, similarly dosha, dhatu and mala (three bio-energies+seven body tissues+three wastes) are very important for maintaining human body. These elements are compared to GOD- Development (Genesis)+Maintainance (Operation)+Degeneration (Destruction).

If the roots decay, the tree can not grow. Similarly if dosha, dhatu and mala get vitiated, body mechanism gets disturbed and diseases start.

In the previous principle we have mentioned five elements as the generators of body and now we are mentioning dosha-dhatu-mala as fundamental elements. Why ? Because Even dosha, dhatu and mala are composed of the five primordial substances. But the action of these five elements can be practically understood, through the media of dosha-dhatu-mala. So this principle is a mere practical application of the previous principle. Dosha-dhatu-mala concept is the base in Ayurveda in general and Sharira-kriya in specific. We can explain all the functions of the human body in terms of dosha-dhatu-mala. To understand the importance of these,

we must understand, how the functions of these elements are useful for human body.

Functions of Doshas

Dosha is the energy or the structural and functional unit of human body. All the body activities can be classified as:

1) Various types of movements.
2) Different digestive and metabolic activities.
3) Growth, union, stability and composition.

These three types of functions are carried successfully with Vata, Pitta, Kapha respectively. Normal functioning of doshas is responsible for health. Derangement in any function disturbs the health. For example, heart beats should be of particular number and type otherwise cardiac problem sets in.

Functions of Body Tissues

Functions of dhatu are to give support and strength. Nirukti of the word dhatu is 'dhru-dharayati' – the elements which hold or maintain the body structures and physiology. Function of each dhatu is as follows –

'प्रीणनं जीवनं लेपः स्नेहो धारणपूरणे ।
गर्भोत्पादश्च धातूनां श्रेष्ठं कर्म क्रमात्स्मृतम्' ॥ (A.H.Su 11:4)

1) Rasa dhatu provides freshness to each body cell. This is known as *prinana* (rehydration). To understand this function, let us take an example of a man, who has come from strenuous work in the hot sun, in summer, when he washes his face and hands with cool water and takes a glass of lemon juice, his experiences fresh sensation. This is *prinana.*

2) Rakta or blood is directly responsible for preservation of life and is known as *jivana* or giving proper oxygenation to all the cells in the body. For proper functioning, each cell in the body requires prana which is provided by the blood. In

many serious road accidents, the victims loose their life on the spot, due to heavy blood loss.

3) Mamsa or muscles give specific shape and size to different body organs. Bones, nerves are covered and protected by the muscle layers. Muscles protect the internal body organs from injury or trauma.

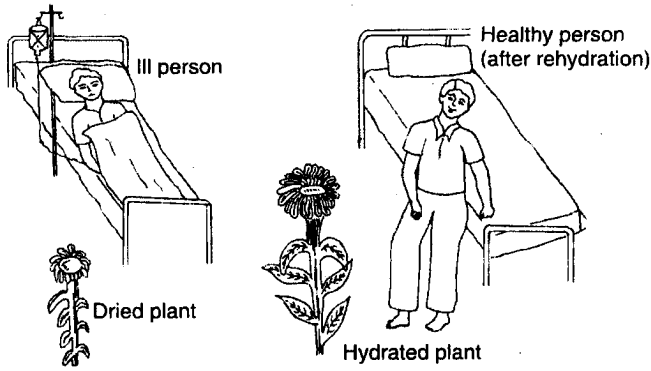
4) Meda or fat preserves the unctuousness and softness of body organs, and prevents wear and tear created by the friction. The main function of fatty tissue is lubrication.

5) Asthi or osseous tissue (bone) is directly concerned with the function *dharana* to maintain or to hold body organs. Skeletal frame work gives the shape to the body and it protects vital organs.

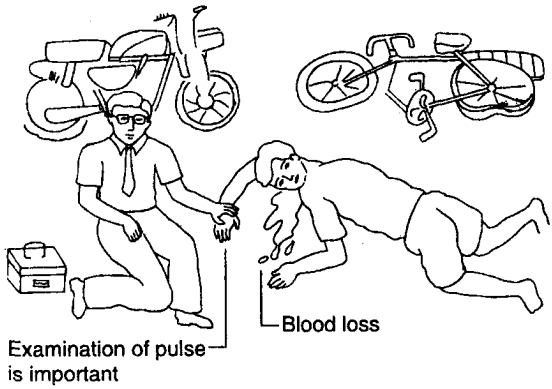
6) Majja dhatu (nervous tissue or bone marrow) is deep inside the body and is filled in bony structures. It is responsible for communication, intelligence and movement.

7) Shukra or reproduction is the main function. Also this tissue is responsible for body strength and immunity.

Rakta dhatu (Blood)	Cellular part and hemoglobin of blood	Oxygenation of the blood
Mamsa dhatu (Muscle)	Muscle tissue	Movement
Medo dhatu (Fat)	Adipose tissue	Lubrication
Asthi dhatu (Bone)	Supporting and accommodating bony structures	Support
Majja dhatu (Nerve and Bone marrow)	Tissue within the bony cavity	To promote understanding
Shukra dhatu (Reproductive Tissue)	Reproductive secretions	Reproduction

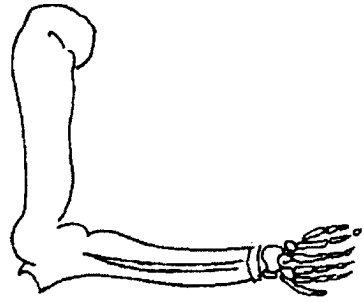


Function of Rasa dhatu : Prinan (Rehydration)

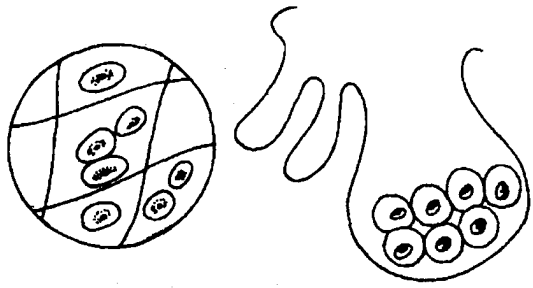


Function of Blood : Jeevan (Prevention of life)

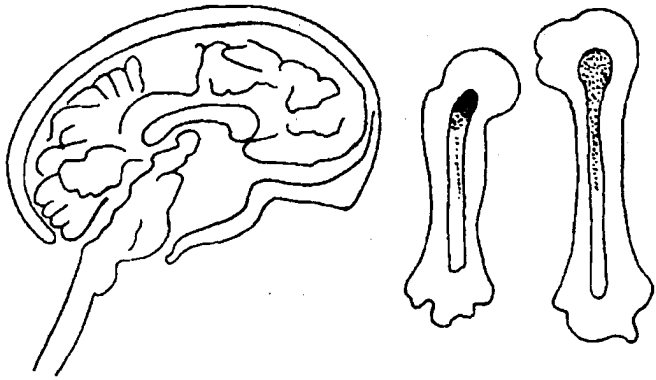
Function of muscles : Lepan (to cover)



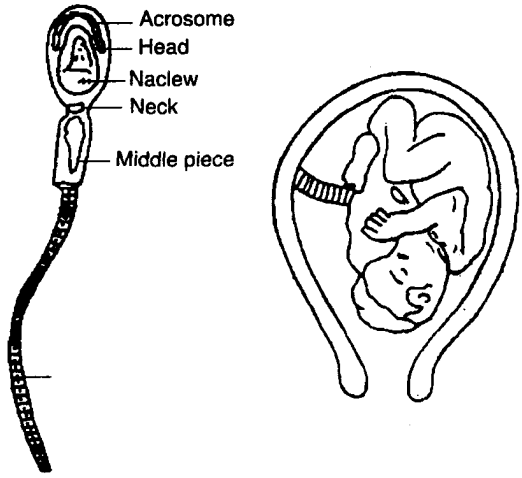
Function of Bone (to support)



Snehan : Function of Adipose tissue
(To provide unctuousness)



Majja Dhatu : Nervous tissue & Bone marrow



Shukra dhatu : Spermatozoa function (Reproduction)

Now it will be quite clear that Dosha and Dhatu perform very important functions in the human body. But what about waste products? Why they are also important, like dosha and dhatu?

Functions of Waste Products

Waste products carry away the unwanted and toxic material outside the body and keep the body clean. We cannot understand their importance till they are functioning normally. But when any abnormality takes place, one can understand the importance of wastes in biological activities, for example:

1) In oliguria or anuria, when urine output goes below normal, many toxins accumulate in the body and serious condition like uremia can occur.

2) In spite of normal stools, once in the morning, when a person suffers from loose motions, severe dehydration can threaten the life of a child.

Hence, normal functions of waste products are beneficial for body.

1) Function of urine

'मूत्रस्य क्लेदवाहनम्' । (A.H.Su. 11:4)

To eliminate the liquid waste products (kleda) from the body is a function of urine.

2) Function of feces

'पुरीषस्य अवष्टम्भनम्' । (A.H.Su. 11:4)

To eliminate solid wastes and toxins from the food is the main function of the feces. Indirectly it also supports the digestive fire and controls Vata (body activities).

3) Function of sweat

'स्वेदस्य क्लेदविधृतिः' । (A.H.Su 11:4)

To eliminate the liquid wastes and maintain the slight moister on the skin (thereby avoid cracking) and maintaining healthy lustrous and smooth body hairs is a function of sweat.

Now after this long discussion it is clear, that why Dosha-Dhatu-Mala are compared with roots of trees.

Basic Principles : 4

Roga-arogya-karanam

(The fundamental cause for disease and health)

'कालार्थकर्मणां योगो हीनमिथ्यातिमात्रकः ।
सम्यग् योगश्च विज्ञेयो रोगारोग्यैककारणम् । (A.H.Su 1:19)

Excess, low or perverted contact of time, sensory objects and activities, with human body, results in disease. Optimum or proper contact keeps the body fit. Let us see some examples:

1) Time (factor) – Consider three seasons. Absolute no rain or rainfall below average can cause drought. Excessive rainfall and floods, ruins the crops and property. Getting the rain in winter or summer is perverted contact. All these three situations are not good for the health of human being.

2) Sensory objects – Sound, touch, taste, appearance and smell is perceived by five sensory organs – ear, skin, tongue, eyes and nose respectively. This contact should be optimum and balanced which results in health. Loud and perverted sound can produce disease like deafness. Similarly no sound at all and too low sound can cause depression. If a child is deaf, possibility of developing dumbness is more common. Continuous hearing bad words or crying of dogs or wild animals can disturb mental health. On the same line, concept can be understood for other sensory organs.

3) Activities – These are mainly of three types - physical activity (kayika), verbal activity (vachika), mental activity (manasik). These activities should also have balanced nature.

Excess, low or perverted activities are cause of illness. For example, i) Physical inactivity, sedentary lifestyle can lead to obesity. ii) Excessive physical activity (workaholic or too much traveling) can lead to chronic fatigue syndrome by Vata aggravation. iii) Improper physical activities - doing yoga postures in abnormal or incorrect way can make a serious damage to body organs.

Basic Principle : 5

Roga-arogyasya lakshanam

(Important features of health and illness)

In the previous principle, we have seen the causes, now we are going to see the features.

'रोगस्तु दोषवैषम्यं, दोषसाम्यमरोगता' । (A.H.Su. 1:20)

'विकारो धातुवैषम्यं साम्यं प्रकृतिरुच्यते ।
सुखसंज्ञकमारोग्यं विकारो दु:खमेव च' ॥ (C.Su. 9:4)

Vagbhata says, that imbalance of dosha means disease and balance of dosha means health. This clarifies that in any disease, imbalance (mainly aggravation) of dosha is an important event. Due to faulty diet and lifestyle, doshas get vitiated and then these disturbed doshas attack other body elements like dhatu and mala, and thus the disease is developed. This process has been described in Ayurveda as follows:

'दोषदूष्यसम्मूर्च्छनाजनितो व्याधि:' ।

This means amalgamation of aggravated dosha and weak dushya causes the disease. Imbalance of dosha occurs in two ways – i) excess activity, ii) low activity.

Excess or low is also of three types – 1) by substance, 2) by properties, 3) by functions. In healthy individual, doshas remain in balanced state.

To explain this concept, Charaka says, in disease, there is

dhatu-vaishamya (imbalance in dhatu), but here, dhatu word is not used only for seven tissues like rasa, rakta, but also describes other elements like dosha and mala (because in normal physiological conditions, they also carry out important functions). Dosha, dhatu and mala together are called as tridhatu. Hence, *dhatu-vaishamya* of Charaka also denotes *dosha-vaishamya.*

Charaka has used the words sukha (happiness) and duhkha (unhappiness) for health and diseased condition respectively. One must remember that the important factor in patho-genesis is imbalance of dosha.

Basic Principle : 6

Samanya-vishesha Siddhanta
(Principle of Homologus and Heterologus)

'सर्वदा सर्वभावानां सामान्यं वृद्धिकारणम् ।
ह्रासहेतुर्विशेषश्च, प्रवृत्तिरुभयस्य तु ॥
सामान्यमेकत्वकरं, विशेषस्तु पृथक्त्वकृत् ।
तुल्यार्थता हि सामान्यं, विशेषस्तु विपर्ययः' ॥ (C.Su. 1:44-45)

This principle is useful for the advice to be given for keeping up the fitness and in treating disease.

According to Vaisheshika - Samanya means similarity and Vishesha means dissimilarity. Samanya and Vishesha are opposite words. Samanya means the substances of same qualities and Vishesha means substances of opposite qualities. However in Ayurveda the meaning of these two words is little bit different. Charaka says, Samanya is responsible for increase and Vishesha is responsible for decrease. This also means that samanya substances are the cause of union and vishesha is a cause of separation.

Samanya is of three types - substance (dravya samanya), quality (guna samanya) and action (karma samanya). If we take into consideration mamsa dhatu then meat is dravya-

samanya, wheat is guna-samanya and proper exercise can be karma-samanya. Similarly Vishesha is also of three types - substance (dravya-vishesha), quality (guna-vishesha) and action (karma-vishesha). For mamsa dhatu guggulu is dravya-vishesha, herbs like kumbhajatu (Carea arborea) are guna-vishesha and excessive exercise is karma-vishesha.

This principle can be applied in Sharira Kriya for better understanding of properties and functions of the body elements. Tridosha's hyper or hypo state can occur due to consumption of samanya or vishesha substances in the diet. For example, if we eat too much spicy & oily food, it can provoke Pitta dosha (because hot and sharp properties of food are similar to hot and sharp qualities of pitta). On the contrary, to pacify the Pitta, we must use foods and drinks which are cold in nature, as that is opposite to the qualities of Pitta (vishesha). After studying the properties and functions of dosha-dhatu-mala, anybody can make a long list of samanya and vishesha foods, drinks and activities. This is the most important principle having applied value in medical practice.

Basic Principle : 7

Dravya-guna-karma Siddhanta
(Substance-(their) properties and functions)*

Ayurveda believes that any substance can very well be studied by understanding its properties and functions. Functional activity of any substance depends entirely on its properties. Properties develop, according to composition and structure of a substance.

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* One can learn the detail definitions of dravya (substance), guna (properties or attributes) and karma (functions) while studying the subject of 1st BAMS (Padarth-Vijnan)

Basic Principle : 8

Dravyasya rasa-virya-vipaka-prabhava Siddhanta
(Energetic principles)

These are energetic principles of food and herbs. According to Ayurvedic pharmacology, the action of any substance depends on its taste (rasa), active principle (virya), post digestive effect (vipaka) and special potency (prabhava).

This principle is important part of the 2nd BAMS subject Dravya-Guna-Vijnan.

Basic Principle : 9

Karya-karana Siddhanta
(Principle of cause and effect relationship)

There always exists some particular cause behind any function or activity. Without reason, no function can occur. The physician while examining patient, should make a sincere attempt to find out the causative factors, behind the manifestation of disease. Sometimes, the causative factors are vivid and other times hidden.

After understanding fundamental principles let us see the details about Dosha, Dhatu & Mala.

Chapter 3

Tridosha Vijnan

(Science of Three Bio-energies)

Dosha, dhatu and mala are the basic elements of human body. Amongst these doshas are more important. Let us first begin the study of doshas.

Principle of '*Purusha-loka sammit nyaya*' (Theory of macro and micro cosmos) explains that Kapha, Pitta, Vata maintain body functions, just the same as moon, sun and wind do it in the nature.

Definition of Dosha

Dosha (bio-energies) are structural and functional units of human body. Vata, Pitta, Kapha do following important functions:

1) Vata – All sorts of movements in the human body.
2) Pitta – Digestion, transformation and change.
3) Kapha – Union, stability and strength.

Each Dosha has five subtypes:

Vata	Pitta	Kapha
1. Prana	1. Pachaka	1. Kledaka
2. Udana	2. Ranjaka	2. Bodhaka
3. Vyana	3. Bhrajaka	3. Avalambaka
4. Samana	4. Sadhaka	4. Shleshaka
5. Apana	5. Alochaka	5. Tarpaka

Dosha Nirukti

'दूषयन्ति इति दोषाः' । (A.H.Su. 1:6, Arunadatta)

The literary meaning of the word dosha is that which causes decay, destruction or vitiates (others when in aggravated

condition). However this is not the correct definition as we all know that when doshas are in balanced condition they carry out all prominent physiological functions and maintain health.

When doshas get disturbed, they attack other body tissues which are weak and disease is created. The elements, which get spoiled due to vitiated doshas are called as 'dushya' (victims). They are dhatu (body tissue), mala (wastes), organs, channels, sense organs etc. In short dushya are everything in body excluding doshas.

Knowledge about dosha is very fundamental in the process of learning Ayurveda. Concept of Tridosha has gradually evolved in Ayurveda, for example – 1) In Charaka Samhita which is the first compendia, only five types of Vata dosha have been described. 2) In Sushruta, five types of Pitta are added. 3) In the texts of Vagbhata, including Kapha all fifteen sub-doshas have been described.

Comparative understanding of Dosha-Dhatu-Mala

Dosha-dhatu-mala are basic elements of human body. But there is some difference in their functional aspect, as follows:

1) To keep the body healthy and clean – some unwanted substances must be eliminated from the body like urine, stool etc. If these substances are retained inside the body for a longer time, they can harm (anuria, uremia). So this group is called as 'waste products'.

2) Some other substances in the body are gradually increasing as the body grows (except in illness). Although there is wear and tear in these substances, it is immediately replenished and structure and growth of the body is maintained. This group is called as 'dhatu' or body tissues. Tissues stay in the body, between the skin from outside and

mucous membrane of gastro-intestinal tract internally. Excluding shukra or reproductive tissue, no other tissue leaves this boundary. If the tissues go out from the skin or penetrate the mucous membrane of the organs, they cause serious disturbance e.g. during accidents if the blood is lost due to external hemorrhage or due to internal hemorrhage, both are serious conditions.

3) There is a third group. The elements from this group are not totally eliminated from the body like the 1st group, nor do they gradually increase like the 2nd group. In short, the elements which are not completely eliminated from the body and neither grow continuously are included in the 3rd group of 'Dosha' or bio-energy.

Detail Study of Tridosha

The study will be made according to following points:

1) Etymology (Nirukti) – How these words Vata, Pitta and Kapha are derived from original Sanskrit roots ?
2) Synonyms – Many different names are used in different places of texts so it is better to understand all these synonyms.
3) Composition and structure – All the elements on this earth including tridosha are formed from five basic elements. We will see, which basic elements from these five are predominant in particular dosha.
4) Properties – What are the properties of each dosha? In 1st BAMS, Padartha-Vijnan subject the student has learned details of guna (properties) concept. In Tridosha, same properties from Vimshanti guna (20 attributes) are present.

Twenty Attributes

'गुरुमन्दहिमस्निग्धश्लक्ष्णसान्द्रमृदुस्थिराः ।
गुणाः ससूक्ष्मविशदा विंशन्तिः सविपर्ययाः' ॥ (A.H.Su 1:18)

Guru (heavy), manda (dull), hima (cold), snigdha (unctuous), Shlakshna (slimy), Sandra (dense), Mridu (soft),

Sthira (stable), Sukshma (subtle), Vishada (cleansing) are the ten attributes. These ten attributes and their opposites are called as Vimshati gunas.

In above verse 10 qualities and their 10 antagonistic qualities have been described.

Ayurvedic understanding of guna (properties or attributes) is different than physical properties. Because it is based on the action of a substance when it is ingested. Hence these are not only physical properties but these are functional properties. Therefore, to understand the action of a particular substance is like studying pharmaco-dynamics. Few examples will clarify the above note.

1) Guru & Laghu: Guru means heavy and laghu is light. The definition of guru according to Ayurveda is the substance which is heavy for digestion and responsible for weight gain (brimhana). Food substances like meat are heavy to digest and also responsible for weight gain. Hence they are guru. But popcorn is laghu (light) in property and does not help in building body tissues.

2) Manda & Teekshna: Manda means dull and teekshna is sharp or penetrating quality. Manda quality occurs in substances having a moderating energy along with cooling, calming and pacifying qualities like ghee, butter, and milk. This quality exists in earth, water, and ether. Teekshna quality has a purifying, penetrating and stimulating affect. Pungent taste and hot energy substances like cayenne or dry ginger are sharp in their action. It is found predominantly in fire, earth, and air.

3) Hima or shita & Ushna: Hima means cold and ushna is hot. Cold quality has astringent property which is responsible for stopping the fluids going out of the body or obstruction of motion. Bitter, astringent and sweet substances has cold quality. Substances like chilly, cayenne,

black pepper are hot, due to its burning and irritation property. Hot quality helps for the digestion. Even if chilies are kept in refrigerator and eaten while they are chilled, the hot property will not change. Students should keep this Ayurvedic understanding of properties, in mind while studying tridosha and then only their action will be clear.

4) Snigdha & Ruksha: Snigdha is oily and ruksha is dry. Oily substances like ghee or sesame oil have the property of lubrication or creating wetness (kledana). Dryness has a desiccating quality that squeezes out essential material from the cells. Such substances are barley and horse gram (kulattha), or any dry food article like toast. This quality is not so useful for tissue building but helps remove excess fluids.

5) Shlakshna & Khara: Shlakshna means capable of holding fast while khara or rough substances have the property to scrape or reduce. Shlakshna substances have ability to heal (ropana). Such soft or slimy substances avoid friction and have a soothing effect as in the cases of honey or aloe gel. Khara or rough (to the touch) has the property to remove toxins and excesses. Vata-predominant substances like guggulu, myrrh, and alkalis are of this quality.

6) Sandra & Drava: Sandra is a fluid with particles in suspension, while drava is clear fluid only. Sandra substances have the quality of binding things together like honey and sweet fruit juices. Pure water is an example of the drava quality, but if a pinch of salt or sugar is added to it, then it becomes sandra. Pure water is not useful for building tissues unless there are certain solid substances in solution or suspension.

7) Mridu & Kathina: Mridu means soft or pulpy quality, while kathina is hard. Fatty and oily substances are soft, which has a loosening effect that can be laxative. Examples

are sesame oil, ghee or any fat. All hard substances possess the property of making tissue firm or stable. Almonds and calcium substances like coral are hard (earthy).

8) Sthira & Chala: Sthira means stable and Chala are having mobile quality. Sthira substances are enduring and steady. All substances that are strengthening to the muscles and bones have this quality, like wheat and natural calcium. All oily substances are mobile but particularly laxatives like psyllium and castor oil.

9) Sthula & Sukshma: Sthula are gross while sukshma are subtle. Soft and round substances like butter have a covering or enveloping effect. The natural arrangement of whole substances (sthula) is more useful than the separated or fine form (sukshma). Example of sukshma substance is alcohol. They spread quickly in the body because of this quality.

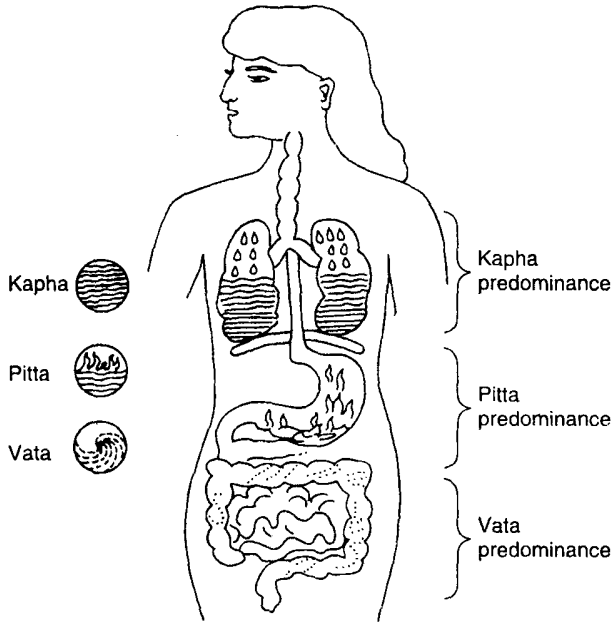
10) Picchila & Vishada: Picchila are sticky substances while Vishada have clear quality. Sticky substances like the gums of different plants have the property of adhering or forming a coating which is useful for tissue building and healing. Such are gum acacia, myrrh, guggulu, honey, or peanut oil. Clear or Vishada substances have the power to clean. Examples are soap nut tree, shikakai and such saponin-containing herbs as yucca root.

General functions

We have already seen, important functions of each dosha. We will study other important body functions.

1) Medias for the actions of doshas: All doshika functions are carried out through some tissues.

2) Sites of Dosha: Although tridoshas are acting throughout the body. Still, at some particular places, the activities of tridosha are more prominent. We will see, which these sites are.



वायु: पित्तं कफश्चेति त्रयो दोषा: समासत: ।
प्रत्येकं ते त्रिधा वृद्धिक्षयसाम्यविभेदत: ॥ (A.Hr.Su. 1:6)

3) Sub-types of each dosha: Why only five subtypes of each dosha and why not 6 or 7? This can be the curious question. Sushrut says that five sub types are according to five types of specific actions, occurring in five specific parts of the body.

Some Ayurvedic scholars explain that in each sub type there is a predominance of one of the five primordial elements. (This has been mentioned in following 3 tables.)

I Vata - Subtypes

Type	*Properties*	*Mahabhuta predominance*
Prana	Light, subtle, clear	Akashiya
Udana	Cold	Jaliya (apya)
Vyana	Mobile	Vayaviya
Samana	Near fire	Taijasa
Apana	Rough, odor	Parthiva

II Pitta - Subtypes

Type	*Properties*	*Mahabhuta predominance*
Pachaka	Sour with typical odor	Parthiv
Ranjaka	Property of spreading (sara)	Vayaviya
Bhrajaka	To keep adequate oiliness in skin	Apya
Sadhaka	Subtle, related with intelligence, Grasping capacity	Nabhasa (Akashiya)
Alochaka	Related with vision (light)	Taijas

III Kapha- Subtypes

Type	*Properties*	*Mahabhuta predominance*
Kledaka	Sweet, related with oiliness and moisture	Apya
Bodhaka	Shweta (white)	Taijasa
Avalam-baka	To hold the organs in position	Parthiva
Shleshaka	Related with hollow space in joints	Akashiya
Tarpaka	Related with activity of sense organs	Vayaviya

The above three tables are new thought provoking material. Much more discussions and research on these topics is expected.

Pathology of Tridosha and its Management

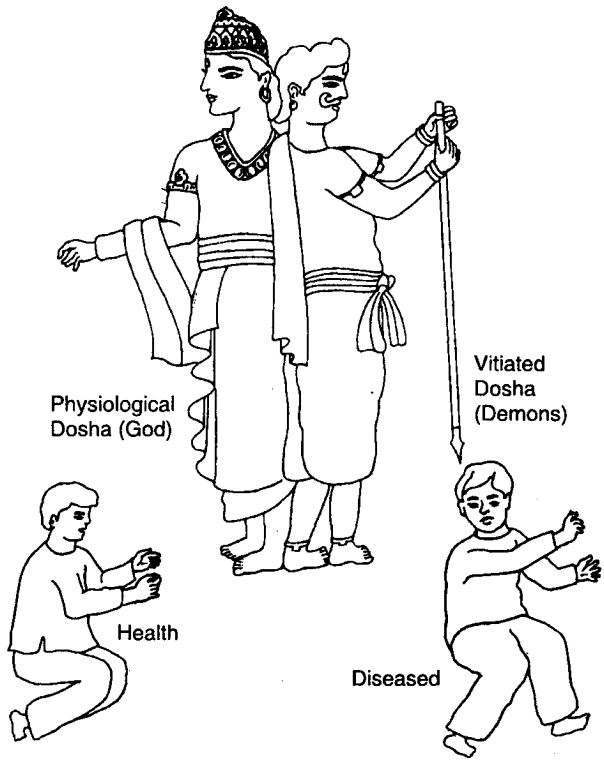
The pathological activity of tridosha can be grouped in two types -Vriddhi (hyper) and Khsaya (hypo) activity. Hyper & Hypo state is at 3 levels – 1) By substance, 2) By properties, 3) By functions. Based on the principle of homologous and heterologous, pathology in Tridosha can be treated, e.g. in

hyper state of Vata dosha, the physician will use vishesha substances (which have opposite properties to Vata) for balancing disturbed Vata. In this way, we will study each dosha as per 9 points mentioned above.

Importance of Tridosha

1) Healthy and unhealthy state of a human being depends on normal or abnormal condition of tridosha.

'विकृताऽविकृता देहं घ्नन्ति ते वर्तयन्ति च' । (A.H.S. 1:6)



Health & Disease - Both depends upon the status of doshas

2) Tridoshas are responsible for the creation of human body (and its constitution).

'वातपित्तश्लेष्माण एव देहसम्भवहेतवः' । (C.Su. 21:3)

3) Amongst Dosha-dhatu-mala, importance of dosha is noteworthy, as they are the main cause for the formation of Prakriti as well as for formation disease (when imbalanced).

'प्रकृत्यारम्भकत्वे सति दुष्टिकर्तृत्वं दोषत्वम्' ।

(M.N., Madhukosha)

4) The elements which are responsible for formation of Prakriti and which have the power of vitiating other body organs and tissues are called as Doshas.

5) If any person consumes diet or follows irregular lifestyle, which is similar to the properties of doshas, they get disturbed and spoil the other body tissues.

'दूषणस्वभावत्वाद् दोषा' । (A.S.Su. 20:3)

'स्वातन्त्रेण दूषकत्वं दोषत्वम्' ।

6) Doshas are the energies which have the nature to get disturbed and vitiate other body structures.

Hence, to maintain health, by keeping balanced condition of tridosha, we must know in detail the properties and functions of tridosha.

Chapter 4
Vata-Dosha

An element in the body which is responsible for any sort of movement is called as 'Vata dosha'. Vata has special importance among Tridoshas.

'पित्तं पङ्गुः कफः पङ्गुः पङ्गवो मलधातवः ।
वायुना यत्र नीयन्ते तत्र वर्षन्ति मेघवत् ॥ (A.H.Su.)

In the human body, Pitta, Kapha, tissues and wastes are handicapped for doing their activities independently. Each and every action needs the stimulation of Vata dosha. We can observe the same thing in nature. Movement of clouds, sea waves, shifting of sand, movement of tree leaves and even earthquake are all due to the principle of propulsion.

Vata nirukti

'तत्र 'वा' गतिगन्धनयोरिति धातुः' । (S.Su. 2:5)

"Ta" is a suffix to "Va". "Va" word is concerned with movement (gati) and enthusiasm (gandhan) so, the movement, needed for union and separation is carried by Vata dosha.

Synonyms of Vata

Marut, chala, anila, samirana and pavan. All these words suggest movement and are the synonyms of Vata.

Composition of Vata

Although Vata is Panchabhautika (made up of five primordial elements) Vayu and Akasha substances are predominant.

Structure of Vata

'अव्यक्तः व्यक्तकर्मा च' । (S.Ni. 1:7)

Vata dosha is invisible, but can be experienced from its functions. It does not possess physical measurements like length, breadth, height but the activities of Vata can be seen. Vata can be compared with electrical energy. We can not see the electricity but we can experience its functions like lightning bulbs, tube lights, televisions and through various other electrically operated machines.

Properties of Vata Dosha

'तत्र रूक्षो लघुः शीतः खरः सूक्ष्मश्चलोऽनिलः' । (A.H.Su. 1:11)

To understand Vata functions, first we must understand Vata properties. Each and every property is directly or indirectly helping the main function of Vata i.e. movement.

1) Ruksha (dry) – For the normal activities in the body like respiration, movement of limbs, the body requires constant supply of oiliness and water element. If these are not supplied to the body, it becomes dry and Vata increases. Hence dryness is the quality of Vata. This is opposite to oiliness. Unctuousness is useful for union and dryness is for separation. Dryness has a capacity to absorb water and oil. Therefore due to dryness, molecular union breaks and separation occurs. In different periods of life, dosha predominance differs. For example in young age there is Kapha predominance while in old age, Vata activities are dominant. That is why in old age, dryness of Vata causes increased dryness in the body, which makes cracking sound in the joints, wrinkles on face, cracks on soles and palms. When a person understands that the cause behind these symptoms is dryness of Vata, it is easy to adopt preventive measures, by applying opposite properties. Therefore all persons after 40 years of age, should carry out abhyanga - apply warm sesame or coconut oil to whole body every day or at least at weekends and should take one cup of warm milk and 1 spoon of cow's ghee every night.

2) Laghu (light) – Aggravation of Vata means loss of tissues, which results in lightness. Due to this quality, mobility increases. Fasting makes the body light. Exercises can also increase lightness. Heavy is opposite to light. In obese person, due to heaviness, mobility decreases.

3) Sheeta (cold) – It is our experience that in the Nature, when the wind gets combined with heat, it results into hot air, while when the air mixes with cold it turns into cold air. Hence many commentators claim that Vata is yogavahi. However while treating the patient, Vata gets alleviated by hot quality and hence the quality of Vata is cold. Cold quality also reduces tissues and thereby increases Vata.

4) Khara (rough) - The property by which scrapping is done is rough quality. Scrapping helps in separation, which is a function of Vata dosha. To reduce the fat content of obese people, the physician has to use the drugs having the property of scrapping.

Note - Dryness (of skin) is perceived by eyes and roughness (of skin) is perceived by touch.

5) Sukshma (subtle) – It is well known fact that during fasting when the person does not get proper food, his activities gets reduced. This shows that sukshma quality is responsible for increasing Vata. This property enables molecular separation and to reach the deepest possible atomic structure. This property helps to exhibit Vata activity at microscopic levels.

6) Chala (mobility) – Movement is the main function of Vata, hence chala or mobility is the quality of Vata dosha.

Other properties of Vata mentioned by the critics (commentaries on original Ayurvedic classics) are as follows:

1) Yogavahi – Yoga means union. Vahi means to carry with. The substance, when mixed with another substance, carry

the properties of other substance (without loosing its own properties) is called Yogavahi substance i.e. catalyst. Catalyst carries substance more correctly and faster. Vayu is sheeta (cold) but also catalyst. Therefore when Vata mixes with Kapha, it becomes cold but when it mixes with Pitta, it becomes hot in nature.

'योगवाहः परं वायुः संयोगादुभयार्थकृत्।
दाहकृत् तेजसा युक्तः, शीतकृत् सोमसंश्रयात्' ॥ (C.Chi. 3:39)

Honey is an example of best catalyst. So many Ayurvedic drugs are given mixed with honey.

2) Vishada – means clear. It cleans the substances. Due to this property, Vata absorbs excessive water or secretions make the site cleaner.

3) Daruna – This means part becoming cleaner or harder. Due to excessive dryness, some times the part becomes stiff.

4) Rajobahula – For the creation of any substance in the universe, super qualities like sattva, rajas and tamas in addition to five primordial substances are required. Amongst these higher qualities, sattva is stimulator, rajas is activator and tamas is controller. Vata is rajobahul (i.e. predominant in rajas), because rajas is related with movement.

Vata Properties mentioned by Sushruta

1) *Vaishthambhya* – This means causing obstruction (to the feces).

2) *Avyakto vyaktakarma cha* – Vata is avyakta i.e. invisible since it does not possess physical dimensions like length-breadth-height. Vata dosha can be understood by its functions like electrical activity.

3) *Tiryak* –Although Vata attributes are observed in all directions. Vata activities are also observed in tiryak (transverse) direction.

4) *Dviguna* – Vata dosha is composed of Vayu and Akasha mahabhuta. Hence, it has dual properties - sound and touch.

5) *Rajobahula* – Vata dosha has predominant rajas quality.

6) *Achintya veerya* – Veerya means working potentiality. One cannot imagine the potency of Vata, or the nature of its activities due to its wide and varied nature. This explains the superiority of Vata.

7) *Doshanam neta* (leader of tridosha) – We have already seen the importance of Vata dosha, in comparison to dhatu and mala. Amongst all doshas, it is the only energy that has the capacity to move others. That is why Vata can be called as leader.

8) *Rogasamuharat* – This means that Vata is responsible for many group of diseases. Diseases, caused by Vata aggravation are more than the number of Kapha and Pitta diseases.

9) *Ashukari* – Ashu means of sudden onset, or quick activities. Therefore most of Vata symptoms are of sudden onset.

10) *Muhurmuhushchari* – Muhur-muhuh-chari means time to time occurrence and periodical exacerbations. Vata functions occur in typical rhythm. Also Vata types of symptoms show particular rhythm e.g. spasmodic pain in abdomen or asthmatic attack. These remission and relapses are called as vega-avastha and avega-avastha in Ayurveda. (Su.Ni.1-7)

Qualities of Vata

Charaka	Sushruta	Vagbhata
Ruksha, shita, laghu sukshma, chala, vishada khara, daruna, amurtatva & yogavahi	Ruksha, shita, laghu muhuschara, vishada khara, vaishtambhya avyakta, tiryak ashukari	Ruksha, shita sukshma, chala khara, vibhu, ashukari, balitvad

Benefits of understanding Vata properties

To keep balance in Vata dosha, above said properties should remain in balanced state. But if a person follows the diet or activities, similar to properties in excess, then as per the principle of homologous and heterologous, Vata dosha provocation can take place. For example, if somebody eats too much of dry substances like popcorn, toast, sandwich, salads, Vata dosha gets aggravated and abdominal pain can start.

Similarly too much physical activities can disturb mobile and light property. This type of Vata can create symptoms like fatigue, giddiness, weakness etc.

Common Functions of Vata Dosha

वायुस्तन्त्रयन्त्रधरः, प्राणोदानसमानव्यानापानात्मा, प्रवर्तकश्चेष्टानाम् उच्चावचानां, नियन्ता प्रणेता च मनसः, सर्वेन्द्रियाणामुद्योजकः, सर्वेन्द्रियार्थानामभिवोढा, सर्वशरीरधातुव्यूहकरः, सन्धानकरः शरीरस्य, प्रवर्तको वाचः, प्रकृतिः शब्दस्पर्शयोः, श्रोत्रस्पर्शनयोर्मूलं, हर्षोत्साहयोनिः, समीरणोऽग्नेः, दोषसंशोषणः, क्षेप्ता बहिर्मलानां, स्थूलाणुस्रोतसां भेत्ता, कर्ता गर्भाकृतीनाम्, आयुषोऽनुवृत्तिप्रत्ययभूतो भवति अकुपितः'।
(C.Su. 12:8)

Akupita means, which is not Vikrita (abnormal). In above text the different functions of normal Vata dosha are given. Let us try to understand each phrase.

- *Vayustantrayantradharah*: If we see the structural and functional framework of human body, it can be compared with complicated machine. If this machine (yantra) has to work smoothly, there should be some specific operational system (tantra). Machine (human body) and its mechanism are totally dependent on Vata dosha. Each and every organ in the body should be structurally normal, at its appropriate site, then only it can function properly. This is hardware of the human machine. But due to structural defects, there can be valvular defect in heart or can be a case of

undecended testis, so here is the importance of balanced Vata activity in embryonic and foetal development. Similarly body mechanism like respiration (14-16/min) or cardiac beats (72/min) are controlled by Vata dosha. Therefore, to control hardware and software of the human body is the main function of Vata dosha. All the following functions are a part of this main function.

- *Pranodanasamanavyanapanatma*: These are the subtypes of Vata dosha, according to site, functional variations. We are going to study it afterwards.
- *Pravartakashchetanamucchavachanam*: Initiates upward and downward movements.
- *Niyanta praneta cha manasah*: Niyanta means to control and Praneta means to stimulate. Vata dosha gives stimulation to the mind for its normal functioning and also controls its activities. Vata dosha makes the mind to think on 'good and bad' and selects the appropriate one.. Mind is called 'Ubhayendriya' (dual nature - sensory and motor). It does the sensory function as follows:

'आत्मा मनसा संयुज्यते'	- Soul gets connected to mind
'मन: इन्द्रियेण'	- Mind makes linkage with senses
'इन्द्रिय अर्थेन'	- Sensory organs perceive the sensation
'तत: ज्ञानम्'	- Then a man gets the knowledge

- *Sarvendriyanamudyojakah*: Vata dosha stimulates sensory and motor organs and mind. Vata dosha helps for the smooth functioning of senses.
- *Sarvendriyarthanamabhivodha*: Abhivodha means attraction or indication. The attraction of sense organs towards their object is due to Vata dosha. e.g. good perception of sound by ear, can occur due to Vata.
- *Sarvashariradhatu-vyuhakarah*: Vata dosha is responsible for making proper arrangements of different tissues and organs in the body. For the creation and maintenance of

complicated networking of structures and functions, Vata dosha is responsible.

- *Sandhanakarah sharirasya*: Sandhana means to unite or to join. Actually the union or binding is due to Kapha dosha but the stimulation is of Vata.
- *Pravartako vachah*: Vachah means to speak. Vata dosha is responsible for speech. Vata is also responsible for different sounds produced in the body e.g. heart sounds, respiratory sound, abdominal peristalsis sound etc.
- *Prakritih shabdasparshayoh; shrotrasparshayormulam*: Constitution or root cause of sound and touch is Vata dosha. For the perception of sound and touch Vata is necessary. The main composition of auditory senses and touch sense is from Vata dosha.
- *Harshotsahayonih*: Yoni means origin. If Vata is in normal state, physical and mental happiness can be maintained, since Vata is stimulator for mind and senses.
- *Samirano-agneh*: Vata dosha stimulates digestive fire.
- *Doshasamshoshanah*: The subtle waste products (kleda) created during body metabolism are absorbed, due to stimulation of Vata.
- *Kshepta bahirmalanam*: The movements required for throwing waste out of the body are done by Vata dosha. Vata dosha does the function of excursion of urine, stool and sweat.
- *Sthulanusrotasam bhetta; karta garbhakritinam*: Sthula means big, macro and anu means small, micro. Strotas means channels and to give specific size and shape to body organs in the foetal life is a function of Vata dosha.
- *Ayusho-anuvrittipratyayabhutah*: For the continuation of life, the above said functions of Vata dosha are contributory. For the continuous union and amalgamation of physical body + sensory organs + mind + soul, Vata dosha

is helpful. Man lives, till the functions of Vata dosha are normal.

Media for the Activity of Vata Dosha

Vata dosha is described as - *Avyakto vyaktakarma cha* (it is invisible, but can be understood by functions). The body elements through which Vata dosha works are the media.

Three important medias are:

1) Dhamani – In Sushruta Samhita, in the chapter on 'Dhamani Vyakarana', the functions of dhamani are explained as follows – For getting knowledge there should be this chain – mind→dhamani→sensory organs→object.

2) Sira – Sushruta has mentioned Vatavaha-sira and its color as blackish. Vatavaha sira means which gets stimulated by Vata (and does not mean, which carry Vata).

3) Stimulation from molecule to molecule level – Actually each activity of Vata takes place via molecular propulsion. Even the cause of first two medias is also molecular propulsion.

Common Sites of Vata-dosha

The nature of tridoshas is all pervading throughout the body. But the organs where Vata dosha functions are predominantly observed have been mentioned as its main site.

'पक्वाशयकटी-सक्थिश्रोत्रास्थिस्पर्शनेन्द्रियम्।
स्थानं वातस्य, तत्रापि पक्वाधानं विशेषतः' ॥ (A.H.Su. 12:1)

1) Pakvashaya (large intestine) – Here, digested food gets separated in sara (useful) and kitta (waste) by Vata dosha. Also waste parts are thrown out of the body by stimulation from Vata. Vata dosha and pakvashaya are intimately related with each other. Pakvashaya is the place, for genesis of Vata, main site of activity, site as an origin of pathogenesis and

selective site for main treatment of Vata (i.e. basti or medicated enema).

2) Kati (pelvic girdle) – This region incorporates important organs like large intestine, rectum, anus, urinary bladder, uterus and ovaries. These organs are related with excretory activities like micturition, defecation, menstruation etc. These functions are part of the separations-type functions of Vata dosha.

3) Sakthi (thigh) – Walking, running are the activities of leg. These movement functions are related with Vata dosha.

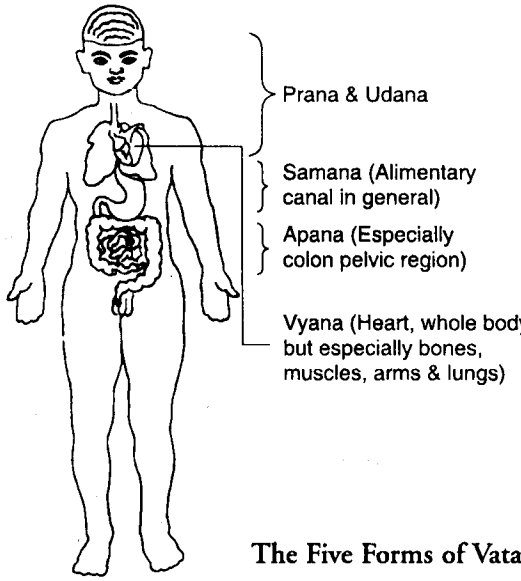
4) Shrotra (ears) – Sound is perceived by ears. Sound is a property of akasha (ether) mahabhuta. Composition of Vata includes akasha. For the proper activity of Vata in the ear, Ayurveda has suggested karna-puran (filling of ears with oil) as a part of daily regimen (dinacharya).

5) Asthi (bone) – Bones and Vata dosha has a special relation called as 'ashrayashrayi'. Bones are ashraya (media) and Vata dosha is ashrayi (dweller). a) Body activities are mainly concerned with body joints, and any activity can not take place without Vata. b) Bone is the hardest element in the body.

6) Sparshanendriya (Sense organ of touch is skin) - Skin perceives different types of touch sensations like cold, hot, soft, hard. Vata dosha is composed of Vayu and Akahsa (air and ether). Touch is a property of vayu mahabhuta, hence, relation of Vata dosha with touch sensation is established.

Sub-types of Vata Dosha

Up till now we have seen the general information of Vata dosha. Now let us see sequentially about the sub-types of Vata dosha.



The Five Forms of Vata

1) Prana Vayu

Definition – The type of Vata which helps to take in the useful elements from nature (like air, food and water) is known as Prana. This is also energy on which the life is dependant.

Sites –

'स्थानम् प्राणस्य मूर्धोरः ।
कण्ठः जिह्वास्य नासिकाः' ॥

Head and chest are two main sites. Head, throat, mouth, tongue, nose, heart, mind and intelligence are also included.

Functions –

'उरःकण्ठचरो बुद्धिहृदयेन्द्रियचित्तधृक् ।
ष्ठीवनक्षवथूद्गारनिःश्वासान्नप्रवेशकृत्' ॥ (A.H.Su 12:4)

1) To maintain the proper and smooth activity of buddhi (intelligence) heart, mind and sense organs. Mental functions like dhi (selection of good and bad), dhriti (courage) and smriti (memory).

2) To perceive the sensation and to decide which are the functions of sensory and motor organs.

3) Inspiration and deglutition are most important functions of Prana. Pure air and food (external prana) are taken in. The direction of Prana activity is from nature to body (external to internal). If these inward movements get obstructed, problems like asthma begin.

4) Spitting, sneezing and belching are comparatively less important functions.

Actually all these activities are the efforts of the body to throw away unwanted material. The direction of these activities may seem to be opposite, as compared to explained before in point 2. But as these activities clear the normal pathway of Prana, they are included in functions of Prana.

Charaka has mentioned following functions - shthivana, kshvathu, shvasa, udgara and aharana. Sushruta has mentioned – pranavalambana, hridayadharana. Vaghbhata has mentioned – control over buddhi, indriya, hridaya, mind, dhamani and respiration.

Disease due to vitiation of Pranavayu-

'प्रायश: कुरुते दुष्टो: (प्राण:) हिक्काश्वासादिकान् गदान्' । (S.N. 1:14)

Vitiated Prana is responsible for hiccough (hikka), bronchial asthma (shwasa) etc. The problems related to head, throat, tongue, mouth, nose, chest and that of Pranavaha and Annavaha srotas can be included in this group. The symptoms observed may be like cold, cough, and difficulty in deglutition, fatigue, loss of memory, unconsciousness and even coma.

2) Udana Vayu

If Prana activity from nature to human body is considered as anuloma, then direction of Udana vayu activity is pratiloma

i.e. opposite to Prana (although the activity area of both is same).

Sites -

'उरःस्थानम् उदानस्य' । (A.H.Su 12:57)

It's site is nose, pharynx, chest and abdominal organs near umbilicus.

Functions -

'वाक्प्रवृत्तिप्रयत्नोर्जाबलवर्णस्मृतिक्रिया' । (A.H.Su 12:57)

'भाषितगीतादीति आदिशब्दादुच्छ्वासादि विशेषाः' ।
(S.Ni. 1:14, Dalhana)

Functions of Udana Vayu are speech, efforts, to give energy and strength, color to the skin and maintain memory.

1) Vak pravritti (speech) – We are going to discuss speech activity in detail in another chapter.

2) Prayatna (efforts) – Activity to achieve something.

3) Urja (energy) and Bala (strength) – Both these are required for activity.

4) Varna (color of skin) – Normal colors are fair, dusty, black and in between fair and dusty.

5) Smriti (memory) – To reproduce stored knowledge, in the brain.

The above functions have been mentioned by Charaka. Sushruta has mentioned functions like speech and singing, while Vagbhata has mentioned all the functions mentioned by Charaka and giving strength to the mind, controlling all channels.

Subtle, volatile/gaseous waste, formed in the process of metabolism is thrown out of the body through expiration, which is also the function of udana vayu.

All above activities have similarity i.e. each activity is an

outward expression from the human body, which is matching with the direction of activity of udana vayu. The functions expiration and speech are easy to understand. But efforts, energy, color functions can not be easily understood for its co-relation, if any. Let us now understand this interrelation, amongst the activities of Udana.

Expiration – Expiration is a main function of Udana, but when this function gets disturbed, CO_2 gets accumulated inside the body. Acidosis develops and many functions get hampered, like cyanosis (discoloration) occurs; patient looses his strength, and energy. Sometimes, in serious conditions patient becomes drowsy, memory gets lost, irrelevant speech can occur.

Note – Some Ayurvedic scholars believe that prayatna (efforts), urja (energy), bala (strength), smriti (memory)- these functions are related with main function of Udana – vak-pravritti (speech). For proper speech efforts, energy, strength is required, because in serious conditions of a disease or in chronic debilating disease, speech gets affected.

Diseases due to vitiation of Udana

'उर्ध्वजत्रुगतान् रोगान् करोति च विशेषतः' । (S.N. 1:15)

The diseases of the organs which are above clavicle occur due to vitiation of Udana e.g. the diseases of nose, eye, mouth, ear and head. In practice many times problem arise due to disturbance in the co-ordination of Prana and Udana e.g. hiccough, bronchial asthma. Abnormalities of speech and color are also common with Udana vayu.

3) Vyana Vayu

Sites -

'व्यानो हृदि स्थितः' । (A.H.Su. 12:6)

Site is heart, but the whole body is activity area.

Functions -

'कृत्स्नदेहचरो व्यानो रससंवहनोद्यतः ।
स्वेदासृक्स्रावणश्चापि पञ्चधा चेष्टयत्यपि' ॥ (S.N. 1:16)

'गत्यपक्षेपणोत्क्षेपनिमेषोन्मेषणादिकाः ।
प्रायः सर्वाः क्रियास्तस्मिन् प्रतिबद्धाः शरीरिणाम्' ॥ (A.H.Su 12:8)

The different activities of the body are controlled by Vyana vayu. Some Ayurvedic scholars explain that the word hridaya is used for two different organs – i) heart concerned with circulatory system and ii) hridaya also means brain.

1) Cardiac output (*Rasa-samvahanodyatah*): Blood circulation (*Asrik-sravam*) - Vyana vayu is responsible for stimulation for blood circulation (cardiac stimulation - cardiac output). Due to circulation, only food, water and air – these outer nutrients can nourish body tissues. Blood circulation has been discussed in another chapter.

2) Sweating (*Sweda-sravan*) – Sweating is controlled by Vyana. Rasa and rakta are watery elements. Blood circulation provides nutrients to tissues and simultaneously, waste which is formed in metabolic process is excreted through the skin by Vyana vayu. Hence the transport and excretion of sweat is under control of Vyana. In practice also, we can see that during heart attack (disturbed Vyana) profuse sweating occurs.

3) Five types of activities - Many body activities depend upon Vyana, because if body tissues do not get proper nutrients through circulation, then normal activities like sitting, standing, walking can be hampered. All body activities can be classified into five types – a) Utkshepana – upward direction, b) Apakshepana - downwards direction, c) Vinamana – transverse direction, 4) Akunchana – contraction and e) Prasarana – relaxation (expansion).

Other than above five, two more activities are also

mentioned in some texts; e.g. a) Unmesha – to open the eyes or dilation of channels, b) Nimesha– to close the eyes or constriction of channels.

Charaka has mentioned functions like all the movements in body, prasarana, akshepa and unmesha, Sushruta – rasa samvahana, sweda and asrik sravana and all five types of actions described above. Vagbhata has mentioned all above actions and purification of all srotasas.

Diseases due to vitiation of Vyana

'क्रुद्धश्च (व्यानः) कुरुते रोगान् प्रायशः सर्वदेहगान्' । (S.N. 1:18)

The whole body is the activity area of Vyana, hence diseases can manifest at any part of the body. In practice, following problems are common – i) cardiac problems – e.g. cardiac arrest, hypertension, ii) circulatory problems – problems regarding sweating, hyper or hypotension, cold hands and feet etc.

4) Samana Vayu

Samana has been defined as '*Samana nayanat samah*'. Sama means balanced, there by keeping balanced state of body is a main function of Saman vayu.

Sites -

'समानोऽग्निसमीपस्थः' । (A.H.Su 12:8)

'कोष्ठे चरति सर्वतः' । (A.Hr.Su. 12:8)

The main site is Koshtha. According to Charaka it is svedavaha, ambuvaha and doshavaha srotas. Sushruta has mentioned its site near agni, stomach and large intestine, while Vagbhata has mentioned all above and near shukra and artava.

Functions –

'अन्नं गृह्णाति पचति विवेचयति मुञ्चति' । (A.H.Su. 12:8)

Primary digestion occurs smoothly, due to stimulation of Saman vayu. Following different functions are under control of saman vayu. e.g.

i) To receive the food (*grihnati*),

ii) Digestion of food (*pachana*),

iii) Separation in between useful and waste part (*sara-kitta vibhajana*). This function of separation is called as vivechan,

iv) To propel the waste material to colon and rectum (*munchati*).

Actually, digestion is a chemical function, for which Pachak pitta is mainly responsible, but Samana vayu helps the function of digestion indirectly. Samana vayu helps in secreting mechanism and makes different movements of digestive organs like i) peristalsis, ii) anti-peristalsis, iii) segmentation, iv) deglutition and v) propulsion.

The main function described by Charaka is Agnibala-pradhana i.e. giving strength to the digestive fire. According to Sushruta digestion of food and separation of useful part of the digestive process and waste part like mutra and purisha is the main function. Vagbhata has mentioned that Agni-sandhukshana or invigoration of digestive fire is the main function along with other functions like separation of sara and kitta part after digestion is complete, pushing kitta part downwards, and controlling shukra, artava and ambuvaha srotas.

Diseases due to vitiation of Samana

'गुल्माग्निसादातीसारप्रभृतीन् कुरुते गदान्' । (S.Ni. 1:17)

Vitiation of Samana mainly disturbs digestion; e.g. i) gulma means tumor like bulging due to retention of contents (when movements get obstructed), ii) agnimandya – low digestive fire when appetite and digestion becomes low, iii) atisara –

diarrhea. The problems like indigestion, acidity, vomiting, colic can also occur due to this.

5) Apana Vayu

'Apana' vayu is located in the lower part of trunk. So, the Vayu, which controls the activity in the Apana region (i.e. urination, defecation etc.) is called as Apana vayu.

Sites -

'अपानोऽपानगः श्रोणिबस्तिमेढ्रोरुगोचरः' । (A.H.Su. 12:9)

Mainly lower abdomen or pelvic area. Apan vayu has the control on organs around umbilicus and in pelvic girdle, urinary bladder, genitals, rectum and thigh.

Functions –

'शुक्रार्तवशकृन्मूत्रगर्भनिष्क्रमणक्रियः' । (A.H.Su. 12:9)

Controlled expulsion of semen, menstrual discharge, feces, urine, flatus and fetus. Controlled means holding all these elements for a limited period (till there function in the body is complete) and then their elimination at proper time e.g.

1) Semen expulsion – Elimination of Shukra dhatu from the body is the function of Apana.

2) Menstrual discharge - Artava means female gamete and Raja means menstrual discharge. If artava unites with male gamete, pregnancy takes place, but otherwise ovum is thrown out with menstrual bleeding. Apan vayu is responsible for proper menstrual discharge. When Apana activity is normal menstruation and menopause all stages remain normal.

3) Expulsion of fetus – When conception occurs, the cervix is kept constricted till nine months. During labor cervix gets dilated and uterine muscles start contractions. This total phenomenon is under control of Apana vayu. Vitiation of Apana leads to miscarriages or abortions.

4) Defecation – After Sara-Kitta division, solid waste i.e. stool is formed. When there is urge for defecation, sphincters in the rectum gets dilated and stool is thrown out through anus. When Apana vayu gets disturbed retention or incontinence can occur.

5) Urination – When the urinary bladder is full with urine, stimulation of Apana opens the sphincter at urethra and urine is voided. Vitiation of Apana vayu leads to retention or incontinence of urine. So functions of pelvic organs are under control of Apana vayu.

Diseases due to vitiation of Apana

'क्रुद्धश्च कुरुते रोगान् घोरान् बस्तिगुदाश्रयान्' । (S.Ni. 1:20)

Due to vitiation of Apan, many serious diseases about bladder, rectum can occur like retenion/incontenance of urine/stool, miscarriage/abortion.

Pathology of Vata

Hyper state (Vata-vridhi)
Hypo state (Vata-kshaya)

1) Vata-vriddhi

(Hyper activity of Vata)

'कार्श्यकार्ष्ण्योष्णकामत्वकम्पानाहशकृद्ग्रहान्' ।
बलनिद्रेन्द्रियभ्रंशप्रलापभ्रमदीनता:' ॥ (A.H.Su 11:6)

1) Karshya (weight loss) - This is due to excessive light and dryness qualities. This can occur due to frequent fasting or dieting, taking low calorie diet, excessive physical activities, chronic illness. These patients get benefited with adequate physical and mental rest, high nourishing diet and herbal combinations like milk with powder of asparagus (shatavari-kalpa).

2) Karshnya (black discoloration) - This can be local or general. Excess dry and cold properties are causative agents.

Normal color depends on rakta and Pitta. Due to excessive cold property, vessels get constricted – circulation hampers and discoloration takes place.

3) Ushnakamitva – This means desire for warm things. Like food and atmosphere. Due to Vata aggravation, cold property increases and desire for warm substances develops.

4) Kampa (tremor) - Excess, uncontrolled movement of any part of the body or of muscles is called tremor. It is a natural reaction to balance excessive cold. Tremor is due to mobile property of Vata. Warm gentle oil application can reduce tremor.

5) Anaha (bulging of abdomen) - Due to excess dry quality of Vata, peristaltic movements get disturbed and air, stool etc. get accumulated in colon. This causes bulging of lower abdomen.

6) Shakrit-grathana – Means constipation. As explained above, due to excessive dry quality of Vata, peristalsis slows down and constipation develops. 1 cup warm milk with 1 spoon of ghee at night can relieve this symptom.

7) Bala-nidra-indriya-bhramsha – Bhramsha means improper functioning. When light and dry qualities become excess, strength lowers down, excess mobile activity of Vata, disturbs sleep. Due to dryness (improper nourishment and smoothening) senses cannot function normally. Nervine degeneration can sometime lead to paralysis.

8) Pralap – Delirium or irrelevant talk. This can occur in hyper activity of Vata.

9) Bhrama – Means giddiness. This is the effect of excess mobile and light property of Vata. These patients can be improved by tonic, nourishing and smoothening diet and adequate rest.

10) Dinata – Weak mind. The person can not think and make a decision with confidence. Inferiority complex develops. This is due to mobile, dry and light quality of Vata. Psychological counseling and meditation can reduce this problem.

Vata-kshaya

(Hypo-activity of Vata)

'लिङ्गं क्षीणेऽनिलेऽङ्गस्य सादोऽल्पं भाषितेहितम्' । (A.H.Su 11:15)

Usually the low activity of any dosha do not cause any disease. However due to hypo-activity of Vata, certain symptoms can be noted like:

1) Angasada – Means weakness or debility of body. Due to less stimulation of Vata sensory and motor activity gets reduced. Therefore physical activity also slows down.

2) Alpa bhashite – Means less desire to talk. Vata stimulation is lacking.

General Principle of Treatment

According to the principle of homologous and heterologous, in the hyper activity of Vata the diet, behavior and medicines should be of antagonistic nature to Vata properties e.g. use of milk, ghee, oil, nourishing food, physical and mental rest, oil applications and medicines like Shatavari kalpa (made from asparagus), Balarishta (medicinal wine prepared from Sida cordifolia) are useful.

Importance of Vata-dosha

Till now students must have understood the importance of Vata-dosha. Therefore all Ayurvedic texts are full of praise for Vata in following words:

'वायुरायुर्बलं वायुर्वायुर्धाताशरीरिणाम् ।
वायुर्विश्वमिदं सर्वं प्रभुर्वायुश्च कीर्तितः' ॥ (C.Chi. 28:2)

Union of physical body, senses, mind and soul can be

maintained due to Vata only. Therefore maintenance of quality of life depends on physiological status of Vata dosha. Vata is responsible for feeding air, food and water and to keeping the body strength.

'स्वयम्भूरेष भगवान् वायुरित्यभिशब्दितः ।
स्थित्युत्पत्तिविनाशेषु भूतानामेव कारणम्' ॥ (S.Ni. 1:5-6)

Ultimately, we can say the Godliness and leadership of this universe goes to Vata dosha. As vayu is responsible for creation, sustenance and timely destruction, it can be termed as 'God'.

Chapter 5

Pitta-Dosha

After consuming food, water etc. from the universe, it should transformed in to useful form, with the help of metabolic activity. This transformation, digestion and metabolism is done by Pitta dosha.

Pitta-nirukti

(Etymology)

'तप् सन्तापे'। (S.Su. 29:5)

The word '*Tap-santape*' means creation of heat, or oxidation process or color change etc.

Synonyms of Pitta

Agni is the most commonly used synonym for Pitta. While describing sub-types of Pitta, Sushruta has used the word Agni e.g. Pachak agni, in spite of Pachak pitta, Ranjak agni in spite of Ranjak pitta.

Synonyms of agni (Vaishvanara, Vahni, Pavan, Anil) can also be considered as synonyms of Pitta. As Pitta and Agni are, many times used as synonyms of each other, the question arises – "whether Pitta and Agni are same or different?" For this, let us see following:

'अग्निरेव शरीरे पित्तान्तर्गतः कुपिताकुपितः शुभाशुभानि करोति; तद् यथा— पक्तिमपक्तिं, दर्शनमदर्शनम्, मात्रामात्रत्वमूष्मणः, प्रकृतिविकृतिवर्णौ, शौर्यं भयं क्रोधं हर्षं मोहं प्रसादम्, इति एवम् आदीनि च अपराणि द्वन्द्वानीति'। (C.Su. 12:11)

Pitta is a substance with the specific properties and function. Agni is the energy residing in Pitta. This agni in normal or abnormal conditions show positive or negative effects as explained in the above verse e.g. proper or improper digestion, proper or improper vision, thermal regulation,

normal or abnormal color, courage or fear, anger or joy, satisfaction or attraction etc.

Agni menas hot and penetrating (ushna and tikshna) properties and all digestive and metabolic functions. Hot and penetrating capacity is also main properties of Pitta, but properties like little oily, fluid and unpleasant smell also exist in Pitta. Digestion is the main function of Pitta, but one can also see other functions of Pitta. Students should carefully study the similarities and dissimilarities in Pitta and Agni (Concept of agni has been thoroughly described in the chapter on Dieteties).

Structure

'पित्तं आग्नेयम्' । (C.Su. 42:5)

Pitta is fiery in nature.

Composition – Although Pitta has a composition of five elements, Fire element is predominant.

Properties of Pitta-dosha

'पित्तं सस्नेहतीक्ष्णोष्णं लघु विस्रं सरं द्रवम्' । (A.H.Su. 1:11)

1) Sa-sneha (slightly oily) – This property helps to make food soft, during the process of digestion or transformation slight oil is essential. But naturally oiliness of Pitta is not that much of Kapha. Utility of oil for digestion can be clarified by practical example – while making vegetables or curry, housewife puts some oil or ghee for seasoning. Less oil or ghee can burn up the substance.

2) Tikshna (sharp or penetrating) - '*Shodhane tikshnah*'- This explains penetrating power. This property helps Pitta to reach at molecular levels of food, in the process of digestion. Sharp quality of Pitta can break the complex molecular structure of food.

But abnormal or excess Pitta can create ulcers in digestive tract (e.g. peptic ulcers).

3) Ushna (hot) - This property is directly related with digestion. Hence hot and sharp are main properties of Pitta. But hotness should also be in appropriate proportion and quality. Hot property changes color, taste and smell of a substance.

Different amount of heat is required to cook different substances. Hot property can stay with only Pitta. (*Pittadrute nasti ushma* - Vagbhata).

4) Laghu (light) - Proper digestion creates lightness in the body. Cooked food is easy for digestion. Light property is helpful for hot and sharp properties.

5) Visra-gandha (unpleasant smell) - Pitta element, by nature has some specific odor. This is specific with each person. Hence every person has different smell.

6) Sara –This means fluid or flowing character. This is covering and spreading. In digestion, Pitta should cover the molecular surfaces of food and also it should spread to cover all area.

7) Drava (liquid) – Pitta consists of little amount of water, which is essential for its flowing nature. Pitta governs various digestive juices that are poured in the gastro-intestinal tract. For this action watery content of Pitta is useful.

While cooking rice, adequate amount of water is expected. Absence of water can burn up the rice. Too much water can make too soft rice.

Qualities of Pitta

Charaka	Sushruta	Vagbhata
Sa-sneha, ushna, teekshna, drava, sara	Ushna, tikshna	Sa-sneha, ushna, tikshna, laghu, drava, sara, vida-gdha, vaishadya

Charaka	Sushruta	Vagbhata
katu, amla rasa	katu & amla rasa	
visra gandha	puti gandha	visra gandha
Shuklaruna-varjit varna	nila, pita varna	

Common Functions of Pitta-dosha

'पित्तं पक्त्युष्मदर्शनैः ।
क्षुत्तृड्रुचिप्रभामेधाधीशौर्यतनुमार्दवैः' ॥ (A.H.Su. 11:3)

1) Pakti - Means digestion or transformation. This is the main function of Pitta. Inorganic (bahya panchabhautika) matter is converted to organic (sharira panchabhautika) matter, after proper digestion, due to hot and sharp properties. While understanding the function of digestion, Ayurveda does not only expect food digestion, but mentions other aspects of digestion, like digestion of water, air, knowledge also. Improper digestion or improper conversion and improper assimilation is one of the main causes of disease formation.

2) Ushma - Means heat. Proper temperature is necessary for many physiological activities. Heat is generated in the process of metabolism. Pitta is responsible for thermal regulatory mechanism of the body. In fever, due to Pitta provocation, body temperature increase.

3) Darshan - Means vision. Eyes are Pitta dominant organ. Pitta has predominance of Tej (fire) mahabhuta. So naturally, vision function is done by Pitta. Alochaka pitta, does the function of vision assimilation (digestion) through eyes.

4) Kshut - Means hunger. Hunger sensation develops due to Pitta. Metabolism is continuous ongoing process. Degenerated cells are constantly replaced by new ones, this requires nourishment from food. This demand of food is expressed with 'hunger sensation'. Hunger expression indi-

cates normal metabolic process in the body. In illness anorexia develops. Appetite improves as health improves.

5) Trit - Means thirst. Pitta activity requires water. This need is expressed with thirst sensation. To protect mucosa and organs from the heat of Pitta, body requires adequate water balance, which is maintained by thirst sensation. In high fever, when 'hot' property of Pitta increase, thirst sensation increases (dryness of mouth).

6) Ruchi - Means taste. This is a good indicator of normal digestion process. When jatharagni digests the food properly, all the internal systems become clean which develops good taste sensation on the tongue.

7) Prabha - Means luster and complexion of skin. It depends on good internal environment of the body. Good environment means all the dhatus (tissues) are of good quality. Good tissue formation is dependent on good digestion. Especially digestion at the level of rasa and rakta is concerned with skin luster and texture.

8) Medha - Means grasping or understanding capacity. When Sadhaka pitta is functioning well, mental and intellectual activity is of high rank and then the person can grasp the knowledge very quickly. Mind and physical body are functionally dependent on each other. Therefore, naturally when food digestion is good, chances of good mental activity are more.

9) Shaurya - means braveness and courage. Normal Pitta produces normal metabolism, which gives good quality of dhatus. Dhatus are responsible for body strength which produces braveness.

10) Tanu Mardava - Normal metabolism at the level of rasa, and rakta produces good quality skin which is soft, delicate, with good complexion and lustre.

Media for Pitta activity

1) Metabolism of Pitta takes place at molecular level, for this media of rasa-rakta is helpful. Pitta dosha and rakta-dhatu are intimately related with each other. Properties and functions of both are similar to each other.

2) Different glands in the gastro-intestinal tract, which secrete digestive juices are also media for the activity of Pitta.

Common Sites of Pitta-dosha

'ते व्यापिनोऽपि हृन्नाभ्योरधोमध्योर्ध्वसंश्रयाः' । (A.H.Su. 1:7)

'नाभिरामाशयः स्वेदो लसीका रुधिरं रसः ।
दृक् स्पर्शनञ्च पित्तस्य, नाभिरत्र विशेषतः' ॥ (A.H.Su. 12:2)

Tridosha pervade throughout the body. Kapha is predominant in chest region, Pitta in between heart and umbilicus and Vata in lower abdomen.

The sites, where digestion or other functions of Pitta are predominant are mentioned in above verse.

1) Nabhi - Means abdominal parts around umbilicus. The organs related with primary digestion e.g. stomach, small intestine, pancreas, liver are situated in this region. As pakvashaya (large intestine) is main site of Vata and nabhi (small intestine) is a main site of Pitta activity. Therefore for treating Pitta area of nabhi is used e.g. local massage or for dhara treatment.

2) Amashaya (stomach) - Chakradatta has explained that urdhva amashaya is a site for Pitta and adho-amashaya is a site for Kapha.

3) Sweda (sweat) - Sweat is useful to control the heat of Pitta. Excessive heat is removed from the body through sweat.

4) Lasika (serum) - Watery element in the skin which helps in regeneration of skin tissue.

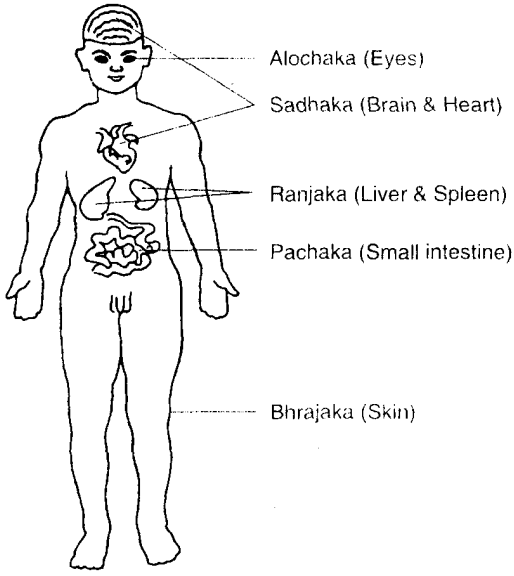
5) Rudhir (blood) - Pitta and blood are closely related with each other.

6) Rasa - Rasa-rakta circulation helps to carry out different functions of Pitta, like metabolic activity, thermal conduction etc.

7) Drik - In the eyes. Digestion takes place with relation to vision topic.

8) Sparshanendriya - The site is skin. Skin is responsible for digestion (transformation of senses) with respect to tactile sensation (soft-hard, hot-cold touch). Also different skin applications (like paste, ointments) are digested and absorbed through skin. This is done by the local Pitta.

Sub-types of Pitta-dosha



The Five Forms of Pitta

1) Pachaka Pitta

'पित्तं पञ्चात्मकं तत्र पक्वामाशयमध्यगम्।
पञ्चभूतात्मकत्वेऽपि यत्तैजसगुणोदयात्॥
त्यक्तद्रवत्वं पाकादिकर्मणाऽनलशब्दितम्।
पचत्यन्नं विभजते सारकिट्टौ पृथक् तथा॥

तत्रस्थमेव पित्तानां शेषाणामप्यनुग्रहम्।
करोति बलदानेन पाचकं नाम तत्स्मृतम्' ॥ (A.H.Su. 12:10-12)

i) Site – Pachaka pitta is one of the five types of Pitta. Digestion occurs mainly in the part between amashaya (stomach) and pakwashaya (large intestine). This region is called as grahani (small intestine). This is the site of Pachaka pitta.

ii) Composition - Although Pachaka pitta is composed of panchamahabhuta, it is predominant in teja mahabhuta (fire element).

iii) Function – Mainly that of digestion. If there is less water content (*tyakta dravatva*) then this function is carried out best. Due to functions like paka (pachana – digestion) this Pitta is called as anala (fire). Sara-kitta separation, after digestion is done (sara means nourishing, useful part and kitta means subtle waste part).

iv) Utility and importance of digestive function - Pachaka pitta from grahani, gives stimulation, support and strength to other types of Pitta. In short if primary digestion in the abdomen is normal, all the other metabolic processes in the body can remain normal.

Pachaka pitta, at some time is also called as Pachak-agni, Koshta-agni or Jathar-agni. Digestion due to Pachaka pitta is primary digestion. If this digestion is not proper, then incomplete digested material which are toxic to the body can affect other types of fire i.e. tissue fire. Hence it is said that subtle parts of this central fire exists in all other types of fire (e.g. tissue fire).

2) Ranjaka Pitta

'आमाशयाश्रयं पित्तं रञ्जकं रसरञ्जनात्'। (A.H.Su. 12:13)

'यत्तु यकृत्प्लीह्नोः पित्तं तस्मिन् रञ्जकोऽग्निः इति संज्ञा, स रसस्य रागकृत् उक्तः'। (S.Su. 21:10)

Pitta in amashaya is called as Ranjaka pitta. Its main function is to give color (to blood). Rakta dhatu poshaka elements (precursor of blood) are present in the digested food juice (ahar-rasa). Ranjaka pitta acts on this precursor elements of blood and helps in formation of blood. When "Water" predominant digestive fluid comes in the liver and spleen, Ranjaka pitta participates in the process of transformation of rasa to rakta. Ranjaka Pitta is responsible for red color of blood, hence, in anemia, one has to rule out the possibility of pathology in Ranjaka pitta as a cause of paleness.

In short, blood has the normal color of skin and other mucus layers, when Ranjaka pitta gives proper color to blood. (normal haemopoesis). Ranjaka pitta can be considered as Hemoglobin in the blood.

3) Sadhaka Pitta

'बुद्धिमेधाभिमानाद्यैरभिप्रेतार्थसाधनात् ।
साधकं हृद्गतं पित्तं' ॥ (A.H.Su. 12:13)

Sadhaka pitta is responsible for proper functioning of buddhi (intellect), medha (understanding capacity) and abhiman (self esteem). Sadhaka pitta exist in the heart and maintains normal functioning of buddhi and mind. Sadhaka pitta removes the obstacles of tamas (ignorance) and Kapha (inertia) and stimulates the mind to understand its subjects (knowledge-matters). Hence it is also called as 'Medhakar pitta'. When mind is under control, shukra dhatu (tissue responsible for regeneration) becomes excellent in quality and ojas production takes place (immune system becomes strong). For this reason Sadhaka pitta is also called as 'Ojakar pitta'.

We have already seen the common functions of Pitta. Amongst them, medha (understanding capacity), dhi

(courage), and braveness, all these functions occur due to Sadhaka pitta.

The function of buddhi (intelligence) is to take decision after analysis, to draw conclusion, to perceive the knowledge of sound, touch etc. e.g. professor teaches 50 students in a class room in the same manner. But the lecture cannot be grasped equally by all the students. This means knowledge also has to be digested. Hence it is not important for the teacher not to deliver huge information in a class, but care should be taken to see how much information is digested by the students.

Ayurvedic students should understand this new concept of 'knowledge digestion' by Sadhaka pitta.

Medha means grasping or understanding capacity. Abhiman means self esteem with respect to Desha (surrounding, locality) and Kala (time factor).This is also called as Desha-Kala-Atma-vijnan. Normal medha and self esteem depends on Sadhaka pitta.

Site of Sadhaka Pitta : Heart

Today we know that intelligence and mental activity are controlled by some part of brain. Hence the site of Sadhaka pitta related with buddhi and medha, is in the brain.

Some Ayurvedic scholars also believe that there is relation in cardiac activity and Sadhaka pitta. Since anxiety, anger (mental emotions) can alter heart activity.

Low I.Q. (intelligent quotient), loss of memory and forgetfulness can occur due to abnormality in Sadhaka pitta. There can also be a weak mind which can result into fear and confusion.

4) Bhrajaka Pitta

'त्वक्स्थं भ्राजकं भ्राजनात् त्वचः' । (A.H.Su. 12:14)

'यत्तु त्वचि पित्ते तस्मिन् भ्राजकोऽग्निरिति संज्ञा, सोऽभ्यङ्गपरिषेकावगाहलेपादीनां क्रियाद्रव्याणां पक्ता छायानां च प्रकाशकः' । (S.Su. 21:10)

'भ्राजनं इति दीपनं प्रकाशनम्' ।
'भ्राजनात् दीपनात्' । (Ash.M. 12:14)
'भ्राजनं प्रकाशनं कर्म' ।

Pitta in the skin is called as Bhrajaka pitta and it maintains, complexion and color of skin. Bhrajaka pitta is called as Bhrajaka agni by Sushruta.

'Bhrajan' has the meaning to brighten or to glorify.

Dalhana has differentiated the words Chhaya and Prabha. Chhaya can be seen from close distance but Prabha can be seen from a long distance.

'छायाप्रभयोः को भेदः ? उच्यते—
आसन्ना लक्ष्यते छाया, प्रभा दूरात् प्रकाशते ।
वर्णमाक्रमतिच्छाया, प्रभा वर्णप्रकाशिनी' ॥

(S.Su. 21:10, Dalhana)

Skin is the organ for understanding tactile sensation. Touch sensation is properly digested or understood, due to Bhrajaka pitta. Soft - rough, cold-hot these types of different sensations are properly perceived, due to Bhrajaka pitta.

Different medicaments are used for abhyanga (oil massage), parishek (pouring hot oil or water), avagaha (tub bath), lepa (paste). These medicaments are absorbed and digested due to Bhrajaka pitta. Herbal pastes which are applied for various skin problems like acne and for cosmetic purposes work through the medium of this type of Pitta.

Absorption through skin can be experimentally proved e.g. sandal wood paste is applied to reduce burning of skin. After drying the paste, try to reuse it. It is very well seen that second time, this paste does not work as effectively as the first time. This clarifies that active ingredient is absorbed the first time through Bhrajaka pitta.

Sweating occurs through skin. Therefore Bhrajaka pitta has also relation with sweating mechanism and sweat control.

5) Alochaka Pitta

'—रूपालोचनतः स्मृतम् । दृक्स्थम् आलोचकं—

(A.H.Su. 12:14)

Alochaka pitta is responsible for normal vision. Understanding of size, color, appearance of a subject by the eyes means vision (alochana). While looking at the high mountain, the vision is adjusted and tall height is transformed into appropriate size. Alochaka pitta is responsible for all sorts of transformations required for proper vision. Eyes are teja mahabhuta predominant organ.

In Bhela Samhita, two types of Alochaka pitta are described - 1) chakshu-vaisheshik and 2) buddhi-vaisheshik. These two types explain the activity of optic pathway in i) eye and in ii) optic centre in the brain respectively.

Pathology of Pitta

Hyper state (Pitta-vriddhi)
Hypo state (Pitta-kshaya)

1) Pitta-vriddhi

(Hyper activity)

'पीतविण्मूत्रनेत्रत्वक्क्षुत्तृट्दाहाल्पनिद्रता ।
पित्तं—(वृद्धं तु कुरुते) ॥ (A.H.Su. 11:7)

1) Pita menas yellow. Due to Pitta-vriddhi, yellow colored in stool, urine (high colored urine) and yellow eyes and skin are seen. We can see high colored urine, yellow discoloration of eyes and nails in the patients of kamala (infective hepatitis).

Yellow color has been explained as color of Pitta in all texts (Ref. Sharangdhar, first section).

2) Kshut – Excessive hunger (polyphagia). This occurs due to excess hot and sharp properties of Pitta. Ayurveda has explained this symptom in bhasmak disease.

3) Trit – Excess thirst (polydypsia). In high fever, due to

excess hot and sharp properties of pitta, excessive thirst occurs, desire for liquid increases. This is the natural mechanism of body protection, from heat. These patients are given medicated water with two types of sandal wood, vetivera, musta, parpata and shadangodaka).

4) Daha – Burning Sensation. In hot summer, Pitta constitution people complain of burning sensation in the whole body or burning eyes, burning hands and feet. To reduce this effect of excess heat, sandalwood paste application or putting milk drops in eyes, these measures are useful.

5) Alpa nidrata – Insomnia. This is due to excess Pitta which can cause inflammation and irritation. Due to burning and irritation, patient can not sleep properly and becomes restless.

2) Pitta-kshaya

(Hypo-activity)

'पित्ते मन्दोऽनलः शीतं प्रभाहानिः' । (A.H.Su. 11:16)

1) Mando-analah – Anal means digestive fire. This fire becomes weak and low digestion occurs. This is due to lowering of hot and sharp properties. Garlic, ginger and black pepper can improve this condition.

2) Sheeta (cold) – Pitta does thermal regulation. Patient feels cold, due to lowering of Pitta.

3) Prabha-hani – Due to low Bhrajaka pitta, the brightening, and glorification function becomes low and skin lustre is lost. Pitta and rakta are closely related. Therefore blood quality also gets disturbed and it affects skin color, complexion and texture.

Principle of Treatment

Hyper or hypo state of Pitta can occur in 3 types - 1) by substance, 2) by properties, 3) by function.

In hyper state of Pitta, one should follow diet, behavior and medicines of the antagonistic properties of Pitta. Cooling, soothing measures are expected e.g. milk, ghee, sugar, mung dal, cold drinks, adequate sleep, mental rest and medicines like shatavari sugar granules - shatavari kalpa, coral and rose petal jam.

Chapter 6
Kapha-Dosha

There is constant wear and tear in the body *(Shiryate tat shariram)*. However we experience that from the childhood till death the body grows and is maintained well. Because addition of tissues by proper nourishment is also taking place along with wear and tear. Protection of all organs against wear and tear and by maintaining molecular union and to provide stability, to stimulate growth is a function of Kapha dosha. Due to this anabolic activity, body is preserved from ageing.

Kapha-nirukti

'केन (जलेन) फलति इति कफः' ।

This means to increase. The element, which increases due to contact with water, is called as Kapha. This explain the intimate relation of Kapha and water. Also it is clear that body growth is dependant on Kapha and water.

Synonyms of Kapha

(shleshma & balasa)

1) In short, this word explain the union of two mole molecules.

2) Balas means strength, weight. This is related with functions of Kapha.

Structure

Kapha is soft, stable and cool in nature.

'श्लेष्मा सोमः (सौम्यः)' । (A.H.Su. 3:96)

Composition – Although tridoshas are made up of five mahabhutas, Kapha is predominant in earth and water mahabhutas.

Properties of Kapha-dosha

'स्निग्धः शीतो गुरुर्मन्दः श्लक्ष्णो मृत्स्नः स्थिरः कफः' ।

(A.H.Su. 1:12)

Let us see, how each property of Kapha, is useful for its function like union, stability, softness and strength.

1) Snigdha (oiliness or unctuousness) - This is the most important property of Kapha. This provides moisture. This property due to moisture and fat provides softness. This keeps long standing union of molecules. If physical body has to be sustained, Kapha (having unctuous property) should be normal.

Slight unctuousness of Pitta dosha, helps for digestion and excess oiliness of Kapha helps for the union of molecules. Students should note this difference.

2) Shita (cold) - Within normal limits, this property protects the body organs and prevents ageing also. Due to cold, body elements are preserved for longer time and degeneration is slowed down. This is why the people from cold region are having strong built and better functional capacity with longer life span. In winter, vaso-constriction occurs due to cool property thereby sweating is prevented and body heat is preserved. Cold increases and heat decreases the density of Kapha.

3) Guru (heavy) - Heavy property is responsible for weight gain. Union becomes more and also of good quality. Strength increases, wheat, black gram are heavy natured as that of Kapha. Brimhana – weight promoting function of Kapha is due to heavy property.

4) Manda (slow) - Slow property gives stability. It prevents degeneration. Shaman (pacification) means to reduce the irritating or excited state. Yatra means journey. Long time preservation and slow activity of molecules is suggested by

the word yatra. Due to manda property, tissue depletion becomes less.

5) Shlakshna (slimy) - This property replenishes the damage or degenerated tissues. In nasal, oral, respiratory passages and in heart, lungs, there is continuous movement of air, food, water and blood circulation. Continuous movement creates more dryness. To prevent wear and tear of these places, Kapha with its slimy property is secreted which gives protection and support. Gum from catechu is of slimy nature.

6) Mritsna (sticky) - This property is responsible for coating, which prevents damage to the tissues.

7) Sthira (stable) - This is against the mobile property of Vata. Due to these body tissues remain stable which can give more support to the body.

Qualities of Kapha

Charaka	Sushruta	Vagbhata
Guru, shita, snigdha manda, sthira, picchila, mridu, matsarya, stimita, madhura, shouklya, vidaha, lavana, shveta.	Guru, snigdha, shita, pichchhila, manda, shlakshna, mritsna, sthira, madhura, avidagdha	Snigdha, guru, shita

Common Functions of Kapha

'सन्धिसंश्लेषणस्नेहनरोपणपूरणबलस्थैर्यकृत् श्लेष्मा 'पञ्चधा' प्रविभक्त उदक-कर्मणाऽनुग्रहं करोति' । (S.Su. 15:4)

'श्लेष्मा स्थिरत्वस्निग्धत्वसन्धिबन्धक्षमादिभिः' । (A.H.Su. 11:3)

1) Sandhi-sanshleshana - Kapha gives stability to bony joints. Usually the word joint is used for bony joint. But Ayurveda has also explained join between two muscles, two sira etc. It is clear that, Kapha is responsible for union of any

two molecules. This function is achieved by the unctuous, stable, slimy qualities.

2) Snehana - Unctuousness or oiliness. The fat content of every tissue is due to Kapha. Due to this function of Kapha, Vata activity can occur smoothly. Tissue destruction is avoided and strength of tissue increases.

3) Ropana - Healing function. When any disease attacks on the body, the body tissues like rasa, rakta get damaged. Due to healing function of Kapha, regeneration process becomes fast. Body can be preserved by the healing properties of Kapha like slimy, sticky etc.

4) Purana - Replacement or filling function. Healing is meant for partial damage of tissue and filling is required for complete destruction of tissue.

5) Balakrit - Means gives strength. The strength of the body decides the capacity to do maximum work. Kapha by nourishing property gives strength and stability to all dhatu (body tissues). Strength increases, when all the tissues work at their optimal level.

6) Sthairyakrit (stability). This is due to heavy and stable properties of Kapha. Physical body in general and tissues in specific get stability due to Kapha (minimum wear and tear).

7) Kshamadi (to forgive) - Soft, unctuous, cool, stable qualities of mind also affect the mind, like the physical body. Kapha reduces the irritation and excess stimulation of mind and intellect. Tranquil mind can think properly, develops tolerance and flexibility. The person develops the power of forgiveness.

8) Udaka-karmana - To keep water and electrolyte balance. Kapha helps the proper functioning of jala-mahabhuta.

9) Comparison of Kapha and soma-shakti (cooling principle) –

'सोम एव शरीरे श्लेष्मान्तर्गतः कुपिताकुपितः शुभाशुभानि करोति । तद्यथा— दार्ढ्यं शैथिल्यमुपचयं कार्श्यमुत्साहमालस्यं, वृषतां क्लीबतां, ज्ञानमज्ञानं, बुद्धिं मोहमेवमादीनि च अपराणि द्वन्द्वानीति' । (C.Su. 12:12)

Soma-shakti from nature exhibits its functions through Kapha dosha. These functions are as follows : 1) Sturdiness – Flaccidity, 2) Proper nourishment – Under nourishment, 3) Energetic – Lethargic, 4) Potent – Impotent, 5) Knowledge – Illiteracy, 6) Intelligence – Ignorance and confusion.

Common Sites of Kapha-dosha

'उरःकण्ठशिरःक्लोमपर्वाण्यामाशयो रसः ।
मेदो घ्राणं च जिह्वा च कफस्य सुतरामुरः' ॥ (A.H.Su. 12:3)

Kapha functions are predominantly seen in the following organs:

Comparatively in chest, throat, head, pancreas, small joints and stomach wetness is more. Rasa is a watery fluid tissue. Fat has similar properties like Kapha e.g. oily.

1) Chest, throat, head, kloma (pancreas), bony joints, stomach, rasa, fat, nose, tongue are the main sites of Kapha. Heart and lungs, in the chest cavity have to perform important function like blood circulation and respiration throughout the life. Due to continuous movement, there is more possibility of wear and tear. To minimize the damage to heart and lungs, these organs are covered with the sac having slimy - Kapha material in it for protection. As chest and throat are Kapha organs, disease of Kapha (cold, cough, asthma) is common in this part.

2) Kloma - This means soft palate or pancreas.

3) Shira (head) - It is a marma (vital organ). All the controlling centers of motor and sensory system are in brain. Mind and senses also act continually. To control Vata activity and to protect brain, unctuous Kapha is present in the brain in the form of cerebro-spinal fluid.

4) Parvani (bony joints) - When any two bones unite together, it is called as Sandhi. Kapha is responsible for keeping this union intact without wear and tear. Activity of Vata at bony joints is counter balanced by existence of Kapha at joints.

5) Amashaya (stomach) - Kapha, helps in digestion taking place in stomach. Kapha provides moistness, wetness to food. Due to action of Kapha, food becomes soft and easily digestible. Also stomach is protected from acidic digestive juices (of Pitta) by Kapha.

Origin of Kapha disease is many times also found in stomach. Therefore Kapha diseases are treated by the therapy acting on the stomach i.e. vaman (induced vomiting).

6) Rasa dhatu - This tissue is predominant in jala mahabhuta and does the similar function. Hence rasa dhatu and Kapha are similar in composition and function.

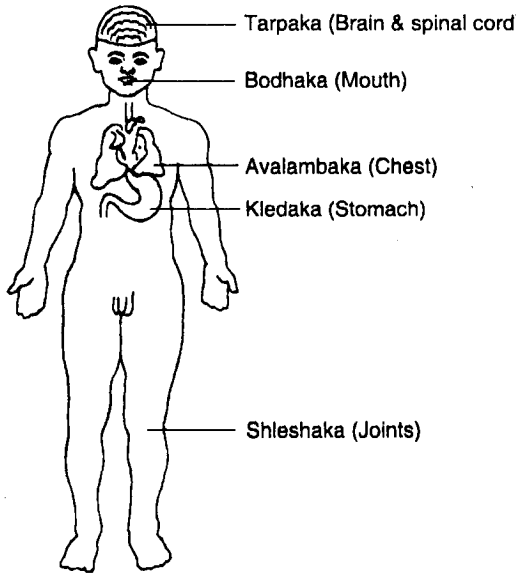
7) Medo dhatu (Fat) - This tissue has maximum oiliness. Kapha and fat are very similar in properties. That is why, Kapha aggravating diet for example excessive sweet and oily substances also make excessive fat deposition in the body (obesity). To cure obesity, the patient is asked to do the exercises to reduce stable property of Kapha.

8) Ghrana (nose) - This organ is concerned with smell, which is a property of prithvi mahabhut. Earth is also a part of Kapha composition. This clarifies relation of nose and Kapha. As nose is part of respiratory system, air is continuously taken in and thrown out through nostrils. Therefore, to protect nose from dryness, Kapha exists in nose. When there is loss of Kapha in the nose, disease like atrophic rhinitis develops. Treatment for this is nasal drops instillation (nasya) with anu oil, two drops three times a day.

9) Jivha (tongue) - Digestion starts from mouth itself. For

proper digestion, moisture is required, which is provided on the tongue and oral cavity by Kapha. This wetness also helps in understanding taste of a food. This is common experience, that after eating dry food, it is difficult to detect taste of the substances. Taste and Kapha both are related with jala mahabhuta.

Sub-types of Kapha dosha



The Five Forms of Kapha

1) Kledaka Kapha

'—यस्त्वामाशयसंस्थितः ।
क्लेदकः सोऽन्नसङ्घातक्लेदनात्—' ॥ (A.H.Su. 12:15)

'स तत्रस्थ एव स्वशक्त्या शेषाणां श्लेष्मस्थानानां शरीरस्य च उदककर्मणाऽनुग्रहं करोति' । (S.Su. 21:14)

Kledana means moisturizing or wetting. Kledaka kapha provides watery content to ingested food, which is helpful to moisten and soften the food. Pachaka pitta, then can act more potently on this food.

For the process of digestion, moistness, softness, unctuousness is necessary. For this reason Kledaka kapha exists in amashaya. Consider the cooking of vegetables or curry. In addition to the fire, the next important thing is not to forget to put oil, ghee or water into the cooking pan.

Normal digestion is dependant on Kledaka kapha. Naturally the functional capacity of other types of Kapha, at all other places is dependent on Kledaka kapha. Ayurveda says Kledaka kapha does obligation on other types of Kapha.

Udaka karma of Kledaka kapha means, to keep the adequate moisture in the body with the properties like liquid, cool and unctuous. Kledaka kapha is also important for the protection of stomach, colon from the action of acidic digestive juices.

2) Avalambaka Kapha

'हृदयस्यान्नवीर्याच्च तत्स्थ एवाम्बुकर्मणा ।
कफधाम्नां च शेषाणां यत्करोत्यवलम्बनम् ॥
अतोऽवलम्बकः श्लेष्मा—' ॥ (A.H.Su. 12:15)

'अवलम्बनं इति स्वकर्मणि सामर्थ्यं उत्पादयति' ।
(A.H.Su. 12:15, Arunadatta)

Avalambaka kapha stays in chest and supports trik – three elements. Avalamban means to give strength and to help the normal functioning of that organ. Trik denotes heart, lungs and mediastinum. Unctuous and slimy properties of Kapha give protection to these organs. Heart and lungs perform their duties from birth to death, wherever there is more movement, possibility of wear and tear is maximum. To minimize this damage and to provide nourishment is the function of Avalambaka kapha.

Avalambaka kapha from chest by its udaka karma (hydration) like kledana (moisturizing), tarpana (replenish) and

purana (supplementary) help to other types of Kapha for their smooth functioning.

Trik is also understood in different way by some Ayurvedic scholars. Dalhan says – trika means joint of head and both arms. Avalambaka kapha gives strength by its own action to the entire body.

Arunadatta and Hemadri describes Prishthadhara i.e. sacro-coccygeal region.

At both of the above places head and the whole body is balanced; naturally support of Avalambaka kapha is necessary.

3) Bodhaka Kapha

'रसबोधनात्। बोधको रसनास्थायी'। (A.H.Su. 12:17)

'जिह्वामूलकण्ठस्थो जिह्वेन्द्रियस्य सौम्यत्वात् सम्यग् रसज्ञाने वर्तते'। (S.Su. 21:14)

Bodhaka kapha does the bodhan of taste of the food. Bodhan means to make understand. Sweet, salty, bitter, pungent, astringent tastes are understood because of Bodhaka kapha. Understanding of taste is a type of transformation (digestion). This digestion also requires moisture, which is provided by Bodhaka kapha. It also protects buccal mucosa from very hot and spicy food and harmful substances.

4) Shleshaka Kapha

'—सन्धिसंश्लेषात् श्लेषकः सन्धिषु स्थितः'। (A.H.Su. 12:17)

Sandhi word generally refers bony joints like knee joint, wrist joint. But Ayurveda has broader understanding of the word sandhi. Sandhi means union of any two elements like bone and tendons, muscle and nerve etc.

Unctuous and slimy properties of Kapha bind the two elements of sandhi together. If the binding is good, joint

works very smoothly and naturally, otherwise deformity develops in the joint. In old age Vata dominates and synovial fluid becomes less in joints like knee, hip etc. This makes the disease like osteo-arthritis and patients complain of joint pain and swelling, difficulty in joint movement and cracking sound during movement.

Slimy (picchil) property of Kapha avoids friction of bones during joint movements.

'सन्धिस्थः श्लेष्मा सर्वसन्धिसंश्लेषात् सर्वसन्ध्यनुग्रहं करोति'।
(S.Su. 21:14)

Sushruta says that due to Shleshak kapha joint movements occur easily, just like movement of wheel around the central axis due to lubricating oil.

5) Tarpaka Kapha

'—शिरःसंस्थोऽक्षतर्पणात्—तर्पकः'। (A.H.Su. 12:17)

'शिरःस्थः स्नेहसन्तर्पणाधिकृतत्वात् इन्द्रियाणाम्। आत्मवीर्येण अनुग्रहं करोति'। (S.Su. 21:14)

Tarpaka kapha from head provides nourishment and protection to centers of sense organs in the brain. Due to cool and unctuous properties of Tarpaka kapha, senses can function smoothly and remain active for longer time. Tarpaka kapha keeps the control on Vata activity of the brain. This Kapha gives nourishment and protection to all parts in the cranium.

Pathology of Kapha

Hyper state (Kapha vriddhi)
Hypo state (Kapha kshaya)

1) Kapha-vriddhi

(Hyper activity)

'श्लेष्माऽग्निसदनप्रसेकालस्यगौरवम्।
श्वैत्यशैत्यश्लथाङ्गत्वं श्वासकासातिनिद्रता'॥ (A.H.Su. 11:8)

1) Agne-sadan – means weak digestive fire or agni-mandya. Loss of appetite, improper digestion, constipation results due to this. These complaints occur due to Kapha provocating causes like heavy diet, cold food and drinks. This lowers the hot property of Pitta and indigestion occurs. Fasting and use of garlic, ginger can reduce this problem.

2) Praseka – Excessive salvation. Due to vitiation of Kledaka kapha, digestion gets disturbed and then other types of Kapha also suffer.

3) Alasaka – Lethargy. Due to heavy, high calorie diet, cold food/drinks, sedentary lifestyle Kapha provocation occurs and obesity develops. This obstructs natural Vata stimulation and lethargy develops.

4) Gauravam – As said above, due to Kapha provocation body becomes heavier.

5) Shwaitya– Whitish color or paleness. Kapha aggravation produces this color.

6) Shlathangatva – Laxity and flabbiness in the body organs develop due to excess Kapha. Tone of the organs becomes less. Especially when Kapha provocation causes obesity, fat accumulation occurs on the abdomen, breast, thighs etc. Then these organs loose their tonicity and become flabby.

7) Shwasa (breathlessness) - Due to obstruction in the respiratory passage by hyper secreted Kapha, Prana and Udana activity gets disturbed. This causes breathlessness.

8) Kasa (cough) - Cough is a natural reflex to remove obstructions. (Excessive cough causes obstruction, as explained above)

9) Ati-nidra (excessive sleep) - Drowsiness. Due to excess Kapha properties like heavy, cold increases. Then this obstructs stimulatory activity of Vata, senses can not remain alert and the person feels drowsy.

2) Kapha-kshaya

(Hypo activity)

—कफे भ्रमः ।
श्लेष्माशयानां शून्यत्वं हृद्द्रवः श्लथसन्धिता' ॥ (A.H.Su. 11:16)

1) Bhrama – Giddiness. This is due to loss of Tarpaka kapha in the brain. Hence sense organs cannot get proper nourishment which produces giddiness.

2) Shleshma-shayana-shunyatvam – Hollowness in Kapha organs. Feeling of hollowness develops especially in the chest, head and the bony joints. This indicates the disturbance in Kapha activity of nourishment and stability.

3) Hrid drava – Means palpitation. This symptom indicates deficiency of Avalambaka kapha activity like nourishment and stability.

4) Shlatha sandhi – Due to deficiency of heavy, unctuous, stable qualities of Shleshaka kapha, bony joints become weak and flaccid.

Principles of Treatment

In Hyper state of Kapha dosha one should follow diet, behavior and medication opposite to the qualities of Kapha (unctuous, cool and heavy). For example, adequate exercise, no fatty food, no cold drinks, use of ginger, garlic, spices, chitrakadi churna, higvashtaka churna, bhallatakaksara, triphala guggulu etc.

Chapter 7

Tridosha in Detail

Why only Three Doshas?

This question can be answered with different understandings:

1) There are only three elements which are responsible for the formation of constitution (Prakriti).

2) There are only three elements in the body, which when vitiated can damage all body elements.

3) All the body functions can be classified into three groups - union (stability), transformation and movement (separation), so naturally these three functions are main functions of Kapha, Pitta and Vata respectively.

4) The whole universe is stable in balance due to three principle energies residing in moon, sun and wind. Similarly the body is stable in balance with three elements i.e. Kapha, Pitta and Vata.

5) Each and every element on this earth is made up of panchamahabhuta. Amongst these five mahabhutas, only three mahabhutas have the capacity to move. These three mahabhutas are Ap, Teja and Vayu. Hence, three energies formed from these mahabhutas are Kapha, Pitta, and Vata respectively. These are three doshas, which maintain body activities and seldom disturbs healthy condition. Here it is understood that Ap, Teja and Vayu mahabhutas have to work with Prithvi and Akasha mahabhutas for the forma-tion of three doshas.

Creation of Doshas

Concept of Prakrita and Vaikrita Dosha

Doshas, present at the time of birth and which are responsible for development of Prakriti are called as Prakrita dosha. The quality of these three basic doshas remains permanent in the body and do not change even after the effect of food or climate.

For day-to-day activity doshas are formed from various elements as follows - a) Rasa mala – Kapha, 2) Rakta mala – Pitta, c) Anna mala – Vata. This means that Kapha dosha is formed as byproduct from the metabolism that takes place during the formation of rasa dhatu, Pitta dosha is formed as byproduct at the time of metabolism that takes place during the formation of rakta dhatu and energy that the body receives from the food is called as Vata dosha. These doshas are called Vaikrita doshas. The quantity of these Vaikrita doshas changes according to age, season, phases of digestion etc.

Relation of Dosha and Dhatu

(Ashraya-ashrayi relation)

Doshas are all pervading in the body. But each dosha acts with specific media of dhatu. This media is called as 'ashraya' i.e. shelter. Doshas are the shelter-users and called 'ashrayi'.

1) Kapha dosha is ashrayi which shows its activity through its ashraya (shelter) i.e. rasa, mamsa, meda, majja and shukra. The function of ashrayi and ashraya is the same, i.e. to keep the union process at molecular level to provide nourishment, stability and support.
2) Pitta dosha is ashrayi. Ashraya of Pitta is rakta and sweda. There is a gross similarity in the properties and functions of Pitta and rakta.
3) Vata dosha is ashrayi and hollow spaces in bones are

ashraya (shelter) of Vata dosha. (Please note that the hard part of bones is related to Kapha).

Importance of Dosha-Dhatu Relation

1) There exists a close relationship in between ashraya (dhatu) and ashrayi (dosha). The both affect each other. If dosha gets disturbed they attack on ashraya (dhatu). Ashraya and Ashrayi get disturbed simultaneously. For example, if Pitta dosha increases, rakta and sweda also increases and if rasa increases then Kapha increases.

Exception is the relation of Vata and Asthi.

When Vata increases, asthi decreases. And if hollow spaces in asthi increase (e.g. osteoporosis) Vata activity decreases (like movements).

2) While examining the functions of dosha, one can concentrate on concerned dhatu (ashraya). It is easier to examine the ashraya of Kapha and Pitta rather that of Vata. Examination of ashraya is many way useful to assess the quality and quantity of dosha.

Importance of understanding Sites of Dosha

'ते (दोषः) सर्वव्यापिनः । (A.H.Su. 1/7)

Although they occupy the whole body, their main sites are as follows:

Kapha - Upper part of the body (chest)
Pitta - Middle part of the body (around umbilicus)
Vata - Lower part of the body (pelvis and lower extremities)

'ते व्यापिनोऽपि ह्रत्राभ्योरधोमध्योर्ध्वसंश्रयाः' । (A.H.Su. 1:7)

In above mentioned places, comparatively, the functions of concerned dosha are predominant. For example the site around umbilicus, means in stomach and small intestine. The digestion function of Pitta dosha is predominant in these organs.

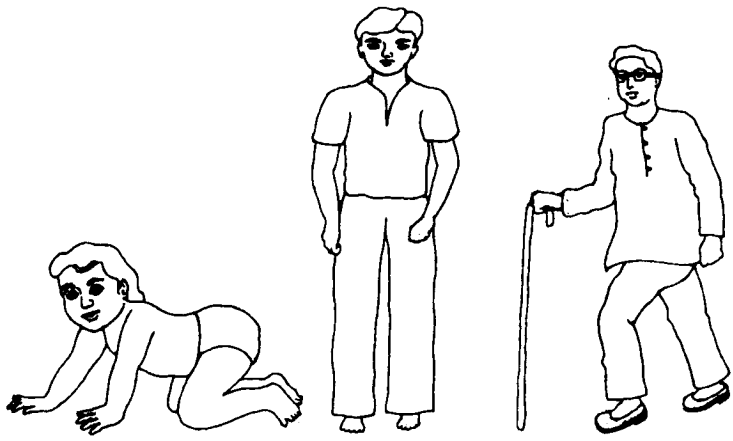
We have also seen specific sites of dosha. In vitiation of dosha, we can examine specific sites of dosha first. Also for the treatment purpose, concept of specific site is useful. e.g. for treating Vata it is always useful to give basti (medicated enema), as this has action on large intestine which is the main site of Vata dosha.

Circadian Rhythm of Tridosha.

'वयोऽहोरात्रिभुक्तानां तेऽन्तमध्यादिगाः क्रमात्' । (A.H.Su. 1:7)

Tridoshas are in state of constant flux. They increase and decrease according to age, day and night, stages of digestion of food and seasons. However this flux or increase and decrease in within normal physiological limits and do not cause any disease. This is called as the circadian rhythm.

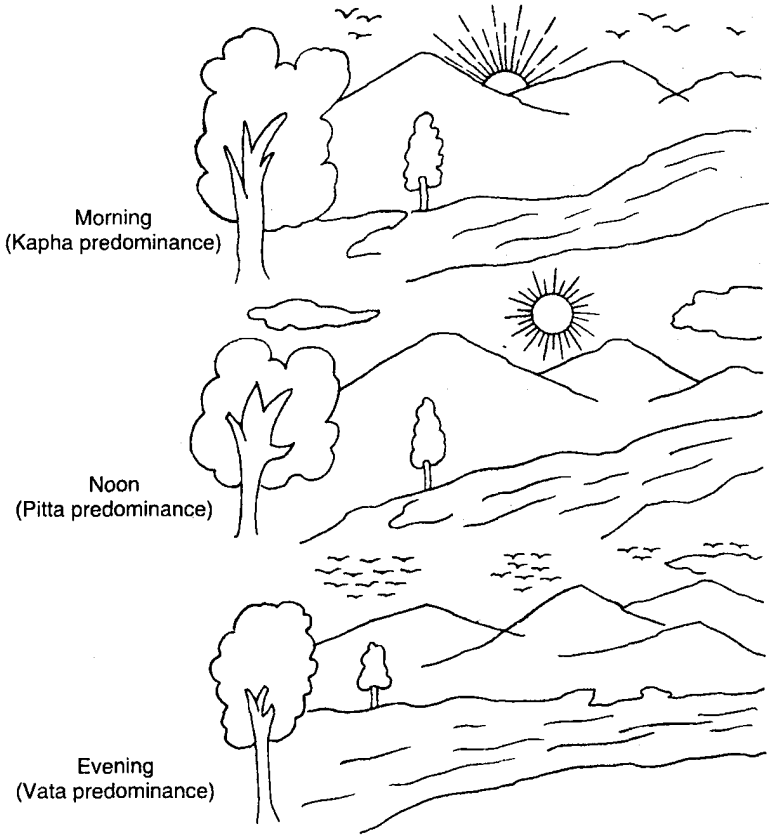
1) Age - In childhood, Kapha properties and activities are predominant (growth process is of Kapha nature). Pitta is dominant in middle age and Vata is dominant in old age (that is why regular soft oil massage is useful in old age).



Childhood (Kapha predominance) | Young age (Pitta predominance) | Old age (Vata predominance)

2) Day and Night cycle –

Day	Night
6 to 10 am - Kapha	6 to 10 pm - Kapha
10 to 2 pm - Pitta	10 to 2 am - Pitta
2 to 6 pm - Vata	2 to 6 am - Vata



3) Digestion – Immediately after lunch or dinner, Kapha is predominant, so body becomes heavy and lethargic. After one and half hour secretions of Pitta predominant juices and enzymes start and at this time naturally the person feels thirsty and little bit hot. Later on after another one and half hours again movements become easier which is phase of Vata predominance.

This type of high and low variations are natural physiological variations. Hence they do not disturb the body mechanism. On the contrary, Ayurvedic physician can take the benefit of this natural increase and decrease phenomenon e.g. Vaman (therapeutic vomiting) therapy should be done in the morning time (around 7 am), because at this time Kapha is predominant, so it is easier to take it out.

Relation of Tridosha & Triguna

Let us first see, the concept of Triguna. We have seen that each & every substance on this earth is panchabhautik (made up of five elements).

'सर्वं द्रव्यं पाञ्चभौतिकम् अस्मिन्नर्थे'। (C.Su. 26:10)

But for the creation of any substance in the Universe, first the activity by triguna namely sattva, rajas and tamas are necessary. Trigunas are super qualities and hence are also called as omni-substances. Sattva is light and is responsible for intelligence and knowledge. Rajas is stimulator, activator, and mobile. Tamas is controller of the activity and heavy in nature. Trigunas are called as Mahaguna.

'सत्त्वं प्रकाशकं विद्धि रजश्चापि प्रवर्तकम्।
तमो नियामकं प्रोक्तं अन्योऽन्यमिथुनप्रियम्' ॥ (K.Su.)

'सत्त्वरजस्तमश्चेति त्रयः प्रोक्तां महागुणाः'। (A.H.Su. 1:38)

However the question is that how the entire matter in the Universe can be formed from the qualities?

First somebody gets an idea about formation of new article. This new conception is due to intelligence in the brain. This is Sattva property.

Rajas quality is responsible for execution of programming i.e. the activity of creation.

Tamas quality is responsible for stopping the activity at expected moment. This is controlling mechanism.

From the above explanation it will be clear that sattva, rajas and tamas are required for the formation of every substance in the Universe. Therefore like Panchamahabhuta, triguna are also necessary for the formation of human body. In human body their predominance at the time of birth, decides the psychological constitution.

At the level of mind, sattva is considered as guna or the good quality of mind and rajas & tamas are called as dosha or the bad quality. This is because; Sattvika mind directs the person towards health conscious habits and keeps him healthy by proper understanding and knowledge about diet, behavior etc. While rajas & tamas leads to turbulence and inertia in the mind which is prone for prajnaparadha and can ultimately become the cause of diseases.

In medical practice also it is important to know the psychological constitution of the patient, so that his symptoms can be understood and can be treated better. For example, Sattva predominance make the patient for more tolerant for pain, he follows exactly the instructions of physician faithfully and so responds well to treatment. On the other hand Rajasika predominant patient has very low tolerance for the pain which makes him panicky. He exaggerates the symptoms, remains always doubtful about the treatment. Tamasika predominant patients are ignorant of the health problems. They are lethargic and sometimes adamant.

In short - Triguna can be responsible for 1) curiosity, 2) activity and 3) stoppage of activity.

Up till now, we have discussed about triguna. If we compare the similar properties and functions of triguna and tridosha, we can establish some relation in them. This relation is mentioned in following table, as per 'Law of Predominance' *(vyapadeshastu bhuyasah)*.

It has been said that Vata is rajas predominant, Pitta is sattva predominant and Kapha is tamas predominant, still we do find that there is predominance of other gunas in doshas also.

'पवनः रजो गुणमयः, पित्तं सत्त्वगुणोत्तरान्, कफः तमोगुणाधिकः' ।

Relation of Triguna - Tridosha

No.	*Triguna*	*Tridosha*	*Similarities*
1.	Sattva	Pitta	Fire, Light, knowledge
2.	Rajas	Vata	Mobility, stimulator
3.	Tamas	Kapha	Stability, inertia

Above table indicates only comparatively predominance. Actually each dosha is composed of all trigunas.

Now, henceforth, always remember that each and every element on this earth is made up of 'panchamahabhuta' and 'triguna'.

Relation of Tridosha & Six Tastes

We consume the food, having 6 types of Tastes - 1) sweet (madhur), 2) sour (amla), 3) salty (lavana), 4) pungent (katu), 5) bitter (tikta) and 6) astringent (kashaya).

The relation amongst tastes & Tridosha is mainly useful to understand Pathology & Treatment. But for easy reference, the relation is given in tabular form.

	Vata	*Pitta*	*Kapha*
Tastes which cause vriddhi	Katu, tikta, kashaya	Katu, amla, lavana	Madhur, amla, lavana
Tastes which cause kshaya	Madhur, amla, lavana	Madhur, tikta, kashaya	Katu, tikta, kashaya

Chapter 8

Shvasan Prakriya

(Respiration)

Introduction

Respiration process is not directly described in Brihat-trayi (Charaka, Sushruta and Ashtanga Hridaya). But respiratory problems are mentioned in abnormalities of Pranavaha srotas.

Srotas is named according its main content and the substance it carries (like prana, anna, udaka, rasa) and not according to its functions or organ (like respiration, digestion, musculo-skeletal system).

Shvasan mainly includes 2 phases - 1) nishvasa (inspiration) and 2) uchchhvasa (expiration). By the process of inspiration, human being accepts prana-dravya from nature and through expiration, five gaseous wastes, formed during metabolism is thrown out of the body.

Organs Related with Shvasan-prakriya

Shvasan occurs, mainly through Pranavaha srotas. But for proper respiration, the functioning of other srotasas, should also be normal.

- The main site of Shvasan is chest.

Respiratory tract can be considered as :

1) Ist part (urdhwa) jatrugata = from nose to pharynx.
2) 2nd part is from pharynx to lungs

Organs – Mukhavivara, nasika, trachea, apastambha (bronchi), phupphusa (lungs).

1) Nasika (nose) - Nasa srotas has been mentioned in

Sushrut-Uttara tantra. The region from nose to throat is like English letter 'S'. Arunadatta has described it as 'phanakriti marga'.

2) Mukhavivar (mouth cavity) - Sushruta has described it as Vaktra. Prana moves in the mouth cavity.

'यो वायु: वक्त्रसञ्चारी स प्राणो नाम—'। (S.Ni. 1:13)

Dalhana in his critics has given the name mukha-kuhar to mukhavivar.

3) Kantha-nadi - Vayu, which enters through mukha and nasika passes through kantha-nadi, apastambha and finally enters in phupphusa.

4) Phupphusa (lungs) - Sushruta has used the word 'phupphusa' in singular form. Sushruta has mentioned hridaya and 10 dhamanis as mula-sthana of Pranavaha srotas, while Charaka has mentioned mahasrotas and hridaya as mula-sthana. Here phupphusa are not directly mentioned. But we feel that, by the name hridaya, we should consider heart and lung apparatus.

Phupphus (lungs) is formed from = blood - shonitaphena.

'शोणितफेनप्रभव: फुप्फुस:'। (S.Sha. 4:25)

Note: Srotas is specific concept in Ayurveda. Srotas means hollow channel. Human body is formed from innumerable hollow channels. So human being is called as '*srotomayam purushah*'. Srotas is concerned with 4 important activities - (i) creation (ii) transformation (iii) transport and (iv) excretion.

To understand Shvasan process properly, one has to consider also the organs like heart, diaphragm, chest and abdominal muscles.

Shvasan & Dosha-Dhatu-Mala

Shvasan process is mainly concerned with prana & udana

vayu, sadhaka pitta, avalambaka kapha, rasa, rakta, mamsa, asthi, majja and subtle gaseous waste products.

1) Function of Prana Vayu:

'उरः कण्ठचरो बुद्धिः हृदयेन्द्रियचित्तधृक् ।
ष्ठीवनक्षवथूद्गारनिःश्वासान्नप्रवेशकृत्' ॥ (A.H.Su. 12:5)

'प्राणोऽत्र मूर्धगः' । (A.H.Su. 12:4)

'प्राणो ह्यभ्यन्तरो नृणां बाह्यप्राणगुणान्वितः ।
धारयत्यविरोधेन शरीरं पाञ्चभौतिकम्' ॥ (A.H.Su. 17:13)

Prana vayu from head gives stimulation to all the muscles of respiration, for expansion. It also stimulates diaphragm and abdominal muscles. Due to its activity the chest cavity broadens and inspiration occurs.

External prana (pure air & oxygen) gives strength to internal Prana (energy in physical body + senses + mind). This function is described as "*Pranah cha api avalambate*". If respiration remains normal (with the proper functioning of Prana) life is maintained.

2) Function of Udana Vayu:

'उरःस्थानमुदानस्य, नासानाभिगलांश्चरेत्' । (A.H.Su. 12:5)

'भाषितगीतादिरिति आदिशब्दात् उच्छ्वासादि' ।
(S.Ni. 1:14, Dalhana)

Prana vayu is responsible for inspiration and Udana vayu is responsible for expiration. Subtle, gaseous waste, formed during metabolism is expelled out in expiration. If waste is not thrown out, toxins remain in body and patient can become unconscious or may die. There should be proper co-ordination in inspiration and expiration.

3) Function of Sadhaka Pitta:

Vitiated Sadhaka pitta can disturb the mental functions producing mental stress, and fear which can affect respiratory rate.

4) Function of Avalambaka Kapha:

Oily and slimy properties of Kapha can protect the important organs like heart and lungs. Respiration is a continuous process, from birth to death. To prevent the damage of heart and lungs, from its continued activity, Kapha helps by its properties like cool, unction, soft and steady. Due to Kapha, heart and lungs can function for longer time, contraction and relaxation can occur smoothly.

5) Rakta, Mamsa, Meda, Asthi, Majja:

These body tissues are closely related with the respiration. e.g. If rakta dhatu is deficient (anemia), external prana (oxygen) can not be efficiently transported and hence respiratory rate increases.

Similarly in old age or in chronic stage of any disease, due to vitiation of Vata, respiratory rate increases.

Normal respiration depends upon, normal anatomy and normal dosha, dhatu & mala functions.

Normal physiology depends on normal anatomy. We cannot understand pathology unless we know anatomy, for example - If the patient comes with symptom of breath-lessness we must find the cause, so that we can treat it properly. For this the physician must examine anatomy and physiology. Cause for breathlessness may be DNS (deviated nasal septum – which is anatomical problem) or disturbance in Prana-Udana action (physiology is disturbed) due to obstruction by Kapha.

Shvasan-prakriya

(Respiration Process)

Sharangadhara has explained this procedure in brief but in a very peculiar fashion.

'नाभिस्थ: प्राणपवन: स्पृष्ट्वा हृत्कमलान्तरम् ।
कण्ठाद् बहिर्विनिर्याति पातुं विष्णुपदामृतम् ॥

पीत्वा चाम्बरपीयूषं पुनरायाति वेगतः ।
प्रीणयन् देहमखिलं जीवयञ्जठरानलम्' ॥ (Sha.Pu. 5:48-49)

Prana-pavan (prana vayu), from umbilical region, after touching hritkamala goes out through Kantha. Then it reaches *vishnupada* and after drinking *ambara-piyusha*, speedily comes back. Then this prana vayu carries out the function like prinana, jivana and stimulates jatharanala or jatharagni.

Above verse is a word to word translation. But this verse of Sharngadhara explains many important steps, systematically, as follows :

The word umbilical region, explains the participation of diaphragm and abdominal muscles in the process of respiration.

The direction of expiration from abdomen is in the upward direction, through chest and throat region.

Ambarapiyusha - principally explains the intake of oxygen.

Punarayati - explains the inspiration and expiration.

Prinan word denotes the instant refreshing effect due to intake of oxygen.

Jatharanalam - stimulation of digestive fire, means stimulation of oxidation process.

According to Ayurveda, Prana vayu controls the process of respiration, by active dilatation of chest (expiration is a passive recoiling) and Udana vayu is responsible for expiration.

In Pranavaha srotas, external *prana dravya* is converted into absorbable form and then it is transported with rakta throughout the body.

'प्राणो हि रक्तम् अनुधावति' । (C.Su. 24:4)

Sharngadhara also explains dhatu-poshana or tissue nourishment through Vayu.

'सिरा धमन्यो नाभिस्थाः सर्वां व्याप्य स्थितास्तनुम्' ।
पुष्यन्ति चानिशं वायोः संयोगात्सर्वधातुभिः' ॥ (Sha.P. 5:88)

Therefore although respiration although is the process occurring through Pranavaha srotas, all the body tissues are affected by it.

Shvasan Sankhya

(Respiratory rate)

Yogachudamani Upanishad has given the reference of exact number of normal respirations in human being.

'हकारेण बहिर्याति सकारेण विशेत्पुनः ।
हंसहसेत्यमु मन्त्रे जीवो जपति सर्वदा ॥
षट्शतानि दिवारात्रौ सहस्राण्येकविंशतिः' ॥
(Y.Chu.Up. 1:31-32)

According the above verse, calculations of respiration are as follows:

1 day = 21,000 respirations
1 hour = 900 respirations
1 minute = 15 respirations

The same respiratory rate (15/min) is now, also accepted by the modern physiology.

Importance of Respiration

Respiration is very much essential for the life i.e. jeevan function of rakta.

When respiration gets disturbed, all the body elements suffer. Especially *sadyah pranahara marmas* like heart and brain may stop functioning and the person can die.

Vayoh rakta-sancharana – Circulation of Vata with blood: Actually this topic has been explained further under the title O_2 and CO_2 carriage by blood.

But the student should at least note that, Charaka has already mentioned that ***Pranohi raktam anudhavati*** – Circulation of Prana with blood.

Ambarapiyusha is accepted from the air and then it is carried to all body tissues through blood. In the anemic patient, this activity is hampered due to less hemoglobin. Therefore the respiratory rate increases to compensate the mechanism. Breathlessness or dyspnoea on exertion is one of the symptoms of anemia.

Role of Vata in Pranayama & its Importance

(Pranayama gata vayuh, tasya mahattvam)

Yoga and Ayurveda allied sciences and can be used for preventive and curative aspect.

'Yoga' means control of physical & mental activities.

Eight stages of yoga are:

1. Yama - means self disciplinary rules e.g. speaking always truth, non-violence etc.
2. Niyama - rules for social conduct.
3. Asana - physical postures.
4. Pranayam - breathing exercises.
5. Pratyahara - control over sense organs.
6. Dharana -
7. Dhyana – meditation.
8. Samadhi - ultimate stage of physical and mental control with gain of eternal happiness or bliss.

This is called as Ashtanga yoga.

Pranayama

Pranayam means *'Pranat ayam'*. Ayam means extension or pause. Therefore Pranayama is conscious rhythmic breathing with pause.

There is a direct relation in between physiology/pathology and respiratory rate. In quiet, relaxed state, the respiration rate is normal and smooth. But in emotional upsets like anger, the respiratory rate increases and become irregular.

Life span and respiratory rate is also related, for example, in tortoise respiratory rate is low 5-6/min & life span is 100 years. Dog's respiratory rate is 28-30/min. & its life span is only 15-20 years.

Therefore it is better to have control on respiratory mechanism.

When the chest or abdominal cavity is normal, the respiratory rate is normal, but if there is abnormality in chest cavity (like pleurisy or anatomical deformity) or in abdominal cavity (like ascites etc) the respiratory rate alters.

Controlled respiration is also useful to maintain the healthy state of koshtha (hollow spaces).

Pranayama is method to control respiratory mechanism.

Yogic sciences explains 4 phases of respiration:

a) Puraka - Inspiration
b) Antah-kumbhaka - To hold the breath, after inspiration.
c) Rechaka - Expiration
d) Bahih-kumbhaka - To hold the breath after expiration

Advantages of Pranayama

Pranayama is not only lung-exercise. While controlling respiration, automatically mind control also occurs. Hence all the sensory and brain functions improve. This reflects in improving quantity and quality of life.

Caution for Pranayama

For practicing Pranayama requires specific training and skill. Therefore it is advisable to learn it from yoga-teacher.

It is advisable to clean the body before Pranayama. This can be achieved by Ayurvedic panchakarma or yogic cleansing processes like dhauti, neti, nauli etc.

Duration of Pranayama

Normally one respiration requires 4 sec. Hence, to begin with Purak & Rechek can be practiced for 2 & 4 sec. respectively. Pranayama can be done 5 times in one sitting. This can be increased up to 15-20 times in one sitting.

Method of Pranayama

Take a comfortable position, close the right nostril and inspire deeply through the nostril. Now gradually release the right nostril and expire. The same procedure can be repeated while closing left nostril. Practice gradually antah-kumbhak & bahi-kumbhak. Pranayama can be suppleme-nted with chanting of 'OM' or Gayatri mantra. Any step of Pranayama, if done forcefully, can harm the person.

Note : Sushrut in sutra-sthana has mentioned Dirgha shvasa (prolonged respiration) as one of the symptom of Dirghayu or long life.

Pranayam gata vayu niyantran

It is useful to control the Vata while carrying out Pranayama. In some diseases, in addition to conventional treatment, supplement of Pranayama is definitely useful.

RESPIRATION

(Modern view)

Four major events in respiration are as follows:

1) Pulmonary ventilation
2) Diffusion of O_2 & CO_2 between alveoli and blood
3) Transport of O_2 & CO_2 - to & from the cells
4) Regulation of ventilation.

1) Pulmonary Ventilation

Lungs can be expanded and contracted by 2 ways - (i) down ward and upward movement of diaphragm, (ii) elevation and depression of ribs.

Normal quiet breathing mainly involves inspiratory movement of diaphragm. During expiration, diaphragm simply relaxes and elastic recoil of lungs, occurs. Muscles that elevate chest cage can be classified as muscles of respiration (which include mainly - neck muscles). Muscles which depresses chest, are the muscles of expiration (which include abdominal recti)

Intra-Alveolar Pressure

During inspiration, the intra-alveolar pressure becomes slightly negative with respect to atmospheric pressure (normally, slightly less than - 1 mm Hg). During normal expiration, the intra-alveolar pressure slightly rises (slightly less than + 1 mm Hg).

Recoil Tendency of Lung

These fibers in the lungs account for 1/3rd of recoil tendency and surface tension of fluid lining the alveoli accounts for 2/3rd of recoil tendency.

Elastic fibers

Surfactant - Reduces collapse tendency.

A lipo-protein mixture, which is called as surfactant, is secreted by type 2 granular pneumocytes (alveolar epithelium surfactant is very important, for minimizing the effect of surface tension in causing collapse of lungs). In premature babies, inadequate quantities of surfactant, makes lung expansion difficult. This condition of inadequate ventilation is called as Hyaline membrane disease or Respiratory distress syndrome.

Lung Compliance

The expansibility of lungs and thorax is called 'compliance'. Expressed as - volume increase in lungs for each unit increase in intra-alveolar pressure. Normal compliance of lungs and thorax together = 0.13 liter/cm. of water pressure.

The condition, which destroys, lung tissue, or become fibrotic or edematous and blocks the bronchioles, is known as decreased lung compliance.

Also, deformities of chest cage (kyphosis, scoliosis), fibrotic pleurisy or paralyzed and fibrotic muscles also results in reduce compliance.

Breathing

Respiratory muscles, normally work only to cause inspiration, because expiration is entirely a passive process (elastic recoil of lung).

Work of Inspiration - (1) Work required to expand lungs, against its elastic forces (compliance work), (2) Work required to over come the viscosity of lung and chest wall structures (tissue resistance work), (3) Work required to overcome air way resistance (airway resistance work).

During normal quiet respiration, only 2 to 3% of total energy expended by body is required to energize, pulmonary ventilatory process.

Lung Capacities

A simple method for studying pulmonary ventilation is to record, the volume movement of air in & out of lungs. This process is called as spirometry.

Pulmonary Volumes

Tidal Volume (TV) = Volume of air inspired or expired with each normal breath (500 ml.).

Inspiratory Reserve Volume (IRV)= Extra volume of air that can be inhaled forcefully, after the end of TV (3000 ml.).

Expiratory Reserve Volume (ERV) = Amount of air that can be exhaled forcefully, after the end of normal tidal expiration (1100 ml).

Residual Volume (RV) = Volume of Air still remaining in lungs after the most forceful expiration (1200 ml.).

Pulmonary Capacities

Inspiratory capacity = Tidal Volume + IRV = 350 ml.
Functional Residual Capacity = ERV + RV (2300 ml.).
Vital Capacity = IRV + TV + ERV (4600 ml.).

Total Lung Capacity = Maximum volume to which lung can be expanded with the greatest possible inspiratory effort (5800 ml.).

Note :- (i) All pulmonary volumes and capacities are 20 to 25% less in females than in male, (ii) Values are greater in large and athletic person than in small and asthenic persons.

Vital Capacity

Other than anatomical build of a person, vital capacity - depends on (i) position of a person, during measurement (ii) strength of respiratory muscles (iii) Dispensability of lung & chest together (compliance).

The average vital capacity in young adult male is = 4.6 lit. Young adult female = 3.1 lit.

i) Paralysis of respiratory muscles (spinal cord injuries or poliomyelitis) - capacity decreases up to 1/2 to 1 lit.
ii) T.B, emphysema, chronic asthma, lung cancer, chronic bronchitis and fibrotic pleurisy - reduces pulmonary compliance.

Vital Capacity measurements are very important for assessing the progress of different types of diseases.

Minute Respiratory Volume

MRV = Total amount of new air, breathed each minute.

MRV = TV x R.R. (respiratory rate) = 500 x 12 = 6 lit/min.

Person can live for short periods of time with MRV - 1.5 lit/min.

Young male adult has maximum breathing capacity (MRC) = 100-120 lit/min.

Alveolar Ventilation

Rate, at which new air does reach in gas exchange areas (alveoli) is called as alveolar ventilation.

Dead Space

Some of the air that a person breathes never reaches the gas exchange areas, but only fills, the respiratory passages.

This air is called as dead space air, because it is not useful for gas exchange process.

Normal dead space air in young adult is 150 ml. The amount increases slightly with age.

Anatomical and physiological dead space - All space of respiratory system, besides, gas exchange areas is called the anatomical dead space.

But, some of the alveoli, are not functional or partially functional, due to absent or poor blood flow. Therefore, from functional point of view, these alveoli, must be considered as physiological dead space.

In normal person, anatomical & physiological dead spaces are nearly equal, because nearly all alveoli are functioning.

But in persons with partially functional or non-functional alveoli, physiological dead space is sometimes, 10 times more than anatomical dead space.

Alveolar Ventilation

$VA = Freq \times (V_T - V_D)$

VA = Alveolar ventilation

Freq = R.R. (Respiratory rate)

V_T = Tidal volume

V_D = Dead space volume

$VA = Freq \times (V_T - V_D)$

$VA = 12 \times (500 - 150)$

$VA = 4200$ ml/min

Alveolar ventilation - determines the concentration of O_2 & CO_2 in alveoli.

Functions of Respiratory Passage

1) Nose - (i) Air is warmed by extensive surface of turbinates and septum (ii) Air is moistened (iii) Air is filtered by hairs and precipitation of particles on conches.

All these functions, together are called as 'Air conditioning function'.

Note : When tracheotomy is done, person breathes air, through tube, directly into trachea. Here cooling and drying effect in trachea and lungs, can lead to lung infection.

2) Trachea - Bronchi & Bronchioles : Multiple cartilage rings prevent the trachea, from collapsing, during inspiration. Less extensive cartilage plates are there in bronchi. **These plates completely disappear in bronchioles.** The walls of bronchioles mainly consists of smooth muscles. (exceptions - terminal or respiratory bronchiole).

Obstructive diseases of lung causes narrowing of muscular bronchioles, due to excessive contraction of smooth muscle. (e.g. in chronic bronchial asthma).

Bronchioles and nervous control - Parasympathetic nerve fibers from vagus - secrete acetylcholine and cause mild to

moderate constriction of bronchioles. Drugs, which block the effect of acetylcholine e.g. atropine - can relax the bronchioles, to relieve the obstruction.

Bronchioles and humoral substances - (i) histamine and (ii) slow reactive substance of anaphylaxis - Both these substances are released in lung tissue, by mast cells, during allergic reactions. (Pollen allergy). They cause airways obstruction (in bronchial asthma). Also other irritants like smoke, dust, sulfur dioxide, acidic element in smog - all cause similar local reactions, which cause obstructive constriction of bronchioles. Anti-allergic or anti-histaminic drugs are useful in these conditions.

Hormonal Effect

Epinephrine and nor-epinephrine are secreted by adrenal glands, in response to sympathetic stimulation. These hormones relax the bronchioles. So in severe attack of bronchial asthma Inj. Adrenaline S/c is given to relieve bronchial spasm.

Use of Mucous & Cilia

Respiratory passages from nose to terminal bronchiole are kept moist by a layer of mucus, which is secreted by goblet cells and submucous glands. Mucus, keeps the surfaces moist and also traps small particles, from inspired air.

Mucus, itself is removed by ciliated epithelium (200 cilia on each epithelial cell). Cilia beat at a rate 10-20 times/sec. power stroke is always toward the pharynx. So mucus and its entrapped particles are either swallowed or coughed to the exterior.

Cough Reflex

Bronchi and trachea are so sensitive that any amount of foreign matter or irritation initiates cough reflex. Afferent

impulses pass from the respiratory passages through vagus to medulla.

2) Gaseous Exchange

After alveoli are ventilated, the next step is diffusion of O_2 from alveoli into pulmonary blood and diffusion of CO_2 in opposite direction. Gases can move from one point to another by diffusion. The O_2 diffuses from alveoli into pulmonary capillary blood, because of pressure difference. pO_2 in alveoli is greater than in pulmonary blood - pO_2 is lower in the cells than in arterial blood, entering the capillaries.

O_2 is metabolized with foods in the cells to form CO_2. pCO_2 rises to high value in cells, so CO_2 diffuse from cells into tissue capillaries. Also pCO_2 is lower in the alveoli than in blood. Therefore transport of O_2 and CO_2 depends on both diffusion & movement of blood.

The exchange of O_2 and CO_2 are passive (i.e. no ATP is consumed). Exchange of gases can be explained by two gas laws: (1) Dalton's Law (2) Henry's Law.

1) Dalton's Law - Each gas in a mixture of gases, exerts its own pressure, as if all the other gases were not present. The pressure of a specific gas in a mixture is called its partial pressure and is written as P.

Atmospheric pressure (760 mm Hg) = pO_2 + pCO_2 pN_2 + pH_2O.

Partial pressures are important in determining the movement of O_2 and CO_2 between the atmosphere and lungs, the lungs and blood & blood and body cells.

A) External or pulmonary respiration.

pO_2
Atmospheric air = 160 mmHg

Alveoli = 105 mmHg
Pulmonary blood = 100 mmHg
Capillary

pCO_2
Atmospheric air = 0.3 mmHg
Alveoli = 40 mmHg
Pulmonary blood = 45 mmHg
Capillary

B) Internal Tissue Respiration :

pO_2
Systemic blood capillary = 100 mmHg
Systemic tissue Cells = 45 mmHg

pCO_2
Systemic blood capillary – 40 mm Hg
Systemic tissue cells – 45 mm Hg

2) Henry's Law - The quantity of a gas that will dissolve in a liquid is proportional to the partial pressure of gas and its solubility coefficient, when the temperature remains constant.

Note - Clinical utility of this law is in the use of hyperbaric oxygenation (HBO). When the patient is infected with anaerobic bacteria like tetanus, or in gangrene - HBO technique is used for treatment, in which pressure is used to dissolve more O_2 in the blood. Anaerobic bacteria can not live in the presence of free O_2

3) O_2 & CO_2 Carriage by Blood

1) Oxygen Transport

About 1.5% is carried in dissolved state in plasma & 98.57 are transported with Hb.

$$Hb + O_2 \rightleftharpoons HbO_2 \text{ (Oxyhemoglobin)}$$

O_2 partial pressure (pO_2), determines how much O_2 combines with Hb. The relation between, percent saturation of Hb & pO_2 can be shown by O_2 - Hb dissociation curve. When pO_2 is high, Hb binds with large amounts of O_2 and is fully saturated (in pulmonary capillaries).

In tissue capillaries, where pO_2 is lower (40 mm Hg), O_2 is dissociated from Hb and is released for diffusion into tissue cells.

Apart from pO_2, some other factors also influence with which Hb, binds O_2.

O_2 dissociation from Hb is faster, when pH decreases (acidity increases), **pCO_2 rises, at high temperature, greater level of BPG.**

Note - BPG = 2.3 - biphosphoglycerate - a substance found in RBC. Certain hormones e.g. thyroxin, GH, epinephrine, testosterone, increase the formation of BPG. It is also high in the people who live at higher altitudes.

2) CO_2 - Transport

i) Dissolved CO_2 - 7% is dissolved in plasma.

ii) Carbaminohaemoglobin - 23% combines with globin portion of Hb.

Hb + CO_2 - Hb - CO_2 (Carbamino hemoglobin)

iii) Bicarbonate ions - 70% is transported in plasma as bicarbonate ions.

$CO_2 + H_2O$ -CA- $H_2CO_3 - H^+ + HCO_3$

(Carbonic acid) (Bicarbonate ions)

CO_2 diffuses into tissue capillaries and enters RBC. It reacts with water, in the presence of enzyme carbonic anhydrase (CA) which is present in RBCs.

The carbonic acid dissociates into H^+ & HCO_3. Many of H^+ combines with Hb (H^+ Hb). As HCO_3 accumulates inside

the RBC, some diffuses into plasma. In exchange, chloride ions (ct) diffuse from plasma into RBC. This phenomenon is called as chloride shift. **The effect of this is that CO_2 carried from tissue cells as HCO_3 (bicarbonate ions) in plasma.**

Control of Respiration

In the human body there is a specific mechanism which co-ordinate respiratory effort - to metabolic demand. Basic rhythm of respiration is controlled by some part of medulla oblongata and pons.

Respiratory Centre:

The area from which news impulses are sent to respiratory muscles - 3 Areas.

a) Medullary rhythmicity area in medulla oblongata - This area controls the basic rhythm of respiration. (inspiration = 2 sec, expiration = 3 sec).

b) Pneumotaxic area in Pons - Transmits inhibitory impulses to inspiratory area (which help to turn off the **inspiratory area before the lungs become too full of air).**

c) Apneutic area in Pons - Sends stimulatory impulses to inspiratory area (This can occur only when pneumotaxic area is inactive).

Factors affecting the activity of Respiratory Center

i) Cerebral Cortex - One can voluntarily alter the pattern of breathing. Voluntary control is protective, because then one can avoid water or irritating gases entering the lungs. Nerve impulses from the hypothalamus and limbic system also stimulate the respiratory center.

ii) Chemical Regulation - Central chemoreceptors are situated in medulla oblongata. Peripheral chemoreceptors are in the walls of systemic arteries. They are located in the aortic body (in the wall of arch of aorta) and carotid bodies

(in the wall of left and right common carotid arteries). Both chemoreceptors are stimulated due to high pCO_2 and rise of H^+ ion concentration. Peripheral chemoreceptors also respond to Hypoxia.

iii) During exercise, nerve impulses from proprioceptors (which monitor movement of joints and muscles) stimulate inspiratory area of medulla.

iv) Hering - Breuer Reflex - Baroreceptors or stretch receptors are present in the walls of bronchi & bronchioles. When receptors become stretched during over inflation of lungs, nerve impulses are sent along 10^{th} Nerve (vagus) to inspiratory and apneutic area, which are inhibited. This reflex is protective to prevent excessive inflation of lungs.

v) Blood Pressure - Carotid and aortic sinuses (which are close to carotid and aortic bodies) have baroreceptors which detect changes in B.P. These baroreceptors are concerned mainly for control of circulation, but they also affect respiration. Sudden rise of B.P. decreases rate of respiration.

vi) Limbic System - Emotions like anxiety, anger stimulate limbic system, which sends stimulatory signals to Inspiratory area.

vii) Temperature - Increase in Body temp - increases Respiratory rate.

viii) Pain - Sudden, severe pain causes Apnea. prolonged pain increases respiratory rate.

ix) Stretching of Anal sphincter - Increases Respiratory rate.

x) Irritation of airways - Due to mechanical or chemical irritation to pharynx or larynx, breathing stops, for a while and it is followed by coughing or sneezing.

Respiratory Insufficiency

Causes

1) Less ventilation
2) Less gaseous diffusion
3) Obstruction in O_2 transport.

1) Causes of Less Alveolar Ventilation

i) Extreme hypoventilation occurs due to paralysis of respiratory muscles e.g. bulbar polio, cervical trans-section of spinal cord, depression of respiratory centre by anesthetic drugs etc.
ii) Obstruction in respiratory passage e.g. Asthma, Emphysema.
iii) Functional capacity of Lung becomes less e.g. T.B. cancer, silicosis.

2) Causes of Less Gaseous diffusion, through Respiratory Membrane

i) Less surface area of respiratory membrane e.g. damage due to T.B. or surgical removal of damaged part of lung.
ii) Thick and hard respiratory membrane, e.g. pulmonary edema, due to left ventricular failure or pneumonia.
iii) Abnormal ventilation perfusion ratio, in some part of lung e.g. thrombosis of pulmonary artery, emphysema etc.

3) Abnormality in O_2 Transport

i) Anemia - Less Hb is available for O_2 transport.
ii) Carbon-monoxide poisoning - Hb is unable to Carry O_2.
iii) Less blood supply to tissues due to low cardiac out put or localized tissue is ischemia.

Hypoxia

Cellular hypoxia of different intensity occurs due to respiratory insufficiency. In some of the cases O_2 therapy is very useful and in other cases the utility is limited.

- Effect of Hypoxia: Due to severe hypoxia, death can occur. In mild or moderate hypoxia - mental functions get disturbed, functional capacity of muscles and tissues decreases. Sometimes patient goes into coma.
- O_2 Therapy in Hypoxia: O_2 can be given by - placing the patients head in a tent that contains air fortified with O_2, Allowing the patient to breathe pure O_2 or high concentrations of O_2 from a mask or O_2 is given through nasal tube.
- O_2 therapy is of great value in following types of hypoxia: i) Atmospheric hypoxia, ii) Hypoventilation hypoxia, iii) Hypoxia caused by improper diffusion.
- O_2 Therapy is partially useful in following Hypoxia: Anemia or Abnormality of O_2 transport.
- O_2 Therapy is of no use: Hypoxia caused by circulatory insufficiency.

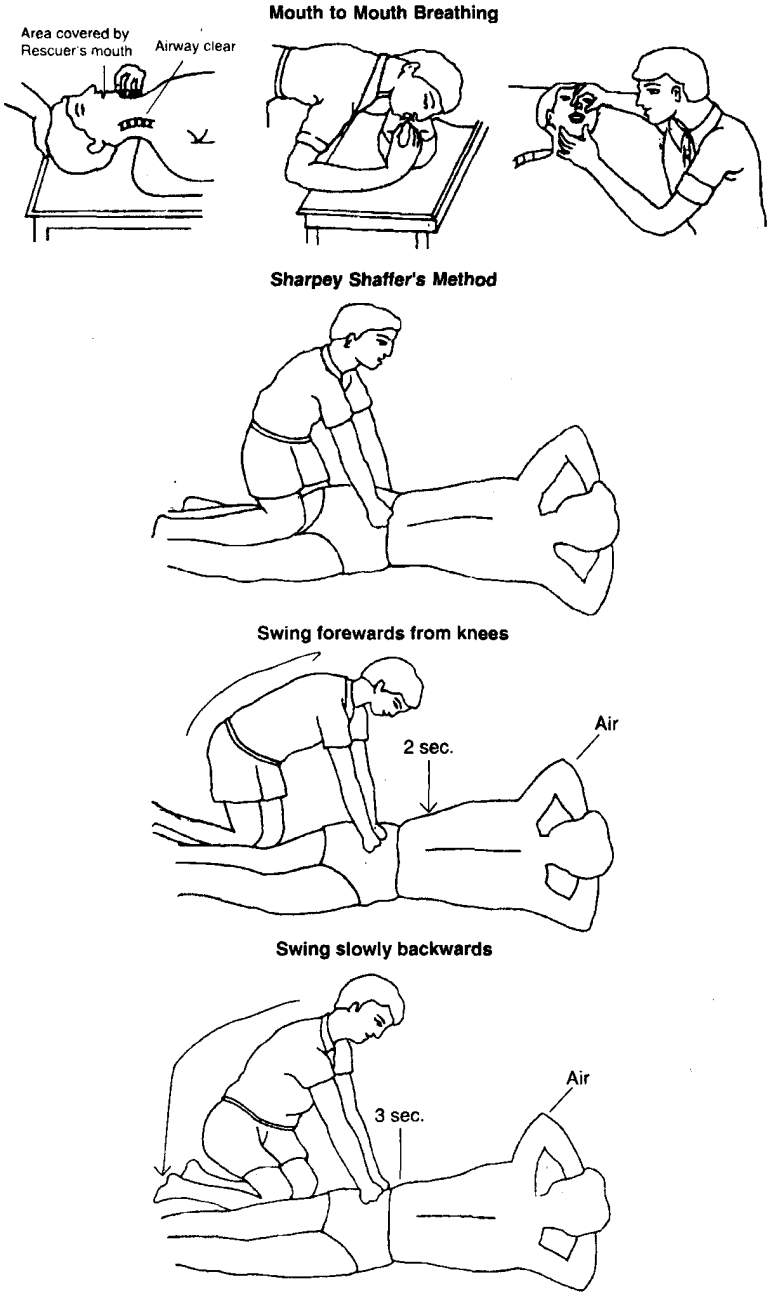
Artificial Respiration

Artificial respiration is useful in various accidents like drowning or electric shock.

Methods of Artificial Respiration

1) Mouth to mouth breathing - Very easy & successful method. Healthy person takes a deep breath and exhale into the patient's mouth (during this time the nose of the patient must be closed by the fingers of the person who is forcing the air into his lungs). This is done 10-12 times per minute. At some time, this method was neglected due to misconception that expired air healthy person, may be not be good for the patient. But this thought was not right, since even expired air contains some amount of O_2 and secondly, CO_2 of expired air is a good stimulant for respiratory center.

2) Sharpey Shaffer's method - The head of the patient is turned on one side. After cleaning the throat, tongue is pulled. Lower part of sternum is pressed and released by the physician. This is also done 12-14 times per minute.



Artificial Respiration

3) Marshall Hall method - Patients who has drowned in water, is turned on either side - right and left, repeatedly.

4) Mechanical method - Artificial respiration is provided through the apparatus called as the resuscitator. This instrument forces air through mouth into lungs of the patient, during the positive pressure cycle and allows the air to flow passively out of lungs. Most resuscitators have safety valves to control positive or negative pressure.

Tank Respirator - Here, at one side of tank, opposite the patient's head is a motor driven leather diaphragm, which moves inward and due to this positive pressure develops around the body of the patient which causes expiration. As the diaphragm moves outward, negative pressure causes inspiration. Thus with the help of this instrument artificial respiration is carried out.

Chapter 9

Rasa-Rakta Samvahana Prakriya
(Circulation)

Rasa-rakta-samvahana, means well controlled circulation of rasa and rakta.

In the original text of Charaka and Sushruta, frequent references can be found about rasa being transported through hridaya (heart). But raktavahi sira or the blood vessels have not been mentioned directly. But Chakradatta in his critical commentary has mentioned that rasa is drava dhatu and so when rasavahana is mentioned, it also includes circulation of all other liquid dhatus like rakta through vessels.

Rasa and rakta are circulated together so, to specify this point one has used specifically the term Rasa-rakta-samvahana (and not only rasavahana or raktavahana). Jeevan means life. Life is dependant on rakta dhatu. How rakta dhatu is supplied to each and every cell is understood by the process of Rasa-rakta-samvahana.

Before the actual process, let us see about important organ for this process is hridaya.

Hridaya (heart)

Synonyms - Mahat

Site -

'स्तनयोर्मध्यमधिष्ठायोरस्यामाशयद्वारं सत्त्वरजस्तमसामाधिष्ठानं हृदयं (नाम मर्म)'। (S.Sha. 6:26)

Sushrut in Sharira-sthana, has mentioned that hridaya is situated in between breasts and at the door of amashaya. Heart is the site of sattva, rajas and tamas and it a is vital marma.

Relation of hridaya with other organs is mentioned by Vagbhata.

'तस्याधो वामत: प्लीहा फुफ्फुसश्च, दक्षिणतो यकृत् क्लोम च' । (S.Sha. 4:31)

'यदाश्रया हि धमन्य: प्राणवहा:' । (S.Sha. 4:31)

Hridaya - Self explanatory word

Hridaya word is formed by Hri + da + ya

These roots of Sanskrit have the following meaning:

Hri = Harati = to take back - the impure blood.
Da = Dadati =to give - the pure or oxygenated blood.
Ya = Yamyati = to control - the process of give and take.

Therefore, the word Hridaya itself is a symbol of circulation - process:

Composition of Hridaya

(*Hridayasya upadanam*)

'शोणितकफप्रसादजं हृदयम्' । (S.Sha. 4:31)

Hridaya is formed from sara part of shonita and Kapha. It is muscular and matrija organ. Healthy state of heart also depends on normalcy of blood and Kapha.

Shape of Hridaya

'पुण्डरीकेण सदृशं हृदयं स्यादधोमुखम्' । (S.Sha. 4:32)

'मांसपेशीचयो रक्तपद्माकार अधोमुखम्' । (A.H.Sha.)

Hridaya is like inverted lotus. In pathological condition (like left ventricular hypertrophy) this shape gets distorted.

Site for Chetana

'हृदयं चेतनास्थानमुक्तं सुश्रुत ! देहिनाम्' । (S.Sha. 4:34)

The whole body is a site of chetana (life, energy) but Sushruta has specifically mentioned heart as a site of chetana. This is obvious, because tissues or cells can survive

only after proper blood circulation. Oxygen is also supplied to cells, through blood only. Function of heart starts after four months of embryonic life. After that mind and intelligence develops. Hridaya is also mentioned as site of mind. But hridaya has also been used for brain.

Effect of cardiac pathology

'तस्योपघातान्मूर्च्छायं भेदान्मरणमृच्छति' । (C.Su. 30:6)

Slight abnormalities in the heart function can cause fainting attack but major problem can be fatal.

Hridaya & Dosha-Dhatu-Mala

1) Hridaya & Udana vayu

Expiration, to expel gaseous waste is a function of Udana vayu. If this function gets disturbed co-ordination of Prana and Udana does not remain. This affects heart function. Also udana expresses happiness, sadness, fear etc, which also affect cardiac functions.

2) Hridaya & Vyana vayu

The chief site of Vyana vayu is hridaya. Electrical activity of heart is under Vyana contract so cardiac cycle is maintained by Vyana vayu.

3) Hridaya & Sadhaka pitta

The site of Sadhaka or medhakara Pitta is mentioned as hridaya. But here hridaya word suggests the activity of brain.

Note: But it is interesting to note that, hridaya word is used for Heart, as well as for brain. In practice, we know the close intimacy of brain activity and heart function. Therefore now a day's mental stress is becoming the chief cause of cardiac problems.

4) Hridaya & Avalambaka kapha

The heart function is going on from birth to death.

Avalambaka kapha is responsible for protection & nutrition of cardiac muscles. It also provides nourishment to the heart.

5) Hridaya & Ojas

The best essence from all the body tissues is called Ojas in Ayurveda. Ojas stays in heart. Ojas has special meaning in Ayurveda and still considered as a challenging topic of research.

Rasa-rakta Vikshepana Kriya

1) Rasa dhatu, formed from Ahara rasa in small intestine is carried to the heart due to the stimulation of Samana vayu.

2) From the hridaya, rasa and rakta are sent to lungs, for purification. Here, detoxification is done and again pure blood is sent to the heart.

3) Then rasa with preenan activity and rakta with prana are circulated through all the body.

4) This takes place due to the stimulation of Vyana vayu.

5) All the body cells get the nourishment and oxygen for metabolic activities.

6) Metabolites wastes are again taken back from the heart for further purification and circulation.

'रसो यः स्वच्छतां यातः स तत्रैवावतिष्ठते ।
ततो व्यानेन विक्षिप्तः कृत्स्नं देहं प्रपद्यते' ॥
(A.H.Su. 12:15-16, Arunadatta)

'स तु व्यानेन विक्षिप्तः सर्वान् धातून् प्रतर्पयेत्' । (S.Su. 46)

Note- Following verse from Bhela samhita, explains the circulatory and continuous activity of cardiac cycle.

'हृदो रसो निःस्सरति तत एव च सर्वतः ।
सिराभिः हृदयं याति तस्मात् हृत्प्रभवं सिराः' ॥ (Bhel.Su. 21)

Rasa-rakta-Samvahan

1) By the stimulation of Vyana vayu, rasa and rakta is

continuously circulating. Circulation predominantly takes place in 3 directions - i) upward, ii) downward & iii) transverse.

'स शब्दार्चिर्जलसंतानवत् अणुना विशेषेण अनुधावत्येवं शरीरे केवलम्'। (S.Sha. 14:16)

Sushruta has compared the directions of circulation with the direction of i) Fire flame or *archih* in upward direction, ii) Water flow in downward direction, iii) Sound waves in transverse direction.

Some Ayurvedic scholars have also tried to explain these similarities in another way also.

i) In person having teekshanagni, circulation is very fast like sound transmission, in madhyamagni person it is like fire and in mandagni person, it is slow and soft, like the movement and nature of water.

ii) Rasa-rakta samvahana comprises of the circulation of rasa (having watery in nature) and rakta (having hot in nature). This circulation can be understood with pulsation (sound). Therefore circulation is compared with *shabda, archih* & *jala.*

iii) Rasarakta samvahana explains the three important features of Vata, Pitta, Kapha i.e. sound, heart and fluidity.

'तेन मूलेन महता महामूला मता दश।
ओजोवहाः शरीरेऽस्मिन् विधम्यन्ते समन्ततः'॥ (C.Su. 30:8)

2) Rasarakta samvahana starts in heart from ten dhamanis. Then through its branching network rasa dhatu is circulated throughout the body.

In the above verse, 'ojovaha' word indicates, circulation of Ojas. But Ojas is nothing but the essence of seven tissues.

3) After contraction of heart muscles nourishment & oxygen is provided to body tissues. Metabolic wastes again mixes with blood and returned back to heart through vessels.

'हृदो रसो निःस्सरति तत एव च सर्वतः ।
सिराभिः हृदयं याति तस्मात हृत्प्रभवं सिराः' ॥ (Bhel.Su. 21)

4) The main control of Rasa-rakta samvahana is by Vyana vayu.

'व्यानेन रसधातुर्हि विक्षेपोचितकर्मणा ।
युगपत् सर्वतोऽजस्रं देहे विक्षिप्यते सदा' ॥ (C.Chi. 15:36)

5) Rasa-rakta samvahana is continuous function from birth to death. It this function, even stops momentarily the person can die.

'यदृते सर्वभूतानां जीवितं नावतिष्ठते' । (C.Su. 30:9)

6) During rest or night sleep, the heart function slows down. This is the only time, that heart can relax a bit, but complete rest is not possible in the life.

'जाग्रतस्तद्विकसति स्वपतश्च निमीलति' । (S.Su. 4:32)

7) Rasa-rakta vikshepana takes place 70 to 80 times per minute, Heart rate = pulse rate.

So pulse examination is very important to assess Rasa-rakta samvahana. Yogaratnakar has included Nadi pariksha as one of the important aspect, in eight fold examination of patient.

'नाडीं मूत्रं मलं जिह्वां शब्दं स्पर्शं दृगाकृतिः' । (Y.R.)

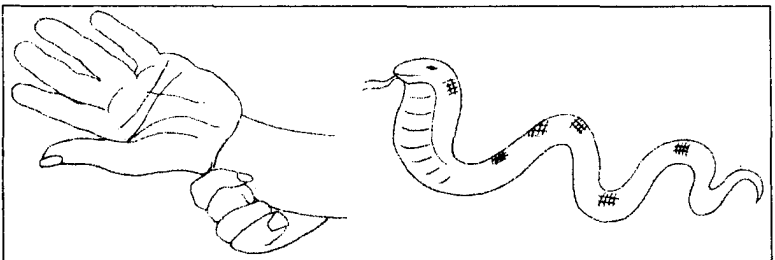
During pulse examination - rate, rhythm, strength, touch and style is noted. Pulse is compared with the gait of animal and then doshika predominance can be understood.

1) Vata dosha - Sarpa gati (serpentine)
2) Pitta dosha - Manduka gati (frog-jump)
3) Kapha dosha - Hamsa gati (swan)

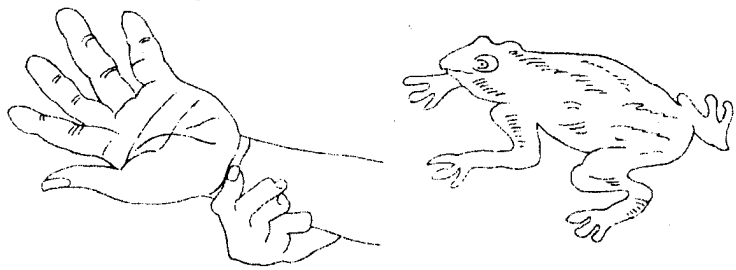
Any physical activity accelerates the heart function.

'प्रायः सर्वाः क्रियास्तस्मिन् प्रतिबद्धाः शरीरिणाम्' । (A.H.Su. 12:7)

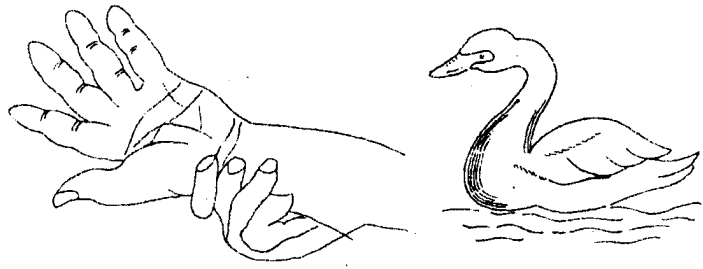
During digestion, talking, walking, running, exercise the cardiac activity increases and so pulse rate increases.



Vata Nadi
(Sarpa gati : Like the movement of Sanke)



Pitta Nadi
(Manduk gati : Like the movement of Frog)



Kapha Nadi
(Hansa gati : Like the movement of Swan)

Pathology

1) Hrit-karyavarodha

Literally this means obstruction in heart functions or cardiac activity.

Ayurvedic classics have described the disease, namely hridroga - which includes Vataja, Pittaja, Kaphaja, Krimija types. Similarly in this hrid-vidradhi can be included.

In Hrit-karyavarodha, we can at least note the verses of Vataja hridroga and hritshula.

'वेपथुर्वेष्टनं स्तम्भः प्रमोहः शून्यता दरः' । (C.Su. 17:31)

Here stambhna - indicates obstruction. Similarly the term *avaruddhastu* explains obstruction.

'कफपित्तावरुद्धस्तु मारुतो रसमूर्च्छितः ।
हृदिस्थः कुरुते शूलमुच्छ्वासारोधकं परम्' । (S.U. 43:132)

Note: Hrit-karyavaroaha can be understood, after studying following diseases, from modern science:

1) Heart block
2) Angina pectoris
3) Myocardial infarction.

CIRCULATION
(Modern View)

William Harvey, demonstrated for the first time that blood is not a stable liquid and it circulates continuously throughout the body all the time, during life. Circulatory system is an organic transport system (a river of life). It's function is to supply food, O_2 and other essential constituents to the cells and to remove waste products from cells & carry them to the organs like lungs, kidney & liver for elimination.

Blood vascular system consists of (i) Heart (ii) Blood vessels and (iii) Blood, the medium of circulation.

In human being, the blood circulation is of closed type, because blood flows through the body in the closed and continuous network of vessels. There is double circulation - (i) Pulmonary circulation - from heart to lungs and back to heart. (ii) Systemic circulation - from heart to rest of organs and back to heart.

Closed vascular system is more useful, as it keeps sufficient blood pressure and quick flow of blood, so keeping the man more active.

Heart

Heart is hollow, muscular organ, with size of ones closed fist, well equipped for its life long job.

Position - Heart is situated ventrally in thorax in between the lungs. It is protected in the cage of ribs and covered with double membrane, called pericardium having pericardial fluid in between the membranes. Pericardium with pericardial fluid acts as shock absorber, reduces friction & prevents over distension of heart.

A) External Structure of Heart

Heart is conical with its apex directed posteriorly, pointing towards the left. Heart is made up of 4 chambers - upper two chambers are of atria and lower two chambers are ventricles. The left ventricle is slightly bigger than the right.

Atria are receiving chambers. Rt. atrium receives the superior and inferior vena cavae, while Lt. atrium receives pulmonary veins.

Ventricles are propelling chambers. Rt. ventricle gives out the pulmonary artery, while the Lt. ventricle gives out aorta or aortic arch.

The heart also has the right and left coronary arteries arising from aorta, at its origin and supplying blood to the wall of heart itself. The coronary arteries divide into capillaries ramifying in the wall of the heart. These capillaries ultimately join to form coronary sinus which opens directly into right atrium.

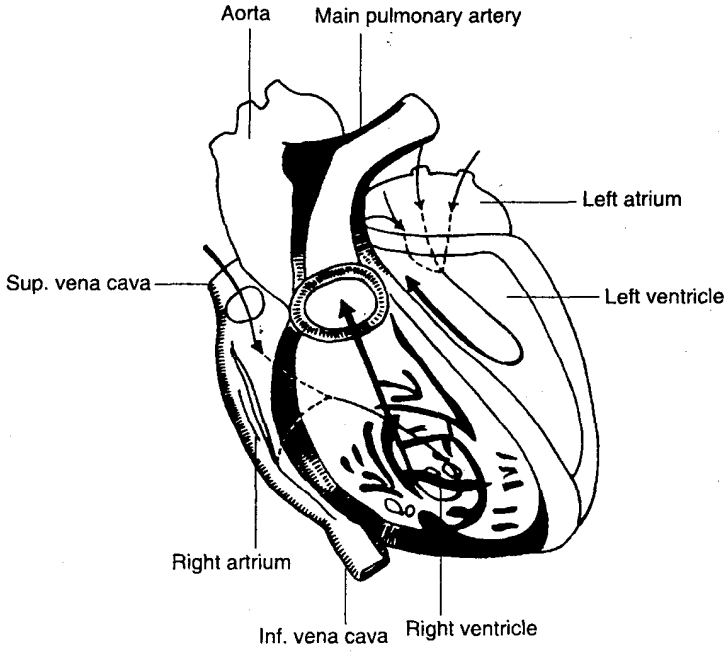
B) Internal Structure of Heart

Internally the heart is divided into right and left halves by a vertical partition, so that the right side deals with deoxygenate of blood and left side deals with oxygenated blood.

Partition between the atria is called as 'inter-atrial septum' and between the ventricles is called 'inter-ventricular' septum.

1) Atria or auricles - As they are receiving chambers, they are thin-walled. The Rt. atrium collects deoxygenated blood from the body through superior and inferior vena cava. Lt. atrium receives oxygenated blood from lungs through pulmonary veins.

2) Ventricles - The ventricles are thick walled, because they are forcing chambers. The Lt. ventricle is larger and more muscular than the Rt. ventricles, because it has to pump the blood to the entire body. The Rt. ventricle gives out pulmonary artery which carry deoxygenated blood to the lungs, while the Lt. ventricle gives out aortic arch, carrying oxygenated blood to the body.



Blood circulation through Heart

The atrium and ventricles are in communication with each other through atrio-ventricular openings guarded by the conical or cuspid valves.

Rt. atrium & Rt. ventricle = Tricuspid valve.
Lt. atrium & Lt. ventricle = Bicuspid valve.

Bicuspid valve is called as 'mitral valve' due to its fancied resemblance to **bishop's mitre or tall cap.** These valves are anchored to the walls of the ventricles by ligamentous cords called chordae tendinae, attached to the papillae like out growths of the wall of ventricles called papillary muscles. This prevents the extension of valves back into the auricles, during the contraction of ventricles.

Semilunar or Atrial Valves

At the opening of the pulmonary trunk arising from Rt. ventricle and at the base of aortic arch, arising from Lt. ventricle, are seen three semilunar valves, which also prevents back flow.

Heart is a double pump - pumping blood to the lungs and pumping to the rest of the body.

Working of Heart

Heart is made up of cardiac muscles, which are capable of rhythmic contraction and relaxation. The sequence of rhythmic contraction (systole) and relaxation (diastole) of the heart, is called heart beat or cardiac cycle. The heart beat varies from 60 to 80 times per minute but normally it is 72/ min. The heart beats can be felt as pulse in the superficial artery like that of wrist, temporal region etc.

The heart of man is myogenic, as its contraction is initiated and conducted by the modified muscle plexuses called nodes, independent of nerve supply.

For proper functioning of heart beats, in regular fashion, the heart has specialized conduction system as follows:

1) Sino-atrial node (SA node) - situated at the opening of superior vena cava. As it maintains the rhythm, it is also called a pace maker.

2) Atrio-ventricular node (AV node) - Situated in the middle partition conducting impulses from atria to ventricles.

3) Bundle of His - consisting of specialized muscle fibers called parkinje's fibers dividing and ramifying in the wall of the ventricle.

Cardiac Cycle

Heart beats automatically. Cardiac cycle explains, events associated with each heart beat. In each cardiac cycle, atria and ventricles contract and relax which causes pressure changes. Blood flows from the area of higher pressure to lower pressure. Phase of contraction is called as a 'systole' and phase of relaxation is called as a 'diastole'.

Phases of Cardiac Cycle

1) At the end of heart beat, ventricles start to relax. This is the beginning of relaxation or **proto-diastole or quiescent period.**

2) Now the ventricular blood volume does not change, because both semilunar and AV valves are closed. This is **isometric or isovolumic relaxation.**

3) When ventricular pressure drops below atrial pressure, the AV valves open and **Rapid filling phase** occurs. Nearly 2/3rd blood passes from atria to ventricles.

4) This is followed by middle 1/3rd **Reduced filling phase or diastole.**

5) Then, firing of SA node, results in atrial depolarization (P wave). Atrial systole occurs in last 1/3rd of ventricular filling.

Note - As, Atrial systole contributes only 20-30% of total blood volume in the ventricles, atrial contraction is not absolutely necessary for adequate blood flow for normal heart rate.

6) At the end of atrial systole, the impulse form SA node has passed through AV node and into the ventricles. Depolarization of ventricles is represented by QRS complex in ECG. Ventricles get filled with blood. AV and semilunar valves, both are closed. So this is isovolumic or isometric contraction.

7) As ventricular contraction continues, pressure inside the chambers rises. When the pressure of right and left ventricles rises up to 80 & 120 mm. of Hg respectively, SLVS open and **Rapid ejection phase** occurs.

8) Above Phase is followed by **Reduced ejection phase**, which is the 3rd and last phase of ventricular contraction.

Notes

a) During ejection, ventricular volume decreases from 130 ml (EDV = End diastolic volume) to 60 ml. (ESV = End systolic volume).

b) Stroke volume = (SV) = Amount of blood ejected by a ventricle during, each systole = 70 ml.

c) Cardiac output = (CO) = Amount of blood ejected by Lt. or Rt. ventricle per minute.

CO = SV x HR (Heart rate)
CO = 70 x 72 = 504 ≈ 500 ml.

Cardiac output depends on venous return, force of cardiac contraction, Rate of heart beat and B.P.

d) **Cardiac Reserve** Ratio - between the maximum cardiac out put a person can achieve and the cardiac out put at rest.

Stroke volume depends on

i) Pre-load - The stretch of heart before it contracts.
ii) Contractility - Forcefulness of contraction of ventricular muscle fibers.
iii) After load - The pressure, which must be exceeded before ejection of blood from ventricles begin.

Heart Rate is regulated by

1) ANS

(i) signals from Proprioceptors (Position of limbs & muscles),
(ii) Signals from Chemoreceptors (chemical) changes in blood - acidosis and alkalosis - depress cardiac activity,
(iii) Signals from Baroreceptors (monitor B.P. in major arteries and veins).

Cardiovascular center in the medulla oblongata, receives the above said signals.

Sympathetic N.S. - increases the H.R. & Parasympathetic decreases H.R.

2) Effect of Hormones on H.R.

i) Epinephrine and Nor epinephrine from Adrenal medulla increases H.R. Secretion of these hormones is more during exercise, stress and excitement.
ii) Thyroid hormone increases H.R. Therefore in hyper-thyroidism, tachycardia during sleep is important diagnostic sign.

3) Other Factors, affecting H.R.

Age, sex, physical fitness and Body temp can influence on H.R. For ex : In newborn baby, H.R. = 120/min., H.R. moves in females than males, physically fit person, may show bradycardia i.e. 60/min. Increased body temp e.g. fever and exercise, increases H.R.

Heart Sounds

Heart sounds can be heard during auscultation with stethoscope.

1) First Heart Sound: i) Soft, prolonged Low pitch = Lubb, ii) Occurs due to sudden closure of AV valves, iii) Best heard at Apex beat, iv) Indicates force of ventricular contraction and condition of myocardium.

2) Second Heart Sound: i) Sharp, short, High pitch = Dup, ii) Occurs due to sudden closure of semilunar valves, iii) Best heart at 4^{th} right costal cartilage for aortic and 2^{nd} left inter costal space for pulmonary artery, iv) Indicates competence of semilunar valves.

3) Third heart sound = is heart in 60% of cases. This sound is soft, low pitched. This occurs due to vibration of AV valves, vibration in ventricular muscles and vibration of semilunar valves while closing. 3^{rd} sound is best heart at Apex beat.

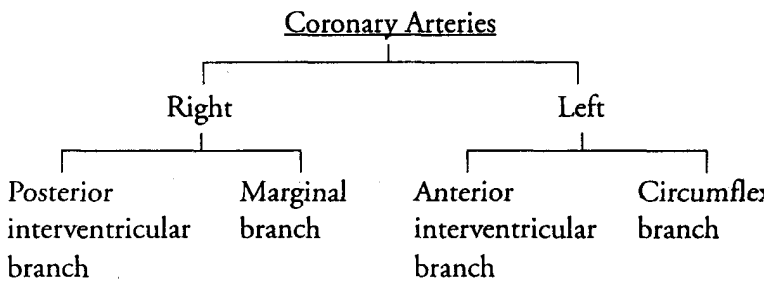
4) Fourth heart sound is very rarely heard.
Abnormal Heart Sound = murmur

Types of Murmur

i) Pre-systolic - Heard during auricular contraction
ii) Systolic - Occurs during ventricular contraction
iii) Diastolic - This murmur occurs in Aortic regurgitation.

Nutrition of Heart

Nutrition of Heart occurs through Coronary arteries.



Arteries	*The part getting circulation*
I) Rt. coronary	
a) Posterior interventricular branch b) Marginal branch	a) Walls of two ventricles and interventricular septum b) Rt. ventricle
II) Left coronary	
a) Anterior interventricular branch b) Circumflex branch	a) Walls of both ventricles and interventricular septum b) Walls of Left ventricle and Left atrium

Radial Pulse

Definition - Pulse is a wave, transmitted by increased pressure which passes, along the arteries during each heart beat.

Radial pulse is used for clinical examination due to its situation against the bone (Radius).

Venous pulsation may be seen in jugular vein (especially in venous engorgement in CCF)

Capillaries do not show any pulsations.

Examination of Pulse - (1) Rate (2) Rhythm (3) Character (4) Tension (5) Condition of arterial wall.

Normal Pulse - 70-80/min.
Record of Radial Pulse is done by Sphygmograph.

Common Variation in Pulse

1) Tachycardia - Increase in pulse rate (e.g. in fevers, emotional stress, after meal, after exercise, increased BMR like in thyrotoxicosis).

2) Bradycardia - Decrease in pulse rate (e.g. in increased intra cranial pressure)

3) Auricular fibrillation - Pulse rate rises up to 400/min.

4) Pulsus alterans - Alternate weak and strong pulse (e.g. in M.I.).
5) Water hammer pulse - Sharp and steep rise and fall of pulse (e.g. in aortic regurgitation).

Blood Pressure

Definitions

1) Blood pressure - Lateral pressure exerted by blood on the unit area of vessel walls, during its flow.
2) Systolic pressure - Maximum pressure recorded during contraction of ventricles.
3) Diastolic pressure - Minimum pressure recorded during relaxation of Heart.
4) Pulse pressure - Difference between systolic & Diastolic pressure.

Ratio of systolic & diastolic : Pulse pressure is 3:2:1.

Normal systolic B.P. = 120-140 mmHg.
Normal diastolic B.P. = 80-90 mmHg.
Measurement of B.P. is done with Sphygmomanometer.
Methods - Palpatory & Auscultatory.

B.P. depends upon - cardiac output & peripheral resistance.

Peripheral resistance comprises of

1. Elasticity of vessel wall
2. Lumen of arterioles
3. Viscosity of blood
4. Velocity of blood

Physiological variations in B.P.

1. Systolic B.P. increase with age.
2. Pressures increases after meal, exercise and emotional upsets.
3. B.P. in males > females.
4. During sleep - B.P. is lowest.

= Pathology - Hypertension

As Diastolic B.P. reading remains more constant, than systolic, types of hypertension are determined on the basis of Diastolic B.P.

Type of Hypertension	*Diastolic B.P. (mm of Hg)*
Mild	90 – 100
Moderate	100 – 110
Severe	> 100

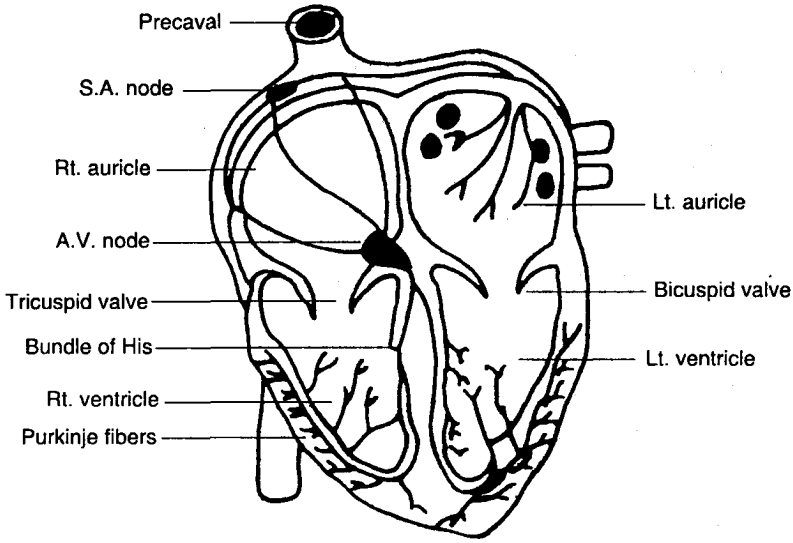
Types of Hypertension, according to Etiology

1) Primary or Essential Hypertension - Idiopathic, no specific cause can be found (may develop due to faulty life style).

2) Secondary Hypertension - Due to disorders of other systems like kidney damage or endocrine disorders.

Electro Cardiogram (E.C.G.)

This is a graphic record of the electrical activity of Heart.



Conduction system of Heart

ECG is recorded with E.C.G. machine. Machine contains E.C.G. paper with small and large squares. One large square is made up of 5 small squares. E.C.G. paper moves, at a rate such that in one minute 300 Large squares are covered. Hence,

$$\text{Heart Rate} = \frac{300}{\text{Number of large squares in between R - R waves}}$$

E.C.G. contains, P, Q, R, S, T & U waves.

Wave	*Indicates*
P Wave	Atrial activity
QRS	Ventricular depolarization
T wave	Ventricular repolarisation

On ECG Paper

1 Small square = 0.04 sec

1 Large square = 0.2 sec

Normal Values

1) PR internal = 0.12 - 0.20 sec

2) QRS complex = 0.04 - 0.10 sec

E.C.G. is recorded with the help of following leads (position of electrodes) -

Bipolar leads = I, II, III

aVR, aVL, aVF

Chest leads = V_1, V_2, V_3, V_4, V_5, V_6.

Indications for E.C.G. examination

40 up check up

Family H/O cardiac problems and having obesity, high cholesterol.

Patient having diseases like - hypertension, angina, myocardial infarction, rheumatic fever, obesity and diabetes mellitus.

Patient C/o - chest pain, dyspnoea on exertion, fatigue and giddiness.

E.C.G. Report is given, mentioning the following points (1) Rate (2) Rhythm (3) Axis (4) Voltage (5) P wave (6) PR internal (7) QRS complex (8) ST segment (9) T wave (10) QT interval (11) U wave (12) Remark or conclusion (e.g. WNL = within Normal limit or suggestive of LVH).

Some pathological findings

1) In M.I. - ST elevation & T inversion
2) In Rheumatic heart disease - PR interval is increased

Obstruction in Cardiac Function
(Hrit-karyavarodha)

Following diseases from modern medicine, should be considered in this topic:

1) M. I. (myocardial infarction)

Pathology - O_2 supply to cardiac muscle becomes nil due to occlusion of one of the branches of coronary artery.

Etiology - i) coronary thrombus
ii) Coronary embolism.

Symptoms - 1) Severe retro-sternal chest pain, 2) profuse sweating, 3) restlessness, 4) nausea, vomiting, 5) sometimes radiating pain to the hands or lower jaw.

ECG - ST elevation, inverted, abnormal Q wave (other investigation - Angiography)

2) Angina Pectoris

Angina means- I cry or the cry of the heart as it receives less blood supply. It is cardiac pain of short duration due to inadequate blood supply to cardiac muscles.

Etiology - 1) coronary atherosclerosis, 2) severe anemia, 3) aortic valve.

Symptoms - 1) Short duration chest pain after exercise like climbing hill, going on stairs or after sex, 2) Duration of pain, max 2-5 min. only, 3) Pain is relieved after rest or sublingual administration of sorbitrate tab.

Investigation - Stress Test

3) Heart Block

This is the defect in the conducting system of Heart, Improper formation of Impulse at SA node and its propagation through junctional tissue.

Types - SA block, AV block, BBB (bundle branch block).

Clinical features of complete Heart Block: 1) Pulse - 36-40/ min., 2) Tension & volume of pulse - high, 3) Arterial wall - sclerosed, 4) Pulse character - collapsing, 5) ECG is diagnostic.

Chapter 10

Vak-Pravritti

(Speech)

Vak-pravritti is important function of Udana vayu.

Anatomical Aspect

Vak-pravritti means to speak. This function takes place in the oral cavity. Vag-indriya is a karmendriya. Tongue is a site of this karmendriya.

'जिह्वा वागिंद्रियं वाक् च सत्या ज्योतिस्तमोऽनृता' । (C.Sha. 1:26)

Tongue - It is three *angula* broad muscular organ. Tongue is situated in mouth cavity.

Pointed part of tongue touches the various parts of mouth (like teeth, lips, cheeks) and different types of words are produced. Sound that is emitted from throat, gets verbal form in mouth.

Swaravaha Srotas

The main organ is in the throat. In addition to that mouth and nose are concerned with sound production. Sushrut, while describing swara-bheda has mentioned swaravaha srotas.

In Madhukosha commentary of Madhavanidan, four swara-vaha srotasas are mentioned in the throat.

'स्वरवहेषु स्रोतःसु शब्दवाहिनीषु धमनीषु' ।

(S.Utt. 53:3, Dalhana)

In this verse, Shabdavahi dhamani are also explained in addition to srotas. Vayu through dhamani, stimulates swaravaha srotas and tongue for the function of speech.

Speech & Dosha/Mahabhuta

Speech is mainly concern with production of sound. Sound is an attribute of Akasha mahabhuta. Akasha is an open space in the chest and throat. Similarly swaravaha srotas, mouth cavity and nose are all organs with having space.

'वायु:—प्रवर्तको वाच:' । (C.Su. 12:8)

'प्रकृति: कारणं, शब्दकारणत्वं च वायोर्नित्यमाकाशानुप्रवेशात्' ।
(C.Su. 12:8, Chakrapani)

From the five sub-types of Vata dosha, Udana vayu is mainly responsible for speech.

'उदानो नाम यस्तूर्ध्वमुपैति पवनोत्तम: ।
तेन भाषितगीतादिविशेषोऽभिप्रवर्तते' ॥ (S.Ni. 1:14)

In the above verse it has been explained that entry of Vayu in Akasha is a cause of production of sound.

Prime Requirement for Speech

For speaking, it is essential to hear those words.

Speech is always an expression of the outcome of hearing. This is why the parents try to talk with a small kid constantly with words like Ba, Ka-ka, Ma-ma etc.

Following two practical observations are also worth to note:

1) If auditory defect exists in a small child, he starts speaking late or sometime he can become dumb (due to deafness).

2) Although there are many languages, the child speaks the same language which he hears repeatedly.

In short, speech always depends on hearing.

सर्वं शब्दं नभोवृत्ति: श्रोत्रोत्पन्नस्तु गृह्यते । (Muktavali)

Sound - Types

Sound can be classified according to cause and the nature:

- Types - According to causes:

a) Samyogaja - By union of two things – e.g. clapping.
b) Vibhagaja - By separation of two thing – e.g. to cut the log of wood.
c) Shabdaja - speech or talk of a person.

- Type - According to nature
  a) Dhwanyatmaka - Instrumental e.g. tabla, sitar and gitar etc.
  b) Varnatmaka – Vacha or words, coming from throat and mouth. Language is vocal type of sound.

'उर्ध्वगा: शब्द-स्पर्श-रूप-रस-गन्ध-प्रश्वासोच्छ्वास:···· । द्वाभ्यां भाषते, द्वाभ्यां घोषं करोति' । (S.Sha. 9:5)

'भाषत इति ताल्वादिस्थानव्यापारनिष्पादिताकारादिवर्गव्यक्तियुक्तं शब्दं करोति, घोषश्च तदविपरीतोऽव्यक्त: शब्द:' । (S.Sha. 9:5, Dalhana)

Through the contact of tongue with palate, tongue teeth etc. different types of syllabi are spoken. This is articulation. Sound without syllabi is phonation.

Speech

(Creation of Sound)

Ayurvedic classics explain that Udana vayu is responsible for vocal language, songs etc.

Sound is produced firstly at the umbilical region and its manifestation occurs, through mouth in four stages before its manifestation are as follows:

1) Sound - created at umbilical region which is inaudible and self experienced is called as *Para vani.*

2) Slightly audible sound at chest region is called as *Pashyanti vani.*

3) Sound, at the throat level is called as *Madhyama vani.*

4) After contact of tongue, with different parts of mouth like cheek, palate, teeth etc., manifestation of sound occur as specific words. This is called as *Vaikhari vani.*

Articulation - According to different parts:

Different syllabi are spoken, according to touch of tongue with different parts of mouth like cheek, palate, teeth etc.

They are as follows:

1) Kanthya (throat) (Ka, Kha, Ga, Gha, Ṅa)
2) Talavya (palate) (Ca, Cha, Ja, Jha, Ña)
3) Murdhyan (palate) (Ṭa, Ṭha, Ḍa, Ḍha, Ṇa)
4) Dantya (teeth) (Ta, Tha, Da, Dha, Na)
5) Oshthya (lips) (Pa, Pha, Ba, Bha, Ma)
6) Anunasik (nose) Ṅa (ङ), Ña (ञ), Ṇa (ण), Na (न)

If particular part in the mouth is anatomically defective, the pronounciation of concern syllabi may not be proper. This is the reason why, in deft palate or when teeth are mission, speech becomes defective.

The Process - Before speech:

(Ayurvedic understanding)

Acquiring knowledge is the basic requisite for speaking. Knowledge is gained through chain as follows:

Contact of sail with mind +
Contact of mind with senses +
Contact of senses with their objects

Then knowledge occurs.

आत्मा मनसः संयुज्यते।
मनः इन्द्रियेण।
इन्द्रिये अर्थम्।
ततः ज्ञानम्। (Nyayasutra)

After acquiring knowledge, desire to speak develops. Mind gives stimulation to Udana vayu. Then sound begins at umbilical region and after passing through larynx (sound box) manifest itself through the mouth.

According to Panini, Shiksha-Shastra is a science of formation of words and pronounciation.

'आत्मा बुद्ध्या समेत्यार्थान्मनो युङ्क्ते विवक्षया ।
मनः कायाग्निमाहन्ति स प्रेरयति मारुतम् ।
मारुतस्तूरसि चरन्मन्द्रं जनयति स्वरम् ॥
सोदीर्णो मूर्ध्न्यभिहतो वक्त्रमापद्य मारुतः ।
वर्णाञ्जनयते तेषां विभागः पञ्चधा स्मृतः ।
अष्टौ स्थानानि वर्णानामुरः कण्ठः शिरस्तथा ।
जिह्वामूलं च दन्ताश्च नासिकोष्ठौ च तालु च' ॥ (Panini-Shiksha)

First, Atma, with the help of buddhi (intellect) decides about what to speak and what not ? Then according to thought, meaning and language, it stimulates mind. Mind further stimulates kayagni (fire); kayagni stimulates Vayu. After proceeding through chest, larynx and throat, Vata gets manifested in mouth. And then articulation takes place through mouth.

From the above verse it is clear that Kayagni also plays important role with Vayu.

Sushruta in Sharira-sthana has mentioned that *Adhidaivata* of vak-karmendriya is agni.

In practice also, it is common experience that in the process of speech, one should know the relation of tissue strength and kayagni. In chronic illness, when kayagni lowers down and tissues strength decreases, the patient's voice becomes very weak.

Spreading of sound waves

In Ayurveda, two theories are mentioned to explain, the spread of sound waves:

1) Vichitarang nyaya - When the person speaks, wave is formed from the sound energy. This wave itself forms another wave. These sound waves then spread in all directions. (Vichi - wave, nyaya - theory)

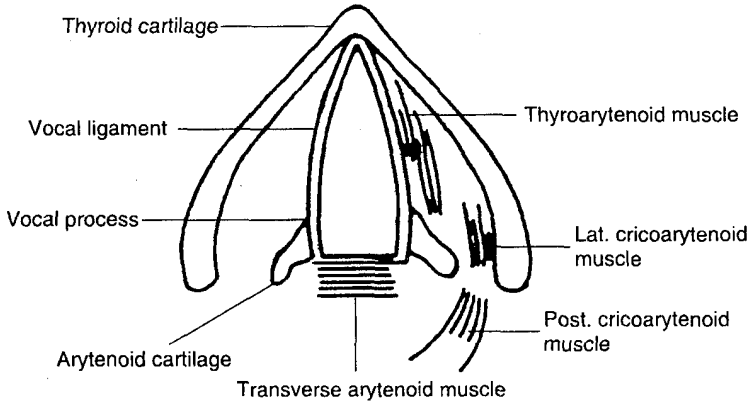
2) Kadamba-mukul nyaya - Mukul means bud. As the flower-bud of kadamba tree, blooms in all the direction,

sound waves are also distributed in all directions, simultaneously.

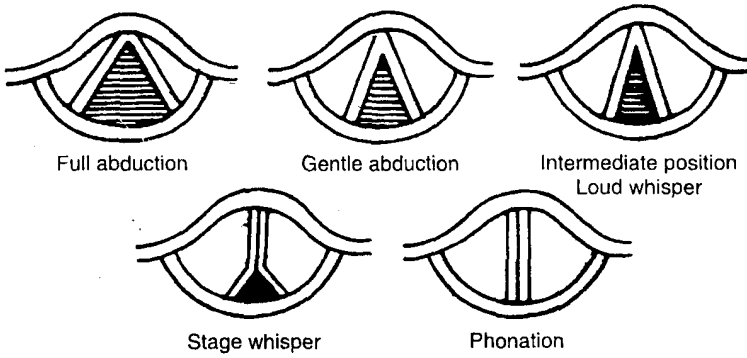
Speech -Vocalization

Speech involves - (a) Nervous control centers in cerebral cortex (b) Respiratory control centers of brain (c) Articulation and resonance structures of mouth and nasal cavities and (d) Mechanical functions of speech.

a) Phonation - larynx acts as a vibrator - vocal cords are stretched and positioned by cartilages and muscles (thyroid and adenoid cartilage - anterior and posterior side; posterior crico-arytenoids & transverse arytenoids muscles).



Basic Structure of the Larynx



Frequency of Vibration

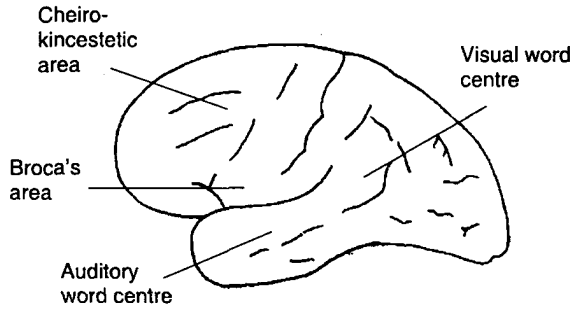
b) Articulation - 3 major organs of articulation are - lips, tongue and soft palate. Resonators are mouth, nose, associated nasal sinuses, pharynx, chest cavity.

Two Aspects of Communication:

1) Sensory aspect - ears and eyes
2) Motor aspect - vocalization and its control.

Two stages of process of speech:

1) Formation of thoughts in the mind to be expressed and choice of words to be used. This takes place in Wernick's area, in the posterior part of superior temporal gyrus. so, in Wernick's aphasia or global aphasia, person is unable to formulate the thoughts to be communicated.



Center of Speech

2) Second stage is - motor control of vocalization and the actual act of vocalization. (The motor aphasia is due to damage to Broka's speech area, which is in the premotor facial region of cortex).

Articulation - Occurs due to muscular movements of mouth, tongue, larynx etc. which are responsible for actual emission of sound. The facial and laryngeal regions of motor cortex activate these muscles and cerebellum, basal ganglia and sensory cortex all help to control muscle contractions by feed back mechanism.

Chapter 11

Prakriti

According Ayurveda every individual in unique. Not only each individual has different size and shape but its physiological and even psychological characters are different. This is because they have predominant panchamahabhuta, dosha or triguna at the time of birth which decides their constitution. Once this constitution is set, it is permanent for that individual. It is like water mark on the currency notes. Once this predominance is decided, every tissue, every organ and every system in the body has this mark or predominance in them and hence they function according to this predominance. If proper care is not taken then, this slight predominance may lead to certain disease. This is because of Prakriti or constitution. According to this predominance every individual needs certain type of food, drinks and behavior to keep him healthy. Therefore each individual must know his own constitution so that he can take opposite qualities of food, drinks etc. to keep him healthy. Hence Ayurvedic physician makes an attempt to understand Prakriti of each and every patient so that proper advice of health can be given to his patient. Prakriti is also important for making correct diagnosis of the disease, for giving proper treatment and rasayana to the patient.

What is Prakriti?

In the society, we observe the differences in the individuals. Some like chilly, spicy food, others are sweet eaters. Some enjoy warm summer, some prefer winter. Some are big eaters while others prefer to eat small quantity of food. This shows that each and every individual has its own specific, liking and

disliking. These individualistic features are the manifestations of Prakriti or constitution or biotype. In short Prakriti means individual nature.

'प्रकृतिः शरीरस्वरूपम्' । (Arunadatta)

Definition of Prakriti

'जन्ममरणान्तरालभाविनी अविकारणी दोषास्थिती प्रकृतिः' ।
(Rasavaisheshika)

Qualitative and quantitative, unchangeable doshika predominance from birth to death is called as Prakriti.

How Prakriti is formed?

'शुक्रशोणितसंयोगे यो भवेद्दोष उत्कटः ।
प्रकृतिर्जायते तेन—' ॥ (S.Sha. 4:63)

Doshika predominance, at the time of union of male and female gamete, forms the Prakriti. For example, at the time of birth if, Vata dosha is predominant (quantitatively and qualitatively) compared to Pitta & Kapha, then we call the individual having Vataja Prakriti. Predominant Vata dosha affects the anatomy, physiology, psychology and immunity of that person. Features are seen, according to properties and functions of Vata dosha.

Other Factors responsible for Prakriti

Sushruta has mentioned that the condition at the time of union of male and female gamete also affects the formation of Prakriti. Charaka has mentioned following additional factors which determine the Prakriti.

1) Nature of the season.
2) Condition inside the uterus
3) Food of mother, during pregnancy.
4) Other regimens adopted by mother during pregnancy.

Importance of knowledge of Prakriti

If we observe different individuals and their nutritional

requirements, their tolerance to the atmosphere or their behavior patterns, we find that for maintaining health, they have different needs. They may prefer different types of food, drink and activity. Even if two people with identical weight and height are chosen, their requirements still may be quite varied. One may prefer large amounts of food or drink, while the other may prefer less. If we analyze the serum or blood, in these individuals, we may not find any substantial difference. Yet differences clearly exist.

Therefore, it becomes clear that tolerance to food, drink or environment cannot be decided by the analytical study of body tissues. It depends upon individual constitution. By understanding the constitution of every individual, we know which food & drink and what type of job & exercise are appropriate for maintaining their health.

As there is a predominance of dosha in each individual, each type requires substances different or opposite to the constitution to maintain health. Vata people possess quality of coldness, dryness, roughness and lightness. Hence a person of Vata constitution requires food which is worm or hot, oily or unctuous. Otherwise, there is always a tendency for Vata to increase, giving rise to Vata diseases. To compensate this high Vata the person should eat food having sweet, sour and salty tastes.

For maintenance of health, every person should know his or her constitution. We have seen that in each constitution there is a predominance of one or more doshas. If the daily activities, diet, occupation and behavior are not adjusted to balance this, then the constitutional humor will increase, thus giving rise to its characteristic diseases. If the constitution is known then herbs, diet and other regimens including yogic postures can be advised correctly both for disease treatment and to promote longevity.

Types of Prakriti

Actually not a single individual is a like the other. In this way there may be innumerable varieties of individuals or innumerable Prakriti. But for practical purpose, Prakriti has been classified as follows:

Classification No. 1

• Doshaja Types

According to predominance one or two doshas, types of Prakriti are seven - 1) Vataja 2) Pittaja 3) Kaphaja 4) Vata-pittaja 5) Vata-kaphaja 6) Pitta-kaphaja and 7) Vata-pitta - kaphaja is sama-doshaja Prakriti.

However in practice we do find another 3 types viz. Pitta-kaphaja, Kapha-vataja and Kapha-pittaja. Thus making the total of 10 types.

Classification No. 2

• Bhautika Prakriti

According to predominance of Panchabhautik elements, there are five types of Prakriti - 1) Parthiva, 2) Apya, 3) Taijas, 4) Vayaviya & 5) Akashiya.

Classification No. 3

• Gunamayi Prakriti

According to predominance of sattva, rajas, tamas, gunamayi or manas Prakriti is decided.

1) Sattvika Prakriti - 1. Brahma 2. Mahendra 3. Varuna 4. Kauber 5. Gandharva 6. Yamya 7. Rishi Sattva
2) Rajasa Prakriti - 1. Asura 2. Rakshasa 3. Paishacha 4. Preta 5. Sarpa & 6. Shakuna.
3) Tamas Prakriti - 1. Pashava 2. Matsya & 3. Vanaspatya.

Classification No. 4

• Jatyadi Sapta Prakriti

This classification has mentioned in Ashtanga Sangraha.

1) Jatiniyat Prakriti - Features according to caste like Brahman, Kshatriya, Vaishya and Shudra.
2) Deshaniyat Prakriti (habitation)
3) Kalaniyat Prakriti (seasonal)
4) Vayaniyat Prakriti (age) - childhood - Kapha dominance, youth - Pitta dominance, old age - Vata dominance,
5) Balaniyat Prakriti (strength)
6) Pratyatmaniyat Prakriti

Quality Assessment of Prakriti

In doshaja Prakriti, sama Prakriti or trisohaja Prakriti is the best. But this is found rarely.

Dual Prakriti is nindya or bad. Out of this Pitta-kaphaja is bad, Vata-kaphaja is worse & Vata-pittaja is worst.

Single Doshaja Prakriti is better. In these types Vata Prakriti is good, Pitta is a better & Kapha is best.

Quality assessment of Prakriti indicates - i) status of health, ii) difficulty in maintaining healthy state and iii) response to treatment in diseased conditions.

Doshaja Prakriti

In all the above classification doshaja types are more useful in day-to-day practice. According to dosha-predominance at the time of union of male and female gamete, the doshaja Prakriti is determined. The features of doshaja predominance have been clearly mentioned by Ayurvedic texts. According to these features, one can easily diagnose the predominance of single or dual dosha. When there are equal features of all the three types, it is tridosha Prakriti.

Out of all texts of Brihat trayi, only Charaka has mentioned, dosha-predominant features, explaining its relation with the properties of dosha, e.g. due to dry property, the body is dry and the person is undernourished (*apachita*). In Sushruta & Vagbhata, there is only listing of predominant qualities.

Predominant features of Doshaja Prakriti

1) Vata Prakriti

'वातस्तु रूक्ष-लघु-चल-बहु-शीघ्र-शीत-परुष-विशदः । तस्य रौक्ष्यात् वातला रूक्षापचिताल्पशरीराः । प्रतत-रूक्ष-क्षाम-सन्न-सक्त-जर्जरस्वरा, जागरूकाश्च भवन्ति, लघुत्वाल्लघुचपलगतिचेष्टाहारव्याहाराः, चलत्वादनवस्थितसन्धि-अक्षि-भ्रू-हनु-ओष्ठ-जिह्वा-शिरःस्कन्धपाणिपादाः, बहुत्वाद् बहुप्रलापकण्डरासिराप्रतानाः, शीघ्रत्वाद् शीघ्रसमारम्भक्षोभविकाराः शीघ्रत्रासरागविरागाः श्रुतग्राहिणोऽल्पस्मृतयश्च, शैत्याच्छीता-सहिष्णवः प्रततशीतकोद्वेपकस्तम्भाः, पारुष्यात् परुषकेशश्मश्रुरोमनखदशनवदन-पाणिपादाः, वैशद्यात् स्फुटिताङ्गावयवाः, सततसन्धिशब्दगामिनश्च भवन्ति; त एवंगुण-योगाद् वातलाः प्रायेणाल्पबलाश्चाल्पायुषश्चाल्पापत्याश्चाल्पसाधनाश्चाल्पधनाः च भवन्ति' । (C.Vi. 8:98)

Vata is un-unctuous, light, mobile, and abundant in quantity, quick, cold, rough and non slimy. (Various manifestations due to these attributes of Vata in human body, having Vataja type of constitution are given in table below).

Attributes and Manifestations of Vata

1. Ruksha (dry) & Parusha (hard)	Ununctuousness, emaciation & dwarfness of body; long-drawn, dry-low-broken-obstructed & hoarse voice; always keeping awake or disturbed sleep.
2. Laghu (light)	Light & inconsistent gait and action, food & movement (or talk).
3. Chala (mobile)	Unstable – joints, eyes, eyebrows, lips, tongue, head, shoulder, hands & legs.
4. Bahu (abundance)	Talkativeness, abundance in tendons & veins
5. Shighra (quick)	Quick in initiating actions, getting irritated & the onset of morbid manifestation, quick in affliction with fear, quick in likes & dislikes, quick in understanding & forgetting things.

6. Shita (cold)	Intolerance for cold things often gets afflicted with cold, shivering & stiffness.
7. Khara (rough)	Roughness in the hair of head, face & other parts of body, nails, teeth, face, hands & feet.
8. Vishada (non-slimy)	Cracking of the limbs & organs, production of cracking sound in joints when they move.

Because of the above mentioned qualities, individuals having Vataja type of constitution have lesser strength, span of life, procreation capacity, accessories of life and wealth.

2) Pitta Prakriti

'पित्तमुष्णं तीक्ष्णं द्रवं विस्रमम्लं कटुकं च। तस्यौष्ण्यात् पित्तला भवन्ति उष्णासहा, उष्णमुखाः सुकुमारावदातगात्राः, प्रभूतपिप्लुव्यंग-तिल-पिडकाः, क्षुत्पिपासावन्तः क्षिप्रवली-पलित-खालित्यदोषाः, प्रायो मृद्वल्प-कपिल-श्मश्रु-लोम-केशाश्च, तैक्ष्ण्यात् तीक्ष्णपराक्रमाः, तीक्ष्णाग्नयः, प्रभूताशनपानाः, क्लेशासहिष्णवो, दन्दशूकाः, द्रवत्वा-च्छिथिलमृदुसन्धिमांसाः, प्रभूतसृष्ट-स्वेद-मूत्र-पुरीषाश्च, विस्रवात् प्रभूतपूतिकक्षास्य-शिरःशरीरगन्धाः, कट्वम्लत्वादल्पशुक्रव्यवायापत्याः, च। त एवं-गुणयोगात् पित्तला मध्यबला मध्यायुषो मध्यज्ञानविज्ञानवित्तोपकरणवन्तश्च भवन्ति'।

(C.Vi. 8:97)

Pitta is hot, sharp, liquid, having fleshy smell and is sour & pungent. Various manifestations due to these attributes in the human body, are given below:

Attributes and Manifestations of Pitta

1. Ushna (hot)	Intolerance of hot things, having hot face, tender & clear body of port-wine marks, freckles, black moles, excessive hunger & thirst, quick advent of wrinkles, graying of hair & baldness, presence of some soft & brown hair on the face-head & other parts of the body.
2. Tikshna (sharp)	Sharp (demonstration of) physical strength, strong digestive power, intake

	of food & drink in large quantity, inability to face difficult situations & glutton habits.
3. Drava (liquid)	Looseness & softness of joints & muscles, voiding of sweat-urine & faces in large quantity.
4. Visra (fleshy smell)	Unpleasant smell of axila mouth-head & body in excess
5. Katu- Amla (pungent & sour)	Insufficiency of semen sexual desire & procreation.

By virtue of the above mentioned qualities, a man having Pitta constitution is endowed with moderate strength, moderate span of life, moderate spiritual & materialistic knowledge - wealth & the accessories of life.

3) Kapha Prakriti

'श्लेष्मा हि स्निग्ध-श्लक्ष्ण-मृदु-मधुर-सार-सान्द्र-मन्द-स्तिमित-गुरु-शीत-विज्जलाच्छः। तस्य स्नेहाच्छ्लेष्मलाः, स्निग्धाङ्गाः, श्लक्ष्णत्वाच्छ्लक्ष्णाङ्गाः, मृदुत्वाद् दृष्टिसुखसुकुमारावदातगात्राः, माधुर्यात् प्रभूतशुक्रव्यवायापत्याः, सारत्वात् सारसंहत-स्थिरशरीराः, सान्द्रत्वादुपचितपरिपूर्णसर्वाङ्गः, मन्दत्वान्मन्दचेष्टाहारव्याहाराः, स्तैमित्यादशीघ्रारम्भक्षोभविकाराः, गुरुत्वात् साराधिष्ठितावस्थितगतयः, शैत्यादल्पक्षुत्-तृष्णासन्तापस्वेददोषाः, विज्जलत्वात् सुश्लिष्टसारसन्धिबन्धनाः, तथाऽच्छत्वात् प्रसन्न-दर्शनाननाः, प्रसन्नस्निग्धवर्णस्वराश्च भवन्ति। त एवंगुणयोगाच्छ्लेष्मला बलवन्तो वसुमन्तो विद्यावन्त ओजस्विनः शान्ता आयुष्मन्तश्च भवन्ति'। (C.Vi. 8:96)

Kapha is unctuous, smooth, soft, sweet, firm, dense, slow, stable, heavy, cold, viscous & dear. Various manifestations in the human body having shleshmala (Kaphaja) type of constitution are as follows:

Attributes and Manifestations of Kapha

1. Snigdha (unctous)	Organs, skin and hairs are oily.
2. Shlakshna (smooth)	Organs, skin and hairs are smooth.
3. Mridu (soft)	Pleasing appearance, tenderness & clarity of complexion.

4. Madhura (sweet)	Abundant quantity of semen, desire for sex-act & number of procreations.
5. Sara (firm)	Firmness, compactness, & stability of body.
6. Sandra (dense)	All organs properly nourished.
7. Manda (slow)	Slow - in action, intake of food & movement
8. Staimitya (stable)	Slowness in initiating actions, getting irritated & morbid manifestations.
9. Guru (heavy)	Stable gait with the entire sole of the feet, presenting against the earth.
10. Shita (cold)	Lack of intensity in hunger, thirst, heat & perspiration
11. Achchha (clear)	Happiness in the look & face, happiness & softness of complexion & voice

By virtue of the above mentioned qualities, a man having Kapha type of constitution is endowed with the excellence of strength, wealth, knowledge, energy, peace & longevity.

Dual Constitution

'संसर्गात् संसृष्टलक्षणाः' । (C.Vi. 8:99)

Individuals having constitution dominated by the combination of two doshas are characterized by the combination of the manifestations of respective doshas.

Sama-doshaja Constitution

'सर्वगुणसमुदितास्तु समधातवः' । (C.Vi. 8:100)

Individual who has all the doshas in the state of equilibrium is endowed with the good qualities of all the three types.

In this type good qualities of all three types of individuals are mainfested; Vibrate therefore, has described this to be the best of all types of constitution.

Mental Constitution

Like doshic constitution, mental constitution is also important. Mental constitution is determined by comparative predominance of sattva, raja and tama qualities. Sattvic, rajasik & tamasik are the three main constitutions and they have 7, 6, & 3 subtypes respectively.

• **Sattvic Constitution - Types**

1) Brahma Sattva

'तद्यथा—शुचिं सत्याभिसन्धं जितात्मानं संविभागिनं ज्ञानविज्ञानवचनप्रतिवचन-सम्पन्नं स्मृतिमन्तं कामक्रोधलोभमानमोहेर्ष्याहर्षामर्षापेतं समं सर्वभूतेषु ब्राह्मं विद्यात्' । (C.Sha. 4:37-1)

i) Purity, love for truth, self controlled,
ii) Power of discrimination, material and spiritual knowledge,
iii) Power of exposition, reply and memory,
iv) Freedom from passion, anger, greed, ego, ignorance, jealousy, dejection, intolerance,
v) Favorable disposition equally for all creatures.

2) Arsha Sattva

'इज्याध्ययनव्रतहोमब्रह्मचर्यपरमतिथिव्रतमुपशान्तमदमानरागद्वेषमोहलोभरोषं प्रतिभावचनविज्ञानोपधारणशक्तिसम्पन्नम् आर्षं विद्यात्' । (C.Sha. 4:37-2)

i) Devotion to sacred rituals, study, sacred vows, oblations and celibacy,
ii) Hospitable disposition,
iii) Freedom from pride, ego, attachment, hatred, ignorance, greed and anger,
iv) Intellectual excellence and eloquence,
v) Power of understanding and retention.

3) Aindra Sattva

'ऐश्वर्यवन्तमादेयवाक्यं यज्वानं शूरमोजस्विनं तेजसोपेतमक्लिष्टकर्माणं दीर्घ-दर्शिनं धर्मार्थकामाभिरतमैन्द्रं विद्यात्' । (C.Sha. 4:37-3)

i) Lordship and authoritative speech,

ii) Performance of sacred rituals,
iii) Bravery, strength and splendor,
iv) Freedom from mean acts,
v) Foresightedness,
vi) Devotion to virtuous acts, earning of wealth and proper satisfaction of desires.

4) Yamya Sattva

'लेखास्थवृत्तं प्राप्तकारिणमसम्प्रहार्यमुत्थानवन्तं स्मृतिमन्तमैश्वर्यलम्भिनं व्यपगतरागेर्ष्याद्वेषमोहं याम्यं विद्यात्' । (C.Sha. 4:37-4)

i) Observance of the propriety of actions,
ii) Initiation of actions in time,
iii) Non-violability,
iv) Readiness for initiating action,
v) Memory and lordship,
vi) Freedom from attachment, envy, hatred & ignorance.

5) Varuna Sattva

'शूरं धीरं शुचिमशुचिद्वेषिणं यज्वानमम्मोविहाररतिमक्लिष्टकर्माणं स्थानकोप-प्रसादं वारुणं विद्यात्' ।। (C.Sha. 4:37-5)

i) Bravery, patience, purity and dislike for impurity,
ii) Observance of religions rites,
iii) Fondness for aquatic sports,
iv) Aversion for mean acts,
v) Exhibition of anger and pleasure in proper place.

6) Kaubera Sattva

'स्थानमानोपभोगपरिवारसम्पन्नं धमर्थिकामनित्यं शुचिं सुखविहारं व्यक्तकोपप्रसादं कौबेरं विद्यात्' । (C.Sha. 4:37-6)

i) Possession of honor, luxuries and attendants,
ii) Constant liking for virtuous acts, wealth and satisfaction of desires,
iii) Purity,
iv) Liking for pleasures of recreation.

7) Gandharva Sattva

'प्रियनृत्यगीतवादित्रोल्लापकश्लोकाख्यायिकेतिहासपुराणेषु कुशलं गन्धमालानुलेपनवसनस्त्रीविहारकामनित्यमनसूयकं गान्धर्वं विद्यात्' । (C.Sha. 4:37-7)

i) Fondness for dancing, singing, music and praise,
ii) Expertness in poetry, stories, historical narrations and epics,
iii) Constant fondness for scents, garlands and association of women and passion.

Note: Of the 7 types of Sattvika constitutions, described above, Brahma is the purest.

• **Rajasic Constitution - Types**

1) Asura Sattva

'शूरं चण्डमसूयकमैश्वर्यवन्तमौपधिकं रौद्रमननुक्रोशमात्मपूजकमासुरं विद्यात्' । (C.Sha. 4:38-1)

i) Bravery, cruelty, envy, lordship, movement in disguise, terrifying appearance and ruthlessness,
ii) Indulgence in self praise.

2) Rakhasa Sattva

'अमर्षिणमनुबन्धकोपं छिद्रप्रहारिणं क्रूरमाहारातिमात्ररुचिमामिषप्रियतमं स्वप्नायासबहुलमीर्ष्युं राक्षसं विद्यात्' । (C.Sha. 4:37-2)

i) Intolerance, constant anger, violence at weak points, cruelty, gluttonous habit and fondness for non-vegetarian food,
ii) Excessive sleep and intolerance,
iii) Envious disposition.

3) Paishacha Sattva

'महाशनं स्त्रैणं स्त्रीरहस्काममशुचिं शुचिद्वेषिणं भीरुं भीषयितारं विकृतविहाराहारशीलं पैशाचं विद्यात्' । (C.Sha. 4:38-3)

i) Gluttonous habits,
ii) Fondness for women,
iii) Liking for staying with women in lonely place,
iv) Unclean habits, disliking for cleanliness,

v) Cowardice and terrifying disposition,
vi) Resorting to abnormal diet and regimens.

4) Sarpa Sattva

'क्रुद्धशूरमक्रुद्धभीरुं तीक्ष्णमायासबहुलं सन्त्रस्तगोचरमाहारविहारपरं सार्प विद्यात्' । (C.Sha. 4:38-4)

i) Bravery when in wrathful disposition and cowardice when not in wrathful disposition,
ii) Sharp reaction,
iii) Excessive indolence,
iv) Walking, talking and eating food and resorting to other regimens with a fearful disposition.

5) Preta Sattva

'आहारकाममतिदुःखशीलाचारोपचारमसूयकमसंविभागिनमतिलोलुपमकर्मशीलं प्रैतं विद्यात्' । (C.Sha. 4:38-5)

i) Excessive desire for food,
ii) Excessively painful disposition in character and past times,
iii) Enviousness,
iv) Actions without discrimination, excessive greediness and inaction.

6) Shakuna Sattva

'अनुषक्तकाममजस्रमाहारविहारपरमनवस्थितममर्षणमसञ्चयं शाकुनं विद्यात्' । (C.Sha. 4:38-6)

i) Attachment with passion,
ii) Excessive food and regimen, unsteadiness and ruthlessness.

• Tamasic Constitution -Types

1) Pashava Sattva

'निराकरिष्णुममेधसं जुगुप्सिताचाराहारं मैथुनपरं स्वप्नशीलं पाशवं विद्यात्' । (C.Sha. 4:39-1)

i) Forbidding disposition,
ii) Lack of intelligence,

iii) Hateful conduct and food eating habits,
iv) Excessive sexual indulgence and sleep.

2) Matsya Sattva

'भीरुमबुधमाहारलुब्धमनवस्थितमनुषक्तकामक्रोधं सरणशीलं तोयकामं मात्स्यं विद्यात्' । (C.Sha. 4:39-2)

i) Cowardice, lack of intelligence, greediness for food, unsteadiness, constant passionate and wrathful disposition,
ii) Fondness for constant movement and desire for water.

3) Vanaspatya Sattva

'अलसं केवलमभिनिविष्टमाहारे सर्वबुद्ध्यङ्गहीनं वानस्पत्यं विद्यात्' ।
(C.Sha. 4:39-3)

i) Indolence,
ii) Indulgence in food,
iii) Deficiency of all intellectual faculties.

Prakriti - Features

(According to Sushruta)

1) Vata Prakriti

'तत्र वातप्रकृतिः प्रजागरूकः, शीतद्वेषी दुर्भगः स्तेनो मत्सर्यनार्यो गन्धर्वचित्तः स्फुटितकरचरणोऽल्परूक्षश्मश्रुनखकेशः क्राथी दन्तखादी च भवति' ।

'अधृतिरदृढसौहृदः कृतघ्नः कृशपरुषो धमनीततः प्रलापी ।
द्रुतगतिरटनोऽनवस्थितात्मा वियति च गच्छति सम्भ्रमेण सुप्तः ॥
अव्यवस्थितमतिश्चलदृष्टिर्मन्दरत्नधनसञ्चयमित्रः ।
किञ्चिदेव विलपत्यनिबद्धं मारुतप्रकृतिरेष मनुष्यः' ॥

'वातिकाश्चाजगोमायुशशाखूष्ट्रशुनां तथा ।
गृध्रकाकखरादीनामनूकैः कीर्तिता जराः' ॥ (S.Sha. 4:64-67)

A man of Vata-constitution is wakeful, averse to bathing and cold contact, unshapely (unpleasant to look), thievish, vain, dishonest and fond of music. The soles and palms are much fissured, has often a rough and grisly beard and moustaches, nails and hairs. He is violent and has a habit of biting his

nails and grinding the teeth (during sleep). He is a person with less patience and unsteady in his friendship, ungrateful, lean and rough. Especially hands & legs show the network of vessels & tendons. He is talkative person. He is incoherent in his habit and vacillating in his temper. He walks fast and dreams of scaling the skies in his sleep. His eyes are always moving. His mind is never steady. He makes few friends, is capable of accumulating very little money and talks incoherently.

The traits of his character etc. seem to resemble those of a goat, jackal, hare, mouse, camel, dog, vulture, crow & ass.

2) Pitta Prakriti

'पित्तप्रकृतिस्तु स्वेदनो दुर्गन्धः पीताशिथिलाङ्गस्ताम्रनखनयनतालुजिह्वौष्ठ-पाणिपादतलो दुर्भगो वलीपलितखालित्यजुष्टो बहुभुगुष्णद्वेषी क्षिप्रकोपप्रसादो मध्यबलो मध्यायुश्च भवति'।

'मेधावी निपुणमतिर्विगृह्य वक्ता तेजस्वी समितिषु दुर्निवारवीर्यः।
सुप्तः सन् कनकपलाशकर्णिकारान् सम्पश्येदपि च हुताशविद्युदुल्काः॥
न भयात् प्रणमेदनतेष्वमृदुः प्रणतेष्वपि सान्त्वनदानरुचिः।
भवतीह सदा व्यथितास्यगतिः स भवेदिह पित्तकृतप्रकृतिः'॥

'भुजङ्गोलूकगन्धर्वयक्षमार्जारवानरैः।
व्याघ्रर्क्षनकुलानूकैः पैत्तिकास्तु नराः स्मृताः'॥ (S.Sha. 4:68-71)

A man of Pittaja constitution perspires copiously emitting an unpleasant smell. His limbs are loosely shaped and yellowish in color. The finger, nails, eyes, palate, tongue, lips, soles and palms of such a person are copper colored. Most people of Pitta constitution are good looking but when there are many wrinkles, baldness and gray hairs then his looks are not so good. He eats much, is averse to warmth and irritable in temper, though he cools very soon. He is a man of moderate strength and lives up to moderate life span. He is intelligent and possesses a good tetentive memory and loves to be dominant in conversation. He is vigorous and is simply

irresistible in battle. He dreams about meteors, lightning flashes, fire, Kanaka-palasha plants (flowers of red colors). He never fears and bends before powerful opponents. He protects, who surrenders. He frequently suffers from apthous ulcers or stomatitis.

The traits of his character resemble with a serpent, an owl, gandharva (heavenly musician), yaksha, cat, monkey, tiger, bear and a mongoose.

3) Kapha Prakriti

'श्लेष्मप्रकृतिस्तु दूर्वेन्दीवरनिस्त्रिंशार्द्रारिष्टकशरकाण्डानामन्यमयतर्ण: सुभग: प्रियदर्शनो मधुरप्रिय: कृतज्ञो धृतिमान् सहिष्णुरलोलुपो बलवांश्चिरग्राही दृढवैरश्च भवति'।

'शुक्लाक्ष: स्थिरकुटिलालिनीलकेशो लक्ष्मीवान् जलदमृदङ्गसिंहघोष:।
सुप्त: सन् सकमलहंसचक्रवाकान् सम्पश्येदपि च जलाशयान् मनोज्ञान्॥
रक्तान्तनेत्र: सुविभक्तगात्र: स्निग्धच्छवि: सत्त्वगुणोपपन्न:।
क्लेशक्षमो मानयिता गुरूणां ज्ञेयो बलासप्रकृतिर्मनुष्य:'॥

'दृढशास्त्रमति: स्थिरमित्रधन: परिगण्य चिरात् प्रददाति बहु।
परिनिश्चितवाक्यपद: सततं गुरुमानकरश्च भवेत् स सदा'॥

'ब्रह्मरुद्रेन्द्रवरुणै: सिंहाश्वगजगोवृषै:।
तार्क्ष्यर्हंससमानूका: श्लेष्मप्रकृतयो नरा:'॥ (C.Sha. 4:72-76)

The complexion of a man of Kaphaja constitution resembles either the color of a blade of grass, blue lotus, polished sword, stem of shara grass. He is attractive and handsome. He is fond of sweet taste, grateful, courageous, forbearing, non greedy, and strong. He does not hastily from any opinion and is fast in his enmity. His eyes are white, his hair are curly and raven black. He is prosperous in life. His voice resembles the rumblings of a rain cloud, the roar of a lion or sound of mridanga. He dreams in his sleep of large lakes or pools decked with myriads of full blown lotus flowers, swans and chakravaka. His eyes are slightly red towards the corners. The limbs are proportionate and symmetrically developed

with a cool effluence radiating from them. He is possessed of the qualities of sattvic constitution, capable of sustaining pain, stress and is respectful towards superiors. He possesses faith in religious texts and is unflinching & unchanging in his friendship. He suffers no vicissitudes of fortune, makes large gifts after long deliberation, is true to his word and always obedient to his preceptors.

The traits of his character resemble those of Brahma, Rudra, Indra, Varuna, lion, horse, elephant, cow, bull, eagle, swan and of lower animals.

Anukatva

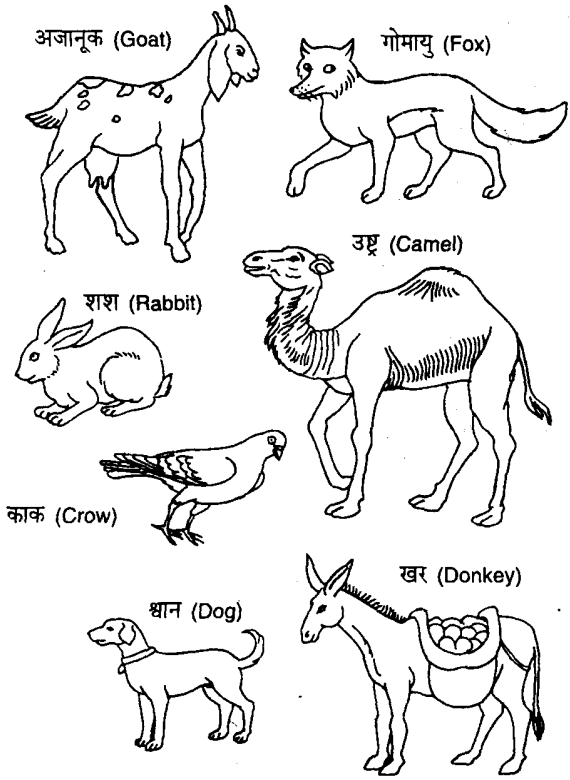
In the description of constitution, Sushruta has shown the resemblance in the features of the constitutions and features of animals. This resemblance in characters, behavior, activity, structure and mentality is called as 'anukatva' in Ayurveda. 'Anuka' means behavior, activity or family.

In the period of Samhitas, the students and teachers were in close contact with nature, so the teaching process always used to mention some environmental facts for better understanding of topic. e.g. Kapha Prakriti people walk like an elephant.

1) Anukatva in Vata Prakriti

Animal	*Similarity with Vata*
1. Aja (goat)	Slender body, low strength, constant movement, eats frequently.
2. Shrigala (fox)	Likes to do the work by deceiving others, has selfish nature, his complexion is dusty and has unstable eyes.
3. Shasha (rabbit)	Small body, mind full of anxiety, moves lot with unstable eyes, fearful nature.
4. Akhu (rat)	Thin and small body having dusty color and hairs likes to steal and destroy with-

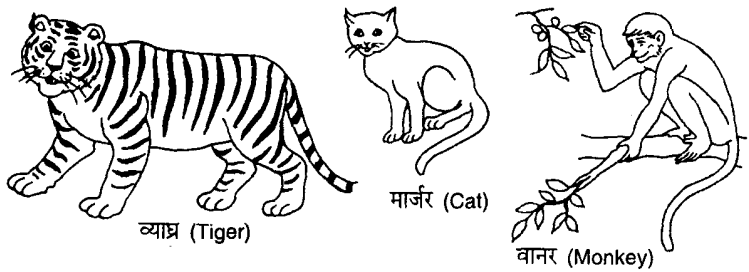
	out purpose. Also has fearful but cruel nature.
5. Ushtra (camel)	Slender & tall, dry & rough voice, rough skin.
6. Shwa (dog)	Small undernourished body, likes to quarrel. Voice is harsh and rough.
7. Gridhra (vulture)	Ugly, wicked, cruel and crooked nature.
8. Kaka (crow)	Black colour, ugly, dry, harsh and rough voice
9. Khara (donkey)	Dry & rough voice, dusty hairs & body, does lot of work without proper thinking.



Similarity of Vata Prakriti & Features of Animals (Anukatva)

2) Anukatva in Pitta Prakriti

Animal	*Similarity with Pitta*
1. Vyaghra (tiger)	Courageous, strong physical power, yellowish skin color, egoistic.
2. Riksha (bear)	Red eyes, courageous, fond of cold.
3. Marjara (cat)	Delicate and medium body, grey eyes.
4. Vanara (monkey)	Intelligent, small but agile body having brownish skin and gray eyes.
5. Nakula (mongoose)	Very courageous, fighting nature.
6. Bhujanga (snake)	Yellow colored skin, delicate and soft body hot tempered.
7. Uluka (owl)	Red eyes, intelligent, afraid of sunlight.

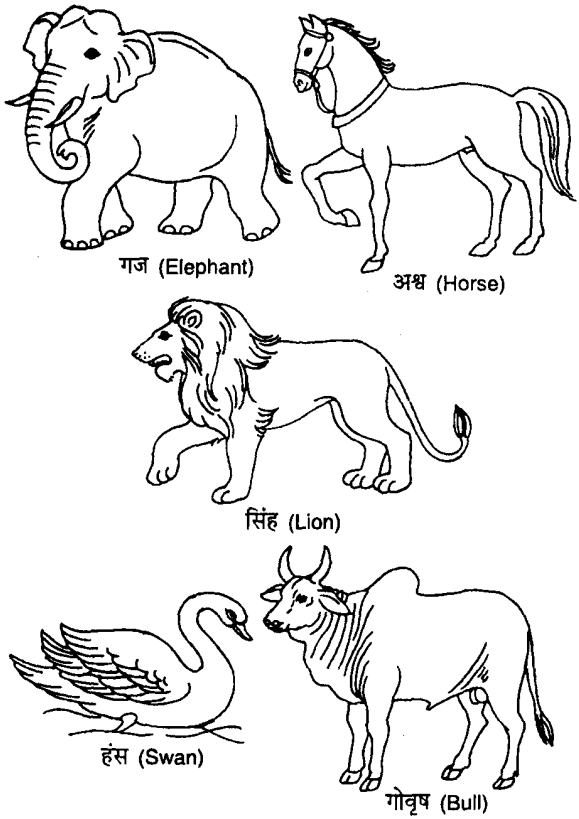


Similarity of Pitta Prakriti &
Features of Animals (Anukatva)

3) Anukatva in Kapha Prakriti

Animal	*Similarity with Kapha*
1. Simha (lion)	Broad chest, courageous, having good strength and strong high resonant voice
2. Ashwa (horse)	Handsome having powerful and strong body. They are very faithful to their masters.
3. Gaja (elephant)	Mighty body with broad forehead, stable gait. Their enmity is long lasting.
4. Govrisha (bull)	Mighty and strong.

5. Hamsa (swan)	Beautiful looking with white skin and having good tissue power. They like water.
6. Tarkshya (eagle)	Strong, faithful to master.



Similarity of Kapha Prakriti & Features of Animals (Anukatva)

Chapter 12

Chikitsadhishthita Purusha

'Chikitsadhishtit Purusha' is a self explanatory word which consists of three words - Chikitsa + Adhishtita + Purusha. This means a person who is being treated or the patient.

Chikitsa or treatment means the activities adopted to balance the disturbed doshas. The word Purusha implies to all living things which includes not only human beings but also the animal and plant kingdom. For their treatment Ayurveda has specialized branches like Hastya Ayurveda (Ayurvedic veterinary science for elephants), Vriksha Ayurveda (Ayurvedic agricultural science). But in the present context, we are restricting the meaning of Purusha as a human being which includes both sexes male and female.

'पुरुषशब्देन च इह सामान्येन प्राणिवाचिना अपि प्रकरणान्मनुष्यरूपः एव पुरुष उच्यते'।

While treating any person or Purusha we have to consider various aspects of human being. These aspects can be clarified by understanding different systems of classification.

1) Shad-dhatvatmak Purusha

'खादयश्चेतनाषष्ठा धातवः पुरुषः स्मृतः'। (C.Sha. 1:16)

Kha (Akasha- space) etc. Five primordial substances and Chetana forms the *Shad dhatwatmak Purusha.* This purusha consists of five basic elements - Earth, Fire, Water, Air & Space.

Our immortal soul and mind plays a significant role in maintaining our mental health. All these things add life to a person. The entire physiological activities take place smoothly only if all the above mentioned elements are in a

proper balance. Ayurveda tries to explain that instead of just treating the outer physical body we have also to treat the mind of that person.

Due to materialistic and modern living conditions man is facing excessive stress which is leading to increasing the psychosomatic symptoms.

Thus while treating we have to treat the person physically as well as psychologically according to the ancient concepts of Ayurveda and also thoughts put down by scientists.

Human body is composed of five elements and food that we eat is also panchabhautik. Hence we can treat deficiency of any element with appropriate food, for e.g. in osteoporoses, earth element is deficient and therefore patient is advised food of earthy quality like food containing calcium.

2) Tridhatuka Purusha

'सत्त्वमात्मा शरीरं च त्रयमेतत् त्रिदण्डवत् ।
लोकस्तिष्ठति संयोगात्तत्र सर्वं प्रतिष्ठितम्' ॥ (C.Sha. 1:46)

Sattva (mind), atma (soul) and sharira (physical body) are like the three pillars of tripod. Health and quality of life all depends on this tripod.

Many problems dwell only in the mind. Thus by mere counseling some problems can be cured. It is the mind which should be healthy along with physical body. It is rightly said - sound mind rests in and sound body.

The mind and body are intimately related to each other. Hence while examining the patient, body and mind should be considered as single unit.

3) Chaturvimshatika Purusha

This means that Purusha is composed of 24 elements. They are self ego, five jnanendriyas (sense organs), five panch-bhautik elements, five karmendriya (motor organs) and five

tanmatra. This concept is important while thinking about salvation (moksha) and advising or counseling the patient spiritually.

4) Rashi Purusha

The word Rashi means a group. While treating any person we have to give the thought for all the elements in a group. e.g. tri-dhatuk (3), shad-dhatvatmak (6) etc.

5) Samyoga Purusha

Samyoga means combination. As in the Rashipurusha there is a combination of 3, 6 or 24 elements or groups. Rashipurusha can also be called as Samyog Purusha.

6) Karma Purusha

Our soul is eternal where as the physical body is mortal.

Ayurveda also explains karma or rebirth theory. The word Karma means deed. When the soul enters the combination fertilized ovum and subtle body (containing four elements and mind) it brings past deeds with it also. It is only the atma (soul) which maintains contact between yester life, present life and future life. The good deeds done in the past life are responsible for healthy and happy life while the bad deeds bring unhappy life and diseases. e.g. leucoderma (vitligo).

'आत्मनः भोगायतनं शरीरम्' ।

Physical body is the carrier of soul (atma) i.e. the soul rests only in a particular body and this is called Karma Purusha.

'मोहाद्धि भावेषु इच्छा द्वेषश्च भवति, ततः प्रवृत्तिः, प्रवृत्तेर्धर्माधर्मौ तौ च शरीरं जनयतो भोगार्थम्' । (C.Sha. 1:53, Chakrapani)

Desire and hatred comes from attachment. This makes the ethical or unethical practices, through physical body e.g. a disease in this life may symbolize a bad deed done in the past life. It is said - as you sow, so shall you reap. Parental negligence in childhood may show its effect in young age of

the child. Bad habits in young age like eating fast food after may bring old age problems like arthritis, hypertension etc. Slight negligence in old age may also invite death. In brief, Chikitsadhisthita Purusha means classification of patient with different perspectives.

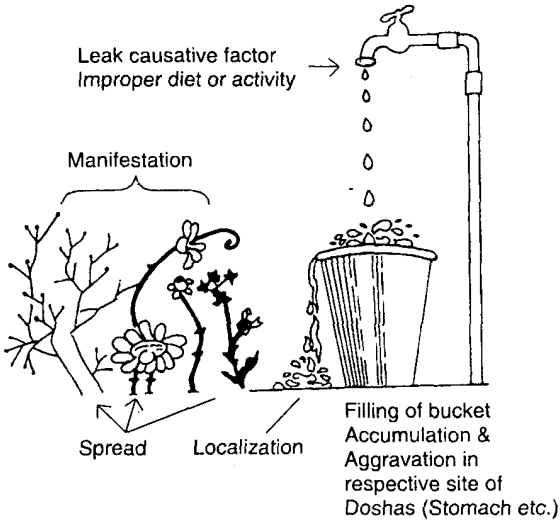
Chapter 13

Shat kriyakala

Till now we know that physiology is the study of normal functioning of the body is study of dosha (bioenergy), dhatu (tissues) and mala (waste matter). Pathology deals with etiology, diagnosis, symptoms of the disease.

To cure the disease completely knowledge of shatkriya kala or samprapti is essential. Shat means six and kriyakala means stages. Samprapti has six stages from the accumulation of doshas till the disease is completely manifested. Sushruta has described these stages in the following way:

'सञ्चयं च प्रकोपं च प्रसरं स्थानसंश्रयम्।
व्यक्तिं भेदं च यो वेत्ति दोषाणां स भवेद् भिषक्' ॥ (S.Su. 21:36)



The Development of Disease
(Pathogenesis)

1) Stage of Accumulation

(Chaya or Sanchaya)

In this stage the disturbed doshas start accumulating in their own sites.

'एनानि खलु दोषस्थानानि एषु सञ्चीयते दोषाः। ·····तत्र सञ्चितानां खलु दोषाणां स्तब्धपूर्णकोष्ठता पीतावभासता मन्दोष्मता च अङ्गानां गौरवमालस्यं चयकारण-विद्वेषश्चेति लिङ्गानि भवन्ति'।

(S.Su. 21:18)

i) In Vata chaya the person senses abdominal bulging due to Vata accumulation and then becomes lethargic.

ii) In Pitta chaya yellowness of nails, eyes and urine is observed.

iii) In Kapha chaya body temperature is lowered. The person starts developing nausea.

'चयो वृद्धिः स्वाधाम्न्यैव प्रद्वेषो वृद्धिहेतुषु।
विपरीतगुणेच्छा च'। (A.H.Su. 12:22)

Chaya is increased in its own sites and produces dislike for things which are the causes of increase and liking for things of opposite qualities.

In this stage mild symptoms are seen. Thus it is very beneficial to cure the person in this 1st stage itself.

'सञ्चयेऽपहृता दोषा लभन्ते नोत्तरागतिः।
ते तूत्तरासु गतिषु भवन्ति बलवत्तराः'॥ (S.Su. 21:37)

If we treat the disease at the stage of sanchaya (accumulation), the disease does not spread further. This is the reason why it is said that if we treat this stage correctly we can win over the disease.

'चयैव जयेद् दोषम्। (A.H.Su. 13:15)

The doshas should be vanquished (by effective treatment) in their stage of chaya.

2) Stage of Aggravation
(Prakopa)

In this stage the doshas go on accumulating further in their own sites.

'तेषां प्रकोपात् कोष्ठतोदसञ्चरणाम्लिकापिपासापरिदाहान्नद्वेषहृदयोत्क्लेदश्च जायन्ते। तत्र द्वितीयः क्रियाकालः'। (S.Su. 21:27)

i) In Vata-prakopa, hyper peristalsis is observed i.e. food passes very rapidly through the stomach and intestine.
ii) In Pitta-prakopa, water brash, polydypsia (frequency in drinking water) and burning sensation is observed.
iii) In Kapha-prakopa the person feels nauseated about food and heaviness in chest is observed.
Vagbhata has said that in this stage dosha spread through out the body; however this is not quite correct.

3) Stage of Spread
(Prasara)

In this stage the doshas are hyper activated and they leave their site and start spreading throughout the body.

'एवं प्रकुपितानां प्रसरतां वायोर्विमार्गगमनाटोपौ, ओषचोषपरिदाहधूमायनानि पित्तस्य, अरोचकाविपाकाङ्गसादाश्च्छर्दिश्चेति श्लेष्मणो लिंगानि भवन्ति; तत्र तृतीयः क्रियाकाल'। (S.Su. 21:32)

i) In Vata-prasara doshas change their place and move in any part of the body. A person experiences tympanitis.
ii) In Pitta-prasara body temperature is raised and burning sensation is sensed.
iii) In Kapha-prasara the person experiences fatigue, indigestion and tastelessness. Also a felling for nausea is developed.

How prasara stage is formed ?

If milk is kept for boiling in a vessel, after some time it comes up to the brim and then if not removed spills out. Similarly doshas leave their place and spread through out the body.

When water and kodrava (type of cereal) are mixed and kept in closed vessel for some time, then fermentation takes place and this mixture spreads rapidly everywhere. Similarly doshas spread rapidly throughout the body.

When water starts accumulating in a lake beyond its capacity then the extra water overflows. Similarly doshas spread rapidly throughout the body.

4) Stage of Localization
(Sthanasamshraya)

'कृत्स्नेऽर्धेऽवयवे वापि यत्रांगे कुपितो भृशम् ।
दोषो विकारं नभसि मेघवत् तत्र वर्षति ॥
नात्यर्थं कुपितश्चापि लीनो मार्गेषु तिष्ठति ।
निष्प्रत्यनीकः कालेन हेतुमासाद्य कुप्यति' ॥ (S.Su. 21:29-30)

In this stage the aggravated doshas attack the dushya or weak tissues or waste products & disease is manifested. In this stage the prodromal symptoms (Purvarupa) starts appearing.

'स्थानसंश्रयिणा क्रुद्धाः भाविव्याधि प्रबोधकम् ।
दोषाः कुर्वन्ति यत् लिङ्ग पूर्वरूपं तदुच्यते' ॥ (M.N. 1:7)

In this stage the disease starts progressing. The type of disease depends on where the doshas have accumulated. Depending on the type of channel these doshas attack, various diseases like diarrhea, kidney stone, fever etc. occurs. To prevent this stage rasayana treatment is very beneficial.

5) Stage of Manifestation
(Vyakti)

In this stage the disease expresses itself. Here the disease can be diagnosed easily. e.g. pyrexia, colitis (diagnosed by type of feces). Sushruta has described this stage as occurrence of disease.

In this stage proper symptoms or Rupa appears, therefore particular disease expresses particular symptoms.

6) Stage of Differentiation

(Bheda)

This is the last stage of shat-kriyakala. In this stage the disease can be diagnosed correctly and its doshaja type can be decided. e.g. Pittaja diarrhea (where Pitta dosha is predominant).

'वातादिलक्षणभेदात् भिन्नत्वे भेदाः' । (S.)

Significance of Shat-kriyakala

1) Understand the stages in a definite sequence before the disease is diagnosed.
2) We can prevent the formation of disease if the initial stages are diagnosed correctly.
3) Different types of treatment can be given for different stages.
4) The physician can successfully cure the patient and prevent the recurrence of the disease.

Chapter 14

Ahara

(Dietetics)

For the nourishment and protection of the body, sense organs, mind and soul we have to consume food and water. Right from birth catabolism takes place and hence for regeneration of tissues, food is constant requirement. In the spiritual texts food is described as something which protects the outer physical body and the immortal soul.

'प्राणो वा अन्नम्। शरीरं अन्नदाम्। प्राणे शरीरं प्रतिष्ठितम्'।

(Taittiriya Up.)

Formation of human body takes place from food as said in the Taitiriya Upanishad.

'आकाशाद् वायुः, वायोस्तेजः, तेजसः उदकम्, उदकात् पृथिवी, पृथव्या औषधयः, औषधिभ्यो अन्नम्, अन्नात् पुरुषः। (Taittiriya Up.)

Note - In the above quote food is referred to something which naturally grows on earth. But today people consume both vegetarian as well as non vegetarian diet.

Three Types of Food

'प्राणाः प्राणभृतामन्नमन्नं लोकोऽभिधावति।
वर्णः प्रसादः सौस्वर्यं जीवितं प्रतिभासुखम्।
तुष्टिः पुष्टिर्बलं मेधा सर्वमन्ने प्रतिष्ठितम्'॥ (C.Su. 27:349)

1) Dosha alleviating food
2) Dosha aggravating food
3) Food that maintains health

While treating patient, along with medication the physician should also give proper advice regarding do's and don'ts about the diet.

Benefits of Food

Consuming food is an inborn instinct. Food helps building up body and gives strength. Along with the body it also gives nourishment to the mind. All the physiological functions take place smoothly if a balanced and healthy diet is consumed.

Choice of Food

There are many types of food available. Out of these one should choose wisely. Food should not be consumed greedily or without knowledge.

'न रागानाप्याविज्ञानात् आहारमुपसेवयेत् परीक्ष्य हितम् अग्नीय, देहो हि आहार-सम्भव:' । (C.S. 24:4)

Beneficial food maintains a balance between dhatus (tissues) while harmful food creates an imbalance between them.

'यदाहारजातमग्निवेश ! समांश्चैव शरीरधातून् प्रकृतौ स्थापयति विषमांश्च समीकरोति इत्येद्धितं विद्धि, विपरीतं तु अहितमिति; इत्येतद् हिताहितलक्षणमनपवादं भवति' । (C.Su. 25:33)

Only beneficial food should be consumed.

'आहारत्वमाहारस्यैकविधमर्था' । (C.Su. 27:3)

Beneficial & Harmful Food

Beneficial or harmful should be decided upon the type of food.

1) Origin

The quality of the food depends on its origin. It can be from animal origin like meat, milk, eggs etc., plant origin (herbs) and natural like saindhava.

2) Occurrence

Sendriya - With life – substances having animal and plant origin.

Nirindriya – Without life - substances like salt, sugar.

3) Effects

(a) Beneficial (b) harmful (c) palliating (d) provocating (e) maintaining health.

'शीलयेच्छालिगोधूमयवषष्टिकजांगलम् ।
सुनिषण्णकजीवन्तीबालमूलकवास्तुकम् ।
पथ्यामलकमृद्वीकापटोलीमुद्गशर्कराः ।
घृतदिव्योदकक्षीरक्षौद्रदाडिमसैन्धवम् ।
त्रिफलां मधुसर्पिर्भ्यां निशिनेत्रबलाय च' ॥ (A.H.Su. 8:42-45)

Shali (rice), godhuma (wheat), yava (barley), shastika (rice maturing in 60 days), jangala (meat of animals of desert like lands), sunishannaka, jivanti, balamulaka, pathya, amalaka, mridvika, patol, mudga, sharkara (sugar), ghrita (butter fat), divyodaka (rain water or pure water), kshira (milk), kshoudra (honey) dadima and saindhava (salt) can be consumed habitually. Triphala along with honey & ghee should be consumed at nights daily for strengthening eye sight.

4) Content (twenty gunas)

'गुरुमन्दहिमस्निग्धश्लक्ष्णसान्द्रमृदुस्थिराः ।
गुणाः ससूक्ष्मविशदा विंशतिः सविपर्ययाः ॥ (A.S.Su. 1:39)

Foods have twenty different types of qualities. These are in two groups of ten qualities having exactly opposite qualities.

Ten attributes having brimhaniya qualities are guru (heavy), manda (mild), shita (cold), snigdha (oily), shlakshna (smooth), sandra (solution, suspension), mridu (soft), sthira (steady), sthula (bulky) and picchila (slimy).

Ten attributes having langhaniya qualities are laghu (light), teekshna (penetrating), ushna (hot), ruksha (dry), khara (rough), drava (liquid), kathina (hard), chala (unstable), sookhma (subtle) and vishada (cleansing).

'धातवः पुनः शारीराः समानगुणैः समानगुणभूयिष्ठैर्वाप्याहारविहारैभ्यस्यमानैर्वृद्धिप्राप्नुवन्ति ह्रासतु विपरीतगुणैर्विपरीतगुणभूमिष्ठैर्वाप्यभ्यस्यमानैः' ।(C.Sha. 6:1)

If blood is lost then it is replaced by blood itself (blood transfusion). If a person becomes thin he is advised to eat heavy food e.g. ghee, milk, udid dal etc.

5) Taste

Our food consists of sweet, sour, salty, pungent, bitter and astringent taste. To maintain one's health the person should consume all types of food. *Nityam sarvarasabhyasa.*

(A.H.Su. 3/52)

All types of tastes should be included in one's diet. If the person continues to consume only one type of food having only one taste then its effects are seen later in the from of provocation of dosha or palliation of dosha. e.g. sweet taste - wheat, milk, sugar etc. increases Kapha and decreases Vata.

Uses of Each Taste

1) Madhura

'तत्र मधुरो रसो जन्मप्रभृति सात्म्यात् सर्वधातुविवर्धन आयुष्यो बालवृद्धक्षत-क्षीणबलवर्णेन्द्रियत्वक्कण्ठकेशहितः प्रीणनो बृंहणो जीवनस्तर्पणः स्थैर्यसन्धानस्तन्य-करो वातपित्तविषदाहमूर्च्छातृष्णाप्रशमनः स्निग्धः शीतो मृदुर्गुरूश्च' । (A.S.Su. 18:6)

Consuming sweet foods nourishes all tissues. It is satmya or acceptable and beneficial in all ages and for young or old, it gives strength and also good for hair; sweet taste also improves complexion. It is also good for throat, hairs and voice. It alleviates Vata and Pitta and increases Kapha. Exception - old rice, green gram and old honey.

A person having Vata or Pitta prakriti should mainly consume sweet foods. As sweet taste calms person's mind of Vata prakriti and palliates the burning sensation in Pitta prakriti. Also it quenches the frequent thirst of Vata prakriti.

2) Amla

'अम्लोऽनिलनिबर्हणोऽनुलोमनः कोष्ठविदाही रक्तपित्तकृदुष्णवीर्यः शीतस्पर्शोः बोधयतीन्द्रियाणि रोचनः पाचनो दीपनो बृंहणस्तर्पणः प्रीणनः क्लेदनो व्यवायी लघुः स्निग्धौ हृद्यश्च । (A.S.Su. 18:9)

Sour taste stimulates peristalsis, increases acidity in stomach. It is hot in potency. Sour taste improves appetite. It is carminative and digestive. It is light and unctuous in properties. It alleviates Vata but aggravates Kapha and Pitta. Exception - dadima and amalaki.

3) Lavana

'लवणो स्तम्भबन्धसंघातविध्मापनः सर्वरसप्रत्यनीकोदीपनो रोचनः पाचनः क्लेदनः शोषणः स्नेहनः स्वेदनो भेदनश्छेदनः सरो व्यवायी विकाशी हरति पवनं विष्यन्दयति कफं विशोधयति स्रोतांसि न अति गुरुः स्निग्धतीक्ष्णोष्णश्च'।

(A.S.Su. 18:11)

Salty taste removes the obstruction. It improves appetite. It is good carminative and digestive. It is carminative and hence removes gas trouble. It has qualities like snigdha, teekshna and ushna. It alleviates Vata but increases Pitta and Kapha. Exception – rock salt.

4) Tikta

'तिक्तः स्वयमरोचिष्णुः अरुचिविषक्रिमिमूर्च्छोत्क्लेदज्वरदाहतृट्कुष्ठकण्डूहरः क्लेदमेदोवसामज्जविण्मूत्रपित्तश्लेष्मोपशोषणो दीपनः पाचनो लेखनः स्तन्यकण्ठशोधनो मेध्यो न अतिरूक्षः शीतो लघुश्च'। (A.S.Su. 18:13)

Bitter taste, itself is unpleasant, but it improves the taste perception quality of tongue. Bitter taste acts as anti-toxic, anti-helminthic, anti-pyretic. It is useful in skin problems, as it is alterative or blood cleanser. It reduces the excess moisture of tissues. Bitter is not too drying but it is cool and light in property. It alleviates Kapha and Pitta but increases Vata. Exception - guduchi and patola.

5) Katu

'कटुकोऽलसकश्वयथूदर्दस्थौल्याभिष्यन्दक्रिमिवक्त्ररोगविषकुष्ठकण्डूप्रशमनो व्रणावसादनः स्नेहक्लेदशोषणो रोचनः पाचनो दीपनो लेखनः शोधनः शोषयति अन्नं स्फुटयति इन्द्रियाणि भिनत्ति शोणितसंघातं छिनत्ति बन्धान् विवृणोति स्रोतांसि क्षपयति श्लेष्माणं लघुरूक्षतीक्ष्णोष्णश्च'। (A.S.Su. 18:15)

Pungent taste is hot, penetrating, and dry & light in qualities. It is good appetizer, carminative and digestive. Pungent food is advised in indigestion, edema, obesity, water retention, worm infestation. Pungent taste reduces Kapha but aggravates Pitta and Vata. Exception - shunthi, pippali and lashuna.

6) Kashaya

'कषायो बलासं सपित्तं सरक्तं निहन्त्याशुबध्नाति वर्चोऽतिरूक्षः ।
गुरुस्त्वक्सवर्णत्वकृत् क्लेदशोषी हिमः प्रीणनो रोपणो लेखनश्च' ॥

(A.S.Su. 18:18)

Astringent taste is cooling, refreshing and healing in nature. It absorbs excess moisture and helps as haemostatic. It aggravates Vata and alleviates Pitta and Kapha. Exception - haritaki.

Effects of Excess Consumption

1) Madhura - If an individual constantly consumes sweet foods there will be Kapha aggravation and he will become lethargic, put on weight, becomes sleepy and may suffer from diseases like obesity, diabetes mellitus etc.

2) Amla - Excess eating of sour food can develop laxity in muscle, anemia, various bleeding disorders, excessive thirst, erysipelas and itching of skin.

3) Lavana - A person becomes thirsty, feels exhausted. Salt makes the blood hypertonic, increases Kapha dosha in the body.

4) Tikta - Foods in this category cause exhaustion, increases the chances of Vataja diseases and makes the skin very dry.

5) Katu - These foods or drinks cause excessive thirst and provocates Vata dosha.

6) Kashaya - This taste develops thirst, provocates Vata dosha, reduces semen, can cause paralysis.

Note- These taste occur naturally in various herbs and plants according to season.

Sweet - Hemant (winter)
Sour - Varsha (rainy season)
Salt - Sharad (autumn)
Pungent - Grishma (summer)
Bitter - Shishir (late winter)
Astringent - Vasant (spring)

Classification of Food

Food composition

Human body is basically made up of five primordial elements. To nourish and maintain our health we should also consume food containing these elements. This can be understood by the principle of homologous & heterologues.

'पञ्चभूतात्मके देहे आहार: पाञ्चभौतिका: विपक्व: पञ्चधा सम्यग्गुणान् स्वान् अभिवर्धयेत्' । (S.Su. 46:526)

Our food should contain all these five elements. The main aim of Ayurveda is to maintain one's health. If at all disease overcomes the person then we should treat the person with suitable medicines.

'प्रयोजनं चास्य स्वस्थस्य स्वास्थरक्षणम् आतुरस्य विकारप्रशमनं च' ।
(C.Su. 30:26)

e.g. In old age the bones become brittle, which are made up from earthly element. To treat this condition we should give foods containing earth element like praval, almonds etc.

(1) Earth

'तत्र द्रव्यं गुरुस्थूलस्निग्धगन्धगुणोल्बणम् ।
पार्थिवं गौरवस्थैर्यसंघातोपचयावहम्' ॥ (A.H.Su. 9:5)

This element is heavy; steady has its own odor. It gives strength or support (e.g. bones); Food – cereals, wheat, meat etc.

(2) Water

'द्रवशीतगुरुस्निग्धमन्दसान्द्ररसोल्बणम् ।
आप्यं स्नेहनविष्यन्दक्लेदप्रह्लादबन्धकृत् ॥ (A.H.Su. 9:6)

Water is cold, heavy, helping oleation, mild and originator of all the tastes. It is predominant in qualities like cleansing, oleating and flowing.

(3) Fire

'रूक्षतीक्ष्णोष्णविशदसूक्ष्मरूपगुणोल्बणम् ।
आग्नेयं दाहभावर्णप्रकाशपचनात्मकम्' ॥ (A.H.Su. 9:7)

This element is dry, light, hot; it gives a burning sensation inside the body. Helps in digestion to a certain extent gives color to the skin (e.g. gastric juice); Food - all spices like clove, chilly etc.

(4) Air

'वायव्यं रूक्षविशदलघुस्पर्शगुणोल्बणम् ।
रौक्ष्यलाघववैशद्यविचारग्लानिकारकम्' ॥ (A.H.Su. 9:8)

This element is dry, rough and light. The function is transport or conduction. e.g. eustachian tube inside ear transmits vibrations to cochlea; Food - toast etc.

(5) Space

'नाभसं सूक्ष्मविशदलघुशब्दगुणोल्बणम् ।
—सौषीर्यलाघवकरम्' ॥ (A.H.Su. 9:9)

This element is light, hollow. Present in all the cells as well as organs like lungs, heart and gastro-intestinal tract or inside bones.

Note- In fact taste is a combination of all these 5 properties

1) Sweet = Earth + Water
2) Sour = Earth + Fire
3) Salty = Water + Fire
4) Pungent = Air + Fire

5) Bitter = Air + Ether
6) Astringent = Air + Earth

Classification According to Ashtanga Sangraha

a) Solid food:

- Grains: Rice, barley, wheat, maize.
- Cereals and pulses.
- Cooked food.
- Meat: pork, beef etc.
- Fruits : Apple, banana etc.
- Monocotyledons like rice and dicotyledons like beans.

b) Liquid food:

- Water : Juices, soft drinks.
- Milk : Milk shakes etc.
- Oil: different oils like groundnut, mustard.
- Beverages: Tea, coffee, alcohol – wine, etc.

Ways of Consuming Food

1) Drinking - Milk, butter milk etc.
2) Chewing - Rice etc.
3) Licking - Jams, sauce, jelly etc.
4) Mastication - Indian bread.

FOOD

(Modern View)

Every human being requires constant supply of metabolites for growth and energy.

Functions of Food

(1) Provides metabolites or building materials, for the human body

(2) Food is the source of Energy

(3) Food is necessary for normal functioning & well balanced growth

(4) Food replaces wear & tear of body

Nutrition

Nutrition is that by which food is obtained, prepared, absorbed & build up into body tissues.

Phases of Nutrition - (i) Ingestion (ii) digestion (iii) absorption (iv) assimilation (v) ejection.

Proximate Principles of Food

(1) Carbohydrates
(2) Proteins
(3) Fats
(4) Vitamins
(5) Minerals
(6) Water
(7) Roughage.

- Body building food = Proteins.
- Energy producing food = Carbohydrates and fats.
- Protective food = Minerals and vitamins

1) Carbohydrates

Carbohydrates contain C, H & O.
1 gm. of carbohydrate provides - 4 kcal of energy.

Types of carbohydrates

i) Mono-saccharides – Glucose and fructose
ii) Di-saccharides - Maltose, sucrose
iii) Poly-saccharides – Starch and glycogen.

Function - Carbohydrates, like glucose, **form respiratory substrate** or fuel substances to produce energy. Excess of glucose is stored in liver and muscle, as glycogen and in the form of starch in plants.

Source - Bread, potato, sugarcane, grapes, wheat, maize
Daily requirement - 400-500 gms.

2) Proteins

Proteins are body building substances.

Proteins contains nitrogen in addition to C, H & O. It also contains phosphorus and sulphur. Proteins are the polymers of unit structures called amino acids.

Function - (1) Proteins are body building materials, which form the main constituent of protoplasm is formed. (2) Proteins are used in repairing wear & tear of body. (3) Various enzymes, some hormones, DNA & RNA molecules are made up of proteins.

Excess of protein (unlike carbohydrates) is not stored in the body, but is broken down in the Liver to form Urea. Which is expelled through urine and remaining part is utilized for forming other complex food substances.

Sources - Meat, fish, eggs, peas, bean and milk.
Daily need - 1 gm/kg. body wt.

3) Lipid

Fats and their derivatives are collectively called as lipids.

Fats are compounds or fatty acids and glycerol. They are composed of C, H & O, but less O_2 than in carbohydrates.

Types of Lipids:

i) Simple Lipids - fats and waxes
ii) Compound Lipids - Phospholipids and glycolipids.
iii) Derived Lipids - Steroids (Cholesterol, sex hormones like estrogen, androgen).

Fats - Highly concentrated energy foods.

1 Gm. of fats provides - **9.5 kcal of energy.**

Function - (i) **Fats are used in architecture of living bodies** (ii) Serves as compact fuel for molecules. (iii) Serves as reserve food.

Source - Butter, cream, oil, nuts, fish.
Daily need - 45 to 60 Gm.

4) Vitamins

Organic food factors - essential for healthy and well balanced growth of the body. Small amount of vitamins is sufficient for the normal functioning of the body. Partial deficiency of vitamins causes deficiency diseases.

Types of vitamins

A) Water soluble - vitamins - B complex & C
B) Fat soluble - vitamins A, D, E & K.

• (A) Fat Soluble Vitamins

1) Vitamin A (Retinol)

Function - (i) Healthy growth of epithelial lining and mucous membrane, (ii) Essential for new cell growth (iii) Forms visual purple in retina (iv) This is anti-infective and growth promoting vitamin.

Source - Milk, butter, ghee, fish, cod liver oil, mutton, eggs, green and yellow vegetables, fruits, carrots, cabbage, mangoes and papaya.

Daily requirement - 5000 I.U.

Deficiency causes - Night blindness, dry skin (toad's skin) and dry eyes (xeropthalmia). It retards growth and lowers resistance for bacterial infection, respiratory infections like common colds, bronchitis. It also leads to faulty development of teeth and spongy gums and formation of phosphatic calculi.

2) Vitamin - D (Calciferol)

Function - (i) Essential for calcification of bones & teeth and prevention & cure of rickets & osteomalacia. (ii) Require for assimilation of calcium & phosphorus and development of bones & teeth.

Source - Milk, butter, ghee, egg, yolk, cod liver oil, exposure to sunlight. (Calciferol is a preparation produced by the irradiation of ergosterol with ultra violet rays and is termed as Vit. D_2. Naturally it is produced in the skin by the action of ultraviolet rays of sun.)

Daily requirement - 400-1000 I U.
Deficiency - Rickets in children & osteomalacia in adults.

3) Vitamin - E (Tocopherol)

This is called as Anti-sterility vitamin. Discovered by Dr. Evans of U.S.A.

Function - (i) It promotes reproduction and (ii) Helps in rapid cell division and growth of embryo.

Source - Milk, vegetables oils, green leafy vegetables, germinating seeds, wheat, cereal. Tocopherol is an oil extracted from wheat germ is the most known source of Vit. E.

Deficiency - (i) Death of fetus in uterus. (ii) Sterility in males and females in lower animals and (iii) muscle defects.

4) Vitamin - K (Phylloquinone)

This is called as coagulation vitamin.

Function - (i) Essential for normal coagulation of blood and (ii) normal functioning of liver.

Source - Milk, green vegetables, cabbage, tomato, cauliflower, spinach, wheat, soya bean oil.

Deficiency - (i) Hypo-prothrombinemia (ii) Occurrence of hemorrhages in the skin and subcutaneous tissues of organs due to prolongation of blood clotting.

• (B) Water-soluble Vitamins

1) Vitamin B - Complex

a) Vitamin - B_1 (Thiamine)

Function - (i) Promotes appetite & growth and nerve function (ii) Essential for growth & health of body.

Source - Milk, eggs, unpolished gains, fish, yeast

Daily requirement - 2 mg.

Deficiency - Beriberi, loss of appetite, neuritis, mental depression and conjunctivitis.

b) Vitamin - B_2 (Riboflavin)

Function - Makes metabolism of carbohydrates & fats easy.

Source - Milk, butter, eggs, green vegetables, fruits.

Daily requirement - 2-3 gms.

Deficiency - Ocular manifestations, irritation of eyes, photophobia, burning, itching, angular stomatitis, glossitis and dermatitis of skin.

c) Vitamin - B_6 (Pyridoxine)

Function - (i) This is called as anti-dermatitis vitamin (ii) Helps as a co-enzyme in many metabolic processes. (iii) Essential for normal protein metabolism & for Hb synthesis

Source - Whole grains, cereals, pulses, milk, vegetables, nuts and fruits.

Deficiency - Skin diseases, anemia, muscular dystrophy, rigidity.

d) Vitamin - B_{12} (Cynocobalmine)

Function - (i) It is called as Anti pernicious factor (ii) Cures pernicious anemia in very small doses. (iii) Maintains normal functions of RBCs.

Source - Milk, meat, Liver, cereals and pulses.

Deficiency - Megaloblastic or Pernicious anemia.

e) Vit P (Pellagra-preventing factor or Nicotinic acid)

Function - (i) Helps in oxidation of carbohydrates and proteins (ii) Maintains healthy condition of skin & mucous membrane.

Source - Meat, Liver, mangoes, nuts, eggs.

Daily requirement - 15-30 mgm.

Deficiency - Pellagra, scaly & pigmented skin, inflammation of tongue, diarrhea, dermatitis, insomnia, mental depression & dementia.

Now, Brief Notes on other trace - B-complex vitamins.

i) Vitamin - H (Biotin)

Function - (i) Helps in fat & carbohydrate metabolism.

Source - Eggs, cereals, yeast and liver.

Daily Requirement - 150 mgm.

Deficiency - Dermatitis, Eczema.

ii) Vitamin - M (folic acid)

Function - (i) Stimulates formation of W.B.C. (ii) Important as a haemopoetic factor.

Source - Green leafy vegetables, liver and yeast.

iii) Inositol (Anti-alopecia factor)

Function - Related with metabolism or transport of fat.

Deficiency - Loss of hairs.

iv) Pantothenic Acid

Daily requirement - 3-4 mgm.

Deficiency - Burning of soles and palms, dermatitis and defective vision.

v) Choline

Daily requirement - 2 gms.

Deficiency - Deposition of fat in liver, degeneration of liver and kidneys.

2) Vitamin – C (Ascorbic acid)

Function - (i) This is an anti-scorbutic vitamin. (ii) Main-

tains capillary integrity (iii) Helps in proper development of bones & teeth and other tissues. (iv) Essential for maturation of R.B.Cs. (v) Needed for formation of intercellular substance.

Source - Citrus fruits (lemons, oranges), amla, tomato, banana, milk, fresh green vegetables, meat.

Daily requirement - 50-100 mgm.

Deficiency - Scurvy, spongy gums, bleeding within skin, anemia, delay in healing of wounds, hemorrhages, bad teeth, offensive breath, loss of weight.

3) Vitamin - P

Function - (i) Helps in preventing capillary permeability.

Source - Occurs along with Vit. C in fresh fruits (lemons), fresh salads.

Deficiency - Purpura, spontaneous capillary hemorrhages, Infiltration of lung.

5) Minerals

Mineral salts form about 4% of our body weight.

Alkali forming elements - Calcium, potassium, sodium, iron and manganese.

Acid forming elements - Phosphorous, sulphur & chlorine.

Important functions of Salts

(i) Maintain tone of muscles and blood
(ii) Stimulates digestive secretions
(iii) To help general growth of the body
(iv) Maintain acid-alkali balance
(v) Maintain rigid structures (e.g. bones, teeth).

Few Important minerals needed for our body functions are given below:

1) Calcium

Function - Chief constituent of bones and teeth, controls rhythmic activities of heart and contractile muscles, necessary for clotting of blood.

Source - Milk, cheese, eggs, dark green leafy vegetables and dried beans.

Daily requirement - 1 gm. (adult), 1.5 gm (lactating mother).

Deficiency - Poor development of bones & teeth, rickets, osteomalacia, delayed blood coagulation.

2) Phosphorus

Function - (i) Essential for multiplication of cells and growth of body (ii) Necessary in the formation of energy rich molecules - called as ATP.

Source - Cheese, yolk of eggs, almonds, nuts, peas, milk, potatoes.

Daily requirement - 1-5 gm.
Deficiency - Softening of bones, caries of teeth, stunted growth.

3) Iron

Function - Main constituent of Hb in blood and Nuclei of cells. Acts as an O_2 carried to the lungs and tissues. Plays important role in the oxidation and catalysis of enzymes.

Source - Pulses, cereals, jaggery, dry fruits, dates, figs, onions, eggs, lettuce, liver, green vegetables, nachani (a type of kshudra dhanya)

Daily requirement - Iron deficiency Anemic (commonest in India).

4) Iodine

Function : Necessary for proper functioning of thyroid gland.

Sources - Salt, sea fish, cod liver oil, yolk of eggs, onions & fluid vegetables.

Daily requirement -150 mgm.

Deficiency - Goiter (may increased during puberty, pregnancy and menopause).

5) Sodium Chloride (NaCl)

Function - Occurs in all tissues & fluids of body. Maintains osmotic pressure in blood and other tissue fluids. Necessary for maintenance of pH ion concentration.

Source - Common salt.

Daily requirement - 10 to 15 gm.

Deficiency - Muscle cramps, marked general weakness, mental lassitude, dyspnoea on exertion and heat exhaustion.

6) Copper (Cu)

Function - Helps in the formation of Hb of blood.

Daily requirement - 2 mgm.

7) Chloride

Function - Essential to maintain the composition of blood and in the formation of HCl.

Source - Common salt, bananas, tomato, green leafy vegetables.

6) Water

Water forms about 60 to 80% of body weight.

Function - (i) Essential for life (because - protoplasm is active only when it is supplied with adequate quantity of water). (ii) Good solvent for many organic and inorganic substances. (iii) Essential component of blood. (iv) Helps in enzymatic reactions. (vi) All metabolic activities stop for want of water.

Source - Drinking plain water or in the form of beverages.

Daily requirement – 2 to 2.5 lit (out of which 1-1.5 lit. is excreted daily in urine, sweat etc.)

Deficiency - Signs & symptoms of dehydration (loss of skin elasticity, dry mouth, sunken eye balls), disturbance in circulation and heat regulation.

7) Roughage

This is coarse indigestible matter of food. It contains mainly cellulose fibers of leafy vegetables.

It stimulates intestine, induces peristalsis and maintains proper bowel movements (so adequate roughage in diet - prevents constipation).

Source - Green leafy vegetables, fruits like tomato, guava and oranges.

Balanced Diet

Definition - The diet, which provides all essential nutrients in adequate quantity and in proper proportion, to maintain good health and physical efficiency, is called as Balanced Diet.

Balanced Diet should have:

i) Sufficient number of calories.

ii) 60% carbohydrates, 20% proteins, 20% fat.

iii) Fresh fruits, milk, butter and green leafy vegetables provide vitamins and roughage to stimulate bowel movements.

iv) Adequate mineral elements, especially calcium, potassium, sodium and iron.

v) Adequate quantity of water.

Daily requirement of calories 3000-3500 depends upon age, sex, growth and physical work.

Pathology

Malnutrition - Person suffers due to lack or deficiency of one or more essential elements of food in the diet.

It causes various deficiency diseases. e.g.

Protein deficiency – kwashiorkor
Iodine deficiency – goiter
Iron deficiency - anemia

Chapter 15
Pachana
(Digestion)

Digestion is nothing but conversion of complex insoluble molecules into simple soluble molecules for the use of body. This is very important as the Vijatiya or bahya pancha-bhautik food has to be converted into Sajatiya or sharira panchabhautik food. If a persons digestive system is not functioning properly, even after taking a healthy and balanced diet, the body cannot use the food.

In this chapter we are going to study the details about digestion according to Ayurveda.

Before going into details, study of the following things is must:

- Pitta - Agni (digestive fire)
- Ahara-vidhi-visheshayatan (eight basic factors in regard to diet)
- Ahara-parinamakar Bhava (transformation of food)

Pitta : Agni
(Digestive Fire)

Pitta dosha is responsible for digestion. Also agni is the energy that is an important factor for this process. However there is a difference between Pitta & agni which has been explained by both Charaka and Sushruta.

According to Charaka

1) Agni is in the form of energy and it works through the medium of Pitta. When it is functioning properly it plays an important role in digestion. When it becomes abnormal

then this same agni is the reason for indigestion. Agni & Pitta are two different things as agni has entered Pitta.

Charaka also says that if hot ghee burns our fingers, we say that the ghee has burnt finger, but in fact agni inside ghee is responsible.

2) Another e.g. to show that agni & Pitta are different - In colitis secretion of Pitta increases while agni decreases.

According to Sushruta

1) In a healthy person

'अग्निरेव शरीरे पित्तान्तर्गतः कुपिताकुपितः शुभाशुभानि करोति; तद्यथा—पक्तिम् अपक्तिं दर्शनमदर्शनम्' । (C.Su. 12:11)

Pitta (samadosha) and agni (samagni) are mentioned separately.

'समदोषः समाग्निश्च समधातुमलक्रियः ।
प्रसन्नात्मेन्द्रियमनाः स्वस्थ इत्यभिधियते' ॥ (S.Su. 15:41)

2) Jatharagni (the main agni inside the body) is compared to God and cannot be shown but Pitta can be seen with its specific color, odor and pungent taste etc.

3) Sushruta critic, Dalhan also differentiates between Pitta and agni in the following way:

i) Ghee palliates Pitta but invigorates agni.
ii) Sheep's milk and flesh increases Pitta but suppresses agni.
iii) Taking a nap during the day also increases Pitta but decreases agni.

In brief

1) Agni and Pitta are two different substances but have an affinity for each other.
2) Agni is hot and is the energy inside Pitta.
3) Agni and Pitta together with their hot, pungent properties helps in digestion.

4) Besides being hot, Pitta is a liquid which is not in the case of agni.

Agni

Definition

The fire element present in human body in microscopic level is called 'agni'.

Appearance

The exact structure of agni is not known and its function being very important it is compared to God.

'जाठरो भगवानग्निरीश्वरोऽन्नस्य पाचकः'। (S.Su. 35:27)

Function

'यदन्नं देहधात्वोजोबलवर्णादिपोषकम्।
तात्राग्नि हेतुः·····' ॥ (C.Vi. —)

'आयुर्वर्णो बलं स्वास्थ्यमुत्साहोपचयौ प्रभा।
ओजस्तेजोऽग्नयः प्राणाश्चोक्ता देहाग्निहेतुकाः॥
शान्तेऽग्नौ म्रियते, युक्ते चिरञ्जीवत्यनामयः' ॥ (C.Chi. 15:3-4)

1) Agni inside the body digests food gives strength and color to skin.

2) Agni maintains body temperature, health and keeps the person active. It also develops courage. Agni keeps a person alive and is therefore considered as a sign of life.

Type*

Agni is considered to be present everywhere where digestion is taking place (even at microscopic level). There are 13 types of agni in our body.

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* One learned author has expressed his opinion that there are 40 types of agni in the body. This statement is not only misleading the readers and the students but it has no scientific basis also. The fact that such book has been published in the West is rather serious as it twists the fundamental principles of Ayurveda.

1) Koshtagni

Koshta means body or gastro-intestinal tract. This is also called 'kayagni' or 'jatharagni'. As it helps in digestion also called Pachakagni. Kayagni works through the medium of Pachaka pitta and performs primary digestion. The place of this agni is in lower part of stomach and small intestine.

Vagbhata

'पञ्चभूतात्मकत्वेऽपि यत्तैजसगुणोदयात् ।
पाकादिकर्मणाऽनलशब्दितम्' ॥ (A.H.Su. 12:10)

The Pachaka pitta in amashaya has excess quality of tejas element and is devoid of liquid quality. It is then called by the term 'anala' because of its function of paka or digestion. It cooks the food and separates it into essential and useful part and waste products. If Jatharagni is not normal food will not be digested properly and the chyme or ahara rasa will also be abnormal. Kayagni is therefore very important and also controls other agnis.

Sushruta

'तच्चादृष्टहेतुकेन.....चतुर्विधमन्नपानं पचति, विवेचयति च दोषरसमूत्रपुरीषाणि; तत्रस्थमेव चात्मशक्त्या शेषाणां पित्तस्थानानां शरीरस्य च अग्निकर्मणाऽनुग्रहं करोति' । (S.Su. 21:10)

Food is digested and after digestion jatharagni separates it from useful (sara) part and waste (kitta) part. From the useful part chyme or ahara rasa is formed and from waste part urine and faces is formed.

To keep the agni normal, it requires constant supply of food, if it doesn't get food then it digests dhatus (tissues). When dhatus are destroyed the person dies. Therefore to keep the physiological function of agni normal, we should eat proper food at proper interval.

'आहारमग्निः पचति दोषानाहारवर्जितः ।
धातून् क्षीणेषु दोषेषु जीवितं धातुसंक्षये' ॥ (A.H.Chi. 10:91)

'शान्तेग्नौ म्रियते युक्ते चिरंजीवत्यनामये' ॥ (C.Chi. 15:)

Prana vayu, Samana vayu and Apan vayu help Kayagni

'प्राणापानसमानैस्तु सर्वतः पवनैस्त्रिभिः ।
ध्मायते पाल्यते चापि स्वे स्वे स्थाने व्यवस्थिते' ॥ (S.Su. 21)

2) Dhatvagni (Tissue fire)

The ahara rasa formed after digestion is converted into seven dhatus or tissues through this agni. Tissue fire is present in each tissue channel. The main site of this agni is in liver.

'स्वस्थानस्थस्य कायाग्नेरंशा धातुषु संश्रिताः ।
तेषां सादातिदीप्तिभ्यां धातुवृद्धिक्षयोद्भवः' ॥ (A.H.Su. 11:34)

In the above quote we can see the relationship between kayagni and dhatvagni. They depend upon each other.

The common function of jatharagni and dhatvagni is transformation of food. When the ahara rasa comes in the respective channels then dhatvagni acts on it and new cells similar to tissues are formed. For the nourishment of dhatus, dhatvagni is essential.

3) Bhutagni or Bhautikagni

We have studied earlier, that human body is made up of five primordial elements. For its growth and development, it naturally needs foods having all these elements. Each of these elements needs bhutagni for their transformation e.g. food containing earth element are digested by parthivagni (bhutagni which digests parthiva element of the food). Bhutagni is present in gastro intestinal tract as well as at the level of tissues in respective channels.

Bhutagni is required for the third stage of digestion, which brings about the formation of special materials for the sense organs. Five Bhutagnis exist for taking the five element portions of the digested food mass and converting them into nutritive substances for the five sense organs. Some of these

specialized materials are the rods and cones responsible for photosensitivity in the eye, special liquids around the taste buds on the tongue, the mucus membrane material inside the nose that aids in smelling, and special cartilage forming the architecture of the ear. Such substances specific to each sense organ are prepared by the Bhutagnis.

'अन्नमिष्टं ह्युपहितमिष्टैर्गन्धादिभि: पृथक् ।
देहे प्रीणाति गन्धादीन् घ्राणादीनीन्द्रियाणि च ।।
भौमाप्याग्नेयवायव्या: पञ्चोष्माण: सनाभसा: ।
पञ्चाहारगुणान्स्वान्स्वान्पार्थिवादीन्पचन्ति हि ।।
यथास्वं स्वं च पुष्णन्ति देहे द्रव्यगुणा: पृथक् ।
पार्थिवा: पार्थिवानेव शेषा शेषांश्च कृत्स्नश:' ।। (C.Chi. 15:12-14)

Note

1) The digestion occurs due to bhutagni doesn't alter the type of element e.g. earth doesn't become water but it changes the structure from nirindriya to sendriya and thus makes the food useful for the body.

2) This is formed by the principle of Pakajotpati in Ayurveda.

Ahara-vidhi-visheshayatan

(Eight Basic Factors in regard to Diet)

The food that we eat is of four types - a) Drinks, b) Foods which are licked, c) Foods that require chewing, d) Foods that do not require chewing (rice).

The food should also include six tastes and should be fresh.

Before having any sort of food the following things should be taken into consideration:

'प्रकृतिकरणसंयोगराशिदेशकालोपसंस्थोपयोक्त्रष्टमानि' ।
(C.Vi. 1:21)

1. Prakriti (nature)
2. Karana (preparation)

3. Samyoga (combination)
4. Rashi (quantity)
5. Desh (habitat)
6. Kala (time of eating)
7. Upyogasamstha (dietary rules)
8. Upayokta (condition of the person eating food)

1) Prakriti

This is the nature or quality of food. Each food substance has its own nature or characteristics, for example meat is heavy while popcorn are light.

2) Karana

This is preparation or samskara.

'संस्कारो नाम गुणान्तराधानम्' । (C.Vi. 1:23)

This means transformation of qualities through various processes like cooking, frying, roasting etc. Due to this the quality or guna gets changed. By roasting and steaming the food becomes light, where as frying makes it heavy. Curd provocates Kapha dosha but the same curd when converted into butter milk is good for health.

3) Samyoga

Combination of different foods may enhance the qualities of the original substance or it may produce altogether new qualities. Honey and ghee are very useful if taken independently but if both are combined together they can be equally harmful.

4) Rashi

This is of two types - total quantity of the food consumed (sarvagraha) or the quantity of individual food (parigraha) eaten.

'द्वौ भागौ पूरयेदन्नैः तोयकं प्रपूरयेत ।
मारुतस्य प्रचारार्थं चतुर्थमवशेषयेत्' ।। (Chanakyaniti)

'गुरूणां अर्धसौहित्य लघुना नाऽतितृप्तताम्' ।

5) Desha

This is the place where the food is grown. The meaning of desha can be of two types - a) Geographical b) Human body.

a) The geographical place can be again divided in three types:

i) includes jangal / sandy / desert region. In this place Vata dosha is predominant.

ii) Anup / marshy / dense forest.

iii) Sadharana or common place where the climate round the year is equal - neither too cold nor too hot.

In jangla desha, Vata is predominant as it is rough and dry e.g. Rajasthan. People in this region should not eat bitter and astringent foods that will aggravate Vata but should take milk, ghee etc lubricating foods.

b) In the human body we should take into consideration whether the person is vegetarian or non vegetarian, his prakriti, age etc.

6) Kala

This is the time when the food is eaten or the state of the individual – healthy or diseased. In summer bitter, hot etc should not be taken, as they will increase Pitta dosha. Fruits available in that season should be consumed. In summer grapes, water melon etc. should be taken after having food. Even the food is decided by Ayurveda to be taken at different stages of life. e.g. in old age dry, light, cold foods should not be taken.

7) Upayogasamstha (dietary rules)

One has to observe several rules while eating like it should be eaten with full concentration on the food, not too slow, not too quick etc.

'उष्णं, स्निग्धं, मात्रावत्, जीर्णे वीर्याविरुद्धम्, ईष्ट देशे ईष्टसर्वोपकरणं, नातिद्रुतं, नातिविलम्बितम्, अजल्पम्, अहसन्, तन्मना भुञ्जीत, आत्मानमभिसमीक्ष्य सम्यक्' । (C.Vi. 1:24)

i) Stimulation of agni: The food eaten should always be fresh and hot. This helps in stimulation of agni and digestion is carried easily. Hot food tastes nice. In this life full of hustle and bustle only a few people can have hot food as many of them have to carry their food in Tiffins.

ii) Oiliness: Proper use of fats must be made for the lubrication of visceral organs. Fats also increase the strength. In stead of rice, dal, ghee which is healthy, people are turning to junk food. Today's food is Pav-bhaji, baked food, which causes indigestion and constipation.

iii) Quantum: This concept is dealt earlier in Rashi (No. 4).

iv) Before consuming food we should take into consideration whether previously taken food is digested or not. Signs that the previously eaten food is digested are feeling hungry again, feeling light, and defecation taking place normally etc.

v) Opposite quality: The foods which are opposite in gunas or quality should not be taken together. e.g. fruit salad as it contains milk and fruits which is opposite. Prolonged intake of such substances can be the cause of various skin diseases.

vi) Appropriate place and utensils: The place where we consume food should be clean, hygienic, and pleasant.

Also, the utensils should be clean. This affects the persons body and helps in proper secretion of enzymes.

vii) Not too fast: Today everybody is behind local trains, buses etc so people eat very fast. This is not good as any amount of healthy diet will not give energy as the food does not digest properly. It is said that one bite should be chewed 32 times.

viii) Not too slow: As eating hastily is not good, similarly eating very slowly is not good.

ix) Ajalpan -Without too much talking: While eating we should concentrate on food itself and avoid chatting, joking etc. Also buffet lunch/dinner is not good as more amount or quantum is taken.

8) Upayokta

This means taking food according to ones own constitution.

Ahara Parinamkara Bhava

(Transformation of Food)

For energy production grains like wheat, rice are essential but we transform them and then consume. (Vijatiya to Sajatiya)

'आहारपरिणामकराणां भावानामिमे कर्मविशेषा भवन्ति; तद्यथा—ऊष्मा पचति, वायुरपकर्षति, क्लेदः शैथिल्यम् आपादयति, स्नेहो मार्दवं जनयति, कालः पर्याप्तिमभिनिर्वर्तयति, समयोगस्तेषां परिणामधातुसाम्यकरः सम्पद्यते'। (C.Sha. 6:15)

Six factors are mentioned as Ahara parimakar bhava:

1) Due to heat food is digested
2) Vayu stimulates the mixing and propulsion of food
3) Moisture lubricates the food.
4) Unctuousness makes the food soft
5) Proper time is required for the enzymatic action
6) Co-ordination in all above faction.

There are 6 ways of transforming food:

1) Heat: For the Parinaman (transformation) heat or agni is very essential.

2) Vayu: The most important function is movement. From the time of ingestion of food, Vayu pushes the food bolus forward.

3) Kleda (moisture): The moisture present inside the organs

of digestive system enables the food to become soft. This also helps the food particles to get separated.

4) Sneha: For the movements of small intestine, stomach etc softness is essential.

5) Kala: For complete digestion of food a specific time period is required. e.g. food stays for a definite time in stomach, small intestine etc.

6) Samayoga (balance): A balance of above five factors is required for complete digestion of food.

E.g. for cooking rice if the cook keeps it on heat for a very long time the rice will burn (digestion disturbed), if there is little water (sneha) the rice will remain uncooked. In a similar way a balance of all these elements in quality and quantity is required.

Physiology of Digestion

This is of two types:

1) Sthula Pachan or Primary digestion – In this procedure from the ingested food like bread, curry etc, and ahara rasa is formed.

Following points should be studied regarding primary digestion:

i) Organs taking part in the process.
ii) Dosha, dhatu & mala are responsible for the action.
iii) Important steps.

2) Sukshma Pachan or Secondary digestion or Tissue metabolism - In this process seven dhatus are formed from ahara rasa. We have to understand this concept here.

Sthula Pachana

(Primary Digestion)

'ओष्ठौ च दन्तमूलानि दन्ता जिह्वा च तालु च गलो सकलं सप्तांगं मुखमुच्यते' ।
(Y.R.)

1) Organs Taking Part in the Process

• a) Mouth: Here teeth and tongue play a significant role. Teeth are pitrija organ and helps in chewing & crushing the food which reduces the size of food particles. The ahara rasa formed now gets a specific smell and taste. Along with teeth, lips and cheeks help in chewing. Tongue helps in pushing the food bolus from the anterior part of tongue to anterior part of esophagus.

'पुरुषेण भुज्यमानमन्नं कठिनतरदशनाभिघातजर्जरितम्' । ( )

'महदास्यं, घना दन्ताः स्निग्धाः श्लक्ष्णाः सिताः समाः' ।

(A.H.Sha. 3:110)

In old people, teeth are not in a good condition and create problems like indigestion, constipation etc.

The tongue helps in differentiating between the six tastes (shad rasas).

Charak has described the tongue in the following manner - Ideal tongue should be thin, red & with proper dimensions.

'आयामविस्तारोपपन्ना, श्लक्ष्णा, तन्वी प्रकृतियुक्ता पाटलवर्णी जिह्वा' ।

(C.Sha. 8:67)

When the physiological function of tongue is disturbed the person loses appetite as he cannot differentiate between six tastes.

• b) Amashaya (stomach): The main place of food in G. I. tract is taken to be stomach.

'अन्नवहानां स्रोतसामामाशयो मूलं वामं च पार्श्वम्' । (C.Vi. 5:8)

According to Ayurveda stomach is the region above umbilicus.

'नाभिस्तनान्तरं जन्तोरामाशय इति स्मृतः' । (C.Vi. 2:23)

Due to this liver, pancreas, thorax, small intestine are included.

Sushruta says - The part above small intestine. He has also described the presence of sphincter muscles which help in chewing movements. Due to this the stomach can hold and pass the food into small intestine.

'आमाशयान्ते सुषिराः स्नायवः सन्ति । ततः अन्नस्य विमोचनं यथावत् भवति' । ()

'आमापक्वाशयान्तेषु बस्तौ च सुषिराः खलु' । (S.Sha. 5:32)

• c) Laghu antra (small intestine): Here most of the digestion takes place. The part of G.I. tract which is between stomach and large intestine is known as Small intestine.

'षष्ठी पित्तधरा नाम या कला परिकीर्तिता ।
पक्वामाशयमध्यस्था ग्रहणी सा प्रकीर्तिता' ॥ (S.Sha. 4:18)

'पक्वामाशयमध्यं पित्तस्य' । (S.Su. 21:6)

'अग्न्यधिष्ठानमन्नस्य ग्रहणात् ग्रहणी मता' । (C.Chi.)

Small intestine is a matrija organ and is the main site of agni.

'अपक्वं धारयत्यन्नं पक्वं सृजति पार्श्वतः' । (C.Chi.)

Small intestine receives indigested food and sends almost digested food into the large intestine.

• d) Brihadantra (large intestine): The part between lumbar region and anus, after small intestine and below the umbilicus is called Large intestine.

'तत्र समासने वातः श्रोणिगुदसंश्रयः, तदुपरि अधो नाभेः पक्वाशयः' । (S.Su. 21:6)

'आमापक्वाशयान्तेषु बस्तौ च सुषिरः खलु' ।

Large intestine carries faces to the anus.

'पञ्चमी पुरीषधरा नाम; याऽन्तःकोष्ठे मलमभिविभजते पक्वाशयस्था' । (S.Sha. 4:5)

• e) Yakrit (liver): In Ayurveda liver is not included in the G.I. tract but liver is very important in digestion.

'गर्भस्य यकृत्प्लीहानौ शोणितजौ' । (S.)

In reality liver transports blood. But according to Ayurveda blood & Pitta have an affinity for each other. Also Pitta is produced in liver. Pitta is the main element in digestion.

2) Relation of Dosha-Dhatu-Mala in Digestion

Dosha

All the physiological functions are brought about by three doshas Vata, Pitta & Kapha.

i) Vata - Responsible for movement of food from one organ to other and for the milking action which is responsible for bringing Pitta secretions in gastro-intestinal tract.
ii) Pitta – Digestion and transformation of food. This is brought about by agni inside Pitta.
iii) Kapha – Protects all the organs from fiery action of Pitta and wear and tear due to action of Vata.

Dhatus

The dhatus like muscles also play a role in digestion.

Mala

At the end of primary digestion urine and feces are formed accordingly. Also three doshas Vata, Pitta and Kapha also are in the form of waste products at this stage produce secondary tissues.
e.g. Kapha dosha is the mala of rasa dhatu, Pitta is the mala of blood.

Types of each Dosha

1) Types of Vata Dosha

i) Prana Vayu: The function of ingestion is brought about by prana Vayu.

'उरःकण्ठचरो·····निःश्वासान्नप्रवेशकृत्' । (A.H.Su. 12:4)

Prana is located in head and moves in the chest and throat. It supports the mind, heart, sense organs and intelligence. It

attends to sneezing, belching, inspiration and swallowing of food.

ii) Samana Vayu: This stays near agni, stimulates digestion and helps in differentiation of useful and waste products of food.

'समानोऽग्निसमीपस्थः कोष्ठे चरति सर्वतः'। (A.H.Su. 12:8)

Samana is located near the agni, moves in koshtha or alimentary tract and other abdomen viscera.

Vagbhata says that due to Samana vayu food is ingested, digested, assimilated and waste is excreted.

'अन्नं गृह्णाति पचति विवेचयति मुञ्चति'। (A.H.Su. 12:8)

iii) Apana Vayu: The main site is below umbilicus and it helps in elimination of waste products.

'अपानोऽपानगः श्रोणिबस्तिमेढ्रोरुगोचरः'। (A.H.Su. 12:9)

'शुक्रार्तवशकृन्मूत्रगर्भनिष्क्रमणक्रियः'। (A.H.Su. 12:9)

Apana is located in the region of pelvis and moves in the waist, bladder, penis (genitals), thighs and carries out the functions such as elimination of semen, menstrual fluid, faces, urine and feces.

2) Types of Pitta Dosha

'पित्तं पञ्चात्मकं तत्र पक्वामाशयमध्यगम्।
पञ्चमहाभूतात्मकत्वेऽपि यत्तैजसगुणोदयात्।
त्यक्तद्रवत्वं पाकादिकर्मणाऽलमशब्दितम्।
पचत्यन्नं विभजते सारकिट्टौ पृथक् तथा॥ (A.H. 12:10-11)

i) Pachaka pitta: This sub dosha is present in stomach and small intestine and helps in the primary digestion of the food.

ii) Ranjaka pitta: This is present in liver and is responsible for the secondary or tissue digestion. Dhatu-agni works through this medium.

3) Types of Kapha Dosha

i) Bodhaka kapha: This is present in mouth and helps in understanding the taste of the food.

ii) Kledaka kapha: This is present in gastro-intestinal tract and protects them during the digestion.

Summary of Tridosha & Digestion

Charaka has brought about the relation between dosha & digestion.

'अन्नमादानकर्मा तु प्राण: कोष्ठं प्रकर्षति ।
तद्द्रवैर्भिन्नसंघातै: स्नेहेन मृदतां गतम् ॥
समानेनावधूतोऽग्निरुदर्य: पवनेन तु ।
काले भुक्तं समं सम्यक् पचत्यायुर्विवृद्धये ॥
एवं रसमलायान्नमाशयस्थमध:स्थित: ।
पचत्यग्निर्यथा स्थाल्यामोदनायाम्बुतण्डुलम्' ॥ (C.Chi. 15:6-8)

Prana is responsible for ingestion. Samana stimulates the fire for digestion. Digestion process is compared with the cooking of rice. (Rice and water together kept on fire for specific time). Prana vayu is responsible for ingestion of food.

'कोष्ठ: पुनरुच्यते महास्रोत: शरीरमध्यं महानिम्नम् आमपक्वाशयश्चेति पर्यायशब्दै: तन्त्रे, स रोगमार्ग आभ्यन्तर: । (C.Su. 11:48)

Koshtha is central G. I. tract which includes stomach & colon. This is Abhyantara rogamarga.

Three Steps in Digestion

A) Avigdhavastha or 1st step - Madhura avasthapaka
B) Vigdhavastha 2nd step - Amla avasthapaka
C) Pakwavastha 3rd step - Katu avasthapaka

• First Stage : Madhura-avastha-paka

'अन्नस्य भुक्तमात्रस्य षड्रसस्य प्रपाकत: ।
मधुराद्यान् कफोभावात् फेनभूत उदीर्यते' ॥ (C.Chi. 15:9)

i) Location: This stage starts when food enters the mouth till it reaches the stomach.

ii) Period: When light food is taken it stays for three hours in amashaya.

iii) Physiology: After consuming panchabhautik food first earth element is digested followed by water. Even if these elements are present in slight amount these elements are digested first. In this stage the ahara rasa formed becomes sweet. By the principle of homologous & heterologues elements Kapha dosha is secreted and makes the food soft which is the 1st step of digestion.

iv) Symptoms: As Kapha dosha is aggravated the person becomes inactive, lethargic and satisfied. Even if any type of pungent and bitter food is taken the same symptoms are observed.

Charaka has described the 1st stage in the following manner- After eating food immediately madhura or sweet Kapha is secreted.

• Second Stage : Amla-avastha-paka

'परं तु पच्यमानस्य विदग्धस्याम्लभावतः ।
आशयाच्च्यवमानस्य पित्तमच्छमुदीर्यते' ॥ (C.Chi. 15:10)

i) Location: This is the main step in digestion carried out more in the small intestine.

ii) Period: After consuming light food stay here for 6 - 6½ hrs.

iii) Physiology: In this stage tej element in the food is digested. Ahara rasa becomes amla. As in this stage Pitta dosha is secreted, conversion of food from vijatiya to sajatiya takes place.

iv) Symptoms: Due to aggravation of Pitta the person feels hot sensation and becomes thirsty.

Charaka has described the 2nd stage in the following way- After digestion the food coming from amashaya has amla rasa it gets converted into achha (clear).

• Third Stage : Katu-avastha-paka

'पक्वाशयं तु प्राप्तस्य शोष्यमाणस्य वह्निना ।
परिपिण्डितपक्वस्य वायुः स्यात् कटुभावतः' ॥ (C.Chi. 15:9)

This is the last step in digestion. Now for the production of tissues ahara rasa is formed.

i) Location: The end part of large intestine.
ii) Period: 6 hrs - 12 hrs
iii) Physiology: In this stage Vayu and Akasha elements are digested. Now the taste becomes katu or pungent. Here Vata dosha gets aggravated.

iv) Symptoms: After separating useful and waste products of the digested food (sara and kitta) following things are observed - After the food is completely digested the person develops enthusiasm and becomes active and once again agni is stimulated and the person feels hungry.

Charaka says - Vayu is formed from the food coming from the intestine.

Note

1) Time period of each stage -The time period of each stage depends upon the type of food consumed, agni and prakriti of the person.

2) Important things between each stage - (i) The food is converted from vijatiya into sajatiya. This is called transformation of food. (ii) Step by step separation of food takes place and each dosha gets secreted-aggravated-gradually. (iii) Separation of elements from digestion takes place from the bhautikagni.

3) Use of stages in treatment - If the abdominal pain is

related to the food then the exact time of pain can be related to the stage of the digestion and accordingly the place of pathology can be known.

4) Changes in environment - Like nature many food products also change their structure. e.g. newly formed curd is sweet and heavy after some time it becomes sour. Fresh curd will aggravate Kapha while sour curd will aggravate Pitta. If the curd is kept for longer time then it becomes pungent and starts getting spoilt.

5) Relation between stages of digestion and vipaka - After complete digestion takes place the rasa formed (post digestive taste) is called as vipaka.

'रसानां परिणामान्ते स विपाक इति स्मृतः' । (A.H.Su. 9:20)

Vipaka or Nishthapaka

Types of Vipaka (post digestive taste)

This depends upon the type of food consumed :

1) Sweet, salty taste - Madhura vipaka
2) Sour taste - Amla vipaka
3) Pungent, bitter, astringent – Katu vipaka

Functions of Vipaka

1) Madhura vipaka- Kaphakara, expels easily shukrudhatu and urine.
2) Amla vipaka- Pittakara, expels shukradhatu, urine.
3) Katu vipaka- Vatakara, obstruction to feces and urine.

Differences Between Avasthapaka (stages) & Vipaka

To differentiate between the two following points should be noted:

1) Avasthapaka are the three regular stages of digestion where as vipaka is the post digestive effect.

2) Avasthapaka is unstable where as vipaka is stable.

3) In avasthapaka agni is not acted fully where as vipaka undergoes after the action of agni.

4) In avasthapaka, kala (time period) plays an important role where as in vipaka time period is not an important.

5) In avasthapaka the location is important where as in vipaka it is not very important.

6) Every food consumed undergoes all the three stages of sweet, sour and pungent avasthapaka but in vipaka there is only one final change.

7) Avasthapaka does not depend on taste of food but vipaka depends upon taste of food.

8) Avasthapaka is always followed by vipaka.

Sara-kitta Vibhajana

This occurs in the last step of digestion, the useful part from the ahara rasa is called Sara where as the waste part is known as Kitta. From kitta urine, faces, sweat etc is formed and then excreted outside

Koshta

This is part of G. I. tract where digestion is constantly taking place.

Depending on the type of dosha the koshta is of the following types:

1) Vata - Krura koshta
2) Pitta - Mridu koshta
3) Kapha - Madhya koshta
4) Balanced - Madhya koshta

'कोष्ठः क्रूरो मृदुर्मध्यो मध्यः स्यात्तैः समैरपि' । (A.H.Su. 1:9)

Due to this the physician can test the sensitiveness of colon, and which is suitable drug for him.

1) Krura Koshta

Due to Vata dosha predominance these people have unsatisfactory bowel habits and they often complain about constipation. Their intestines are dry and hence requires snehana or oil treatment for minimum 7 days.

'स्निह्यति क्रूरकोष्ठस्तु सप्तरात्रेण मानवः' । (C.Su. 13:65)

The person should be given strong purgatives

2) Mridu Koshta

Due to Pitta dosha predominance, people may complain about diarrhea.

'बहुपित्तो मृदुः स्यात् सः दुग्धेनापि विरिच्यते' । (S.Chi.)

The intestines or koshta of such persons are soft and hence people may get loose stool even with consumption of milk. The treatment here is to give ghee for 3 days.

'मृदुकोष्ठस्तिरात्रेण स्निह्यात्यच्छोपसेवया' । (C.Su. 13:65)

3) Madhyam Koshta

In these people either Kapha is dominant or all are in a balance. They do not need any treatment but sometimes can take Triphala.

By knowing koshta we can decide which drugs should be given for virechana.

Sukshma Pachana
(Tissue Metabolism)

This stage comes after sthula pachana. Chakradatta has described it as anupaka (Anu = afterwards; Paka = digestion). Here tissue metabolism occurs. In this stage the dhatus get nourishment from ahara rasa formed during primary digestion.

To understand tissue metabolism two terms must be understood properly -

1) Poshak (precursor)
2) Poshya (final product).

Physiology of Sukshma Pachana

Ahara rasa enters each respective channel of tissues and in this channel with the help of each tissue fire (which acts through Ranjaka pitta) and Vyana vayu tissues are formed. Here ahara rasa is poshaka and the tissue that is formed in the channel is poshya.

First ahara rasa (poshaka) enters in rasavaha channel. In this srotas or channel with the help of rasagni (tissue fire for rasa) which acts through Ranjaka pitta and Vyana vayu, metabolism or sukshma pachana starts and from these three divisions takes place. In the first, poshya rasa dhatu is formed. In second, sub-tissue or upadhatus - breast milk and artava are formed. In the third division two types of waste products or byproducts are formed e.g. Kapha dosha and kleda.

In this way tissues, sub-tissues and waste products are formed in all channels.

'यदा हि एकोऽपि धातुपाचकोऽग्निरुपहृतः, मारुतो वा धातुपोषकरसवाही व्यानरूपः क्वचिदुपहतो भवति, तथा स्रोतो वा धातुपोषकरसवहमुपहतं स्यात्, तदा अशितादिकं धातूनामवर्धकत्वान्नोपचयादिकारकमिति भावः'।

(C.Su. 28:3, Chakrapani)

Dhatu-poshana Niyama

The order for tissue metabolism is following:

'रसाद्रक्तं ततो मांसं मांसान्मेदस्ततोऽस्थि च।
अस्थ्नो मज्जा ततः शुक्रं शुक्राद्गर्भः प्रजायते' ॥ (Chi. 15:16)

Tissues are formed one after another in following order - Rasa (liquid/plasma)→Rakta (blood)→Mamsa (muscle)→ Meda (adipose tissue)→Asthi (bones)→Majja (nervous system)→Shukra (reproductive tissue).

Period for Dhatu-poshana

Rasa requires five days and all further tissues require five days each, thus last shukra is formed after 35 days.

DIGESTION
(Modern View)

Definition - Digestion is the process, in which complex food material is converted into simple absorbable constituents for ex- i) Carbohydrates are converted into glucose and ii) Proteins are converted into amino aids, iii) Fats are converted into fatty acids and glycerol.

Anatomical Aspect

Digestive system of man consists of 2 parts:

A) Alimentary canal (G.I. tract or digestive tract)
B) Associated glands.

A) Alimentary Tract

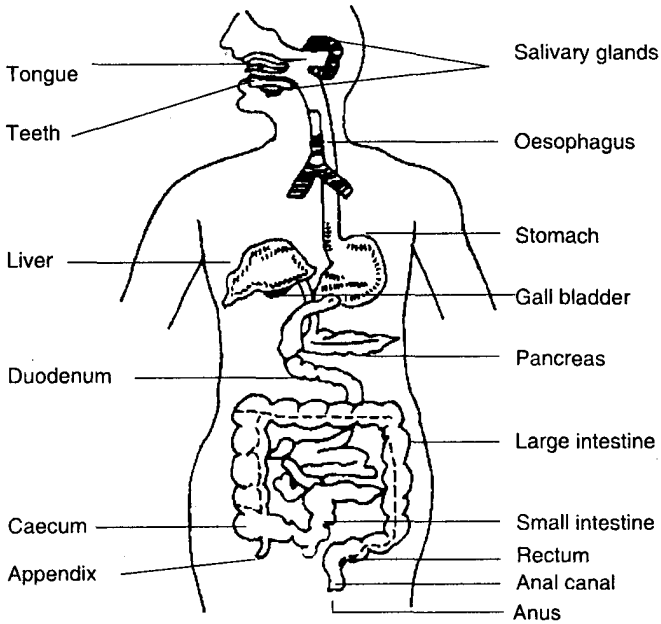
It is a muscular and glandular tube, in which food passes forward by peristalsis. This is a sort of fuel refinery. Food provides crude fuel, while the glands supply enzymes to burn the fuel, for getting the energy for the normal functioning of body.

Important parts of Digestive Tract are:

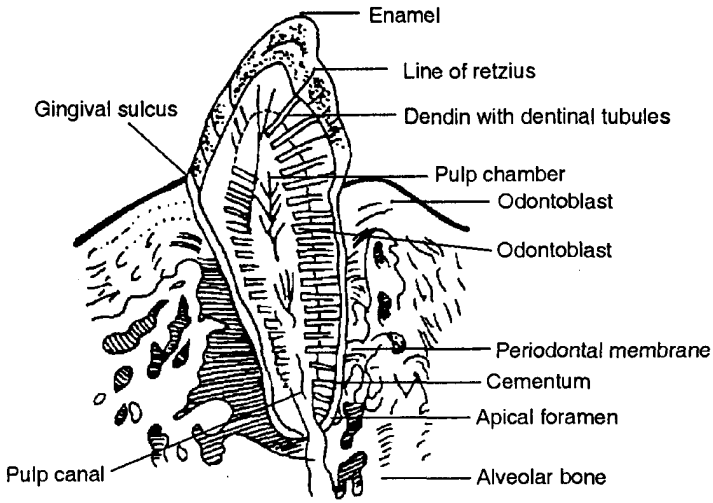
1) Oral cavity 2) pharynx 3) esophagus 4) stomach 5) small intestine - duodenum, jejunum & ileum 6) Large intestine - caecum, ascending, transverse, descending - iliac, sigmoid colon, rectum and anus.

1) Mouth & Oral cavity

Mouth is anterior opening, guarded by pair of fleshy lips. Oral cavity is bounded by upper and lower jaw. Jaw bears 32 teeth, bounded by cheeks on sides, hard and soft palate as roof and tongue as floor.



Organs in Digestive System

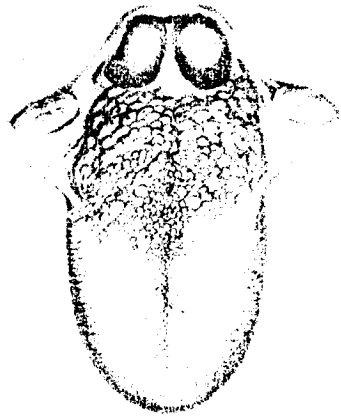


Types of Teeth:

Incisors - Cutting teeth

Canines - Tearing teeth

Premolars - Grinding teeth
Molars -



2) Pharynx

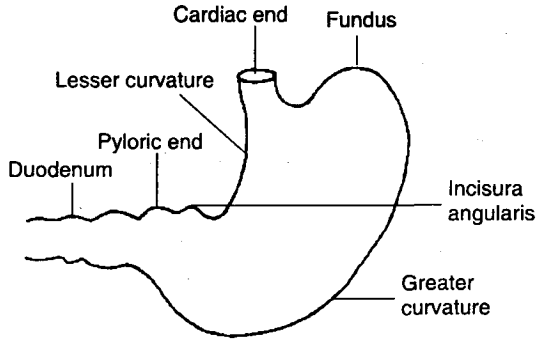
Common passage for food and air - Air passage is guarded by a movable flap called Epiglottis - soft palate closes the way to nasal passage.

3) Esophagus

Tube of 25 cm in length and 2 cm in diameter. Extends from pharynx to cardiac orifice of stomach

4) Stomach

This is wide muscular bag, below diaphragm - Divided into



Outline of Stomach Showing Different Part

cardiac, fundic and pyloric regions. It has 'J' shaped structure. The body is bounded by lesser and greater curvatures.

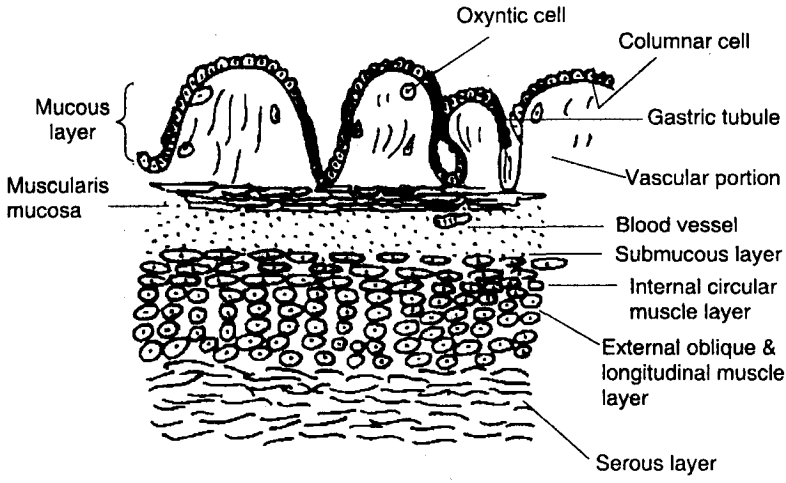
Histology of Stomach

It has 4 concentric layers - i) serosa ii) muscularis iii) submucosa and iv) mucosa.

Mucosa, the innermost layer, is thick and secretory in function. The epithelial lining is sunken to form 'Y' shaped gastric pits into which the compound gastric glands open. Each gastric gland is a compound tubular gland, differentiated into the basal glandular part and short narrow neck, opening into gastric pit. The glandular part consists of 3 types of cells:

i) Central or chief cells or zymogene cells which secrete pepsinogen,
ii) Parietal or oxynthic cells - Secreting HCl,
iii) Mucous secreting cells.

The gastric glands of fundus are well developed and secrete enzymes while those of cardiac and pyloric stomach are short with long ducts and secrete mucus.



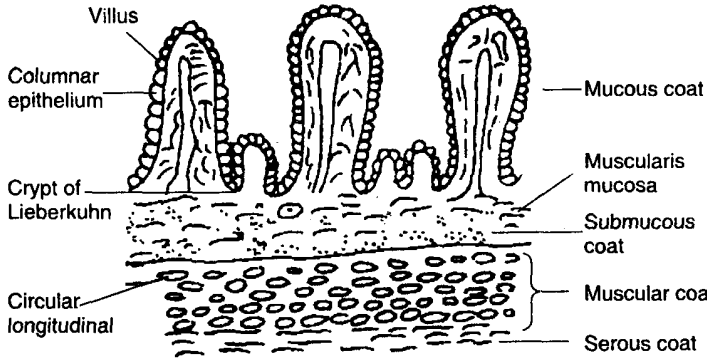
Schematic Section of Stomach (Fundus)

5) Small Intestine

It is 7 meter long tube extending from gastric pyloric orifice up to ileo-colic junction. The 2/5th part is divided into duodenum and jejunum and last 3/5th part is called as ileum.

The duodenum and jejunum are mainly concerned with digestive processes while the main function of ileum is absorption (so, it is richly supplied with villi)

Duodenum is 'G' shaped structure, into which liver and pancreas open.



Structure of small intestine

Histology of Small Intestine

The wall of small intestine shows four layers -

i) Serosa

ii) Muscularis (made up of 2 layers of smooth muscle fibers, while stomach is made up of 3 layers of smooth muscle fibers)

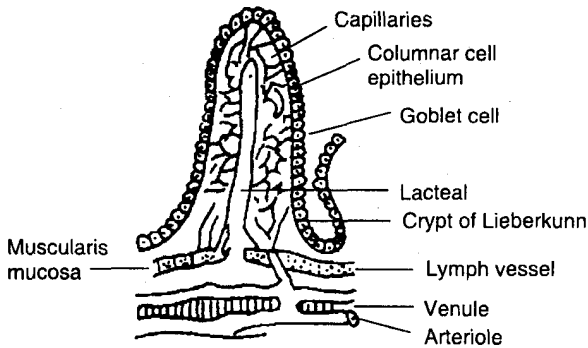
iii) Sub mucosa - extends internally into circular folds to increase the area of absorption.

iv) Mucosa - innermost lining, made up of columnar epithelial cells, giving out minute finger shaped projections

called villi. The core of each villi is made up of connective tissue, and tunica propria containing blood capillaries and lymph vessels.

The epithelial cells of mucosa, except the goblet cells, show striated border of many microvilli. Between the villi are seen two types of glands - (i) The crypts of Liberkuhn, (ii) Brunner's glands.

Internal surface area of the intestine is increased due to muscular folds, villi and microvilli, which is necessary for absorption.



Villi of small intestine

The crypts of Liberkuhn are the simple tubular glands which extend into tunica propria they secrete digestive enzymes.

The Brunners glands are large bundles of grape like structures. They secrete alkaline watery fluid, containing mucin and some enzymes. These glands are present only in duodenum. The secretions of crypts and Brunner's glands together form the intestinal juice (succus entericus).

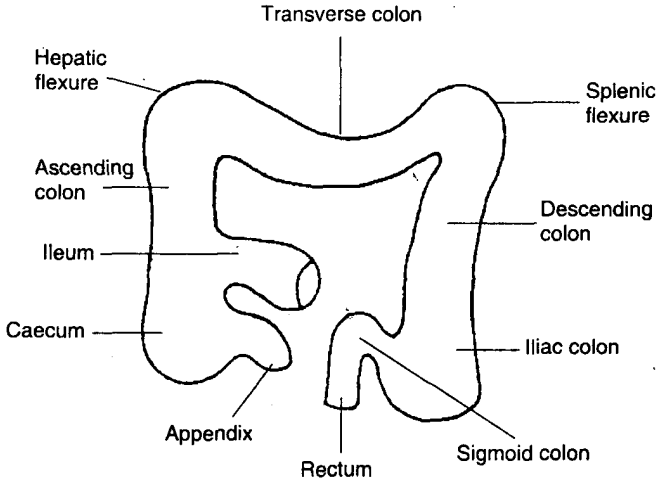
The lymphoid tissue is also distributed in the mucosa of small intestine as lymph nodules. In ileum the nodules are gathered in groups and called as 'Payers patches'.

6) Large Intestine

It is a tube of 1-5 m long & 2 inch broad, its anterior part is

colon and posterior part is rectum. The colon is differentiated into - ascending - transverse - descending and sigmoid colon. At the junction of ileum and colon, a blind pouch - caecum is present, ending into a small projection called Appendix.

Rectum is end part, about 12 cm. long and opening outside through anus which is surrounded by voluntary anal sphincter to control defecation.



Various Parts of Large Intestine

B) Associated Glands for Digestion

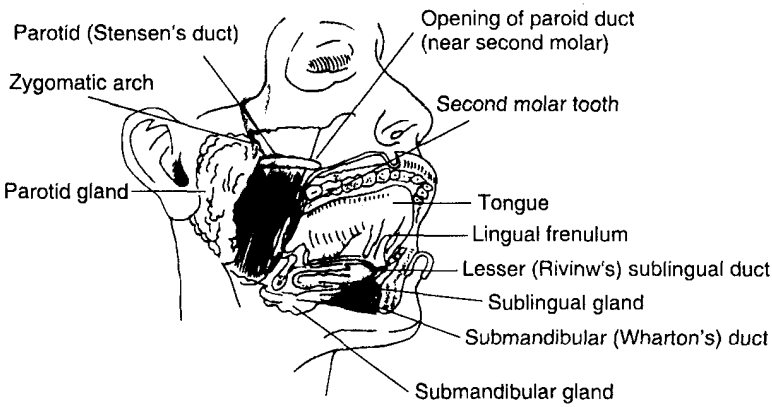
i) Salivary glands ii) Liver & iii) Pancreas - pour their secretions into alimentary canal.

1) Salivary Glands

Three pairs - Sub-lingual, Sub-maxillary and Parotids. These glands secrete saliva which helps in digestion.

2) Liver

It is a largest gland in the body. It is imperfectly bi-lobed. In between the lobes lies a green sac like structure called gall bladder, which stores the secretion of liver, called bile.



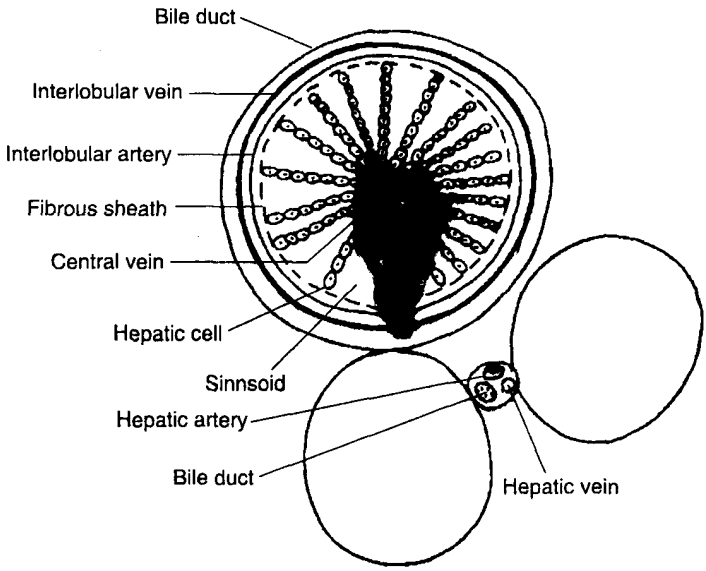
Salivary Glands

The hepatic duct from liver & cystic duct from gall bladder join to form the common Bile duct.

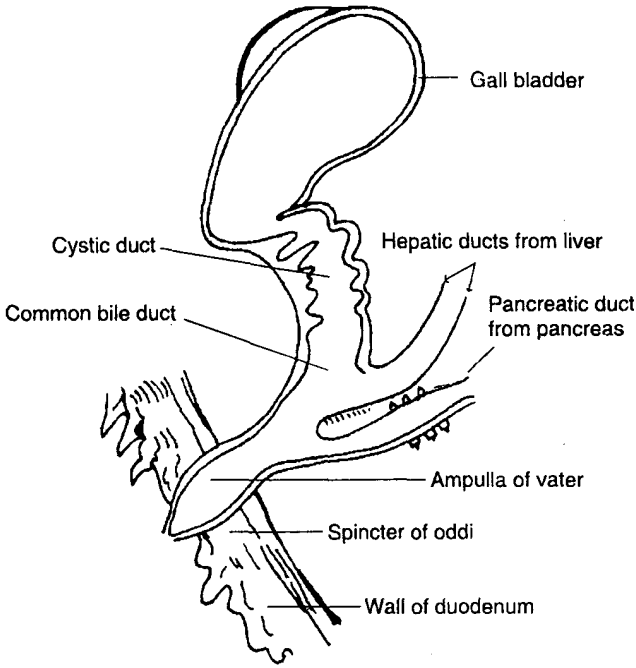
Histology of Liver

Liver is covered by a thin membrane, called as Glisson's capsule. This capsule extends into the substance of liver, dividing into number of hepatic lobules. Each hepatic lobule is hexagonal or prismatic structure. In the centre of each lobule is hexagonal or prismatic structure -intralobular canal or tributary of hepatic vein. The substance of a lobule is made up of many radially arranged, branched, plate like structures called hepatic cords. Each hepatic cord is made up of two rows of hepatic cells. In between the hepatic cells of each cord is seen bile canaliculus in which bile flows from adjoining cells. Similarly in between the cords are seen blood canaliculli and sinusoids.

The flow of bile is from centre to periphery while that of blood is from periphery towards the centre. The sinusoids are lined by incomplete endothelial cells called Kupffer's cells. These cells are amoeboid and phagocyte in function. They also engulf dead and worn out RBCs.



Microscopic Structure of Liver



Gall Bladder with Bile Ducts

The hepatic cells are polygonal with centrally placed spherical nucleus and granular cytoplasm. The cytoplasm is rich in granules of glycogen, fat droplets, pigment granules and iron ions.

3) Pancreas

This is elongated lobulated gland, situated in the loop of duodenum. The pancreatic duct joints the common bile duct and opens into the duodenum.

Histology of Pancreas

Pancreas is composed of large aggregation of alveoli with ducts. Therefore, it is also called as - tubuo-alveolar gland. In histological section, these alveoli appear as vesicles. The alveoli and their ducts are joined by thin connective tissue, blood capillaries and nerve fibers.

The pancreas is made up of two parts i) Non-endocrine or Exocrine & ii) Endocrine

Exocrine Part - Consists of numerous pancreatic secretary components is alveoli or acini. Each acinus consists of a number of pyramidal or conical secretary cells, surrounding central lumen. Acini secretes pancreatic juice.

The Endocrine part - consists of chords of loosely arranged cells seen as isolated masses of cells. These are known as the Islets of Langerhans.

The islet included 3 types of cells - alpha cells, beta cells and delta cells.

α cells secrete - Glucagon
β cells secrete - Insulin
δ cells - function not yet known.

Digestion Process

Digestion is a series of physical and chemical changes, by which complex and non diffusible food is converted into simple and diffusible forms by the action of enzymes.

Physical or mechanical process breaks up ingested food into smaller pieces, while the chemical process reduces it into molecular dimensions, so that it is easily absorbed.

Digestion mainly takes place in 1) buccal cavity 2) stomach and 3) intestines.

I) Digestion in Mouth

Here food is masticated and mixed with saliva. It is molded into bolus.

Function of saliva

Saliva contains mucin and ptyalin; mucin lubricates food while ptyalin or salivary amylase converts starch into simpler soluble sugar is maltose.

$$\text{Starch \& complex sugars} \xrightarrow[\text{Acidic medium}]{\text{Ptyalin}} \text{Maltose}$$

II) Digestion in Stomach

In stomach, food is received, stored, churned and mixed with gastric juice.

Secretion of gastric juice is promoted by the Hormone Gastrin.

Gastric juice contains 0.5% of HCl, pepsinogen and rennin (more active in infants).

a) HCl - kills bacteria, dissolves mineral salts, provides acidic medium for digestion and activated pepsinogen to pepsin.
b) Pepsin - is a gastric protease, which act on proteins.

$$\text{Proteins} \xrightarrow[\text{acidic medium}]{\text{Pepsin}} \text{Proteose \& peptones}$$

c) Rennin - It converts casein of milk into paracasein.

$$\text{Casein} \xrightarrow[\text{Acidic medium}]{\text{Renin}} \text{Paracasein}$$

Paracasein - further digested by pepsin:

Partial digestion of food in stomach reduces food to a paste like consistency called chyme. When acidity of food reaches to a certain level, the pyloric sphincter opens and chyme passes at intervals in brief spurts, into the duodenum.

III) Digestion in Intestine

Food mixes with bile, pancreatic juice and intestinal juice. In intestine food is completely digested and absorbed.

The acidity of food stimulates the mucus of duodenum to secrete the hormones - 1) secretin ii) pancreozymin iii) cholecystokinin and iv) interokinin

Secretin & Pancreozymin	Activate pancreas to secrete pancreatic juice
Cholecystokinin	Stimulates gall bladder to squeeze out bile in intestine

All above secretions are alkaline, which neutralize the acidity of chyme and stop further action of pepsin.

i) Function of Bile

Bile does not contain any enzyme. It contains bile salts and bile pigments.

Bile salts are responsible for emulsification of fats.

Emulsification means, breaking down oil droplets into small globules, forming milky emulsion. Emulsification is necessary for proper digestion of fats.

ii) Function of Pancreatic Juice

Pancreatic juice contains following enzymes - a) trypsin b) chymotrypsin c) pancreatic amylase d) pancreatic lipase.

The Actions of these enzymes are as follows:

a) Proteins + Proteoses + Peptone $\xrightarrow[\text{Alkaline medium}]{\text{Trypsin}}$ Polypeptide

b) Specific proteins $\xrightarrow[\text{Alkaline medium}]{\text{Chymotrypsin}}$ Polypeptide

c) Starch and complex sugars $\xrightarrow[\text{Alkaline medium}]{\text{Pancreatic amylase}}$ Maltose

d) Emulsified fats $\xrightarrow[\text{Alkaline medium}]{\text{p-Lipase}}$ Fatty acids + glycerol

iii) Functions of Intestinal juice (Succus entericus)

a) Polypeptides + Dipeptides $\xrightarrow[\text{Alkaline}]{\text{Erepsin}}$ Amino acids

b) Maltose $\xrightarrow[\text{Alkaline medium}]{\text{Maltose}}$ Glucose+glucose

c) Sucrose (cane sugar) $\xrightarrow[\text{Alkaline medium}]{\text{Sucrose}}$ Glucose+fructose

d) Lactose (milk sugar) $\xrightarrow[\text{Alkaline medium}]{\text{Lactase}}$ Glucose+galactose

e) Emulsified fats $\xrightarrow[\text{Alkaline medium}]{\text{Lipase}}$ Fatty acids+ glycerin

Now, the food is completely digested and converted into liquid form called chyle, which proceed further for absorption.

IV) Digestion - Large Intestine

Large intestine has no digestive function.

Functions

i) Absorbs water from the undigested matter.

ii) Undigested matter is acted upon by bacteria which live permanently in the colon. We get a part of supply of vitamins due to activities of these useful bacteria.

Absorption

The digested food is absorbed through mucosa of intestine (villi). Fatty acids and glycerin are absorbed into lacteals or lymph vessels.

Functions of various movements in digestive tract

i) Coverts food into fine particles (e.g. mastication) ii) To help onward passage of food iii) proper mixing iv) proper absorption v) Evacuation of waste products.

Movements mainly occur via nervous control (neurogenic)

Different Movements

i) Mastication - Co-ordinated movements of jaws, cheeks, tongue and lips. This makes the food soft, and it gets mixed with saliva.

ii) Deglutition (swallowing) - 3 stages - Buccal, pharyngeal and oesophageal.

iii) Gastric movements - Peristalsis (tonic rhythmicity) - 3 to 4 /min, stomach emptying time - 1-4 hrs.

iv) Movements of Small Intestine -

a) Segmentation or churning movements and alternate localized constriction and relaxation.

b) Peristalsis - Wave of constriction (above) following a wave of relaxation (below) function - to propel food forwards. These are reflex movements (**sensory receptors - in Meissener's plexus & motor effectors in Auerbach's plexus**).

c) Anti-peristalsis - Normally present in duodenum.

d) Pendular movements - side to side movements. These are passive in nature.

V) Movements of Large Intestine:

a) Peristalsis, b) Anti-peristalsis, c) Rhythmic tonic movements and d) Mass peristalsis (This last movement occurs during defecation)

I) Carbohydrate - Metabolism

All complex sugars, in the G.I. tract are broken down to glucose, fructose and galactose (which all are mono-saccharides). Absorption of glucose & galactose is fast while absorption of fructose is slower. (Glucose, mainly - fructose and galactose all appear in the liver, via portal vein.)

Mono-saccharides are converted into polysaccharide glycogen by the process called glycogenesis. As per the requirement of the body, the glycogen of the liver is broken down to glucose (The process is glycogenolysis).

Excepting glucose, no other form of monosaccharide is normally found in the blood.

Blood glucose is distributed to various tissues of body - brain, muscle and adipose tissue.

The fate of glucose, in the tissues is as follows:

Glucose may be catabolized to produce energy. Energy is stored as ATP which is used for different kind of work like muscle contraction, glandular secretion etc.

Stages of catabolism

i) First stage: Glycolytic pathway - EMP (**Embden Meyerhof pathway**). The 6 carbon atom structure (i.e. glucose) is converted into -3 carbon structure (pyruvic or lactic acid). This stage can occur in absence of O_2 and small amount of ATP is generated

ii) Second stage: Pyruvic acid enters the Kreb's cycle (citric acid cycle) and broken down to CO_2 & H_2O_2. This stage can not proceed without O_2 and acquire more ATP.

Anabolism of glucose

Glucose may be taken up by the muscles to synthesize muscle glycogen or an intermediate product of glucose metabolism like acetic acid may be utilized for the synthesis of fatty acids.

II) Fat - Metabolism

Amongst different types of lipids, triglycerides, triacylglycerols mainly generate energy. **Fatty acids of triglycerides are the main agents for ATP generation.**

Triglycerides are hydrolyzed in adipose tissue. Fatty acids are released & appear as free fatty acids (FFA). **Plasma albumin-FFA complex in the plasma is mainly transported.**

FFA are brought to different organs (liver, muscle, heart) where further catabolism occurs.

Fatty acids are catabolized by a process called B oxidation within the mitochondria. The end product of fatty acid catabolism is active acetate molecules which immediately enter for Kreb's cycle. **The H atoms, liberated during oxidation (catabolism) are removed by respiratory chain (H carrier system).**

III) Protein Metabolism

The food proteins are digested in GI tract and are ultimately converted into amino acids.

The human body has amino acid pool. The pool includes places like plasma & tissue fluid.

Various body tissues pick up the required amino acids from pool & synthesize their own characteristic proteins. Also simultaneously, disintegrating tissues, discharge amino acids into the pool. The size of this pool remains practically constant.

Protein - Anabolism

a) Amino acids are taken up by tissues for replenishment of wear & tear.
b) For growing children, additional quantity of proteins is required for growth.
c) Some endocrine glands like pancreas, parathyroid, hypo-

thalamus, pick up amino acids for manufacturing their specific hormones (protein in nature).
d) Lactating mother require extra amount of proteins.
e) Enzymes are protein in nature. Therefore cells which secrete eneymes pick up amino acids.

Protein - Catabolism

In catabolism, amino group from amino acids is removed from NH_2 - urea is synthesized and excreted in urine. NH_2 group from amino acid is removed with transamination process. This reaction is catalyzed by glutamate - oxaloacetate transaminase. High value of this enzyme in serum i.e. high SGOT, indicates myocardial infarction or liver damage or skeletal muscle damage.

In short, NH_2 group of amino acids are ultimately removed as NH_3 (ammonia). This is highly toxic. So it is converted into urea. In liver failure, urea can not be formed and increased blood ammonia concentration, damages the brain.

Normal Blood urea - 20 to 40 mgm/100 ml. In renal failure, Blood urea - 200 mg/100 ml. (The condition is uremia).

Creatine & Creatinine

Creatine phosphate occurs in the muscles and due to high energy phosphate compounds, take part in contraction of skeletal muscles.

A part of creatine phosphate is converted into creatinine and is excreted through urine.

Normal serum creatinine 0.6-1.5 mg/100 ml

In Renal failure, serum creatnine increases.

Agni	-	fire, particularly the digestive fire
Ajña chakra	-	center of command; third eye
Akasha	-	ether or space
Alochaka pitta	-	form of Pitta governing vision
Ama	-	toxic material caused by poor digestion
Amla	-	sour taste
Ananda	-	bliss
Anna	-	food
Annamaya kosha	-	food sheath
Annavaha srotas	-	digestive system
Apana vayu	-	downward moving among the five breaths
Apya	-	the element of water
Artava	-	menstrual fluid
Artavavaha srotas	-	menstrual system
Artha	-	the goal of attaining wealth, resources or possessions
Asana	-	yoga posture
Asthi	-	bone
Ashtanga Hridaya	-	Ayurvedic text written by Vagbhatta
Atman	-	inner Self
Avalambaka kapha	-	form of Kapha in the chest
Ayurveda	-	the spiritual science of life (a supplement to the Vedas or Vedanga)
Bala	-	bodily strength
Bhakti yoga	-	yoga of devotion
Bhrajaka pitta	-	form of Pitta governing the complexion
Bhuta	-	element

Bhutagni - digestive fire governing an element
Bodhaka kapha - form of Kapha giving sense of taste
Brimhana - tonification therapy
Buddhi - intelligence principle of discrimination

Chakra - spinal center of energy
Charaka - ancient Ayurvedic author
Charaka Samhita - Charaka's treatise on Ayurveda
Chikitsa - therapy (giving care to)
Dharana - concentration, attention
Dharma - goal, principle, law of one's nature
Dhatu - tissue element of the body
Dhatvagni - Agni in the tissues
Dhyana - meditation
Dinacharya - daily regimen
Gati - quality of the pulse
Gunas - attributes, prime qualities of nature
Guru - quality of heaviness; spiritual teacher

Hatha yoga - yoga of physical postures
Hridaya - heart

Japa - repetition of mantras
Jatharagni - digestive fire
Jiva - individual soul
Jñana yoga - yoga of knowledge

Kama - desire
Kapha - biological water humor
Karma - bondage to action the cause of rebirth
Karma yoga - yoga of service
Katu - pungent or spicy taste
Kledaka kapha - form of Kapha governing digestion

Laghu - lightness
Langhana - reducing therapy

Majja	-	bone marrow and nerve tissue
Mala	-	waste-material of the body/excretas
Mamsa	-	muscle
Manas	-	mind as principle of thought
Mantra	-	words of power, sacred sounds
Marma	-	vital points on the body
Meda	-	fat
Moksha	-	liberation
Mutra	-	urine
Mutravaha srotas	-	urinary system
Nadi	-	Ayurvedic name for pulse
Nasya	-	nasal administration of therapies
Niyama	-	right actions or observances in yoga practice
Ojas	-	primary energy reserve of body and mind
Pachaka pitta	-	form of Pitta governing digestion
Pancha karma	-	five cleansing actions of vomiting, purgation, enemas, bloodletting and nasal medications
Pariksha	-	examination or diagnosis
Patañjali	-	compiler of the classical Yoga system
Pitta	-	biological fire humor
Prabhava	-	special action of herbs
Prajñaparadha	-	failure of wisdom or intelligence
Prakriti	-	primal nature; natural state; constitution
Prana	-	life-force, breath, subtle form of the life-force, inward moving of the five breaths or life-force in the head
Pranayama	-	breath control
Pratyahara	-	control of senses and mind
Purisha	-	feces
Purishavaha srotas	-	excretory system

Purusha - the original spirit, inner Self
Raga - attraction
Rajas - the intermediate principle of energy among the three qualities of nature (gunas)
Rajasika - having the nature of Rajas
Rakta - blood
Raktavaha srotas - circulatory system (hemoglobin portion)
Raktamokshana - therapeutic bloodletting
Rañjaka pitta - form of Pitta coloring the blood
Rasa - plasma; taste
Rasayana - rejuvenation
Ritucharya - seasonal regimen
Sadhaka pitta - form of Pitta governing the brain
Sama - condition of humors with products of indigestion
Samana vayu - equalizing form of the five breaths
Sattva - the higher principle of harmony of the three qualities of nature (gunas)
Sattvika - having the nature of Sattva
Satya - truth
Shita - cool
Shiva - pure being or pure consciousness
Shukra - reproductive fluid
Shukravaha srotas - reproductive system
Sleshaka kapha - form of Kapha lubricating the joints
Sleshma - another name for Kapha or phlegm
Snehana - oleation therapy, oil massage
Sparshana - touch, palpation
Sushruta - ancient Ayurvedic author
Soma - bliss or pleasure principle at work behind the mind and senses
Srotas - the different channel systems or

physiological systems

Sutra - axiom used in Vedic teaching
Swastha - health
Swasthya - state of being healthy
Swasthavritta - regimen promoting health
Swedana - sudation, steam or sweating therapy
Tamas - the lower principle of inertia of the three qualities of nature (gunas)
Tamasika - having the nature of Tamas
Tanmantra - five prime sensory principles (sound, touch, sight, taste and smell) behind organs and elements
Tapas - discipline, self-discipline
Tarpaka kapha - form of Kapha governing the brain and nerves
Tattva - principle of cosmic evolution (24 total)
Tejas - fire on a vital level
Tikta - bitter taste
Udana vayu - upward moving of the five breaths
Upanishads - ancient Vedantic teachings of India
Ushna - hot
Vaidya - Ayurvedic physician
Vagbhatta - ancient Ayurvedic author
Vaisheshika - one of the six systems of Indian philosophy
Vamana - therapeutic vomiting
Vata - biological air humor
Vayas - life span
Vayu - another name for Vata
Vedas - ancient books of knowledge presenting the spiritual science of awareness
Vedanta - culmination of the Vedas in the

		philosophy of Self-realization
Vijñana	-	intelligence
Vikriti	-	disease state, diversification or deviation from nature
Vikriti pariksha	-	examination of disease
Vipaka	-	post-digestive effect of herbs
Virechana	-	purgation therapy
Virya	-	energetic effect of herbs as heating or cooling
Vyana vayu	-	outward moving of the five breaths
Yama	-	right attitudes in Yoga practice
Yoga	-	psychophysical practices aimed at Self-knowledge
Yoga Sutras	-	classical textbook of Yoga