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Ayurveda and its Relevance with Contemporary Medical Sciences

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Abstract

Ayurveda is the Indian system of medicine which originated during Vedic period. *Sanskrit* has been the language of documentation and dissemination of knowledge of *Ayurveda* since generations. The term *Ayurveda* precisely means the science of life. *Ayus* refers to Life and *Veda* refers to Knowledge. *Charaka Samhita* and *Sushruta Samhita* are the major authoritative treatises. *Ayurveda* has an in-depth approach towards health and homeostasis, considering physical body, psyche, emotions, soul, and the environment.

Ayurveda strongly believes in the theory that human being is a miniature of this magnificent universe. Some of the fascinating concepts of *Ayurveda* are *Panchamahabhuta siddhanta*, *Tridosha siddhanta*, *Sapta dhatu siddhanta*, *Srotas siddhanta*, *Prakriti Purusha siddhanta*. These concepts represent an organism at different levels i.e., atomic, molecular, cellular, biochemical, organ system, organism, and population level. This paper is an attempt to highlight the role of foundational principles of *Ayurveda* in relation to contemporary science.

Key words: *Ayurveda*, *Sanskrita*, *Panchamahabhuta*, *Tridosha*, *Loka*, *Purusha*, *Srotas*, *Sapta dhātu*

Introduction

Ayurveda, the Indian system of medicine has taken its origin during Vedic period. *Sanskrit* has been the language of documentation and dissemination of knowledge of *Ayurveda* since generations. The term *Ayurveda* precisely means the science of life. *Ayus* refers to Life and *Veda* refers to Knowledge. *Charaka Samhita* and *Sushruta Samhita* are the major authoritative treatises. *Ayurveda* has an in-depth approach towards health and homeostasis, considering physical body, psyche, emotions, soul, and environment. *Ayurveda* strongly believes in the theory of *Loka Purusha Samyata- Purusho*

ayam loka sammitah. *Loka* is a distinct level of outside entity that can be perceived and *Purusha* is any living being or a distinct unit of life which is a miniature/ *Pratima* /reflection of this magnificent universe and similar foundational principles govern them.

Some of the fascinating concepts of *Ayurveda* depicting the interconnectedness of microcosm and macrocosm which are undoubtedly relevant even today are *Panchamahabhuta siddhanta*, *Tridosha siddhanta*, *Sapta dhatu siddhanta*, *Srotas siddhanta*, *Prakriti siddhanta*. These concepts represent an organism at different levels i.e., atomic level, molecular level, cellular and

biochemical level, organ system level, organism level and finally the population level. This paper is an attempt to elaborate each of these concepts in detail to reveal the ayurvedic understanding of an organism and its contemporary relevance in the medical field.

Review of literature

The fundamentals of *Ayurveda* are strongly based on an important concept called *Loka Purusha Samya vada* (Similarity between man and universe). Acharya Charaka describes,

पुरुषोऽयं लोक सम्मितः। - Charaka

Samhita Sharira sthana 5/ 1

Human body is a miniature of this universe (Acharya, 2001). The structure and functional similarity between the Microcosm and macrocosm is a fascinating concept which needs contemplation. The Vedic concept '*yat pinde tat brahamande*' suggests harmonious continuance of mutually dependent relationships between living and non-living forms in the Universe. *Pinda* as microcosm depicts smallest of the smallest microscopic atoms, molecules, cells while *Brahmanda* as macrocosm represents earth, stars etc in the universe. *Pinda* and *Brahmanda* share interconnected, inter-dependent and dynamic relations' (Patwardhan, 2015).

The smallest functional unit of the nervous system is the neuron and is imagined to be as *Pinda* and the whole universe is considered as *Brahmanda*. The comparison may not be untrue. They surprisingly resemble. Scientists believe that the number of neurons in the human brain is almost same as the number of stars in the galaxy (Fig. 1). Thus, the entire universe is interconnected.

This is one of the fundamental principles of Indian philosophy and Ayurveda (Patwardhan, 2015).

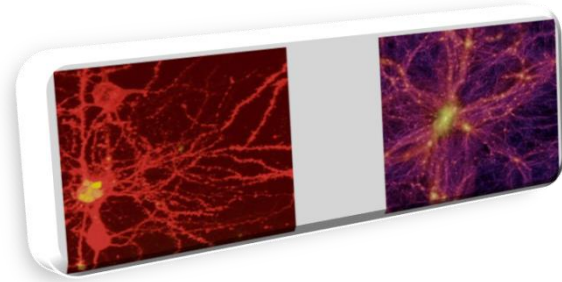


Figure 1: The structures and organization of Macrocosm and microcosm look astonishingly similar. Microscopic structure of mouse (left) and computerised model of the universe (right).

Panchabhuta Theory - Atomic Level

पञ्चभूतात्मकं तत्तुक्ष्मामधिष्ठाय जायते।

अम्बुयोन्यग्निपवननभसां समवायतः।

तन्निवृत्तिर्विशेशश्चव्यपदेशस्तु भूयसा॥ -

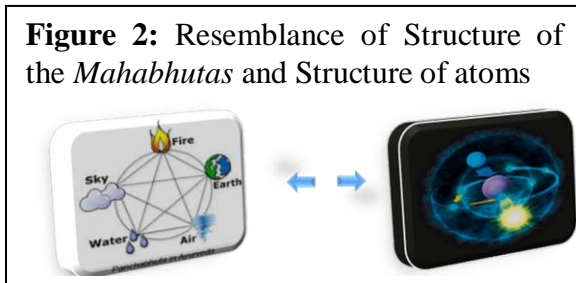
Astanga Hridaya, Sutra sthana 9/1-2

Everything in this universe is made up of five primordial forces *Akasha*, *Vayu*, *Tejas*, *Jala* and *Prithivi*. The *panchamahabhoota* theory explains how the primitive forces like earth, water, fire, energy, air and space are common between the *Microcosm* and *Macrocosm*.

Acharya Vagbhata describes the structure of the *Mahabhutas* and the compound substances, which has striking degree of resemblance with structure of atom described by modern science (Shastri, 2005). He states that in the construction of penta-elemental substances, *Pruthvi* (subtle solid matter) takes the place of mass or nucleus around which the other *bhutas* arrange themselves in different patterns to form

different kinds of substances. It can be correlated in the following way (Tripathy, 2009) (Fig. 2).

- *Prthvi bhuta* is identical with the nucleus of the atom which is said to contain almost total mass of an atom comprising of protons and neutrons.
- *Ap bhuta* represents a kind of glue in binding of various constituents and keep the fast moving electrons
- *Teja* represents the energy levels and the electromagnetic energy associated with charged particles.
- *Vayu* is responsible for all kinds of movements and wave characters in electrons.
- *Akasha* is the vast field of empty space



between nucleus and energy shells.

By understanding the Ayurvedic concept of cosmogenesis and evolution of matter and life a new direction can be squeezed in the field of medical science by developing an entirely new approach of looking at the phenomena of life, disease production and its management above the present materialistic level of scientific understandings.

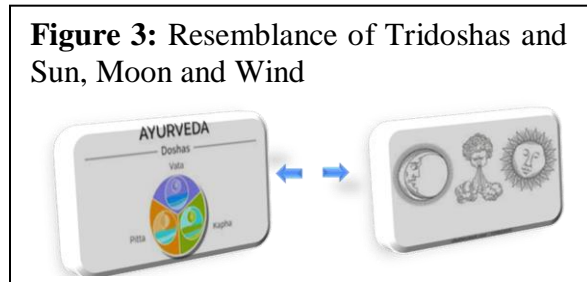
Tridosha Theory-Molecular /Omics Level

विसर्गादगनविक्षेपैः सोमसूर्गावनल र्थग ।
धगरन्ति जर्देहं कफवपत्तगवनलस्तथग ॥ -
Sushruta Samhita, Sutra sthana 21/8

The phenomenon of universe and individual are mainly of three types (Acharya, 2005). They are –

- 1) *Visarga* – That which gives strength or unites
 - 2) *Adana* – This is responsible for transformation or digestion
 - 3) *Vikshepa* – Responsible for movement.
- These functions maintain the balance in the environment

Moon in the environment has the attributes of union which in turn keeping the molecules intact and help in growth and nourishment. The sun is responsible for thermogenesis or transformation. Wind represents all types of movement (Fig. 3). Similarly, *Tridosha-Kapha*, *Pitta* and *Vata* maintain the equilibrium of all body functions. Any fluctuations occurring in the environment causes structural and functional changes in the human body. Hence, any deviation in normal structure and function of the macrocosm plays an important role in causation and development of diseases.



As per *Ayurveda*, matter is made up of five *Mahabhutas* (primitive elements). They are space (*Akasha*), air (*Vayu*), fire (*Tejas*), water (*Jala*) and earth (*Prithivi*). These five mahabhutas combine to form three *Doshas*, and are termed as *Vata*, *Pitta* and *Kapha*.

The *Doshas* are principles that govern different aspects of the human body. *Vata* is formed from the components having properties of *Akasha* and *Vayu*. *Pitta* is formed from the

components with properties of *Teja* and *Jala*. *Kapha* is formed from the components having properties of *Jala* and *Prithvi*.

Ayurveda views the human system from an essentially functional viewpoint. For this, it has identified three main functions namely, movement, metabolic transformation/change, and growth /nutrition and support. These are called as *Vata* (V), *Pitta* (P) and *Kapha* (K) respectively in Sanskrit, the language of ayurveda. Table 1 shows the general functions of *tridoshas*. Everyone has a particular ratio of *Vata*, *Pitta* and *Kapha*. This is known as their psychophysiological make up or constitution and is related with the individual's phenotype (Hankey, 2010; Sharma, 2016).

In fact, *Tridosha* theory could be interpreted at all the levels of systems biology but in this paper an attempt has been made to convey that *tridosha* theory may possibly represent the next grosser level after the *panchamahabhuta* level i.e the molecular level. Interpretation of *Tridosha* theory at the molecular level is as follows. One of the studies reveals that *Vata* can be understood in terms of membrane bound signal transduction, *pitta* as the process of phosphorylation and de-phosphorylation of different proteins (signalling moieties and enzymes) and *kapha* is understood as the degree of gene expression as protein synthesis. All these biochemical mechanisms together contribute to the total body defence mechanism (Tripathi, 2000).

Dhatu and Ojas- Cellular and Biochemical Level

Ayurveda elaborates seven major structural entities that maintains and sustain the body (*rasa*, *rakta*, *māmsa*, *meda*, *asthi*, *majjā* and *śukra*). The previous *dhātu*

nourishes the next in a sequential manner. *Ayurveda* explains the interesting mechanisms of *Dhatu Poshana* (Tissue nourishment) through the theory of *Nyaya Traya*. *Agni* and *Srotas* are the major facilitators of tissue nourishment which mainly occurs through following three mechanisms and are complimentary to each other (Singh, 2009):

1. *Kedari Kulya Nyaya* - Maxim of micro-circulation and tissue perfusion: This *Maxim* suggests that the living body is made up of innumerable micro vascular channels which are responsible for the nourishment of the *Dhātus*. The cells and tissues get perfused with plasma. But tissue perfusion alone is not sufficient to complete the process of nourishment. This requires the complementary action of the other two mechanisms.
2. *Khale Kapota Nyaya* - The *Khale Kapota Nyaya* refers to the selective uptake of nutrients from the blood stream by the respective cells and tissues just as the bird picks up selective grains and cereals from the common harvesting ground because it provides total pool of nutrients to all tissues but the different *Dhatus* require different specific nutrients and therefore there is a need of active selective uptake. For example the *Asthi Dhatu* will absorb mainly the minerals like Calcium - Phosphorus, whereas the *Rakta Dhatu* will take only those nutrients like Iron etc. which are needed for formation of blood.
3. *Kshira Dadhi Nyaya* represents the final transformation and assimilation of the absorbed nutrients into the tissue system. This is very much comparable with the conversion of milk into yoghurt, so the term *Kshira Dadhi Nyaya* has been used.

This process of *Dhatu Poshana* (Nourishment) and *Dhatu Nirmana* (Formation of *dhatu*) ultimately is responsible for the formation of vital essence of the body called *Ojas*. *Ojas* which is described in Ayurveda is basically of two kinds (Singh, 2009).

- *Para Ojas* – The quantity of *Para Ojas* is minute and symbolically measures eight drops and is located in the heart. Injury of *Para Ojas* leads to instantaneous death which indicates vital nature of this category of *Ojas*.
- *Apara Ojas* -*Apara Ojas* is comparatively gross and is spread all over the body. It is responsible for immune functions of the body. This *Ojas* acts as *Bala* or biological strength. Ayurvedic classics have described three kinds of *Ojo Bala* namely (Acharya, 2001).

त्रिविधं बलमिति - सहजं । कालजं । युक्तिकृतं
च सहजं यच्छरीरसत्त्वयोः प्राकृतं ।
कालकृतमृतुविभागजं वयःकृतं च । युक्तिकृतं
पुनस्तद्यदाहारचेष्टायोगजम् - *Charaka Samhita*,
Sutra sthana 11/36.

- 1) *Sahaja Bala* which resembles innate immunity,
- 2) *Kalaja Bala* resembling naturally acquired immunity as an impact of time and other environmental factors,
- 3) *Yuktikrita Bala* which is like artificially induced immunity- (vaccinations) manufactured by therapeutic planning and intervention. The genesis and functioning of *Ojobala* depends upon the integrity of the *Srotas* system (Macro and micro channels).

Ayurvedic texts also describe the pattern of immune disorders which can be of three kinds namely (Acharya, 2005).

तस्य विस्रंसो व्यापत् क्षय इति यत्रयो
दोषाःषफ लिङ्गानि भवन्ति सन्धिविश्लेषो
गात्राणां सदनं दोषच्यवनं क्रियासन्निरोधश्च
विस्रंसे। स्तब्धगुरुगात्रता वातशोफो वर्णभेदो
ग्लानिस्तन्द्रा निद्रा च व्यापन्ने। मूर्च्छा मांसक्षयो
मोहः प्रलापो मरणमिति च क्षये ॥ - *Sushruta
Samhita, Sutra sthana* 15/24.

- 1) *Ojovyapada* which is like early reversible immune disorder,
- 2) *Ojovisramsya* resembling dislodged immunity as it is seen in cases of autoimmune diseases and many other similar immune disorders,
- 3) *Ojokshaya* refers to the real immunodeficiency like AIDS. Such disorders of *Ojas* are strongly associated with endogenous factors like derangement in the integrity of *Srotas* and *Agni*, besides a range of external factors acting via the environment and life-style discordance.

Srotas- Organ System Level

The term *Srotas* takes its derivation from the root word- ‘*Sru-gatau*’ which means to go, to move, to flow, to leak, to secrete, to filter etc. Generally, *Srotas* is defined as ‘*Sravanata Srotamsi*’, the channels or structures through which the nutrient material, waste material, sensory information, body fluids etc are transported.

यावन्तः पुरुषे मूर्तिमन्तो भावविशेषास्तावन्त
एवास्मिन् स्रोतसां प्रकारविशेषाःज सर्वे हि
भावा पुरुषे नान्तरेण स्रोतांस्यभिनिर्वर्तन्ते। क्षयं

वाऽप्यभिगच्छन्तिज स्रोतांसि खलु
परिणाममापद्यमानानां धातूनामभिवाहीनि
भवन्त्ययनार्थेन ॥ - *Charaka Samhita, Vimana
sthana 5/3.*

The Ayurvedic classics affirm that- ‘*Srotomayam hi Shariram*’, which means that living body is comprised of innumerable channels which represent the dynamic inner transport system of the physique-psyche and soul organization, indicating all macro and micro channels and pathways which are meant for divergent functions, both gross and subtle, distinct and indistinct, anatomical and physiological (Acharya, 2001).

The *Srotas* plays an important role in physiology. Nourishment of the tissues and organs through the transport of nutritive materials and regulation of physiological factors, energies, and bioavailability of medicines depends on the proper functioning of *Srotas*. The subtler *Srotas* are responsible for the transmission of impulses, emotions, and thoughts.

The understanding of *Srotas* from a contemporary view is as following (Singh, 2009):

- Whole body as a single long channel.
- Gross and subtle channels of physiology.
- Millions of microtubular structures.
- Subcellular and emotional pathways.
- Membrane potentials, Receptor mechanisms and networks.
- The *Chakras, Nadis, and Koshas*.

Charaka Samhita is the important Ayurvedic classic which describes about *Srotas*-gross channels resembling the major physiological systems of the body as described in the contemporary system of medicine. Two

main principal organs each in the route of the respective *Srotas*, termed as the *Mulam* - ‘*Mulamiti Prabhavasthanam*’. These *mulas* contribute for the multidimensional wellness of the respective *srotas*. Each of these important channels acts as the inner transport system (Singh, 2009).

The texts also describe another important channel called *Manovaha Srotas* which disseminates the impulses of thought and emotion. *Hridaya (Buddhervivasm Hridayam)* is said to be the *Mulam* of *Manovaha Srotas*. The texts describe the causes of the vitiation of these channels and their pertaining diseases. Thus, *Srotas* is an umbrella term referring to a wide range of structures, functions and has different contextual meanings.

The smallest functional unit of the nervous system is the neuron and is imagined to be as *Pinda* and the whole universe is considered as *Brahmanda*. The comparison may not be untrue. They surprisingly resemble. Scientists believe that the number of neurons in the human brain / according to some the number of all basic biological cells, is almost same as the number of stars in the galaxy (Fig. 1) Thus, the entire universe is interconnected. This is one of the fundamental principles of Indian philosophy and Ayurveda (Patwardhan, 2015).

Prakriti - Organism Level

शुक्रशोणितसंयोगे यो भवेद्दोष उत्कटः ।
प्रकृतिर्जायते तेन तस्या मे लक्षणं शृणु ॥ -
Sushruta Samhita, Sharira sthana 4/63

The intensified state of doshas in *shukra* (sperm) and *artava* (ovum) at the time of fertilization determines the *Prakriti* (constitution) of the person (Acharya, 2005). These intensified doshas are capable of inducing defects, but during formation of

prakriti (constitution), there is an innate suitability of *doshas*, which does not cause any harm to the body. Hence constitution is an outcome of intensified, yet balanced state of *doshas*.

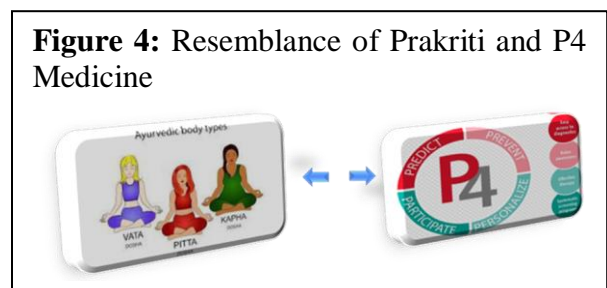
The word *Prakriti* (constitution) has different meanings in different contexts e.g. *samya* (equilibrium), *Arogya* (health), *svabhav* (nature), *karana* (cause), bodily constitution etc. Etymologically *Prakriti* (*pra* = primary or first, *kriti* = formation or creation) stands for the basic model which represents the developmental differences in everyone.

Ayurveda has a very descriptive approach regarding the topic of *deha prakriti* (physical constitution). Various factors have been enumerated by our acharyas which together constitute the psychological and physical make up of an individual. The permutation and combination of these factors result in independent or mixed *prakriti* (constitution). Rastogi (2010) stated that *Prakriti* is an outcome of unique combination of physiological, physical, and psychological features of an individual, and it has seven variants depending on the dominance of specific *dosha*.

Prakriti is an interesting concept of basic principles of *Ayurveda* which has an evident impact on predictive medicine. Knowledge of *prakriti* of an individual is beneficial in understanding health and disease. This concept represents the Organism level in the (six level) hierarchy as it fits well into the definition of an 'organism', being a continuous biological system and having the ability to adapt and maintain a particular structure and behaviour. Human Genome Project has tried to identify the possibilities of inheritance of human *Prakriti* by observing positive

relationship between specific alleles and *Prakriti* variants. Identification of biochemical correlates is the advancement to this correlation.

Customised medicine or P4 Medicine which is currently very popular in the west seems to have taken its roots from *Ayurveda* (Fig. 4). The term P4 medicine has been coined by Leroy Hood of the Institute for Systems Biology. It is personalised, Predictive, Preventive, and Participatory Medicine.



Population Level

After the organism level the next level is the population level. This whole representation of cycle is now-a-days being termed as *Ayurveda Systems biology*. *Prakriti* acts as a tool to classify the human population thus giving a deeper understanding of genetic variation in the population. Therapeutically this is helpful in identifying the human population into disease prone, disease resistant or drug responsive/non responsive etc. categories. This classification would be immensely helpful for the mankind in every possible way.

Conclusion

Ayurveda gives a universal perspective to the nature of life, health and even to the subtlest atoms, cells, and molecules. *Panchamahabhutas* represents the atomic

level, *Tridoshas* representing the Molecular or Omics level, *Sapta dhatus* representing the Cellular - Biochemical level, *Srotas* representing the organ system level, *Prakriti* depicting the Organism level and finally the population level (Fig. 5). Therefore, the concept of *Loka* and *Purusha* has a holistic view regarding human being emphasizing that human being is not just a conglomeration of cells or tissues but physique, psyche, and soul in harmony. *Ayurveda* has so much to offer to the mankind in every field such as preventive medicine, nutrition, genomics, pharmaceuticals and many more. All these principles play a major role in Ayurvedic diagnostics and therapeutics.

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Figure 5: Ayurveda Principles Representing Various Levels of Understanding the Organism

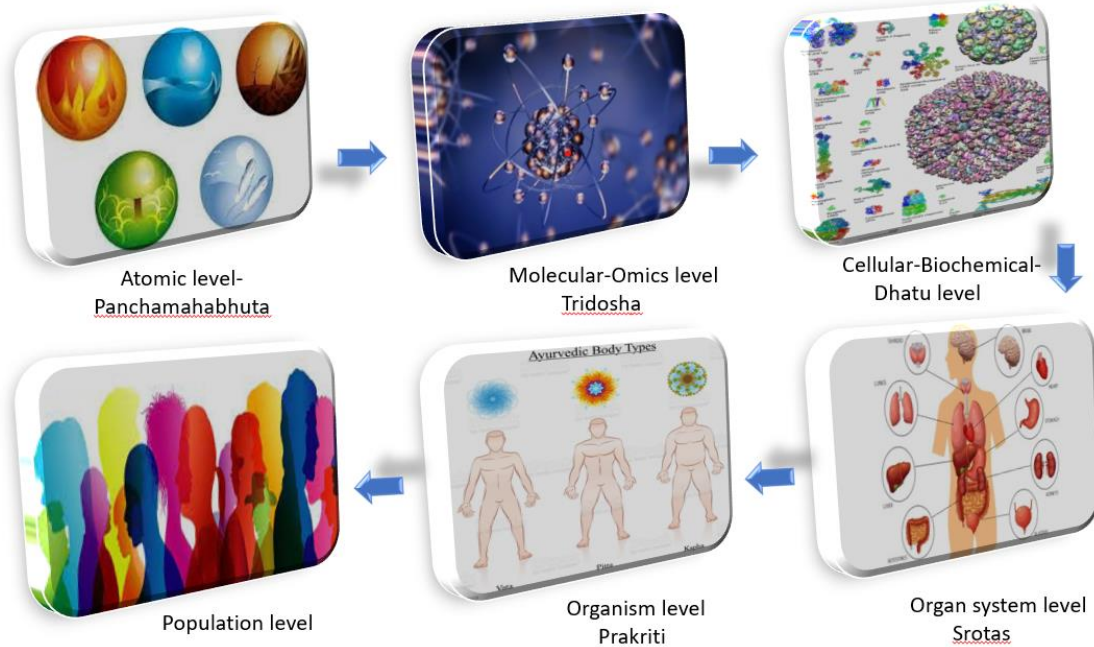


Table 1: Shows the General Physiological functions of *Vata Pitta and Kapha*

Vata	Pitta	Kapha
<ul style="list-style-type: none"> • Movement, Dissemination • Communication, which includes blood flow, Contraction of heart, Inhalation and exhalation • Movement of food down the digestive tract and • Communication of cells via nerve impulses 	<ul style="list-style-type: none"> • Appetite • Digestion • Metabolism • Transformation • Energy exchange, and • Endocrine functions 	<ul style="list-style-type: none"> • Structure and • Cohesion of the body • Strength, stability • Fluid balance • Weight

About Authors



Dr. G. Pallavi is graduated (BAMS) from SDM Ayurveda College Udupi, Karnataka in 2009 and completed her Post graduation in Ayurveda Siddhanta from Government Ayurveda Medical College Mysore in 2012. She pursued MA (Sanskrit) from National Sanskrit University Tirupati in 2019 and Diploma in Manuscriptology and Paleography from the same University in 2022. She published about 25 research articles in peer reviewed National and International reputed Journals. She is currently working as Professor in the Department of Samhita and Siddhanta in the S.V. Ayurveda Medical College, Tirupati, Andhra Pradesh.



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Veda Samskruti Samiti

13-1-62 & 13-1-47/1

Veenapani Nagar, Malkajgiri

HYDERABAD Telangana



Veda Samskruti is an inherent intellectual property of Bhaarata dEsham. It is the basic duty and right of every citizen in Bhaarata dEsham to protect this Intellectual property. Indian Constitution and Law provides provision for protection and preservation of its culture, its monuments, architecture etc.

The Chaturvedas said to have 1131 shaakhaas right up to the time of Aadi Shankaraachaarya and thereafter during last more than ten centuries, many shaakhaas are out of practice due to various reasons and presently only seven shaakaas are in the practice of Guru shiShya parampara.

There is a need to continuously preserve these available shaakhaas which may likely to disappear in future due to various external forces acting in the country vigorously with the power of money and global politics. It is time for the intellectuals of Bharata dEsham to wake-up and work collectively to protect and preserve Veda Samskruti of Bharata dEsham, by empowering the Youth of Bharat dEsham, the future care takers of this great Indian Heritage , with suitable education of our correct history and culture.

The above background lead to formation of this Veda Samskruti Samiti which is registered under Societies acts of Government of Telangana, with Regd. No. 961/2016 by Sri A.H. Prabhakara Rao, who is the Founder and President of the Samiti.

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