

# Ayurveda fundamentals and science – A perspective

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Western medicine was a complementary and alternative system of medicine (CAM) to Ayurveda in India in the 19<sup>th</sup> century. In the 20<sup>th</sup> century perspectives reversed with the exponential growth of knowledge through scientific approaches in all fields and in turn contributing to each other's growth. Currently, there is renewed interest in CAM. A survey published in the New England Journal of Medicine showed that 33% of Americans regularly used these practices and paid them out of pocket. The number of visits to CAM practitioners was more than visits to all primary care physicians.<sup>[1]</sup> All suggesting a hidden mainstream. Such events increased interest and scientific scrutiny of CAM. Many leading scientists termed CAM, a fraudulent and unscientific practice.<sup>[2]</sup> All along skeptics upped their attack on efforts on CAM like funding, research and demanding research methods like randomized, placebo-controlled trials (though these designs may not fit well with CAM philosophies). Research to sync with Western scientific thoughts became reductionist and mechanistic even by CAM practitioners doing research. There was a drop in funding for fundamental concepts in CAM systems such as vitalism, holism, bioenergy approaches, complexity, and component synergy.<sup>[3]</sup> A recent article<sup>[4]</sup> by a professor in Ayurveda questioned the Ayurveda fundamentals as science or pseudo-science, refutable or nonfalsifiable, and their utility in current times. And opined them to be dropped from the syllabus and need not be taught to undergraduate students. Questioned the concept of *Tridosha*, *Dhatu* concept, especially of *Rakta* and *Shukra Dhatu*.

Here, it is an attempt to understand, and analyze the thought process, context, and way forward of Ayurveda fundamentals from both Ayurveda, Western medicine and science perspectives.

## Ayurveda -Thought process, Natural Science, Anthropology, Eco-bio Psychology

Ayurveda philosophy tries to integrate phenomenological aspects of man (*Purusha*), forming a single unit of the

universe (*Loka*). Microcosm and macrocosm are not static and immutable components but are dynamic forces continually interacting with each other. Ayurveda considers the human body as systemic components connected in a cybernetic way. It looks into a holistic approach within the body as well as outside the human body through integration with the social and physical environment. It uses multiple models of natural science in making fundamental principles and their applications. Similar to Ayurveda, the objective of natural science is to understand natural phenomena. It is based on empirical evidence from observation and experimentation. Natural science is divided into physical sciences and life sciences.

Ayurvedic concepts are similar to anthropologic assumptions. Anthropology is the study of humans. It tries to understand the complexity of biology, social and cultural phenomenon, which cannot be done by understanding a particular or single component of complex systems. How humans are similar and differ, the effect of place, time, physical environment, culture, nutrition, dynamic ability, disease, etc., are addressed.

Ayurveda thought process includes current fields like eco-biopsychology. A new methodological discipline that studies the relationship between man and the environment that surrounds him. Developments in man are tied together in an inseparable way with the mineral, the vegetal, and the animal kingdoms, in the process of systemic–complex organization.

Hence Ayurveda, along with health sciences, includes the components of natural science, anthropologic assumptions and

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eco-biopsychology. These components have been integrated into both principles and practices of *Ayurveda*.

## Ayurveda and western medicine-have different perspectives

Ayurveda is based on an experiential, intuitive, and holistic approach. Western medicine is based more on experimental, analytical, and reductive reasoning. Ayurveda tried to understand the whole and made various concepts trying to explain the whole. Western medicine's reductionist approach brought a deeper understanding of biologics such as organs, cells, molecules, pathways, disease, and disease mechanisms as parts. These appear to be their strengths during their biological applications. Ayurveda is a systemic medicine for the overall representation of complex nonlinear biological phenomena where the whole is more than the algebraic sum of the parts. Current analytical approaches have failed to predict nature's complex, adaptive, and emergent behavior.<sup>[5]</sup> There is a huge difference between the two in academic thoughts, theoretical framework, philosophies, approach toward health and illness, disease management strategies, drug preparation, drug administration, etc. Ayurveda encompasses components of health science, medicine, natural sciences, anthropology, eco-biopsychology, humanity, social sciences, philosophies, and culture. Theoretical bases of Ayurveda and Traditional Chinese Medicine (TCM) were incomprehensible to the sub-committee (House of Lords Science and Technology Committee) and this caused them to be placed in a lower category. This caused protests from their respective countries of origin.<sup>[6]</sup> Ayurveda appears unscientific to Western scientists and has received negative reviews.<sup>[7]</sup>

## Ayurveda fundamentals

Ayurveda has various fundamental theories like *Panchamahabhuta*, *Purusha*, *Loka* concept, *Guna*, *Dosha*, *Dhatu*, *Mala*, *Srotasa*, *Agni*, *Manas* etc. Ayurveda fundamental concepts were derived from:

1. Philosophies and knowledge base available during the contemporary period like *Darshanas*
2. Experimental testing through practical or clinical testing. Analyzing the results and cyclically applying them to the fundamental concepts
3. Keen observation of the natural phenomenon. Trying to understand the details and making fundamental concepts
4. Making a macroscopic view of the systems, body, environment, and natural sciences
5. The traditional experimental approach was different from the current scientific approach, like the use of *Pramanas*, *Tantra Yukti*, *Siddhanta*, etc. Current science also uses evidence, theory, logic, etc. Fundamentals of these can be seen in both approaches but differ in methodology.

Many Western biomedical explanatory models of the body are from the biochemistry basis than physics. Concepts in

Traditional systems of medicine are nearer to physics than to chemistry.<sup>[8]</sup> Emerging studies from biophysics can be of use in understanding them. A study<sup>[9]</sup> has shown that water and living bodies have macroscopic coherent properties of quantum mechanical origin. These contribute to the understanding of physics associated with homeopathy, acupuncture, etc.

## Ayurveda fundamentals: Tested and irrefutable through traditional experimental methods

Classical Ayurveda literatures (*Samhita*) are the body of knowledge. The methodology of documentation was guided by *Tantrayukti*. It is also a method for the proper interpretation of a *Tantra* (text). Authors of text ensure the text (information) is in the form of *Sutra* (verses) that is precise and concise. The process of knowledge (theory) development and the methods (traditional methods) are not emphasized. Applications of the theory are emphasized. Maybe because *Samhita* is a teaching guide, to novices and beginners, dialogue between teacher and student like *Agnivesha* in *Charaka Samhita*. They have collected the knowledge which was prevalent, reliable and approved from the scholarly (sages).

Ayurveda accepts a four-fold examination technique. *Pratyaksha* (Examination, testing), *Anumana* (inferring, discussing, reliability, validity, and logic), *Aptoapadesha* (previously cumulated reliable information) and *Yukti* (logic and innovations) as the source of knowledge.<sup>[10]</sup> *Samhita*<sup>[11]</sup> has given an example of the rebirth concept toward the process and methodology of knowledge development. It is established by *Aptopadesh*, *Pratyaksha*, *Anumana*, and *Yukti*. In *Pratyaksha*, careful observations like persons maintaining the memory of previous life, etc., are mentioned. A similar phenomenon has been investigated and reported in current studies. Dr. Ian Stevenson intensively worked on evidence of incarnation. Medical and psychological presentations such as early-observed phobias and phobias, strange childhood play, homosexuality, gender dysphoria, a child's idea of having different parents, temperamental variances that appear soon after birth, unusual birthmarks, and their resemblance to wounds on a deceased person are not explicable through current understandings such as genetics and environmental factors. Hence opines that these presentations can be better understood through the hypothesis of previous lives.<sup>[12]</sup> Similar observations of 2500 children are documented and a study suggests the reincarnation concept is irrefutable and a reality.<sup>[13]</sup> These ancient methodologies produced great advancements in various fields like Ayurveda, traditional metallurgy, architecture, and fine arts.

Scientific explanations must be testable and irrefutable. The main objective of scientists is to identify the research question and identify the best answers to that question. Ayurveda hypothesis (fundamentals) were tested and irrefutable.

As debates were encouraged, different schools of thought on Ayurveda were accepted, Ayurveda gives liberty for a student to critically analyze the science or a teacher, and there are methods of conducting the discussion in seminars and symposia of experts,<sup>[14]</sup> debates, etc. The hypothesis which is tested rigorously through different techniques or angles remains to be unrefuted and established is called *Siddhanta* (theory).<sup>[15]</sup> Types of *Siddhanta* based on the strength of testability and irrefutability are *Sarva Tantra*, *Pratitantra*, *Adikharana*, and *Abhyugama Siddhanta*. The hypothesis which remained testable and irrefutable across the different schools of Ayurveda, across more than 2000 years, is the *Sarva Tantra Siddhanta* (theory). These fundamental concepts which form the *Sarva Tantra Siddhant* are *Tridosha*, *Dhatu*, *Mala*, *Agni*, *Srotasa*, etc.

## Ayurveda fundamentals were accepted globally

Ayurveda theories and practices were widely accepted and applied to other animal and plant sciences. Ayurveda medical textbooks on plant life (*Vrikshaayurveda*), horses (*Ashvayurveda*), elephants (*Hastayurveda*), and the bovine species (*Gavayurveda*) are noteworthy. Concepts similar to Ayurveda are also observed in other contemporary ancient medical systems of Iran, Hellenic countries, and Mesopotamia. Ayurveda was taught in ancient global universities such as Nalanda and Takshashila. Theories of Ayurveda had an impact on Greek medicine. Ayurveda books were translated and they spread to Arab countries, Central Asia, Tibet, Indo-China, Indonesia, and Cambodia. This explains the global validity and acceptance of the Ayurveda fundamentals and traditional experimental methods in the past.

## Tridosha concept

Two central doctrines in Ayurveda are *Mahabhuta* and *Dosha* concepts. Former address the structural and, later on, functional components. *Dosha's* concept evolved from *Atharva-Veda*. Ayurveda scholars worked extensively on this concept, and even Charaka, Sushruta, and Vagbhatta do not agree with one another on the entire concept of *Dosha* and do have subtle differences.

Current studies and scientists have tried to understand the *Dosha* concept. A theoretical model of *Tridosha's* theory linking biological processes and outcomes in all species has been attempted. Systems theory explains the regulation present in any system through three fundamental processes. They are input/output (transport), turnover, and storage. These three are similar to *Vata*, *Pitta*, and *Kapha Doshas*.<sup>[16]</sup> According to Valiathan,<sup>[17]</sup> the *Tridosha* may stand for three families of receptors that are dispersed across the entire body. These are set off by certain specific molecular patterns or other precise environmental stimuli, whether internal or external. A cascade of cellular signals is started upon activation and affects the entire body.

*Dosha's* concept has biological and natural science perspectives. Natural *Vata Dosha* (*Ashareerika*) has action-related to physical bodies such as the sun, moon, stars, planets, clouds, and rain. If disturbed, it can break the peak of the mountains, disturbs the oceans, generates earthquakes, and causes thunderstorms.<sup>[18]</sup> The broad functioning of *Vata Dosha* on living organisms, including humans, is toward regulation, signaling, conduction, and control of any information or any system in our body.<sup>[18]</sup> Hence, *Dosha* concept is applicable to the universe as well as to all living organisms, including humans. It has physical (astrophysics, geophysics, chemical physics, and biophysics) and chemical (biochemistry, chemical biology, geochemistry, and astrochemistry) perspectives. *Tridosha* is a holistic process with a hierarchy of integrated regulatory systems. It makes the whole organism a functional unit. Successful usage of applications of the *Dosha* concept such as *Prakriti*, pathophysiology, and therapeutics by Ayurveda physicians, suggests of its effectiveness. Each *Dosha* along with its subcomponents has anatomical, physiology, pathology, disease, prognostic, pharmacological (drugs that aggravate or decrease *Dosha*), and therapeutic perspectives. *Shodhana* therapy needs to be understood from a Western science perspective. Hence understanding the *Dosha* concept is still elusive to both the current Ayurveda community as well as to Western medicine scholars.

## Dhatu concept

The concept of *Dhatu* (seven *Dhatu*) is applicable to all living organisms. These fundamental concepts like *Dhatu* (tissue) have applications in terms of anatomy, physiology (*Pachakagni*, *Dhatu Agni*, *Bhutagnai*, *Srotasa* including *DhatuVaha-Srotasa*, *Upadhatu*, and *Mala* of *Dhatu*), pathology (*Dhatu-Vridhhi*, *Dhatu-Kshaya*, *Pradoshaja Vikara*),<sup>[19]</sup> *Dhatu Sroto-Dushti* contains separate etiology, symptoms, and principles of management.<sup>[20]</sup> *Dhatu* is part of the pathology in different diseases. The different diseases such as *Jwara*, *Prameha*, *Vata Vyadhi*, and *Kushtha* have different manifestations with different *Dhatu* afflictions. These even have different prognoses and different treatments. Pharmacological perspectives (drug action, therapeutics, etc.) are different. Ayurveda identifies the pharmacological action of drugs on various *Dhatu*. On *Rakta Dhatu* actions are *Rakta Prasadana*, *Rakta-Vardhana*, *Rakta-Nashana*, *Rakta-Shamana*, *Rakta-Shodhana*, *Rakta-Kopana*, *Sonita-Sanghata/Bhedana*, *Rakta-Stambhaka*, *Sonita-Sthapana*, *Rudhiropa-Shoshana*, and *Asrik-Vahana*.<sup>[21]</sup> Treatment for *RaktaVaha-Srotasa* is as explained in *Vidhi Shonita Adhyaya*.<sup>[22]</sup> *Vidhishonita* chapter of *Charaka Samhita* is a special chapter on *Rakta Dhatu* that explains the function of pure *Rakta Dhatu*, the etiology for its vitiation, diseases produced due to *Rakta Dhatu* vitiation, and management strategies for vitiation of *Rakta Dhatu*. *Rakta Mokshana* is one of the major treatments and has wide therapeutic applications not only on *Rakta Dhatu* but also on *Doshas* and other *Dhatu*. Our understanding of a *Dhatu* should be able to explain all these components of a *Dhatu* that are intricately explained. In

*Rakta Dhātu*, our explanation of *Rakta Dhātu* should explain various considerations explained in the Ayurveda texts whose Western considerations include anatomical, physiology, pathology, etiopathogenesis perspectives, disease perspective, prognostic perspective, pharmacological perspective, and special therapeutic considerations. Interpreting *Rakta Dhātu* of Ayurveda as blood (anatomically, physiologically, and pathophysiologically) of Western medicine is a noncomprehensive understanding of the Ayurveda concept. Currently, understanding and fitting Ayurveda fundamentals through a Western medicine perspective looks difficult. Still, we need to develop insights into the understanding of these concepts.

This issue of fundamental concepts and research is faced by all traditional and complementary medicines. TCM uses “Yin and Yang,” Spleen-Stomach theory and kidney theory, and Kidney deficiency or spleen deficiency theory as the key components in diagnostic and therapeutic applications. Study<sup>[23]</sup> opines that the spleen described in TCM is not the spleen of Western medicine anatomically, physiologically, and pathophysiologically. The spleen-Stomach theory is comprehensive and involves various systems such as the digestive, vegetative nervous system, immunologic, endocrine, and hemopoiesis and has wide metabolic activities of muscle, hepatic, protein, nucleotide, energy, water, and salt. Spleen deficiency syndrome may present with many gastrointestinal diseases such as chronic atrophic gastritis, pancreatitis, diarrhea, inflammatory bowel disease, and coeliac disease. Clinical applications based on these concepts have shown diverse beneficial outcomes, improvements in various systems, organs, functions, and restoration of derangements. Experimental research and clinical studies on concepts like spleen deficiency syndrome have shown beneficial outcomes. Si-Jun-Zi decoction (the major component of Spleen-fortifying therapy) has a major action on digestive systems, immunity, blood circulation, liver, muscle metabolism, etc.<sup>[23]</sup> The kidney concept involves various components of Western medicine, genito-urinary system, sexual glands, hormones, immune function, and heart. Kidney-Yang denotes the hypothalamic-pituitary axis, adrenal, gonadal, thyroid hormones, etc.

Hence terms in both science denote different meanings and have to be understood from their perspective. Irresponsible usage of terms brings a lot of confusion and misunderstandings among the students of that particular system, science community and society as a whole.

## Fundamental concept-testing

Though research in Ayurveda has begun from 75 years (the creation of India after independence) but is catching up only since few decades. Major research in Ayurveda is through Western scientific research methods as they are well established. Research on Ayurveda fundamentals is neglected due to its complex and challenging issues. Many funding agencies, including their reviewers, have priority in

the application of the science towards a specific problem than theoretical constructs.

Few studies have been working on these lines and have shown a way forward. Fundamental biology behind Ayurveda theory and practice is being established in a few of the studies.<sup>[24-31]</sup> Association between *Prakriti* and parameters of hematology, biochemistry, physiology, psychology, and genomics have been established. *Prakriti* is genome-based, morphological, physiological, and metabolic tendencies in humans. A study<sup>[32]</sup> established the bio-statistical approach in quantifying the *Tridosha* and established the first empirical evidence for theoretical constructs in Ayurveda. On the qualitative diagnostic criteria of *Tridosha* used by Ayurveda physicians, an algorithmic heuristic approach was applied. The study showed significant levels of convergence. A conceptual review has attempted to understand the neurobiological basis of brain functioning in different *Prakriti*.<sup>[33]</sup>

The application of fundamental theories like *Prakriti*, *Sara*, etc., on humans has been through questionnaires described in the classical texts of Ayurveda. Research on the clinometric and psychometrics of these clinical assessment tools need to be developed.

## Research methods for Ayurveda fundamentals need newer paradigms and more time

An attempt to understand any concept can be made by critically evaluating it from different angles (Definition of *Siddhanta*). Trying to look Ayurveda concept through a Western science lens or Western science components through the Ayurveda lens is agreeable in exploring but not in judging anyone's concept. Our understanding and exploration of the Ayurveda concept are still superficial and of a relatively lesser period (a few decades) due to the huge gaps between the knowledge creators (*Samhita* writers) to knowledge seekers (current period). This gap is being worked out in the process of revitalization by active efforts from the current Ayurveda community, scholars of contemporary sciences, support by government and private sectors, reforms through the National Commission for Indian Systems of Medicine, etc. Efforts are needed to understand traditional research methods. Epistemologically sensitive research methodology needs to be developed.<sup>[34]</sup>

## Way forward

TCM is working on this issue. It has also carved out a path of fundamental research through both traditional and contemporary scientific methods. It has stressed working on inheritance and enrichments of its fundamentals. It established “The special program of basic research on TCM theory” in 2005 under the National Basic Research Program (973 program).<sup>[35]</sup> It covered core and unique fundamental concepts, research on TCM original thinking, etc. The study summarises

that the relationship between inheritance and innovation needs to be carefully handled.

These fundamentals may not look like a tested scientific theory in the vision of Western philosophy. As in the words of Kuhn in *Criticism and the Growth of Knowledge*: “There are many fields – I shall call them proto-sciences – in which practice does generate testable conclusions but which nevertheless resemble philosophy and the arts rather than the established sciences in their developmental patterns. I think, for example, of fields like chemistry and electricity before the mid-eighteenth century, of the study of heredity and phylogeny before the mid-nineteenth, or of many of the social sciences today. In these fields, too, though they satisfy Sir Karl’s demarcation criterion, incessant criticism and continual striving for a fresh start are primary forces and need to be.<sup>[36]</sup> Hence, we opine that core fundamental research has to be done systematically and is a long-drawn process. Dr. Carl Sagan quotes “Absence of evidence does not mean evidence of absence.”<sup>[37]</sup> It is too early to comment on them. The main objective of fundamental research is to inherit, enrich and develop the theoretical fundamentals. We need to use traditional and contemporary experimental methods in their critical evaluation. In the academic curriculum, core fundamental theories of Ayurveda needs to be taught in the sink with the Ayurveda thought flow existing for centuries. Works in the future may bring better understanding. This will have major effects on application, and clinical outcomes and synchronize the growth of the science in line with its great lineage and path of 2000 years. This may throw more light and help in better applications of Ayurveda knowledge bases. It may also help in bridging the gaps or linking different streams of science such as natural science, environmental science, and medical sciences.

Ayurveda development journey of more than 2000 years has shown an open-minded, inclusive, and progressive approach. They integrated the best of the components from different sciences to provide better solutions during various time periods. They integrated information from *Sankhya Darshan*, *Nyaya Darshana*, *Yoga*, *Mimamsa*, astrology, astronomy, botany, geology, veterinary sciences, natural sciences, folklore practices Greco-Arabic medicine<sup>[38]</sup> (newer diseases like *Snayuka Roga*, *Munnatakhyia* disease, and many drugs like *Babbula*, *Akarakarabha* were added to Ayurveda domain). The best way forward is taking the best of the knowledge components irrespective of medical systems and integrating them to address the ever-rising health challenges. Integrative textbooks of Ayurveda incorporating components like current developments in science and ayurveda, Ayurveda knowledgebase and ayurveda fundamentals are the need of the hour.

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