

PANEL DISCUSSION ON FUTURE PERSPECTIVES OF *ĀYURVEDA* BIOLOGY

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Abstract

A panel discussion on the future directions of *Āyurveda* Biology was organized as part of the “*Vidyodaya*” National Seminar on *Āyurveda* Biology-Back to Roots: Exploring the Connections, held on January 9, 2025, at Vaidyaratnam P. S. Varier Ayurveda College, Kottakkal. The session was moderated by Dr. Vinod Kumar M.V., with six distinguished experts engaged in exploring the field's historical development, current challenges, and potential advancements. Participants were carefully chosen by the organizers based on their specialized knowledge in areas such as transdisciplinary health sciences, plant-based research, and computational biology, ensuring a broad spectrum of viewpoints through targeted invitations. The proceedings were structured around questions posed by the moderator, responses from the panelists, and an interactive audience segment, addressing core issues like philosophical foundations, chemical analyses of herbal remedies, genomic applications, microbial ecology, and opportunities for expansion into animal and plant health domains. Emphasis was placed on the necessity for prolonged research grants, clearer conceptual terminology bridging ancient and modern frameworks, consistent governmental backing, and global collaborations to foster wider recognition. *Āyurveda* Biology was framed as a transformative integrative discipline that connects time honoured Ayurvedic wisdom with cutting edge biological insights, paving the way for tailored therapies, genetic-environmental studies, sustainable public wellness strategies, and comprehensive health solutions.

Keywords: *Āyurveda*, *Āyurveda* Biology, interdisciplinary research

Event Details

The panel discussion was held on January 9, 2025, within the framework of the *Vidyodaya* National Seminar on *Āyurveda* Biology at Vaidyaratnam P. S. Varier Ayurveda College, (VPSV) Kottakkal, Kerala, under the guidance of Dr. Vinod Kumar M.V., Professor and Head of the Department of Samhita - Siddhanta and Sanskrit.

Panelists:

- Dr. Unnikrishnan Payyappallimana (P1), Professor and Head of the Centre for Community Health, Clinical Research and Education at The University of Transdisciplinary Health Sciences and Technology (TDU) in Bengaluru
- Sulaiman C.T. (P2), Senior Scientist in Phytochemistry at the Centre for Medicinal Plants Research, Arya Vaidya Sala, Kottakkal
- Dr. P.B. Benil (P3), Professor and Head of the Department of Agadatantra at VPSV Ayurveda College, Kottakkal.
- Dr. Subrahmanya Kumar K. (P4), Associate Professor at TDU's Centre for Ayurveda Biology and Holistic Nutrition
- Dr. Aswini Godbole (P5), Associate Professor, TDU's Centre for Ayurveda Biology and Holistic Nutrition

- Dr. Chaitanya R. Menon (P6), Professor in the Department of Kriyasarira at VPSV Ayurveda College, Kottakkal.

This gathering was thoughtfully planned by VPSV Āyurveda College faculties and PG scholars to illuminate the scope and demands of Āyurveda Biology for the wider Āyurvedic audience, especially those pursuing advanced studies, with the goal of demystifying its present standing and tomorrow's possibilities.

Significance and Selection Methods

Āyurveda Biology has been recognized as an evolving scientific domain over recent decades, weaving together Āyurveda's inherent biological essence with dynamic exchanges across education, investigation, and commerce, thus creating fresh pathways for Āyurvedic scholars to merge with foundational scientific principles. Research in Āyurveda has thus far been predominantly confined to its utilitarian applications, particularly in the realm of drug development. However, Āyurveda offers far more to the serious student of science than its pharmacological potential alone. Beyond its foundational assertion as a holistic system that prioritizes comprehensive well-being, Āyurveda presents distinctive and potentially transformative scientific opportunities when examined through the lens of contemporary scientific inquiry.¹ The past decade has witnessed vibrant engagement from Āyurveda experts and scientists, leading to elucidation of the scientific basis of key concepts such as *doṣa prakṛti*, *pañcakarma*, *bhasma* and *rasāyana*. Just as Āyurveda prescribes *pathyāpathya* and proper *āhāra-vihāra* for health, these principles are equally vital for cultivating Āyurveda Biology: conflicts of interest, biases, and undue interference are detrimental and must be avoided, while integration, openness, collaboration, merit, and transparency should be actively fostered. Historical progress in biology has paralleled advances in physics, chemistry, and technology. Likewise, the current era offers an opportune moment for Āyurveda Biology to flourish through modern tools such as artificial intelligence, machine learning, big data analytics, cloud computing, and high-throughput analytical and omics technologies.² The methodology of Āyurveda Biology serves as a conduit, linking the ever-evolving frontiers of modern science with the foundational principles of Āyurveda. It establishes a communicative interface between ancient wisdom and contemporary technological advancements within the realm of transdisciplinary research. While Āyurvedic knowledge is inherently holistic and systematic, the epistemological framework of biomedical sciences remains predominantly reductionist and structurally oriented.³ Āyurveda is essential for the revitalization of its historical legacy and the strategic direction of research. It advocates an integrative approach that examines the intrinsic connections between foundational sciences, health sciences, and biomedicine.⁴ The concept of health and wellness in Āyurveda is not confined solely to human well-being; rather, it encompasses all forms of life within the universe. Āyurveda regards humankind as an inseparable component of nature, existing in dynamic equilibrium with its elemental composition. Human health, therefore, is understood to be intrinsically interdependent with the well-being of plants, animals, and the broader ecological system. From this holistic standpoint, Āyurveda extends its universal vision of health beyond individual physiology to include agriculture and veterinary sciences. It recognizes that the flourishing of crops, livestock, and natural ecosystems directly influences human vitality. In doing so, Āyurveda establishes a comprehensive and ecologically integrated framework of knowledge. This perspective seeks to ground itself in rigorous philosophical and scientific inquiry within the Indian intellectual tradition, particularly through the synthesis of Āyurveda and biology. At the same time, it engages with Western scientific paradigms, aspiring to develop a transdisciplinary knowledge framework often referred to as Āyurveda Biology that bridges classical Āyurvedic principles with contemporary biological science. Such integration, while ambitious, presents significant conceptual and methodological challenges.⁵ Moreover, modern re-evaluation of Āyurvedic phytochemistry lends empirical support to Āyurveda's foundational constructs, including Rasa (taste), *Vipāka* (post-digestive effect), and *Prabhāva* (specific or unique therapeutic action) of medicinal plants. These investigations strengthen the scientific credibility of classical Āyurvedic theory by demonstrating correlations between traditional classifications and biochemical properties.⁶

The Panel discussion acted as a portal to delve into this domain's facets, where experts were deliberately picked by the hosts for their proficiency in cross-disciplinary studies, herbal science, and data analytics, achieved via personal outreach reflecting their scholarly outputs and professional positions. Discussion was facilitated through moderator-led inquiries answered in turn by panelists, leading into audience interactions that sparked deeper reflections on the subject's importance.

Opening Remarks: Epistemology and Ontology

Moderator: Whenever a new area like *Āyurveda* Biology emerges in our field, questions arise about how the present community receives it. The connection between tradition and modernity is being attempted. Does the epistemological or ontological framework of *Āyurveda* fit with modern science?

P1 (Dr. Unnikrishnan Payyappallimana): *Āyurveda* studies were pursued by me initially, followed by a transition to social sciences, perhaps signalling the emergence of *Āyurveda* Sociology. Issues of evidence and social acceptance surrounding *Āyurveda* were recognized as primarily social and political rather than purely biological, leading to engagement with Sociology of *Āyurveda* and Sociology of Medicine. *Āyurveda* Biology has been observed for nearly 20 years as a fluid, interdisciplinary field, not compartmentalized like astronomy or molecular biology, but rather a social process. The journey began with colonial ethnobotany through Dutch and Portuguese documentation like *Glassia* and *Hortus Malabaricus*. During colonial periods, *Āyurveda* was examined through three lenses: theology/religious philosophy, medical practice and administration. Post 1850s, following Europe's scientific revolution, chemistry gained prominence, evidenced by CSIR (Council of Scientific and Industrial Research) monographs on medicinal plant chemistry during 1950-1960. Molecular biology developments followed, leading to holistic interdisciplinarity by the 1990s-2000s. Professor Valiathan's 2002 Legacy of Caraka and INSA (Indian National Science Academy) working paper identified five research domains: *Āyurgenomics* linking phenotypes to Prakṛti, molecular studies of Pañcakarma effects, plant genomics for doṣa-specific plants (*Vātahara*, *Pittahara*, *Kaphahara*), and *Rasaśāstra* processes resembling nanotechnology for non-toxic mineral preparations, areas already explored in CSIR (Council of Scientific and Industrial Research) laboratories. *Āyurveda*'s epistemology, theorizing through *Vāta-Pitta-Kapha*, *Saptadhātu*, and *malāh* differs fundamentally from chemistry, biology, or physics. This ontological distinction was extensively debated at TDU (formerly FRLHT) and National Institute of Advanced Studies with scholars like Bhushan Patwardhan and Mitali Mukherji. Bhushan Patwardhan's "Genome to Om" critiques modern science's limitations, proposing meta-science that integrates multiple epistemologies, reflecting TDU's transdisciplinary approach linking traditional knowledge with biology, chemistry, and physics. UGC recognition has been secured, and TDU's MSc *Āyurveda* Biology attracts growing numbers of *Āyurveda* students. The objective remains communicating *Āyurveda*'s contemporary relevance to society rather than merely generating evidence, as the practitioner community expands.

P2 (Sulaiman C.T.): A chemistry background underpins work heading the Phytochemistry Division at CMPR (Centre for Medicinal Plants Research) *Ārya Vaidya Śālā*. Progress has shifted from pure phytochemistry to identifying molecular mechanisms underlying medicinal plants' therapeutic efficacy according to *Āyurvedic* properties. Recent efforts focus on *doṣa*-balancing plants, though distinguishing specific phytochemical characteristics for *Vātahara*, *Pittahara*, or *Kaphahara* plants presents challenges. Structural and functional similarities were identified across "Rasnā" sources: *Pluchea lanceolata* leaves per *Āyurvedic* pharmacopeia versus Kerala-practiced *Alpinia galanga/calcarata* rhizomes, effective for *Vātarakta*. LCMS analysis in multiple modes revealed common spectral transmissions targeting arthritis despite structural differences, confirmed through antiarthritic animal model studies. All three sources proved effective, though polyherbal formulations require revalidation due to multi-target pharmacology. *Guggulutiktakam Kaṣāya* with 30 ingredients required over a year for comprehensive analysis; *Amrtotharam Kaṣāya* demonstrated *Zingiber officinale* contributing three compounds directly but enhancing extraction of others, functioning as a bioenhancer. Compound clusters exhibit antimicrobial, antiarthritic, anti-inflammatory, and antipyretic activities, with specific binding determined by physician assessment of *Prakṛti* and *Vikṛti*, exemplifying polypharmacology. *Vikṛti* assessment gains critical importance in contemporary scenarios like ICMR (Indian Council of Medical Research) prioritized chronic respiratory illnesses post-HMPV (Human Metapneumovirus), where *Āyurveda*'s holistic approach considering *agni-koṣṭha*, sleep, *āhāra-vihāra* differs from uniform antibiotic prescribing across age groups with varying immunity profiles. *Āyurveda* represents ancient epigenetics, with environment-gene interactions central to pathogenesis including cancer. NMPB (National Medicinal Plants Board) approved breast cancer prophylaxis research examines *Āyurvedic* formulations reversing epigenetic changes, while CCMB (Centre for Cellular and Molecular Biology) Hyderabad collaborations test *Medhyarāśyanas* in dementia and spinal injury models for neuronal regeneration and cognitive enhancement. The ontology-epistemology challenge requires mutually

understandable vocabulary; chemistry facilitates this translation using modern biological tools for enhanced scientific interaction.

P3 (Dr. P.B. Benil): During 2001 *Dravyaguna* postgraduate training, phytochemistry exploration was prohibited as "chemicals lack *doṣa*," restricting work to preliminary studies. Visiting chemists faced exclusion from college lectures due to fears that chemistry's rising importance would claim *Āyurvedic* faculty positions. Government promotion of omics technologies and transdisciplinarity now drives exponential knowledge growth. Despite claims of *Āyurvedic* completeness, scientific validation remains essential. Clinical trials collect extensive *Āyurvedic* parameters, *Daśavidha Parīkṣā*, *Aṣṭasthāna Parīkṣā*, *Agni*, *Koṣṭha*, *Sārata*, but analyze only selected biomarkers, wasting valuable data in this era of data supremacy. Validated assessment tools for *koṣṭha* remain unavailable, yet pathways must be demonstrated. VPSV dissertations employed *Drosophila* and *C. elegans* as model organisms; current methodologies offer opportunities beyond conventional reverse pharmacology when strategically planned.

P6 (Dr. Chaitanya R. Menon): Initial interdisciplinary experience occurred during postgraduate studies from Amala Institute of Medical Sciences, Thrissur, Kerala. There it was emphasized that *Āyurvedic* practitioners uniquely contribute by explaining concepts from an *Āyurvedic* perspective while employing interdisciplinary research parameters for clinical applicability. Animal studies assessing *Chyāwanaprāśa*'s antioxidant effects through rat forced swimming endurance demonstrated doubled capacity, revealing unexpectedly potent properties when traditional formulations are rigorously tested. *Srotas* and *Srotomūla* studies revealed *kloma* as moola of *Udakavāha Srotas*. When went through the etymological analysis of the word "kloma" identifying it as a body-wide fluid-organ maintaining water balance, paralleling contemporary interstitium discoveries. Comparative analysis of *Hastayurveda*'s *marma* classifications with human *marma* systems through genomics and bioinformatics could elucidate evolutionary conservation across species. *Āyurveda* possesses its own biology: Purusha as life-bearing entity where *doṣa* represents functional aspects and *dhātu* and *mala* as structural components, analogous to the cell as life's fundamental unit. Biochemical pathways parallel *srotas-samprāpti* frameworks; reverse-engineering *doṣa - dhātu - mala* interactions yield *Āyurvedic* metabolic pathways, providing comprehensive biological conceptualization.

Reductionism vs. Holism

Moderator: What distinguishes reductionistic approaches from holistic systems perspectives, and can integration between the two occur?

P2 (Sulaiman C.T.): Reductionism and *Āyurvedic* holism prove complementary. Reductionism identifies specific disease pathogenesis by simplifying macro-cellular mechanisms, while *Āyurveda* correlates these observations with holistic principles like Prakriti-Vikriti. Stanford University's Integrated Personalized Omic Profiling for type 2 diabetes exemplifies this alignment. Omics-based medicine treats the whole patient beyond single targets, recognizing interconnections like hypertension, hyperlipidemia, and diabetes in cardiovascular disease management, poly-targeted therapeutics mirroring holistic prescribing principles.

P5 (Dr. Aswini Godbole): Reductionism and holism coexist throughout biomedical research supporting clinical medicine, progressing from cell line studies through animal models to phase 1-3 human trials. *Āyurveda*'s dosha classification itself represents reductionism. The unifying factor remains quality-of-life outcomes, biomarkers and imaging hold value only when patients experience tangible improvement.

P6 (Dr. Chaitanya R. Menon): Biological pathways translate sentence-by-sentence into dosha-dhatu-mala frameworks, analogous to translating text word-by-word to comprehend the complete narrative. Reductionism constructs holism.

P3 (Dr. P.B. Benil): Complementarity exists, though network analysis and molecular docking risk introducing new reductionism by converging on limited targets. Complex statistical models specific to *Āyurvedic* complexity require development.

Biological Correlations and Definition

Moderator: *Āyurveda* Biology appears in literature, JNU (Jawaharlal Nehru University)/TDU (The University of Transdisciplinary Health Sciences and Technology) curricula, and NET (National Eligibility Test) examinations, does minimum consensus exist among practitioners regarding its definition?

P1 (Dr. Unnikrishnan Payyappallimana): The field remains undefined, akin to blind men describing different aspects of an elephant. *Āyurveda*'s biological etymology clashes with modern biology's paradigmatic framework despite terminological similarity. Institutional applications vary widely; recent publications emphasize social relevance and bidirectional science communication. Professor Valiathan's INSA (Indian National Science Academy) paper emphasized conceptual correlations rather than entity matching, modern microbiome concepts lack direct *Agni-Pāka* equivalents. Bhushan Patwardhan's Science to Meta-science provides conceptual breadth. Definition emerges through philosophical discourse and institutionalization via accreditation processes.

P4 (Dr. Subrahmanya Kumar K.): Nationwide conferences among leading experts become necessary for AYUSH standardization of terminology (*Āyurveda* Biology versus *Āyur*Biology). Currently, *Āyurveda* Biology functions as philosophy harmonizing *Āyurvedic* and biological perspectives. TDU's MSc Life Sciences curriculum correlates *Siddhānta-Doṣa* principles with cell and molecular biology fundamentals, incorporates *Āyurvedic* philosophical foundations, maintains MSc equivalence, and includes eight-month internships.

P6 (Dr. Chaitanya R. Menon): *Āyurveda* possesses its own biology: *Puruṣa* as life-bearing entity with *doṣa* representing functional aspects and *dhātu-mala* as structural components, analogous to the cell as life's fundamental unit. Etymological analysis reveals *kloma* as a body-wide fluid-organ maintaining water balance, paralleling recent interstitium discoveries. Comparative analysis of *Hastayurveda marma* classifications with human texts through genomics and bioinformatics could elucidate evolutionary conservation. *Doṣa-dhātu-mala* metabolic pathways emerge from reverse-engineering *srotas-samprāpti* frameworks.

Research Frontiers: Microbiome and Molecular Validation

Moderator: What role does molecular biology play in validating *Āyurvedic* principles? How do microbiome studies contribute?

P5 (Dr. Aswini Godbole): Small RNAs beyond the central dogma reveal environmental influences like greenery-health effects. Multi-omics generates data overload requiring hypothesis-driven analysis; human molecular diversity persists despite *Homo sapiens* classification. Molecular confirmation validates functionally observed preventive and wellness interventions.

P4 (Dr. Subrahmanya Kumar K.): The HASP study (Heart Attack Stroke Predictability) tracks 300-400 parameters including *Ashtasthāna Parīkṣā*, *Sātmyā*, *Vega dhāraṇa / udīraṇa* and *Āhāra* alongside modern diagnostics in healthy cohorts over ten years, correlating microbiome and molecular profiles with *Āyurvedic* predispositions. HMI India examines *Prakṛti* -microbiome correlations across 17 populations.

P2 (Sulaiman C.T.): Microbiome research addresses autism and neurodegeneration; Florida inquiries sought herbals for environmental enteropathy based on *Āyurvedic* stool consistency assessments. *Vāsti* and *Pañcakarma* demonstrably alter microbiome composition, reversing antibiotic resistance with implications for longevity and health span amid global AMR (Antimicrobial Resistance) crisis.

Challenges and Future Branching

Moderator: What constitutes the primary challenges: funding patterns, scepticism, human resources? Does scope exist for specialization in diagnostics, therapeutics, or plant chemistry?

P2 (Sulaiman C.T.): Research progresses slowly due to complex nature requiring minimum five-to-ten-year funding cycles rather than standard three-year projects. Ontological gaps hinder meaningful dialogue; AIIMS integrative centres exist but lack vocabulary alignment. Policy discontinuity following DSG's 2017 *Āyurveda* Biology suspension created career uncertainty, sustained ICMR/AYUSH support proves essential.

P6 (Dr. Chaitanya R. Menon): Lifelong research commitment defines required manpower beyond temporary PG/PhD projects. *Āyurveda* Biology extends beyond *Mānuṣyāyurveda* to *Mṛgāyurvedā* and *Vṛkṣāyurveda*, enabling *doṣa auśadha* analysis for veterinary and agricultural applications through proper *Āyurvedic* diagnosis rather than empirical prescribing.

P5 (Dr. Aswini Godbole): Challenges persist but solutions emerge through interdisciplinary events fostering confidence. Post-COVID openness accelerated collaborations; 2018 oncology research faced clinician resistance, now allopathic practitioners proactively seek partnerships. Industry commercialization through prakriti assessment tools becomes viable; correlation rather than equation ($HbA1c \neq Pramehā$) guides productive discourse.

P4 (Dr. Subrahmanya Kumar K.): Wrong tools applied incorrectly generate misleading results, as seen in flawed global *Aśvagandhā* studies. Karnataka's integrated *Āyurveda* -modern medicine practitioners abandoned *Āyurvedic* foundations entirely. Growth occurs despite inevitable stumbles.

P3 (Dr. P.B. Benil): *Āyurveda* Biology serves all *Aṣṭāṅgas*; individual specialties must develop capacity to address discipline, specific challenges rather than relying on generalized solutions.

P1 (Dr. Unnikrishnan Payyappallimana): International legitimacy remains absent; German Vasti research appears as "medicated enema" rather than *Āyurvedic* intervention. Definitional clarity and global networking with TCM (Traditional Chinese Medicine) /acupuncture become prerequisites. Subdisciplines including *Āyurgenomics* and network pharmacology already emerge.

Audience Q&A

Audience Q1 (PG Scholar): For postgraduate scholars entering this nascent field with limited literature, what guidance exists for initiating research? What specific challenges arise in omics/transcriptomics study design?

P5 (Dr. Aswini Godbole): Transcriptomics, though expensive, follows accessible workflows: hypothesis driven RNA-seq analysis validated by qPCR. TDU MSc students secure eight-month internships at NCBS (National Centre for Biological Sciences)/ NCCS (National Centre for Cell Science)/ ICAR (Indian Council of Agricultural Research); collaborations develop organically through student PhD registrations. Seminal publications like Mitali Mukherji's PNAS paper elevated *Āyurgenomics*, patience yields transformative impact.

P1 (Dr. Unnikrishnan Payyappallimana): Limited mentorship presents challenges; research aptitude assessment proves foundational for this lifelong commitment. Industry opportunities expand as validation matures. Critical thinking frameworks enhance clinical practice amid complex patient presentations; MD curriculum integration becomes essential. Broad literature exploration including the Mind Matter Unification Project proves invaluable.

P2 (Sulaiman C.T.): Omics datasets abound in public consortia; India lacks *Āyurveda* contextualized interpretation expertise. International collaborations facilitate data analysis.

Audience Q2: How should today's discussion be summarized as meta-science enabling grassroots healthcare transformation? Process, product, or both?

P1 (Dr. Unnikrishnan Payyappallimana): Both process and product serve *Uddeśya*. Societal prevention reduces CVD/metabolic disorder costs; plant biotechnology ensures sustainability. Patwardhan and Mutalik articulate environment society traditional knowledge sensitivity defining meta-science; grassroots initiatives amplify individual sparks of conscience.

P2 (Sulaiman C.T.): Integrative oncology improves quality of life metrics in advanced CA breast/lung cases, complementing conventional treatments through AYUSH Centre of Excellence research.

Audience Q3: How can *Āyurveda* biology integration address complex diseases like oncology and autoimmunity where pathogenesis remains poorly understood?

P4 (Dr. Subrahmanya Kumar K.): *Roga-lakṣaṇāḥ* correlate systematically with established biomarkers, as demonstrated in *Pāṇḍuroga* -anemia classifications by dosha predominance.

P1 (Dr. Unnikrishnan Payyappallimana): Decade long cohorts examining 300+ *Āyurvedic* predisposing factors alongside biomarkers and microbiome profiles validate observational designs over RCTs for complex disease prediction.

P5 (Dr. Aswini Godbole): Detailed medical histories reveal patterns; Parkinson's, chronic constipation and olfactory loss precede motor symptoms, paralleling *Vāta* predominance where Vasti relieves 50% symptoms, correlation guides contribution.

Conclusion

Moderator: This session constitutes a significant milestone in formally articulating emerging concerns and conceptual challenges within the field. The deliberations reflect a critical phase of intellectual maturation, as areas of ambiguity have been identified and constructively examined. Such sensitization reveals transitional “grey zones” analogous to smoke indicating an underlying transformative fire, thereby marking the day as historically consequential for the institution.

The panel discussion firmly positions *Āyurveda* Biology as an emerging meta-science that bridges traditional wisdom and contemporary life sciences. By contributing new perspectives to epigenetics, microbiome-driven wellness, and personalized health, it expands the scientific dialogue beyond reductionist frameworks toward integrative understanding.

The discussion underscored the importance of sustained policy support, strong interdisciplinary collaborations, and active international engagement to translate its principles into evidence-based, cost-effective public health solutions. Moving forward, *Āyurveda* Biology holds the potential not only to enrich global biomedical research but also to shape a more preventive, inclusive, and systems-oriented healthcare paradigm.

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