

CURRICULUM VITAE

Dr. Bhavana Prasher, M.D (Ayu)

Principal Scientist ,
CSIR- TRISUTRA Ayurgenomics Unit,
PI, Centre of Excellence for Applied Development of Ayurveda Prakriti and
Genomics

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Educational qualifications

- **Bachelor of Ayurvedic Medicine & Surgery (B.A.M.S)** from Smt. K.G.Mittal Punarvasu Ayurveda Mahavidyalaya, University of Mumbai (1993) with First division (64.35%)
Registration No. I-26284-A-1(Mumbai)
- **Doctor of Medicine in Ayurveda (M.D)** in 1997 with first division (63.4%) from Dept.of Basic Principles of Ayurveda, Institute of Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurveda University.
Subjects studied: ***Ayurvedic Maulika Siddhanta, Samhita, Sharira Rachana and Sharira Kriya and Itihasa***

MD thesis on: *Fundamental concept of Ojas and its role in attaining positive health and as a preventive measure*

Professional Experience

More than 22 **years** of experience **Post M.D. (Doctor of Medicine, Ayurveda)**

1. **Four** years of clinical experience as practitioner of Ayurveda at Vedanta Ayurveda, New Delhi (1997- 2001)
2. **19** years of research experience at CSIR (2001- till date)
 - October 2001 – February 2003 - Ayurveda expert in Dept. of AYUSH sponsored CSIR led **Traditional Knowledge Digital Library Programme** at CSIR- NISCAIR

- March 2003 to August 2008 - Project associate in DST sponsored Indo-Russian ILTP project on “**Genotype-Phenotype correlation Based on Principles of Ayurveda with special Focus on *Prakriti*”**
- September 2008- March 2011 – R & D management experience as Scientist fellow at Planning & Performance Division, at CSIR HQs, New Delhi and Co-Principle Investigator in a Project on **Ayurgenomics: Integration of Ayurveda with Genomics for system biology approach in predictive and personalized medicine**
- March 2011- 2017, Senior scientist, CSIR, and Principle Investigator (Ayurveda) in **CSIR- Ayurgenomics Unit TRISUTRA at IGIB.**
- April 2018- till date, Principal Scientist, and Principle Investigator (Ayurveda) in AYUSH Centre of Excellence for applied development of Ayurveda *Prakriti* and Genomics, supported by Ministry of AYUSH, Govt. of India

Area of Expertise

Understanding of TRISUTRA Ayurveda, a network medicine with translational approach and its integration with modern biology and genomics and to explore molecular basis to the principles of Ayurveda.

Application of clinical methods and therapeutic practices of Ayurveda for development of predictive and personalized medicine through integrative approaches of Ayurveda, modern biology, computational methods and genomics.

Development of methods for clinical evaluation of *Prakriti* in healthy and diseased for Ayurgenomics studies

Publications

1. Western Indian Rural Gut Microbial Diversity in Extreme *Prakriti* Endo-Phenotypes Reveals Signature Microbes. Chauhan NS, Pandey R, Mondal AK, Gupta S, Verma MK, Jain S, Ahmed V, Patil R, Agarwal D, Girase B, Shrivastava A, Mobeen F, Sharma V, Srivastava TP, Juvekar SK, **Prasher B***, Mukerji M*, Dash D*. *Front Microbiol.* 2018 Feb 13;9:118. doi: 10.3389/fmicb.2018.00118. eCollection 2018. PubMed PMID 29487572; PubMed Central PMCID: PMC5816807.
2. Recapitulation of Ayurveda constitution types by machine learning of phenotypic traits. Tiwari P, Kutum R, Sethi T, Shrivastava A, Girase B, Aggarwal S, Patil R, Agarwal D, Gautam P, Agrawal A, Dash D, Ghosh S, Juvekar S, Mukerji M, **Prasher B***. *PLoS One.* 2017 Oct 5;12(10):e0185380. doi: 10.1371/journal.pone.0185380. eCollection 2017. PMID: 28981546

3. Genomic insights into ayurvedic and western approaches to personalized medicine. **Prasher B***, Gibson G, Mukerji M*. J Genet. 2016 Mar;95(1):209-28. Review. PMID: 27019453
4. Combined genetic effects of EGLN1 and VWF modulate thrombotic outcome in hypoxia revealed by Ayurgenomics approach. Aggarwal S, Gheware A, Agrawal A, Ghosh S, **Prasher B***, Mukerji M*; Indian Genome Variation Consortium, J Transl Med. 2015 Jun 6;13:184. doi: 10.1186/s12967-015-0542-9. PMID: 26047609
5. EGLN1 involvement in high-altitude adaptation revealed through genetic analysis of extreme constitution types defined in Ayurveda. Aggarwal S, Negi S, Jha P, Singh PK, Stobdan T, Pasha MA, Ghosh S, Agrawal A; Indian Genome Variation Consortium, **Prasher B***, Mukerji M*. Proc Natl Acad Sci U S A. 2010 Nov 2;107(44):18961-6 doi:10.1073/pnas.1006108107. Epub 2010 Oct 18. PMID: 20956315
6. Whole genome expression and biochemical correlates of extreme constitutional types defined in Ayurveda. **Prasher B**, Negi S, Aggarwal S, Mandal AK, Sethi TP, Deshmukh SR, Purohit SG, Sengupta S, Khanna S, Mohammad F, Garg G, Brahmachari SK; Indian Genome Variation Consortium, Mukerji M. J Transl Med. 2008 Sep 9;6:48. doi: 10.1186/1479-5876-6-48.PMID: 18782426
7. Ayurgenomics for stratified medicine: TRISUTRA consortium initiative across ethnically and geographically diverse Indian populations. **Prasher B***, Varma B, Kumar A, Khuntia BK, Pandey R, Narang A, Tiwari P, Kutum R, Guin D, Kukreti R, Dash D; TRISUTRA Ayurgenomics Consortium, Mukerji M. J Ethnopharmacol. 2017 Feb 2;197:274-293. doi: 10.1016/j.jep.2016.07.063. Epub 2016 Jul 22. Review. PMID: 27457695
8. Ayurgenomics: a new way of threading molecular variability for stratified medicine. Sethi TP, **Prasher B***, Mukerji M*. ACS Chem Biol. 2011 Sep 16;6(9):875-80. doi: 10.1021/cb2003016. PMID: 21923095
9. Traditional Knowledge-based Medicine: A Review of History, Principles, and Relevance in the Present Context of P4 Systems Medicine . Nathanaël Lemonnier, Guang-Biao Zhou, **Bhavana Prasher**, Mitali Mukerji, Zhu Chen, Samir K. Brahmachari, Denis Noble, Charles Auffray, Michael Sagner. Progress in Preventive Medicine: December 2017 - Volume 2 - Issue 7 - p e0011 doi: 10.1097/pp9.0000000000000011
10. Ayurgenomics: A new approach in personalized and preventive medicine. Mitali Mukerji# and **Bhavana Prasher#** Science and Culture, Jan-Feb, 2011, vol. 77, Page no. 10-17
11. *Fundamental Concept of Ojas and its Role in attaining Positive Health and as a Preventive Measure.* **Palan B**, Dwivedi RB, Ravishankar B: **Ayu** October 1997

12. *Concept of AIDS and Ayurveda*, **Palan B**, Kumari S, Dwivedi RB: AYU, March 1997
13. *Pharmacological studies-Scope, Design and Applications in the field of Ayurveda*. Ravishankar B, Shukla VJ, **Palan B**, Dwivedi RB: Proceedings of National Symposium on Research Methodology in Ayurveda, September 2001
1. **A book Chapter**; Mitali Mukerji and Bhavana Prasher; Genomics and Traditional Indian Ayurvedic Medicine; **Genomics and Society - Ethical, Legal, Cultural, and Socioeconomic Implications** (2016) Academic Press, Elsevier ISBN 987-0-12420195-8

Research Support

1. **Principal Investigator** (Ayurveda) in Ministry of AYUSH supported Centre of Excellence Project for Applied Development of Ayurveda, Prakriti and Genomics (2018-2021)
2. **Principal Investigator** (Ayurveda) in CSIR supported Ayurgenomics Unit (TRISUTRA) for Translational Research and Innovative Science Through Ayurgenomics (2011 – 2017)
3. **Co- Investigator** (Ayurveda) Hypoxia Adaptation and Pregnancy Outcome Study (HAPS): an investigation of the influence of hypoxia on birth weight, collaborative project of UCL, AIIMS, SNM Leh & CSIR-IGIB (March 2017- 18)
4. **Co- Principal investigator** in CSIR supported project on Ayurgenomics: Integration of Ayurveda with genomics for systems biology approach in predictive and personalized medicine (2009 -2012)

Awards and Recognition

- Keertan Sanjeevani Smt. Pushpalata Ranade National research award for women, 2017 for research and contribution in the field of Ayurgenomics along with Dr. Mitali Mukerji
- AYUSH 2017 award for Best research paper in clinical research by Central Council for Research in Ayurvedic Sciences For the PlosOne paper titled: *Recapitulation of Ayurveda constitution types by machine learning of phenotypic traits*
- **Nominated as a member of the working group of CSIR- and Min./o AYUSH for cooperation of activities of common interest- 2019**
- Member of Board of studies for Masters Programme in Ayurveda Biology at Trans Disciplinary University, Bengaluru.
- Visiting Professorship, at TransDisciplinary University, Bengaluru, for Masters Programme in Ayurveda Biology.
- Member of Editorial board of The Journal- of Ayurveda and Integrative Medicine

Academic Collaborations in the area of Ayurgenomics

Within CSIR- IGIB

1. Dr.Anurag Agrawal
2. Dr.Debasis Dash
3. Dr.Shantanu Chowdhury
4. Dr.Vivek Natrajan
5. Dr.Rajesh S. Gohkale
6. Dr.Arijit Mukhopadhyay
7. Dr.V.P. Singh

Outside IGIB

8. Dr. Sanjay Juvekar, KEMHRC-VADU, Pune
9. Dr. Tuhin Biswas, J.B. Roy State Ayurvedic Medical College and Hospital, Kolkata
10. Dr. Anup Thakar, IPGT & RA, Gujarat, Ayurved University, Jamnagar
11. Dr Sudhir Kumar, Ch. Brahm Prakash Ayurved Charak Sansthan, New Delhi
12. Dr. B.S. Prasad, KLEU's BMK Ayurveda Mahavidyalaya, Belgaum, Karnataka
13. Dr. Saurabh Ghosh, Indian Statistical Institute, Kolkata
14. Dr. Nar Singh Chauhan, Maharshi Dayanand University, Rohtak, Haryana
15. Dr. Yogesh Shouche, National Centre For Cell Science, Pune
16. Dr Tulika Prakash Srivastava, Indian Institute of Technology, Mandi
17. Dr. Binay Panda, Institute of Bioinformatics and Applied Biotechnology, Bangalore
18. Dr. K.K.Deepak, Department of Physiology, All India Institute of Medical Sciences
19. Dr. Rohit Bhatia, Dept of Neurology, All India Institute of Medical Sciences
20. Dr. Oddity Mukherjee, National Centre for Biological Sciences, Bangalore
21. Dr. Vishal Bansal, Vallabhbhai Patel Chest Institute, University of Delhi, Delhi
22. Dr. Tanuja Nesari, Director, All India Institute of Ayurveda, New Delhi
23. Dr. Vitthal Huddar, Associate Professor, Dept. of Kaya Chikitsa, All India Institute of Ayurveda, New Delhi

24. Dr. Padma Dolma, SNM Hospital, Leh

25. Dr. Vandana Jain, Dept. of Pediatrics, All India Institute of Medical Sciences

26. Dr. Sara Hillman, Institute for Women's Health, University college London, UK

Patent Granted

Bhavana Prasher, Shilpi Aggarwal, M. A. Q Pasha, Mitali Mukerji Titled: **Biomarker for detecting High- Altitude Adaptation and High Altitude Pulmonary Edema**

International Publication Number **W O 2012/076943 A1**

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Samir K Brahmachari, **Bhavana Prasher**, Shilpi Aggarwal, Sapna Negi, Mitali Mukerji *Questionnaire for Prakriti assessment*.
Reg No. SW-2284/2005, Reg Date 13-May-05

Oral Presentations and lectures

1. Gradation of symptoms of Kapha- At seminar on Gradation of Ayurvedic symptoms I.P.G.T.&R.A, Jamnagar, July 1995
2. Fundamental Concept of *Ojas* and its role in attaining positive health and as a preventive measure, I.P.G.T. & R.A., Jamnagar, 1997.
3. Concept of AIDS and Ayurveda- At seminar on AIDS and Ayurveda, Jamnagar, 1996.
4. Methods of Clinical Evaluation of Ayurvedic Drugs – At National seminar on Research Methodology in Ayurveda, I.P.G.T& R.A., Jamnagar, 1996.
5. Concept of *Ojas* – At Second International Conference on Lifestyle and Health, I.H.C., New Delhi-1999.
6. Fundamental concepts of Ayurveda, Prakriti and personalized medicine – At Institute of Genomics & Integrative Biology (Erstwhile, CBT), Delhi- 2002
7. Criteria for assessment of Prakriti, at National workshop on clinical research Methodology, I.P.G.T. & R.A, Jamnagar, Nov. 2009
8. Molecular basis to concept of Prakriti at workshop on Science of Indianness an Industry academia interaction, **invited talk** at ITC, Bangalore, Nov. 3-4, 2010.

9. Ayurgenomics: A novel approach of integration of Ayurveda and genomics for predictive and personalized medicine, **Invited lecture** at Botanicals in integrated healthcare, convention- 2010, Kolkata- December 26- 28, 2010.
10. Ayurgenomics: A novel integrative approach of Ayurveda & Genomics for Predictive & Personalized Medicine. **Plenary talk** at Acharya P.C.Ray young scientists' Conference At Presidency University, Kolkata, February 2012
11. Ayurgenomics: A novel integrative approach for predictive & personalized medicine **Invited lecture** at National Workshop on "Research Project Designing & Evaluation" IPGT&RA, GAU, Jamnagar, 20th – 21st July 2012
12. Genetics and Ayurveda: Integration of Ancient and Modern methods for development of predictive and personalised medicine. **Invited lecture** at Yashaswini-2, Rashtriya Istri Vaidya Parisamvad "Genetics to Geriatrics" on 19th January, 2014 at Kalyan, Mumbai - 1500 lady practitioners from Ayurveda stream attended.
13. Understanding Beeja Dosha/ Genetics related to Sthaulya/ Obesity : Ayurgenomics Approach. **Invited lecture** at Meda Manthana; National Seminar on obesity, KLEU' BMK Ayurveda Mahavidyalaya, Nelgaum, 10th to 12th April, 2014
14. Evolution and establishment of Prakriti analysis based on Ayurvedic principles for understanding baseline variability in health and disease (scope & purpose)- **Invited talk** at Brainstorming session of assessment of Prakriti, based on Ayurvedic principles by Central Council for Research in Ayurvedic Sciences (CCRAS), 7th August, 2014.
15. Ayurgenomics: A novel approach for integration of TRISUTRA concepts of Ayurveda in Translational medicine . **Invited talk** in the plenary session on Ayurgenomics in the National Conference on 'Ethnopharmacology and Biotechnology in Drug Development : Prospects and Challenges' organised by Institute of Biomedical Sciences and Vaidya Ram Naryan Sharma Institute of Ayurved and Alternate Medical Education and Research, Bundelkhand University, Jhansi in collaboration with Society for Ethnopharmacology, 14th November, 2014
16. Ayurgenomics: Exploring molecular correlates of Ayurvedic principles towards preventive & personalized medicine, **invited talk in Prakriti Workshop** organized by Bharatiya Dharohar, New Delhi, 4th July 2015
17. Ayurgenomics: Exploring molecular correlates of Ayurvedic principles towards preventive & personalized medicine, **invited talk** at South Delhi Municipal

- Corporation (SDMC), **CME series- Clinical Meeting**, New Delhi, 15th July 2015
18. Ayurgenomics: Exploring the conceptual framework of *Trisutra Ayurveda* for integration with genomics and modern medicine, an **Invited talk at National Ayurveda Students and Youth Association (NASYA) Annual Meeting** New Delhi, 13th September 2015
 19. Ayurgenomics: Exploring Trisutra Ayurveda for understanding the molecular basis of Ayurveda principles, **invited talk** at NASYACON 2015- Youth and Ayurveda, Uttarakhand, Haridwar on 27th September 2015
 20. Ayurgenomics: An integrative approach of Ayurveda and genomics for development of personalized medicine, **invited talk** at 5th Annual Meeting of Indian Academy of Biomedical Sciences (IABS 2016) on 26th February, 2016, India Habitat Centre, Delhi
 21. Ethics in biomedical practice and research: Ancient Insights and modern practices, **Invited talk** at 5th International Conference on Ethics; SOCIAL RESPONSIBILITY: THE ETHICAL DIMENSIONS, Organized by Ramanujan college, University of Delhi, on 13th March 2016
 22. Ayurgenomics for predictive, predictive and personalised medicine, **invited talk** in Chandigarh Yoga Festival, Session on Yoga and Medicine at Hyatt Regency, 12th June 2016 (on the occasion of international yoga day celebrations)
 23. Ayurgenomics: exploring genomic & molecular correlates of Ayurvedic principles of predictive & personalized medicine, **invited talk** at Symposium on History of Psychiatry in India at NIMHANS, Bangalore, June 15-16, 2016
 24. Education, clinical practice and research in Ayurveda: contemporary relevance of Ancient principles and methods in modern era, Invited talk at Special Centre for Sanskrit Studies, Jawaharlal Nehru University, New Delhi, during Sanskrit week celebrations, 21st August 2016
 25. Evolution and Establishment of Prakriti Analysis based on Ayurvedic Principles for Understanding Baseline Variability in Health & Disease , **Lecture at M.S.M Institute of Ayurveda, B.P.S.Women's University** Khanpur Kalan 28th September 2016

26. Trisutra ayurgenomics: a novel integrative approach for development of translational medicine **At XXI Quality Improvement Programme**, CSIR- IGIB visit, Organised by DIPSAR, Delhi University, 3rd February 2017
27. Ayurgenomics: Bridging Ayurveda and Genomics, **Invited Lecture** at Symposium and Exhibition on Alternative Medicine (SEAM-2017), **SRI VENKATESWARA COLLEGE, University of Delhi**, March 1st 2017
28. Ayurgenomics: Bridging Ayurveda and Genomics for predictive and personalized medicine, **invited talk at OJA festival**, constitution club, New Delhi 7th May 2017
29. **Prakriti as a window to understand Biology of tridosha and Personalized Medicine**, an Invited lecture on 22nd December 2017 at Panchakarma Training Programme for Ayurveda Medical Officers, Ambala District. Organised by Dept. of AYUSH, Haryana, India
30. AYURGENOMICS: Prakriti as a window to understand Biology of tridosha and Personalized Medicine Panchakarma Training Programme For AMOs, Kurukshetra District Organised by Dept. of AYUSH, Haryana India, 14th January 2018
31. Ayurveda perspective for clinical management and research potential in Myopathies at A conference on Perspectives in GNE Myopathy, Research, clinical management & patient care At Indian National Science Academy February 17th 2018
32. **Harnessing the potential of Satmya concepts of Dynamic adaptation and adaptability from Ayurveda for Precision Nutrition** At Traditional Health Knowledge Inspired Nutraceuticals, Trans Disciplinary University, Bengaluru on March 6th 2018
33. **Ayurgenomics: A novel Ayurveda based approach of linking disease biology and drug research** at XXVI Quality Improvement Programme For Teachers of AICTE approved pharmacy colleges across the country with the theme on Current Trends in Pharmaceutical Sciences at DIPSAR, DPSRU, Delhi on 12th March 2018
34. **Precision Nutrition: Nuggets from Ayurveda, Indian system of medicine** At Symposium on Computational Gastronomy: The emerging data science of food, flavors, and health, Indraprastha Institute of Information Technology Delhi 17th March 2018
35. Lecture on Ayurgenomics for AIIA P.G. Scholar's orientation programme- January 2019
36. Special lecture on Ayurgenomics at CME on CKD, at All India Institute of Ayurveda, organised by All India P.G. Scholar 's Association
37. Ayurveda approach for drug discovery and Development : Novel insights from Ayurgenomics, at XXXth Quality Improvement Programme For Teachers of AICTE approved pharmacy colleges across the country with the theme on

Current Trends in Pharmaceutical Sciences at DIPSAR, DPSRU, Delhi on 27th March 2019

38. Designer diet plan: Personalized considerations for health and nutrition in Ayurveda an invited talk titled: at 3rd Symposium on Computational Gastronomy held at IIT, Delhi, 21st December 2019
39. **Scientific Methods as described in Ayurveda** Presentation to AIIMSONIAN meet at CSIR-IGIB, 26th January 2020
40. **Ayurgenomics for P5 Medicine: Deconvoluting *Trisutra Ayurveda* for Translational Research** at Amity University in DST sponsored workshop on Traditional Medicine and modern approaches for affordable and accessible healthcare, 10th February 2020
41. **Understanding Dosha Prakriti through Ayurgenomics**, at Dr. L. Mahadevan's Vaidyanadham- online class series, 17th June 2020
42. **Introduction to Prakriti Assessment methods and tools**, at Online Training of Master Trainers, Organised by Ministry of AYUSH for C.H.O, under Ayushman Bharat scheme, July 1st 2020

International Presentations

1. Sapna Negi*, **Bhavana Prasher***, Shilpi Aggarwal, Amit K. Mandal, Tav Pritesh Sethi, Shailaja R. Deshmukh, Sudha G. Purohit, Shantanu Sengupta, Sangeeta Khanna, Farhan Mohammad, Gaurav Garg, Samir K. Brahmachari, Indian Genome Variation Consortium, Mitali Mukerji.
Molecular Correlates of extreme human constitution types defined in Ayurveda: The Indian traditional system of medicine
Poster presentation in the XIIIth International Human Genome meeting (HGM2008) held in HICC Hyderabad from 27th September 2008-30th September 2008.
*equal contributions
2. *Genomic Correlates of Prakriti. Key Note Address 3rd World Ayurveda Congress* held in National Institute of Ayurveda, from 19-21 December 2008.
3. *Ayurgenomics: a new approach in predictive & personalized medicine*
Plenary Presentation at 4th World Ayurveda congress, Bangalore December 2010
4. *Ayurgenomics: Integration of Clinical methods of Ayurveda with Modern Genomics for Personalized Medicine* **Key Note Address: Basic & Translational Research in Ayurveda, 5th World Ayurveda Congress, Bhopal, December 2012.**

5. *Ayurgenomics: A novel integration of Ayurveda and Modern Genomics for predictive and personalised medicine. Key note Address:* International Conclave on Current Researches in Healthcare ICCRH-AYUSHYA 2013 , Bareilly , India 15th September 2013
6. *Deciphering the Genomic Variability through phenotype - phenotype links: A novel Ayurgenomics Approach, Invited lecture in Indian Society of Human Genetics (ISHG),* 23rd - 25th , January 2014 in Ahmadabad
7. Posters on Ayurgenomics displayed at Human Genome Meeting, 2012 (HGM-2012) as a part of CSIR's scientific Activities

HUGO Poster1 Title: ***Ayurgenomics: Indian Traditional Medicine for Genetic marker discovery***

HUGO Poster 2 Title: ***Ayurgenomics: Threading molecular variability and re-discovering the Regulatory code***

8. *Genomics through Ayurveda Prism (About Ayurgenomics Project) invited talk* at the research conclave "Ayurveda Inspired Discovery", held as part of the **Sixth World Ayurveda Congress (WAC)** on 7th Nov 2014 TRISUTRA
9. *Ayurgenomics: Exploring the genomic basis of Ayurveda principles for development of predictive and personalized medicine Invited talk at 14th FAOBMB congress* Current excitements in Biochemistry & Molecular Biology for Agri. & Medicine, CSIR-CCMB 30th Nov. 2015,(BITS Pillani Hyderabad)
10. *Ayurgenomics: Exploring the genomic basis of Trisutra Ayurveda towards development of predictive and personalized medicine a Key note Lecture at 6th International Symposium on Translational Cancer Research – Prevention and Treatment of Cancer: Hypes and Hopes”* held during February 04-07, 2016 at Hyatt Regency, Ahmedabad, Gujarat
11. *Trisutra Ayurveda: Exploring the framework of personalised, predictive preventive promotive medicine through participatory approach Plenary talk at International Seminar* on "Promotion, Prevention and Pacification: Ayurvedic Landscape" at Science City Auditorium, Kolkata and J B Roy State Ayurvedic Medical College & Hospital on 09th Feb, 2016

12. *Ayurgenomics: Exploring the genomic and molecular basis of Ayurveda principles for development of predictive and personalized medicine* an **invited talk at 3rd International congress on Ayurveda** with Theme: Ayurveda, the meaning of life: the future in the tradition, 18th september 20, Italy.
13. *Ayurgenomics: Pre symposium workshop* at Tradmed international 2017 at University of Sri Jayewardenepura, **Sri Lanka**.
14. *Ayurgenomics for exploring the genomic and molecular basis of translational aspects of Ayurveda of Predictive and personalized medicine* a Key note lecture At **Tradmed International 2017, Colombo, Sri Lanka** 23rd November 2017
15. *Ayurgenomics: A novel approach of integration of Ayurveda and genomics for development of predictive and personalized medicine*, an invited talk At INDO-US COLLOQUIUM On RECENT DEVELOPMENTS IN INTERDISCIPLINARY RESEARCH, on July 2, 2018 , Hansraj College, Delhi University, Delhi
16. Plenary speakers in 2nd Ayurveda Developmental Therapeutics Program (ADTP) Meeting Pune, Friday, February 8th 2019
17. Ayurgenomics: Exploring the genomic and molecular basis of concept of Ayurveda *Prakriti* for predictive and personalized medicine ; Invited speaker at ASEAN- INDIA Training Workshop On Emerging Technologies for young Biotech professionals from ASEAN MS By CSIR-IGIB, 21st September 2019

Seminars Attended

1. Update Piles, fissure, fistula seminar, KEM Hospital, Mumbai, 1991.
2. All India Workshop on Pancakarma, Jalgaon, Maharashtra, 1992.
3. Seminar on Gradation of Ayurvedic symptoms I.P.G.T.&R.A., Jamnagar, July 1995
4. Seminar on AIDS and Ayurveda, I.P.G.T& R.A., Jamnagar, 1996.
5. National seminar on Research Methodology in Ayurveda, I.P.G.T.&R.A, Jamnagar, 1996.
6. International Seminar on Free Radical Mediated Diseases And Ayurveda, I.M.S, B.H.U., Varanasi, 1996.
7. AIDS (ojoksaya) Vaijnani Parisanvada at University of Mumbai, 1997.
8. National Seminar on Kaumar bhritya, I.P.G.T.& R.A., Jamnagar, 1997.
9. Weekly Seminars on Various Research Subjects – carried out by Scholars of M.D.(Ayu) and Ph.D. (ayu) of different departments, I.P.G.T.& R.A., Jamnagar, 1994-1997.
10. Second International Conference on Lifestyle and Health, I.H.C., New Delhi-1999.

11. International Symposium on Molecular Toxicology and Environmental Health, at ITRC, CSIR, Lucknow November 2003.
12. Satellite meeting of 10th FAOBMB Congress, At IGIB, December 2003.
13. International Symposium on Medicinal & Aromatic Plants, at All India Institute of Medical Sciences, New Delhi, 2009.
14. Indo- US symposium on Ayurvedic, siddha & Unani Drugs: Development & Marketing, December 2-4, 2009
15. Life science conclave- 2010 on Drug Discovery and Development, organized by CII at New Delhi, August 18-19, 2010
16. International Conference on the Utilization of the Traditional Knowledge Digital Library as a Model for Protection of Traditional Knowledge, March 22-24, 2011
17. Genomeet 2012, CSIR- IGIB, New Delhi, December 2012
18. International conference on Next Generation Sequencing, CSIR- IGIB, New Delhi, Nov. 2013
19. Cardiomed conference at IGIB, 2017
20. Institutional seminars, by students & faculty, guest lectures, research council meetings etc
21. Consultative meet to prioritize AYUSH research activities in the field of cancer for international collaboration At Behest of AYUSH, Government of India *Organized by: IASTAM India Feb. 21 & 22, 2016 , Pune*
22. India-U.S. Workshop on Traditional Medicine March 3-4, 2016, organized by Ministry of AYUSH, New Delhi
23. Consultative meet on development of Prakriti assessment scale under Ayurgenomics Project, 22 and 23 March 2016, CCRAS, Janakpuri
24. Ministry of AYUSH and CII Ayurveda Conclave, October 2017, India Habitat Centre, New Delhi
25. Raising towards Excellence, Conference of Heads of National AYUSH institutes, July 17-18, 2018 at India International Centre, Delhi

DETAILS OF EXPERIENCE

A. Teaching: Students of diverse disciplines like Ayurveda as well as modern science streams

1. 2 years at I.P.G.T& R.A., Jamnagar, for first year M.D. (Ayurveda) scholars.

Subjects - Basic principles of Ayurveda – *Ojas, Rasayana, and positive health, Srotas, Agni, dhatuposhana, tridoshas and Prakriti, and charaka samhita*

2. Trained and Guided Ph.D. students of IGIB (both from Ayurveda and modern biology students), working in some specific aspects of Ayurgenomics project doing interdisciplinary work in the field of Ayurgenomics field.
3. **Training of a M. Sc, M.Pharm, M.Tech students from different universities** for their R & D projects and dissertation work towards partial fulfillment of the degree.
4. **Supervising B.tech Computer science students from BITS, Pilani on use of machine learning approaches for analyzing Ayurgenomics phenotype data during their summer internship programme at IGIB**
5. **Trained and guided more than thirty Ayurveda doctors working in Ayurgenomics project** esp. in areas such as literary exploration from Ayurveda which is important for its integration with modern science.
6. **Conducted training workshops for Ayurveda doctors** for clinical phenotyping activity in healthy and diseased populations across diverse ethnicities and geographical locations, objective parameters for assessment of Prakriti. Training in clinical research methodology including data collection, documentation, storage and analysis.
7. **Conducting camps for prakriti**, diet & life style pattern assessment for personalized recommendations in preventive and promotive health.
8. **Adjunct faculty**, at Trans- disciplinary University, Bangalore for M.Sc course In Ayurveda Biology.
9. Development of course curriculum and teaching of **add on course on Ayurbiology for undergraduate students of modern science** in collaboration with Dept. of Biochemistry, Sri Venkateshwara College, University of Delhi, **since 2017 (three consecutive years completed)**
10. **Bhavana Prasher**, an Invited lecture on **Prakriti as a window to understand Biology of tridosha and Personalized Medicine**, 22nd December 2017 at Panchakarma Training Programme for Ayurveda Medical Officers, Ambala District. Organised by Dept. of AYUSH, Haryana, India
11. **Ayurgenomics course co-ordinator and teacher** for AcSIR (Academy for Scientific & Innovative Research) Ph.D students at IGIB since 2014
12. Classes on Traditional systems of medicine in south Asia for students of South Asian University as a part of their coursework- March 2019
13. **Mentorship of PhD Students in the area of Ayurgenomics**
 1. Atish Gheware- AcSIR
 2. Ritu Rani Chauhan, AcSIR
 3. Ratika Sehgal, AcSIR

4. Rintu Kutum- AcSIR
5. Pradeep Tiwari- AcSIR
6. Madiha Haider, AcSIR
7. Sunanda Singhmar
8. Gaura Chaturvedi
9. Dr. Prathiban R- AIIMS, Delhi
10. Dr. Pamila Dua, AIIMS, Delhi
11. Dr. Adil Rais, I.P.G.T & R.A, GAU, Jamnagar, Gujarat
12. Dr. Nishant Malhotra, All India Institute of Ayurveda, New Delhi

B. Research:

1. *Two years MD research on “Fundamental Concept of Ojas and its Role in Attaining Positive Health and as a Preventive Measure”*

Ojas has been described as a physiological entity which is a quintessence of all bodily tissues and is responsible for coordinating the activities of body both at psychic as well as somatic levels and providing strength and vitality to body. (Caraka Su.30).

In this Research project, for the first time fundamental concept of *Ojas* was explored in detail from classics including its applied aspect in health and diseases. Modern scientific interpretation to this unique physiological concept of Ayurveda was explored for the first time through pharmacological approach using *Rasayana* formulation in experimental models.

Pharmacological experiments were designed on the lines of Ayurveda parameters described for assessment of *Ojas* in Ayurveda text for e.g., digestive capacity (by Food conversion ratio and food consumption in rats), physical strength (by swimming endurance test in rats), mental strength (using behavioral despair test in mice and enforced swimming stress induced ulceration and leucopenia in rats), resistance power (by sheep RBC induced antibody formation) etc. For the purpose of assessing the effect of *Ojas*, a *Rasayana* formulation described to enhance *Ojas* was administered on swiss albino rat and mice.

The study also included clinical assessment of effect of *Ojas* enhancing *Rasayana* formulation on patients of general debility and convalescence as well as healthy volunteers using research proforma, biochemical and hematological parameters including spirometry.

Results of the research work carried out were presented & submitted as thesis and also published in journal *Ayu*.

2. *Ayurveda Expert in Traditional Knowledge Digital Library Programme (TKDL), From October 2001- Feb 2003. At NISCAIR, CSIR, New Delhi (A collaborative project of Dept. of, CSIR & Ayush)*

A primary objective of the TKDL project was to provide access about the information on formulations described in Ayurvedic texts in a digitized format to patent offices. I joined this programme with the vision of its potential utility in future Ayurveda based research both basic and applied. In this project I contributed in –

- i. Identifying, transcribing and finalising the information on formulations along with pasting the scanned images of the original verses.
- ii. Execution of project by providing inputs during discussions on quality check, editing the content, updation of the data entry software.
- iii. Conversion of the script of entire database into Diacritical format (a method of transcription of Sanskrit into English) and was also involved in development of software with IT team at TKDL.
- iv. Organizing a workshop for orientation of Senior Ayurveda Experts on methods and structure of execution of TKDL
- v. Writing topics for website content of TKDL (www.tkdl.res.in) Personal Hygiene (swasthavritta- dinacharya and ritucharya) and overall editing of the website content on Ayurveda.
- vi. Chapter in user manual of first CD on TKDL, “Indian systems of medicine: Ayurveda, concepts and ticklish issues.

3. Project Associate in an Indo- Russian Project, “Genotype- Phenotype correlation Based on Principles of Ayurveda with special Focus on Prakriti”, at IGIB. CSIR, Delhi from 2003 – August 2008.

IGIB is one of the main participating organizations in the Joint Indo–Russian Centre for Ayurvedic research and under these auspices conducted an exploratory research to understand principles of Ayurveda in the molecular terms. I joined this project with the aim of developing a conceptual concordance between the most ancient and modern sciences for personalized, predictive, preventive and curative aspects of the medicine.

My contributions in this project were as follows –

- i. Associated from the inception stage and involved in planning and implementation of project from the beginning.
- ii. One of the primary contributions of mine has been the **development of questionnaires for objective assessment of Prakriti, both detailed and screening**. Along with questionnaire I developed a manual of *Prakriti* analysis.
- iii. Also led the development of automated software for scoring of *Vata*, *Pitta* and *Kapha* in individuals’ *Prakriti*.
- iv. Development of software - Anthroprogramme for analyzing and interpreting the data of anthropometrical measurements.

- v. Trained two Ayurveda doctors for carrying out phenotyping of individuals for analysis of their prakriti.
- vi. Phenotyping of nearly 3000 individuals and selection of volunteers of ek doshaj *Prakriti* and recruiting their samples for biochemical, RNA and DNA analysis in India and Russia
- vii. Also in developing conceptual concordance between Ayurveda and Modern genomics for their integrative analysis, beginning from selecting and prioritizing genes polymorphisms/ haplotypes to be typed in the selected samples of *Prakriti*, designing microarray experiments, biochemical profiles as well as global data analysis and interpretation including annotation, GO analysis, RT, biochemical analysis and writing of manuscript.

4. International Experience

Prakriti Analysis in ethnically diverse population of Russia

In the Indo-Russian project, we carried out *Prakriti* analysis of Russian individuals using the same questionnaire for *Prakriti* analysis, in order to cross validate the concept of *Prakriti* in an ethnically diverse population.

Our group visited Russia for the *Prakriti* analysis of Russian volunteers using the same method and successfully screened, identified and recruited volunteers of extreme *Prakriti* for further analysis. Prior to visit a short screening questionnaire was provided to volunteers in Russian who could self fill it. Based on these questions individuals were selected who would be of predominant *Prakriti*. Upon detailed phenotyping in Russia substantial concordance with the screening questionnaire was observed.

This provided two insights. Firstly, it was possible to identify *Prakriti* across a different ethnic population inspite of the fact that Indians and Russians exhibit striking differences in the morphological features for e.g height, skin colour, eye colour, and differences in dietary habits etc. and secondly, unassisted screening of larger number of individuals using the screening questionnaire was successful in identifying specific *Prakriti* individuals from phenotypic heterogeneous population.

This kind of research has been done for the first time where it has been shown that Ayurvedic method of phenotypic stratification holds true across such diverse populations.

Establishment of Ayurgenomics: A new integrative field of research initiated at CSIR

Through integration of Ayurveda principles and methods with modern genomics our group for the first time has been able to demonstrate genomic and molecular correlates of the prakriti and tridosha principles of Ayurveda. Through this Ayurgenomics approach where I provide and execute the Ayurveda component of the study and also do the integrative analysis with genomics counterparts, we have been able to identify novel links between a

gene and a genetic variation with high altitude adaptation. Ayurgenomics study has not only provided a novel molecular framework for integration of these two disciplines, but also highlighted that this integrative approach of Ayurgenomics can accelerate discovery of markers for predictive and personalized medicine.

5. Contributions in the Ayurgenomics project as Co-PI with team IGIB

Overall the project aimed at correlation of Prakriti concept of Ayurveda with modern clinical and biochemical parameters as well as genomic and molecular markers for development of predictive and personalized approach in medicine.

Through this project Ayurgenomics methods for the first time were implemented in Public Health set up.

In this, normal Healthy subjects are classified into different sub groups on the basis of Ayurveda methods of Prakriti and predominant dosha Prakriti individuals are further analysed using clinical, & molecular genomic methods to search for biomarkers of disease susceptibility and response to external environment including drugs.

KEM Hospital Pune's Vadu Rural Health Programme, which has Health and Demographic Surveillance System, was selected as the field of study. More than 10000 subjects residing in Vadu Area have been screened for prakriti in the field and more than 500 subjects have been recruited for detailed clinical phenotyping using different objective parameters and their samples are collected for further molecular analysis.

Specific contributions/ responsibilities in the project:

- Development of the project, "AyurGenomics: Integration of Ayurveda with Genomics for systems biology approach in predictive and personalized medicine" as a Co-Principal investigator with IGIB team.
- Selection of different parameters for objective phenotyping of identified individuals related to skin, anthropometry, and biochemical measurements etc. with the IGIB team
- Developing protocols for objective phenotyping to be undertaken in the study for correlation with *Prakriti* with the IGIB team
- Development of Marathi version of *Prakriti* screening questionnaire
- **Training surveillance workers for door-to door screening of volunteers for their Prakriti**
- Analysis of data generated by filling up of screening questionnaire to identify subjects with *ekala Prakriti*
- **Training Ayurveda Doctors in Analysis of *Prakriti* Phenotype data coming from screening questionnaire to identify individual of *ekala Prakriti* (extreme constitution types)**

- Finalisation and selection of individual of ekala Prakriti (extreme constitution types) from data and selection of samples for genomics experiments.
- Modeling of prakriti through statistical and machine learning methods and identification of features (including objective measures) that could differentiate predominant Prakriti groups.
- Analysis of molecular and genomic variability observed among prakriti groups, and its correlation with descriptions of biology of tridosha and prakriti.

6. At CSIR- Ayurgenomics Unit- TRISUTRA

CSIR Unit for Translational Research and Innovative Science Through Ayurgenomics is an inter-disciplinary networked Unit with a mission to develop Affordable health care solutions based on traditional knowledge of Ayurveda, knowledge of modern genomics and medicine. The main activity of the unit is to conduct research aimed at providing scientific credence and global acceptability to Ayurveda, new leads to genomics, create interdisciplinary expertise in the area and build resources for Ayurgenomics.

As PI (Ayurveda), Development of collaborative Research Proposal for CSIR- Ayurgenomics Unit with the IGIB scientists, and operationalisation of the same.

1. Development of collaborations with Ayurveda Institutes, brainstorming with the collaborators from Ayurveda and Modern medicine academicians and physicians as well as modern genomics scientists;
2. Development of collaborative research proposals with five different institutions viz. Ayurveda and public health cohort.
3. Setting up collaborative sites for execution of collaborative projects that includes ethical clearance for carrying out such large scale studies for Prakriti assessment, Detailed objective phenotyping (DOP) and processing and storage of biological samples;
4. **Development of uniform protocols for recruitment of subjects, detailed proforma for health assessment, prakriti analysis and DOP;**
5. **Training and supervising the Clinical Phenotyping and Prakriti Assessment process, data QC and Analysis of prakriti.**
6. Integrated analysis of Ayurveda based prakriti and objective phenotyping data, and Modelling of *Prakriti*.
7. Analysis of biochemical, Gene expression and genotype conducted on predominant prakriti subjects, and Integrated analysis of Ayurveda descriptions of Prakriti and tridosha with the analysis results of different

OMICS levels experiments to provide scientific validation to the concept as well as leads for discoveries in modern genomics.

8. Validation of molecular signatures of Prakriti as well as therapeutic interventions described in Ayurveda using model systems developed for diseases like Asthma, metabolic syndrome etc
9. **Awareness creation about Ayurveda, Ayur-biology and Ayurgenomics through lectures and workshops**

C. Clinical - 8 years (1993-2001)

- i. One year Houseman ship, with six months each at Smt.K.G.Mittal Hospital, Charni Road, Mumbai and Primary Health Care Centre, Kasara, Thane District
- ii. One year House Physician (Honorary) at I.P.G.T & R.A. Hospital, Jamnagar.
- iii. Two years Clinical Registrar (Honorary) at I.P.G.T & R.A. Hospital, Jamnagar.
- iv. Four years as Ayurveda Consultant (Post M.D): Own Private clinic, Vedanta Ayurveda, Faridabad & Delhi.

Developed **herbal formulations** following the fundamental principles of Ayurvedic Pharmaceuticals and used them successfully for treatment of patients of **female infertility, menstrual disorders, migraine, menopausal syndrome, arthritis, auto-immune disorders, osteoporosis, slip-disc, and Gout.**

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(Bhavana Prasher)