

Ayurgenomics- TRISUTRA

Indian CST and CSIR-IGIB has started the global data basing of gene-disease knowledge for 21st century research and healthcare project that will become the national / International repository, in the areas of mutual interest, cooperative and collaborative activities, that would also will be able to address multidisciplinary scientific, technological and educational problems of relevance to the country.

Indian CST and CSIR-IGIB-TRISUTRA unit have come together in a spirit of mutual interest to synergize their individual strengths in the field of data base development and project management./ monitoring and analysis. It is therefore felt that initiating collaborative programs would be of considerable mutual benefit providing global accessibility based on a solid scientific credential creating inter-disciplinary expertise and developing marketability leads will be a major focus under this collaborative research activity in the areas of mutual interest, cooperative and collaborative activities, which would address multidisciplinary scientific, technological and educational problems of relevance to the country.

Title: Ayurgenomics TRISUTRA Ayurgenomics: Integration of Ayurveda with Genomics for systems biology approach in predictive and personalized medicine and Data modeling and database development for integrated data analysis and creation of a project management portal

Duration: March 2009 to December 2017

Collaborating/Participating Institutes (s):

- Institute of Genomics and Integrative Biology, Delhi
- Vadu Rural Health Program, KEM Hospital Research Centre, Pune.
- Indian Centre for Social Transformation, Bengaluru

Sponsor: Council of Scientific and Industrial Research, Anusandhan Bhawan, 2, Rafi Marg, New Delhi

Investigator (s):

1. Dr Mitali Mukerji (Principal Investigator), Institute of Genomics and Integrative Biology, Delhi
2. Dr Bhavana Prasher (Principal Investigator), Institute of Genomics and Integrative Biology, Delhi
3. Dr Sanjay Juvekar (Co Investigator), Vadu Rural Health Program, KEM Hospital Research Centre, Pune.
4. Dr Binuja Varma (Co Investigator), Institute of Genomics and Integrative Biology, Delhi
5. Raja Seevan (Co Investigator), Indian Centre for Social Transformation, Bengaluru

Rationale: In Ayurveda texts, though the principles of phenotypes in health and disease states are extremely well described, they are not readily decipherable and hence its potential

has not been appreciated by modern genomic researchers. According to Ayurveda individual's basic constitution (Prakriti) describes its predisposition and prognosis to disease status and also the treatment for disease and lifestyle regime. In Genomics, individual's basic constitution is decided by its genetic makeup which indirectly reflects the levels of various biochemical parameters in individual which states its Health status. We aimed at establishment of high correlation of Prakriti with genomic signatures by isolating DNA, RNA and Plasma from the blood sample. It is anticipated that this approach of Ayurgenomics would allow development of surrogate methods for cost effective screening of predisposed individuals in the population. This would result in development of an integrative approach to systems biology for disease and health state.

Aim: To integrate Ayurveda into mainstream contemporary biology and to achieve global acceptability of the concepts and science of Ayurveda.

Objectives/Secondary Objectives:

- To develop objective measures (anthropometric, skin types, autonomic nervous system, olfaction abilities, vital capacity etc) for Ayurveda concept based phenotypic (Prakriti) assessment.
- To assess genome wide (expression, genetic, epigenetic and biochemical) differences in large number of individuals defined by specific Prakriti (Vata, Pitta Kapha) groups from a genetically homogeneous population
- To study segregation of Prakriti phenotypes in family based studies and in older age group along with inheritance of Prakriti at genomic and molecular level.

Added to this, CSIR has established TRISUTRA (Translational Research and Innovative Science Through Ayurgenomics) at Institute of Genomics and Integrative Biology, Delhi

Broad Objective of TRISUTRA-

- Development of affordable healthcare solutions based on Ayurveda, modern genomics and modern medicine knowledge.
- To conduct research aimed at validation and providing scientific evidence to principles/concepts described in Ayurveda for predictive, personalized and pre-emptive approach to health and diseased conditions.
- To undertake and co- ordinate translational research for developing affordable health care solutions for diseases of national priority based on Ayurveda literature.
- To develop interdisciplinary human resources.

Methodology and Study population

- 10,000 individuals of equal number of healthy males and females between age groups of 18–40 years are residing in 22 villages of VRHP area were screened for identification of prospective subjects of predominant Prakriti
- Recruitment of potential 528 individuals of predominant for detailed objective phenotyping as well as molecular and genomic studies
- Out of these 528 individuals, family members of identified 106 Predominant Prakriti individuals are being recruited in ongoing phase to study heritability of Prakriti

Anticipated Outcome: This study aims to integrate Ayurveda into mainstream contemporary biology and achieve global acceptability of the concepts and science of Ayurveda. However some immediate outcomes are-

- Development of Database of Prakriti Phenome of individuals belonging to multigenerational families and older age groups.
- Development of repository of samples like; DNA, RNA, Serum, Plasma, Oral metagenomic DNA
- Molecular signatures/objective phenotyping parameters which help classify the Prakriti types can be used to ensure phenotypic heterogeneity in case control association studies.
- Determination of predictive markers for disease predisposition.

Ayurgenomics is an integrative approach of Ayurveda and Genomics for discovery of predictive markers for preventive and personalized medicine.

In a CSIR study, recently a paper has been published in PNAS (Proceedings of National Academy of Sciences), wherein scientists have reported identification of a gene and a genetic marker linked to high altitude adaptation and hypoxia responsiveness, through genetic analysis of extreme constitution types as defined in Ayurveda. EGLN1, a key oxygen sensor gene was linked to high altitude adaptation and Hypoxia responsiveness using this novel integrative approach of clinical phenotyping methods of Ayurveda, population genetics and disease genomics.

Earlier CSIR has published paper on gene expression and biochemical correlates of extreme constitution types (vata, pita and kapha) in 2008, in Journal of translational medicine.

Following one of the cues from gene expression differences, wherein a gene could be identified and the genetic marker associated with high altitude adaptation and a high altitude illness. The predictive markers that are identified within this gene by the CSIR group have also been filed for patent. Ayurgenomics study so far 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/assist discovery of markers for predictive and personalized medicine.